EXPLORING THE APPLICATION AND EFFECT OF 5-IN-1 STRATEGIES IN TEACHING MATHEMATICS

Patrick G. Galleto, Gerwil R. Descallar, Philippines
Volume 1, Issue No.2 December 2016 ISSN: 2546-0579

Abstract

Teaching strategies help students take more responsibility for their own learning and enhance the process of teaching for learning. This study aimed to find out the application and effect of strategies in teaching Mathematics among Grade 7 students of Kipit Agro-Fishery National High School, Labason, Zamboanga del Norte, School Year 2015–2016. Quasi–experimental method of research utilizing the Pretest–Posttest Nonequivalent Group Design was employed in which the experimental group with 51 students was exposed to 5-in-1 strategies in teaching Mathematics while the control group with 46 students was exposed to the traditional talk-chalk-eraser strategy. The teacher–made–questionnaire consisting of 60 items was used to determine the pretest and posttest performance of the students in both groups. The statistical methods used were the arithmetic mean, z – test one – sample group, t – test for independent samples, and t – test for correlated samples. The study revealed that the 5-in-1 strategies in teaching Mathematics which greatly influenced students' academic performance showed substantive proof or evidence of their effectiveness. This necessitates that teachers and students should collaborate actively in constructing mathematical knowledge through the use of 5-in-1 strategies that encourage them to explore and investigate mathematical ideas. Moreover, teachers and students should cooperate in the teaching and learning of Mathematics to ascertain high level of students' performance which is reflective of the students' success and teachers' teaching achievement.

Keywords: *games, manipulatives, real life application, differentiated instruction, integrating technology devices, achievement*

1.0 Introduction

With the country's integration to the Association of Southeast Asian Nations, there is a huge demand for the country to raise its competitiveness in Mathematics education. Central to the improvement of its competitiveness necessitates the improvement of Mathematics education which is responsible to prepare the graduates to be mathematically globally competitive. Teaching strategies are seen crucial to improving learning. However, the quest for quality Mathematics education has remained elusive.

Maligalig as cited by Galleto (2014) asserted that quality in education is mirrored in the performance of students in achievement test and is an old time problem confronting Mathematics education across educational level. Moore (2012) pointed out that many students, beginning at the elementary level, are not motivated in Mathematics and they perform poorly in the subject. Ingram (2011) supported that poor teaching strategies such as skill and drill, copying from the board, and memorizing formulae create low motivation in students which in turn leads to low academic performance. He strongly suggested that teachers need to avoid these monotonous traditional strategies in order to provide a more positive view of Mathematics in their students.

However, choosing the appropriate teaching and learning strategy is a complicated process which demands a deep thinking on the part of the teacher and the ability to make balance between the available strategies in the light of the many interrelated variables. Duncan (2011) contended that to keep up with the educational standards, teachers must be able to teach Mathematics using various techniques and non-traditional teaching strategies to reach out all learners. He stressed further that non-traditional strategies differ from the predominant traditional strategies of teaching Mathematics as usually it consists of memorization, practical use of numbers and equations. Moore (2012) averred that, once aware of the best strategies, teachers can begin to implement them in their own classrooms which will ultimately instrumental in addressing problem of low performance in Mathematics among students.

It is worth noting that Mathematics teachers should create variable environments and are responsible of coming up with proper decision on what proper strategy to be used that provides students with the chance to relate their previous experiences with the one being taught. The educational schemes today are seeking to develop teachers by making them fully aware of the different Mathematics teaching strategies. Hence, this study was conducted to explore the application and effect of teaching strategies which are non-traditional in nature on students' academic performance. The result of this study is expected to construct possible corrective measures in enhancing performance among the Mathematics teachers and students.

Traditional and Non-Traditional Strategies in Teaching Mathematics

In this study, the researcher explored the use of teaching strategies that are deemed effective in improving students' academic performance in Mathematics. The teaching strategies are applicable to all ages of students, but particularly on the secondary level because this is where negative views of Mathematics typically emerged. In this investigation, traditional and non-traditional teaching strategies were compared and they served as the independent variables of the study. Traditional strategies of teaching Mathematics considered in this study consisted primarily of the talk-chalk-eraser schemes which are usually teacher centered.

On the other hand, non-traditional teaching strategies included games, use of manipulatives, real life application, differentiated instruction, and integrating technology devices into Mathematics as identified by Moore (2012) as research-based teaching strategies. He pointed out that each of these strategies was found effective as revealed in various research findings. However, to create the uniqueness of the identified non-traditional teaching strategies and to make the present study novel from the existing studies, the researcher termed them as five-in-one teaching strategies. This means that the five teaching strategies are used in every lesson in Mathematics instruction. The researcher purported to combine the five-in-one non-traditional teaching strategies in a lesson to validate the claimed of the previous studies. These teaching strategies excite and engage students in the learning process.

Games. Lach et al. (2007) claimed that one of the best teaching strategies to improve achievement in Mathematics is using games in the subject. Games have always played a significant role in Mathematics and learning because they encourage logico-mathematical thinking. It means that the development of knowledge of the positive influence on the affective or emotional component of learning situations can raise levels of student interest and motivation. Ke (2007) also supported that play performs important roles in a child's psychological, social, and intellectual development. Moreover, according to Jacobs (2007), student created games generate student interest, enthusiastic participation, and motivation.

Use of Manipulatives. Another best teaching strategy to improve Mathematics achievement is the use of manipulatives. It is referred to the physical objects that students can manipulate to explore and develop their understanding of a mathematical concept. According to Rapp (2009), manipulatives have shown to help improve both achievement and motivation in the subject among all students, especially among visual-spatial learners. Manipulatives allow students to see and touch the materials that represent mathematical concepts, making these concepts real and concrete. Like games, research has shown that manipulatives improve student achievement in Mathematics (Lach et al., 2007). In short, manipulatives are hands-on tools that enhance student learning and improve behavior. Therefore, teachers need to be aware of how using manipulatives in their teaching enhance understanding when some understanding of the concept already existed.

Real Life Application. The next best teaching strategy to improve Mathematics achievement is incorporating real life application into the subject (Moore, 2012). Accordingly, without real world application, students can find Mathematics too difficult to relate to, boring and abstract. Mathematics is boring, difficult, and hard to relate to because of the lack of real-world application in instruction. Real world application brings life to Mathematics, and students are able to make sense of and relate to the subject. Gallenstein (2009) disclosed that teachers need to connect mathematical knowledge to real-life situations for the children to have greater appreciation of the content. On the other hand, Farren (2008) viewed that several students who received instruction including how Mathematics related to the real world became more interested and motivated in Mathematics even though it was not one of their favorite subjects. Indeed, real-life application engages students and increased engagement leads to increased performance.

Differentiated Instruction. This strategy helps teachers to provide instruction for individuals or groups of students to benefit both those who find academic concepts difficult and those who find them easy. In short, this strategy meets the diverse needs of learners. Levy (2008) supported that the strategy helps teachers meet students where they are when they enter in the class and move them forward closer to their goals. Differentiated instruction is an ideal teaching strategy considering the vast range or diverse learners in the classrooms. Kirkey (2010) posited that differentiated instruction discourages teaching to the norm, but rather allows educators to meet all students' learning needs, whether struggling, average, or gifted. Most importantly, this strategy redesigns instructions on the basis of student abilities, needs and even interests. Here the students are placed into groups based on ability such as above, at, or below grade level for understanding of a specific skill; learning styles such as visual, auditory, analytical, kinesthetic, and the like; and interests such as sports, hobbies, or animals.

Integrating Technology Devices. The integration of technology into Mathematics classroom increases the transfer of skills, lowers anxiety, promotes automaticity of basic Mathematics computational skills, and develops higher order mathematical skills. Gargiulo et al. (2010) disclosed that many students experienced anxiety with Mathematics which blocks initial learning and hinder skills. Likewise, Cavanagh (2007) highlighted that this emotional response blocks working memory and subsequently the ability to recall basic facts. Automaticity of basic computations is considered important for students' mathematical performance as information processing theory highlights that, without direct retrieval of basic facts, students experience difficulty performing more complex tasks. Whitehurst (2008), therefore, suggested that one way around to ensure components of the problem solving tasks become "routine and over-learned" requires practice with the use of technology devices to develop in the students fluent retrieval of basic facts and higher order mathematical skills.

In general, Astin (2005) asserted that the motivation to learn and the acquisition of mathematical knowledge are affected by the teaching strategies used in teaching Mathematics. He emphasized that well designed lessons with interesting teaching strategies become meaningful only when they affect the students in the process. Moreover, Stuart (2009) pointed out that innovations in the strategies of teaching may improve students' self-efficacy and may help them develop confidence in Mathematics. For the aforementioned reason, the study was conducted in order to establish support and strengthen research outputs involving the use of non-traditional research-based teaching strategies in Mathematics instruction.

2.0 Methods and Materials

The study utilized the quasi-experimental design method of research utilizing the Pretest-Posttest Nonequivalent Group Design. Grade 7 students of Kipit Agro-Fishery National High School, Kipit, Labason, Zamboanga del Norte, Philippines were chosen as the respondents of the study. Grade 7 was primarily used in the study because as observed by the researcher, it is on that level that negative views on Mathematics emerged. The researcher formed two groups, the experimental and control groups. Two sections were randomly selected from the six heterogeneous classes in Grade 7 using lottery method. Six one-eighth pieces of paper were rolled out in which one paper was marked control group and another one was marked the experimental grouped. The six pieces of paper were placed in a hat and the class Presidents of each class were asked to pick one rolled paper from the hat. In this case, Section Tuna was chosen as the experimental group consisting of 51 students and Section Perch with 46 students as the control group. The researcher ascertained that threats to internal validity of using the design were prevented. Imelda and Muyangwa (2006) posited that non-randomization of subjects is a threat to internal validity. It is for this reason that respondents of this study were selected at random separating them equally based on their entry competence resulting to nearly equivalent number of members per group.

The experimental group was exposed to the non-traditional 5-in-1 strategies per lesson which included games, use of manipulatives, real life application, differentiated instruction, and integrating technology devices while the control group was taught using the traditional talk-chalk-eraser strategy in teaching Mathematics. The two groups were exposed to the same lessons/subject matters in Grade 7 Mathematics particularly Geometry during the third grading period.

Due to the unavailability of a standardized instrument, the researcher designed a teacher - made test to measure students' academic performance in Mathematics. A multiple choice type consisting of 60 items was constructed by the researcher with the help of books and other teaching kits. The test covered the following topics, namely: Points, Lines and Planes with 7 items; Segments, Rays and Angles with 11 items; Pairs of Angles with 11 items; Angles Formed by Parallel Lines and Transversals with 5 items; Triangles with 8 items, and Quadrilaterals with 18 items. The test was made up of 60 percent easy, 30 percent average, and 10 percent difficult (DepEd Order No. 8, Series 2015). This instrument utilized Bloom's and Anderson's Taxonomy of Learning using the cognitive domain. The distribution and sequencing of items in the test were based on the table of specification which was constructed also by the researcher ahead of the research instrument. This table of specification indicated the topics and sub-topics tested at cognitive level. The pretest and posttest of the study were administered only for 60 minutes.

Reliability check and item analysis of the instrument was also administered. Fifty students who were not the respondents of this study but had already taken the topics covered in this study were used as pilot samples to test the difficulty level, discriminatory index of each item, and the reliability of the whole instrument. Item analysis was performed using the Test Checker and Item Analyzer with Statistics (Bermudo, A. & Bermudo, C., 2007).

The pretest was administered using the validated teacher–made test to the respondents in both the control and the experimental groups before the experiment commenced, after which the experiment followed. The posttest, on the other hand, was administered using the same teacher–made test given during the pretest to the respondents in both the control and experimental groups after the experiment ended. The statistical methods used were the arithmetic mean, z–test one–sample group, t–test for independent samples, and t–test for correlated samples to facilitate the analysis and interpretation of data. Figure 1 shows the research process of the investigation.

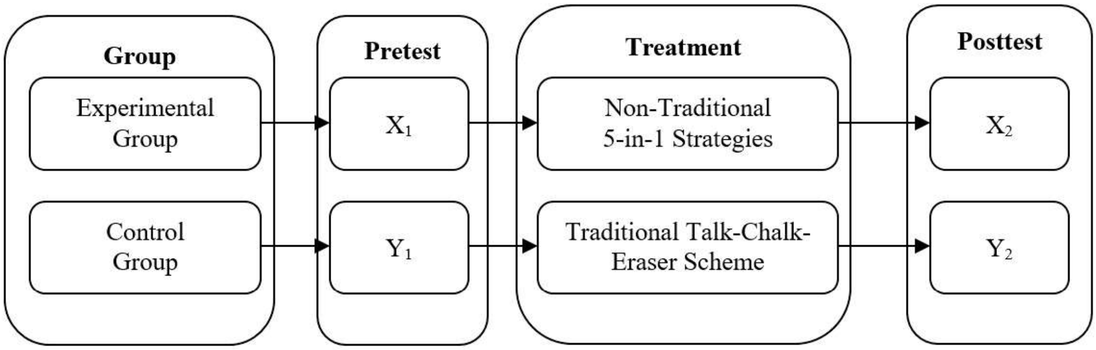

Figure 1. The Research Process

The figure illustrates that before the treatment was started, both the experimental and control groups were given the pretest (X1 and Y1) on the topics lined up for this experiment. This pretest instrument was a teacher-made test and was subjected to reliability and validity testing. The same pretest was administered to both the control and experimental groups in separate rooms at the same time. The researcher conducted the pretest in the experimental group while a co-teacher of the researcher served as proctor of the control group. After giving the pretest, the teacher started the experiment based on the matrix of activities. The experimental group was taught with the topics listed using the non-traditional 5-in-1 teaching strategies while the control group was taught on the same topics using the traditional teaching strategies – the talk-chalk-eraser scheme. The learning competencies of the course based on the K to 10 Curriculum Guide in Mathematics (2011) were the basis in the preparation of the lesson plans for both of the two groups.

In the experimental group, the 5-in-1 teaching strategies were used alternately. For example, the class was started by a strategy using game (Cabbage Relay) in the warm up exercises of the lesson. Review lesson was presented with the integration of technology devices using LCD projector and computer/laptop showing the power point presentation. The real life application was also infused during the presentation of the review lesson. The main lesson was introduced using the manipulatives. The application of the lesson was done by the use of differentiated instruction. In this case, the class was grouped into above average group, average group, and below average group. During the application, the students integrated also technology devices such as handheld calculators and cellular phones with calculators. The evaluation of the lesson was given by integrating technology devices, in this case, handheld calculators or cellular phones with calculators. Finally, the assignment directed the students to answer the problem using handheld calculators or cellular phones with calculators. However, the 5-in-1 teaching strategies in teaching Mathematics did not follow patterns of utilization. Each strategy was used according to its suitability to the part of the lesson. On the other hand, in the control group, the presentation of each lesson was done with the use only of talk, chalk, board and eraser.

Immediately after the interventions, both groups were given the posttest (X2 and Y2) on the subject matters covered during the treatment. The teacher - made test administered during the pretest was also used in the posttest.

3.0 Results and Discussion

Pretest Academic Performance in Mathematics of the Students in the Control Group. The study included six major topics, namely: Points, Lines and Planes; Segments, Rays and Angles; Pairs of Angles; Angles formed by Parallel Lines and Transversals; Triangles; and Quadrilaterals with 7 items, 11 items, 11 items, 5 items, 8 items, and 18 items, respectively. The level of expected performance was set at 75 percent of the total possible highest score in which case 5.25, 8.25, 8.25, 3.75, 6.00, and 13.50, respectively. The hypothetical mean of the whole test was 45 which is 75 percent of 60 items.

Table 1 shows that the actual means of the students' performance in the control group were all within the range with qualitative descriptions of poor. This means that the students have little comprehension on the topics covered in the experiment. This implies that the respondents do not have prior knowledge on the topics. This implies further that the respondents need the necessary interventions to improve Mathematics performance.

On the other hand, the z-values indicate that the scores were significantly lower than the expected 75 percent hypothetical mean. This means that the students' scores are really far below the needed and expected performance. Furthermore, results are reflective that when topics are new and students do not put efforts to learn new topics, they usually get low scores during check-up tests or pretests. This implies that the teacher handling Mathematics need to introduce the lessons comprehensively and develop in the students a clearer understanding of the topics at hand.

Table 1. Pretest Academic Performance in Mathematics of the Students in the Control Group

Groups	Total Points	μ	$\overline{X}$	z	p-value	Description
Points, Lines and Planes	7	5.25	1.17	-45.51	0.00	Poor
Segments, Rays and Angles	11	8.25	1.89	-41.56	0.00	Poor
Points of Angles	11	8.25	1.87	-41.38	0.00	Poor
Angles formed by Parallel Lines and Transversals	5	3.75	0.80	-36.83	0.00	Poor
Triangles	8	6.00	1.37	-46.28	0.00	Poor
Quadrilaterals	18	13.50	2.72	-46.08	0.00	Poor
Overall	**60**	**45.00**	**9.83**	**-46.65**	**0.00**	**Poor**

μ = hypothetical mean, $\overline{X}$ = actual mean, z = computed z – value

Pretest Academic Performance in Mathematics of the Students in the Experimental Group. In Table 2, students in the experimental group performed similarly with that of the students in the control group. The z-values also significantly supported that the actual means were below the expected hypothetical mean. This means that students have very little or almost no idea at all about the topics at hand. They feel the topics are so peculiar, thus, their scores manifest such peculiarity. Further, result could also be attributed to insufficient preparation of the students during the conduct of the pretest. This implies that the respondents also need the necessary interventions to improve Mathematics performance.

Further, the result could be attributed to the application of teaching strategies by the teachers. Learners are classified according to how they want things to be learned. Some learn through watching, others learn through listening while some others learn by doing. These are some of the considerations that the teacher needs to look into. When a teacher fails to facilitate learning because he fails to identify the appropriate teaching strategies, normally, one cannot expect good scores from the students.

Table 2. Pretest Academic Performance in Mathematics of the Students in the Experimental Group

Groups	Total Points	μ	$\overline{X}$	z	p-value	Description
Points, Lines and Planes	7	5.25	1.25	-43.32	0.00	Poor
Segments, Rays and Angles	11	8.25	1.90	-45.10	0.00	Poor
Points of Angles	11	8.25	1.88	-46.76	0.00	Poor
Angles formed by Parallel Lines and Transversals	5	3.75	0.84	-38.23	0.00	Poor
Triangles	8	6.00	1.39	-51.83	0.00	Poor
Quadrilaterals	18	13.50	2.82	-46.76	0.00	Poor
Overall	**60**	**45.00**	**10.10**	**-50.04**	**0.00**	**Poor**

μ = hypothetical mean, $\overline{X}$ = actual mean, z = computed z – value

Test of Difference on the Pretest Academic Performance in Mathematics Between the Control and Experimental Groups. Table 3 presents that the experimental group obtained a slightly higher mean score (10.11) over the control group mean score (9.83). It is safe to say that students in the experimental group performed a little bit better than those in the control group during the pretest. Likewise, the table presents a mean difference (0.28) in favor of the experimental group, which when subjected to t-test, it was found out that there was no significant difference between the pretest academic performance between the control and experimental groups. This means that there is no significant difference in the performance between the two groups during the pretest. This implies that the students' academic performance in both the control and experimental groups are comparable.

Table 3. Test of Difference on the Pretest Academic Performance in Mathematics between the Control and Experimental Groups

Group	N	Mean	Mean Difference	Standard Deviation	Computed t	p-value	Interpretation
Control	46	9.83		7.171			Not Significant
Experimental	51	10.11	0.28	5.604	0.36	0.760	

Posttest Academic Performance in Mathematics of the Students in the Control Group. Table 4 reveals that the total posttest mean score (28.91) was still significantly below the expected score of the students at 75 percent of the total number of test items as supported by the z-value of -11.61 which is significant at .05. The results showed that the students in the control group still did not reach at the expected level of performance and that the difference was quite noticeable enough to warrant significance. Though, it can be gleaned on the table that there was learning during the treatment, however, the control group only failed to obtain the expected performance of 75 percent. It can be inferred that the traditional way of teaching Mathematics along the said topics is not effective.

Table 4. Posttest Academic Performance in Mathematics of the Students in the Control Group

Groups	Total Points	μ	$\overline{X}$	z	p-value	Description
Points, Lines and Planes	7	5.25	3.39	-10.66	0.00	Good
Segments, Rays and Angles	11	8.25	5.35	-11.84	0.00	Good
Points of Angles	11	8.25	5.33	-12.04	0.00	Good
Angles formed by Parallel Lines and Transversals	5	3.75	2.52	-9.96	0.00	Good
Triangles	8	6.00	3.89	-11.60	0.00	Good
Quadrilaterals	18	13.50	8.43	-11.07	0.00	Good
Overall	**60**	**45.00**	**28.91**	**-11.61**	**0.00**	**Good**

μ = hypothetical mean, $\overline{X}$ = actual mean, z = computed z – value

Posttest Academic Performance in Mathematics of the Students in the Experimental Group. Looking at the actual results during the posttest for the experimental group, Table 5 reveals that the experimental group did well during the posttest. The table showed actual means which are higher than the hypothetical means. Computed z-values significantly supported that the actual means were higher than the expected means. Result means that the non-traditional 5-in-1 teaching strategies help in improving performance of the students in the experimental group.

Table 5. Posttest Academic Performance in Mathematics of the Students in the Experimental Group

Groups	Total Points	μ	$\overline{X}$	z	p-value	Description
Points, Lines and Planes	7	5.25	5.84	11.53	0.00	Excellent
Segments, Rays and Angles	11	8.25	9.00	9.47	0.00	Excellent
Points of Angles	11	8.25	9.02	11.73	0.00	Excellent
Angles formed by Parallel Lines and Transversals	5	3.75	4.00	13.75	0.00	Very Good
Triangles	8	6.00	6.72	11.50	0.00	Excellent
Quadrilaterals	18	13.50	14.78	10.72	0.00	Excellent
Overall	**60**	**45.00**	**49.37**	**13.24**	**0.00**	**Excellent**

μ = hypothetical mean, $\overline{X}$ = actual mean, z = computed z – value

Test of Difference on the Posttest Academic Performance in Mathematics Between the Control and Experimental Groups. Table 6 presents that the experimental group obtained a higher actual mean score (49.37) compared to the actual mean score (28.91) obtained by the control group. This means that the experimental group performs better than the control group after the intervention. The table further reveals a mean difference (20.46) in favor of the experimental group, which when subjected to t – test, it revealed that there existed a significant difference in the posttest academic performance in Mathematics of the two groups after the intervention. This means that a significant variation is seen in the performance of the students when taught using the traditional teaching strategy and those who were taught using the non-traditional 5-in-1 strategies in teaching Mathematics.

Table 6. Test of Difference on the Posttest Academic Performance in Mathematics between the Control and Experimental Groups

Group	N	Mean	Mean Difference	Standard Deviation	Computed t	p-value	Interpretation
Control	46	28.91		7.171			
Experimental	51	49.37	20.46	5.604	14.36	0.000	Significant

Test of Difference Between the Pretest and Posttest Academic Performance in Mathematics of the Control Group. Table 7 discloses that there was improvement in the academic performance of the students after the intervention. The table reveals further that there was a significant difference between the pretest and posttest academic performance in Mathematics of the students in the control group. It implies that using the traditional teaching strategy in teaching Mathematics significantly works in improving students' academic performance in those lessons included in the experiment. Unfortunately, however, the strategy failed to exceed the expected standard of the experiment which method can be inferred as less effective.

Table 7. Test of Difference Between the Pretest and Posttest Academic Performance in Mathematics of the Control Group

Control Group	N	Mean	Mean Difference	Standard Deviation	Computed t	p-value	Interpretation
Pretest	46	9.83		7.171			
Posttest	46	28.91	19.09	7.865	12.10	0.000	Significant

Test of Difference Between the Pretest and Posttest Academic Performance in Mathematics of the Experimental Group. Table 8 reveals that the students in the experimental group obtained an actual mean score in the pretest higher than the actual mean score in the posttest. This means that the academic performance in Mathematics of the experimental group is improved after exposing them to 5-in-1 strategies in teaching Mathematics. Further, there was a significant difference between the pretest and posttest academic performance in Mathematics of the students in the experimental group. This means that the non-traditional teaching strategies are effective in improving the students' academic performance in Mathematics.

Table 8. Test of Difference Between the Pretest and Posttest Academic Performance in Mathematics of the Experimental Group

Experiment Group	N	Mean	Mean Difference	Standard Deviation	Computed t	p-value	Interpretation
Pretest	51	10.10		7.171			
Posttest	51	49.37	39.27	7.865	50.90	0.000	Significant

Test of Difference on the Pre-Post Mean Gain on Academic Performance in Mathematics Between the Control and Experimental Groups. Table 9 reflects the mean gain score obtained by the experimental group which is higher than the mean gain score obtained by the control group. When the mean gain score difference was subjected to t – test, it revealed that there was a significant difference in the mean gain scores obtained between the two groups after exposing them to the interventions. It means that students in the experimental group perform better than the students in the control group. This implies that using the non-traditional 5-in-1 strategies in teaching Mathematics provides better students' academic performance than those who were exposed to the conventional strategy.

Table 9. Test of Difference on the Pre-Post Mean Gain on Academic Performance in Mathematics between the Control and Experimental Groups

Group	N	Mean Gain	Mean Difference	Standard Deviation	Computed t	p-value	Interpretation
Control	46	19.08		8.400			
Experimental	51	39.27	20.19	5.276	49.90	0.000	Significant

Discussion

The poor academic performance of the students during the pretest in both the control and the experimental groups is a manifestation that the students are poorly and equally unprepared in getting into the classroom. De Las Peñas et al. (2012) corroborated that the control group did not perform well during the pretest. Galleto and Refugio (2012) also supported whose study revealed that students in the control group were not skillful in the pretest results.

Further, students' academic performance did not significantly differ between the two groups prior to the intervention. This supports the fact that students today have least concerned in advancing self knowledge. Idris and Meng (2011) also disclosed that there was no significant difference in the mean mathematics achievement scores between the experimental and control groups for all the eleven schools indicating that there was no significant difference in mathematics achievement between the experimental and control groups for all the schools.

On the other hand, the posttest academic performance of the students in the control group was good. This means that the students learned the subject with traditional method of teaching Mathematics. The result reflected that there was learning during the treatment but the control group only failed to reach the hypothetical mean of the study. However, students in the experimental group were excellent. This means that the 5-in-1 strategies in teaching Mathematics improved the students' performance. Khurshid et al. (2012) supported the present finding when they revealed that innovative teaching methodologies resulted to better scores and higher grades of students in Mathematics. The frequencies of lower grades during the pretest were remarkably reduced.

The study further revealed that a significant difference in the posttest existed between the control and experimental groups. This implies a significant variation was seen in the performance of the students taught using the traditional method of teaching and those who were taught using the 5-in-1 stratgies in teaching Mathematics. Pangilinan et al. as cited by Murro (2013) substantiated the present finding. The study exposed the students in the control group to the traditional method of teaching while students in the experimental group were exposed to cooperative method of learning. The study revealed that there was a significant difference in the performance of the students between the control and experimental groups.

In similar vein, a significant difference existed between the pretest and posttest academic performance of the control group. This means that the intervention of using the traditional method of teaching Mathematics made improvement on students' academic performance in those lessons included in the experiment. The traditional methods were tried and true, and while they may not be the most exciting way to learn, they worked well enough in the past. Likewise, there was a significant difference between the pretest and posttest academic performance of students in the experimental group. This implies that the 5-in-1 strategies applied in teaching Mathematics improved the students' academic performance in those topics included in the experiment. Hence, both the interventions, the traditional talk-chalk-eraser strategy and the non-traditional 5-in-1 strategies in teaching and learning Mathematics, made improvement in the students' academic performance.

Moreover, there was a significant difference in the mean gain obtained on students' academic performance between the control and experimental groups. This means that students' academic performance in the experimental group was greatly influenced by the non-traditional 5-in-1 strategies used by the teacher and students in the class. This can be concluded that students in the experimental group performed better than their counterpart. It can be construed further that the utilization of the non-traditional 5-in-1 strategies is more effective than using the traditional talk-chalk-eraser scheme. Khurshid et al. (2012) corroborated the present finding. Their study revealed that innovative teaching methodologies outperformed the traditional classroom teaching. The impacts were found on both individual and group level. It met the individual learning requirements and increased the interest level among the students. In similar vein, Olatoye et al. (2009) found out that integration and utilization of varied strategies of teaching are potent in raising students' achievement.

Thus, the study strongly recommended that teachers and students should collaborate actively in constructing mathematical knowledge through the use of 5-in-1 strategies that encourage them to explore and investigate mathematical ideas. Moreover, teachers and students should cooperate in the teaching and learning of Mathematics to ascertain high level of students' performance which is reflective of the students' success and teachers' teaching achievement.

References

Astin, A. W. (2005). What Matters in College. San Francisco: Jossey Bass Publisher

Bermudo, C.B. & Bermudo, A.B. (2007). Micro Analysis (Test Checker and Item Analyzer with Statistics). Workbook Version . ISBN 978-971-93567-6-9.

Cavanagh, S. (2007). Math's anxiety confuses the equation for students. Education Week, 26 (24), 12.

De Las Peñas, M.L.A. & Bautista, D.M. (2012). On Maximizing Technology Resources and Their Benefits in Teaching and Learning Mathematics. Ateneo de Manila University, Philippines. http://webcache.googleusercontent. com/search?q=cache:O2i0bBpoYsgJ:tsg.icme11.org/document/get/223+&cd=1&hl=en&ct=clnk&gl=ph. Accessed 24 September 2015.

DepEd Order No. 8, s. 2015. Policy Guidelines on Classroom Assessment for the K to 12 Basic Education Program. https://www.scribd.com/doc/260853903/DO-s2015-08-Classroom-Assessment-for-K-to-12. Accessed 24 September 2015.

Duncan, A. (2011). Sharpening Mathematics Tools for the 21st Century, NCTM Summing Up. http://www.nctm.org/about/content.aspx?id=29275. Accessed 27 September 2015.

Farren, V. (2008). A reflection on my teaching practices using students' math moments. College Quarterly, 11 (4), 74-81.

Gallenstein, N. (2009). Engaging young children in science and mathematics. Journal of Elementary Science Education, 17 (2), 27-41. https://eric.ed.gov/?id=EJ798816. Accessed 24 September 2015.

Galleto, P.G. & Refugio, C.N. (2012).

Students' Skills In Mathematical Computation Using Graphing Calculator. http://webcache.google usercontent.com/search?q= cache:i154sOnrNUsJ:atcm. mathandtech.org/ep2012/reg ular_papers/3472012_19901.pd f+&cd=1&hl=en&ct=clnk&gl=ph. Accessed 29 September 2015.

Galleto, Patrick G. (2014). Utilization of TI-84 Plus in Teaching Trigonometry. The Threshold, Volume IX, 9 - 18.

Gargiulo, R.M., & Metcalf, D. (2010). Teaching in today's inclusive classrooms: A universal design for learning approach. Belmont, CA. Wadsworth Cengage Learning.

Idris, N. & Meng, C.C. (2011). Effect of Graphic Calculator-Based Performance Assessment on Mathematics Achievement. Academic Research International, Volume 1, Issue 1 http://webcache.googleusercontent. com/search?q=cache:fhuvlel3VE8J: www.savap.org.pk/journals/ARInt./ Vol.1(1)/2011(1.1-01).pdf+&c d=1&hl=en&ct=clnk&gl=ph. Accessed 11 January 2016.

Imelda, S. N. and Muyangwa, M. M. (2006). Introduction to Research in Education and Behavioral Sciences. Pretoria: Publication and Design SelVices, TUT

Ingram, S. (2011). What is a strategy: Fundamentals of strategic planning. Actionable Strategic Planning. http://www.actionablestrategicplan ning.com/?p=61. Accessed 27 September 2015.

Jacobs, A., (2007). Fun and games. Teaching Pre K-8, 37 (4), 54-55.

Ke, F., (2007). Gameplaying for maths learning: Cooperative or not?. Journal of EducationalTechnology, 38 (2), 249-259.

Khurshid, F. & Ansari, U. (2012). Effects of Innovative Teaching Strategies on Students' Performance. Global Journal of HUMAN SOCIAL SCIENCE Linguistics & Education, Volume 12 Issue 10 Version 1.0. https://webcache.googleusercon tent.com/search?q=cache:CQ-5CeUL_5OgJ:https://globaljournals.org/GJHSS_Volume12/7-Effects-of-Innovative-Teaching-Strategies-on-Students-Performance. pdf+&cd=1&hl=en&ct= clnk&gl=ph. Accessed 12 January 2016.

Kirkey, T. (2010). Differentiated instruction and enrichment opportunities: An action research report. Action Researcher, 8 (3), 10-13.

Lach, T. (2007). Let's do math: Wanna play?. Mathematics Teaching in the Middle School, 11 (4), 172-176.

Levy, H. (2008). Meeting the needs of all students through differentiated in struction: Helping every child reach and exceed standards. Clearing House: A Journal of Educational Strategies, Issues and Ideas, 81 (4), 161-164. http://webcache. googleusercontent.com/search?q= cache:jQw7LARDgZQJ:www.

wou.edu/~tbolsta/web/texbook/24_Meeting_the_Needs.pdf+&cd=1&hl=en&ct=clnk&gl=ph

Moore, N.D. (2012). Alternative Strategies for Teaching Mathematics. Education and Human Development Master's Theses. http://digitalcommons.brockport.edu/ehd_theses/130/ Accessed 30 September 2015.

Murro, L.S. (2013). Effects of Cross-Hatched Model in Teaching Division of Polynomials. The College of Education Research Journal, 3(1), 10 – 19.

Olatoye, R.A. & Adejoya, Y.M. (2009). Effect of four teaching strategies on senior secondary students' achievement in an aspect of agricultural science. African Journal of Educational Studies in Mathematics and Science, Volume 7. http://www.ajol. info/index.php/ajesms/article/view/61569. Accessed 11 January 2016.

Rapp, W. (2009). Avoiding math taboos: Effective math strategies for visual-spatial learners.Teaching Exceptional Children Plus, 6 (2), 121-135.

Stuart, V. B. (2009) "Math Curse or Math Anxiety". http://webcache.googleusercontent.com/search?q=cache:2ddE0UfdcVoJ:driscollmathathome.weebly.com/uploads/1/9/8/5/19850427/tcm2000-01-330a.pdf+&cd=1&hl=en&ct=clnk&gl=ph. Accessed 28 September 2015.

Whitehurst, G. (2003). Research on mathematics instruction. Paper presented at the Secretary's Summit on Mathematics, Washington, DC. https://www2.ed.gov/rschstat/research/progs/mathscience/whitehurst.html. Accessed 30 September 2015.