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Research Article

Integrating Differentiated Instruction in Teaching Geometry to Grade 5 Pupils

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ABSTRACT

Being one of the most difficult subjects, Mathematics causes anxiety among Grade 5 pupils when they fail to understand or obtain the desired academic results for an examination. The diversity of pupils in a classroom calls for the need to have instructional approaches that will help improve the teachers' delivery of instruction. The Differentiated Instruction with Multiple Intelligences integration could help address the students' difficulties in learning Mathematics to improve their academic performance.

This study aimed to assess the efficacy of Differentiated Instruction in teaching Geometry among Grade 5 pupils. The focus of the study is to determine the difference in the performance of students if they are taught using Differentiated Instruction. The study used a quasi-experimental design. The research was conducted in a private-sectarian school in Calamba City, Laguna. The respondents were Grade 5 pupils. Simple Random sampling was done to select the experimental group among the two sections. The multiple Intelligence Profile of the experimental group was first described in the study. Pre and post-tests were also given to the respondents. T-test for independent samples was used to check the homogeneity of the two groups to determine if there is a significant difference between the post-test results of the two groups. A paired sample t-test for sample was also used to determine if there was a significant difference between the pre-test and post-test results of each group. The study showed that Differentiated Instruction significantly improved the academic performance of the pupils in Geometry. It was recommended that teachers include Differentiated Instruction in their teaching methods to improve student performance.

INTRODUCTION

Teachers would always want to give the best way possible for students to learn. It would be convenient for a teacher to teach a certain lesson using just one method, but it is a fact that each student learns uniquely. Therefore, it is important that teachers, especially in Grade school, should provide a variety of teaching strategies that could address students' learning needs or styles.

According to Bednar, Coughlin, Evans, and Sievers (2002, as cited in Irina, 2015), teachers should provide the students with rich, engaging, challenging, and stimulating activities. The traditional teaching approach might lead to passive learning. In Mathematics classes, teachers should create engaging activities for the students to participate in the discussion and reach their maximum potential. It can be achieved if the activities or tasks given to students suit their diverse learning needs.

The Philippines, specifically the Department of Education, has implemented the K-12 Program since 2013. The Republic Act No. 10533 known as Enhanced Basic Education Act 2013 aims to improve the education system of the Philippines. This act aimed to create a basic education system that will produce graduates who are productive and responsible with skills, capabilities and values that will help them in any situation they are in. It includes the framework of all subjects with information that will guide the teachers, school administrators to design a curriculum that enables students to learn and better understand the concepts being taught to them. The framework in Mathematics for Basic Education has two goals: problem solving and critical thinking. The content includes the different areas such as Number and Number Sense, Measurement, Geometry, Patterns and Algebra and Probability and In the Philippines, the K-12 Program was implemented in 2013. The Republic Act No. 10533, known as Enhanced Basic Education Act 2013, aims to improve the education system of the Philippines. This act aimed to create a basic education system that will produce productive and responsible graduates with skills, capabilities, and values that will help them thrive in the real world. It includes the framework of all subjects with information that will guide the teachers, school administrators to design a curriculum that enables students to learn and better understand the concepts being taught to them. The framework in Mathematics for Basic Education has two goals: problem-solving and critical thinking. The content includes different areas such as Number and Number Sense, Measurement, Geometry, Patterns and Algebra, and Probability and Statistics. The learning principles and theories involved in teaching Mathematics are experiential and situated learning, reflective learning, constructivism, cooperative learning, discovery, and inquiry-based learning (SEI-DOST & MATHTED, 2011).

Teachers are continuously developing their strategies in teaching mathematics to address the students' learning needs and skills. However, there are still students who are having difficulties in the subject.

This study seeks to analyze the effectiveness of applying the concept of Multiple Intelligence and Differentiated Instruction in teaching Geometry to the academic performance of the pupils of a selected private school in Laguna.

Specifically, the study seeks to:

1. develop an Instructional Design that incorporates Differentiated Instruction based on MI profile in teaching Geometry among Grade 5 pupils.
2. analyze the effect of using Differentiated Instruction in teaching Geometry among Grade 5 pupils.

In 1983, the Multiple Intelligences (M1) theory was introduced by Howard Gardner with his book entitled *Frames of Mind*. In this book, he defined "intelligences" as abilities and mental skills that make human cognitive competence.

Gardner (1983, as cited in Gangi 2011), conduct-

ed his research in the Project Zero program at Harvard University. He formulated the seven distinct intelligences: spatial, linguistic, logical-mathematical, bodily-kinesthetic, musical, intrapersonal, and interpersonal. In the 1990s, naturalistic intelligence was added as the eighth intelligence. The teacher must understand the nine intelligences so that he/she can implement them in a classroom. After understanding the intelligences, the teacher must identify the intelligence of the students. With that, the teacher will address those specific intelligences and facilitate new tools using the data at hand. A number of studies have proved that catering to student's MI has many benefits. Some of these are addressing students' learning needs and helping them to become more participative, which will eventually result in higher academic performance among the learners.

Kagan and Kagan (1998, as cited in Dicker & Gouws, 2011), described MI as an important factor in education. It was found out that MI can achieve the following visions of education:

- Matching the teaching strategies to the ways learners learn.
- Encouraging learners to reach their full potential.
- Celebrating diversity.

In maximizing the development of these intelligences, the teacher can help the learners know more about and appreciate Mathematics.

According to Armstrong (2009), some learners may have all the eight intelligences, while others have dominant intelligences, reflecting their MI type. Awareness of these characteristics of learners is essential for teachers to implement the curriculum and their teaching and learning strategies. Etienne (2011) stated that some individuals possess MIs, which are dominant compared to others. The variation is based on the environment, experiences of an individual, and how the intelligences manifest. Students are encouraged to engage in varied activities or tasks to foster simulation of the brain.

Combining Multiple Intelligence and Differentiated Instruction in teaching Mathematics aims to align the learner and his intelligence in a rich learning environment. The learner must be involved in all learning activities so that he/she can fully understand the topics. In a traditional type of teaching, which does not consider the MIs of the students, the teacher provides generic activities that teach the students to follow instructions needed to find the right answers to a mathematical problem. The teacher's activities are for everyone, and it does not cater to the individual needs of the learners. On the other hand, in differentiated instruction, the teacher need to produce different activities aligned to each learner's intelligence. Dicker and Gouws (2011) emphasized that applying MI theory will help learners be involved in their learning because they draw from their strengths. In this type of learning, both the learners and teachers are equally valuable.

The use of the concept of Differentiated Instruc-

tion improves student achievement. The research conducted by McCoog (2007) and Subban (2006, as cited in Eteinne,2011), stated that the implementation of MI theory is most successful when done through DI. Gault (2009) studied the effects of DI on the achievement of the students. The results showed a significant difference between the number of students who passed the test between the two groups: the control and the experimental groups.

MATERIALS AND METHODS

The design of this study is quasi-experimental. A quasi-experimental study usually implements a pre-test – post-test design with both the experimental and the control groups. The data collected are the scores of the pre-test and post-test. The scores of the treatment and the control groups of the pretest were compared to the post-test scores.

The research study was conducted at a private school in Canlubang, Calamba City, among Grade 5 students of the Basic Education Department. The chosen school is a private-sectarian school exclusive to boys. The school has Basic Education Department, Grade School, High School, Senior High School with strands STEM and TECHVOC, and the College Department (CoEd).

For the Grade School, each grade level is composed of two sections. The average number of pupils per section is 30.

The respondents of the study were the 58 Grade 5 pupils of the Basic Education Department-Grade School. To achieve randomization, draw lots were done. The result of the random assignment was Grade 5 B being the control group and Grade 5 A as the experimental group. Grade 5 B is composed of 28 pupils, while A is composed of 29 pupils.

Before the implementation of the study, approval from the principal was sought through a letter. A letter of approval was received, which indicated that the answers should be treated with utmost secrecy, and the records would be kept in strict confidentiality. It was also mentioned that the results of the study need to be shared with the educational community for the improvement of Mathematics instruction.

In the conduct and reporting of the results of the study, the identity of the school and the respondents were kept confidential.

Random assignment through draw lots was done to assign which section will be the treatment and control groups. The result of the draw lots was Grade 5B was the control group, while Grade 5A was the experimental group. Grade 5A group was given differentiated instruction wherein their MIs were considered. Grade 5B underwent a traditional instructional approach to the teaching-learning process.

The topics covered in the study were polygons, solid figures, circles, and congruent figures that included their definitions and other essential concepts needed to learn them. Learning competencies were

based on the K-12 curriculum provided by the Department of Education.

Instructional designs for both groups were made. The format required by the school was followed. It was ensured that the competencies mandated by the Department of Education were complete. After completion, the Assistant Principal for the Academic Affairs checked each learning plan submitted. Two sets of learning plans were made, one each for the control group and the experimental group. The following are the competencies included in Instructional Design. For Polygons, the learner identifies, names, and describes polygons, describes and compares properties of regular and irregular polygons. For the Congruent Polygons, the learner visualizes congruent polygons. For Circle, the learner identifies a circle and defines the terms related to a circle. For the Solid Figures, the learner identifies and describes 3D figures and creates models of different solid figures: cube, prism, pyramid, cylinder, cone, and sphere using plane figures.

For the validation of the instruments, 66 grade six pupils from the same school were chosen. The pilot study provided quantitative data that tested for internal consistency by conducting Cronbach's alpha. Recommendations on sample size for pilot testing vary. Collingridge (2014), in his article "Validating a Questionnaire", mentioned that sixty participants are enough, especially if the survey is short. After attaining the scores, Chronbach alpha was used to check the reliability of the test. The value of the Chronbach alpha was 0.661. The suggested value for a test to be reliable is 0.7, but 0.65 is considered good, as affirmed by Collingridge (2014).

The study underwent three phases: planning, test construction, and expert validation.

The planning phase included identifying the purpose or objectives of the test, specifying the content area, and identifying the target group. In the construction phase, the competencies mandated by Dep Ed for Geometry were considered, and the Table of Specifications (TOS) was made. Based on the TOS, a 20-item multiple-choice test was constructed. Once the items were written, they were checked by the Assistant Principal for Academic Affairs and the Assistant Principal for Student Affairs, who was the former Subject Area Head for Mathematics. Expert checking was done for the purpose of establishing the validity of the test.

A tool to evaluate the Instructional Design was given to the students. The purpose of the evaluation was to give an idea about the pupils' response in the Differentiated Instruction. The evaluation was adapted from the survey given by the school to evaluate the different activities. The researcher also used the evaluation tool in one of the requirements of her subjects (CED 213: Instructional Systems Design and Management) in graduate school. The contents of the survey were objectives, instructions, activities, and materials. Some of the items in the evaluation tool were adapted from the self-assessment tool for teachers who are implementing DI in their classrooms. It was restated in such a way that they applied to the respondents. It was

retrieved from stetsonassociates.com/wp-content/uploads/2016/08/DI-Self-Assessment-Tool.doc

The two groups took the pre and post-tests. The pre-test was given before starting the chapter's discussion, and the post-test was given at the end. The intervention was conducted in one week. The data generated were used to assess the effectiveness of learning Math with the application of Differentiated Instruction and Multiple Intelligence and compare the two groups' results.

The evaluation tool is in the form of a 4-point Likert scale, where 4 corresponds to strongly agree, 3 to agree, 2 is to disagree, and 1 to disagree strongly.

Qualitative and quantitative research approaches were employed in the study. For the qualitative approach, the Multiple Intelligence of the pupils was described. The quantitative approach was based on the results of the pre and post-test given to the research participants.

Frequency counts and percentages were used to summarize the profile of the students. Frequency counts and percentages were also used to present the results of the pre and post-tests. Arithmetic mean and rank were used to summarize the results of the pre and post-test.

To check the homogeneity of the two groups, a t-test for independent samples was used. The data used were the result of the pre-tests of both control and experimental groups. It was used to determine if there is a significant difference between the post-test results of the two groups.

Another statistical tool used was paired t-test for the sample. The tool was used to determine a significant difference between the pre-test and post-test results of each group.

RESULTS AND DISCUSSION

The quasi-experimental aimed to evaluate whether the students taught using differentiated instruction differed in the post-test scores from students taught using the traditional type of instruction. The Grade 5 pupils involved in a differentiation treatment group were compared to pupils taught in traditional instruction.

The second research question determined the effect of integrating Differentiated Instruction and addressing Multiple Intelligence in teaching Geometry to Grade 5 pupils. The data collected from the study showed the effect of DI on the experimental group. The sources of the data include the pre and post-tests of both groups.

Table 1 shows the mean and the standard deviation of the pre-test and post-test of the experimental group. The mean score and standard deviation of the pre-test are 7.82 and 2.80, respectively. On the other hand, the mean score and the standard deviation of the post-test are 12.18 and 3.88, respectively.

Table I. Descriptive Statistics of the Pre-test and Post-test scores of the experimental group

	MEAN	N	STD. DEVIA-TION	STD. ERROR MEAN
Pre-test	7.8214	27	2.80282	.61864
Post-test	12.1786	28	3.27438	.52968

A paired sample test was conducted to compare the experimental group's pre-test and post-test scores, as shown in Table 2. The pre-test was given before the discussion of Geometry among the Grade 5 pupils. After a week of integration of Differentiated Instruction (DI) in teaching Geometry to the experimental group, the the post-test was given. There was a significant difference in the scores for the pre-test (M=7.86, SD=2.74) and post-test (M=12.18, SD=3.88); t (28), p=0.000. These results showed that the DI has a significant positive effect on the results of the post-test. Specifically, the results showed that the integration of DI in teaching Geometry can significantly increase the post-test scores of the experimental group.

Table II. Paired sample test of the pre-test and post-test result of the experimental group

	PAIRED DIFFERENCES					t	df	SIG.
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			(2-tailed)
Pre-test–Post-test	-4.32143	3.17459	.59994	-5.55241	-3.09045	-7.203	27	.000

Table 3 shows the mean and the standard deviation of the pre-test and post-test of the experimental group. The mean score and standard deviation of the pre-test are 6.78 and 3.27, respectively. On the other hand, the mean score and the standard deviation of the post-test are 10.15 and 3.38 respectively.

Table III. Descriptive Statistics of the Pre-test and Post-test scores of the control group

	MEAN	N	STD. DEVIA-TION	STD. ERROR MEAN
Pre-test	6.77	27	3.27438	.64216
Post-test	10.15	26	3.37867	.67557

A paired sample test was conducted to compare the control group's pretest and post-test scores, as shown in Table 4. There was a significant difference in the scores for the pre-test (M=6.78, SD=3.22) and post-test (M=10.15, SD=3.38); t (28), p=0.000. These results showed that the traditional instructional approach affected the results of the post-test. Specifically, the results showed that the traditional approach results in a significant increase in the post-test scores of the control group. There was a significant increase in the post-test, but the test result was not considered passing. The passing score should be 12, while the group only got 10.15.

Table IV. Paired sample test of the pre-test and post-test result of the control group

		PAIRED DIFFERENCES					t	df	SIG. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Grade 5 B	Pre-test Post-test	-3.3079	3.22	.63189	-4.60910	-2.0068	-5.235	25	.000

In summary, the results showed a positive effect in integrating Differentiated Instruction in teaching Geometry among Grade 5 pupils. According to Etienne (2011), MI is really essential and can be used as a tool to close the gaps in terms of achievement in the class-

room regardless of the characteristics of the learners.

The result is also consistent with the concepts introduced by Willis and Johnson (2001), wherein the differentiated instruction method resulted in a deeper understanding of concepts in Mathematics through multiple representations. It helps learners to understand math better and is more fun.

Beauchaine (2009) conducted a study with similar results. The data showed that a significant difference was observed in the achievement of classes where he used DI in teaching math concepts to grade 3 pupils. The teacher created lessons which were based on the MI so that their individual learners' needs were addressed.

The results revealed that 86% of the students were able able to attain proficient and above proficient range.

Table 5 shows the differences in the pretest and post-test scores of the experimental group. The table illustrates that the highest difference is 10, which means an increase in pretest and post-test, while the lowest is -2, which means a decrease in the pretest and post-test scores. Four of the 26 pupils have no observed change in the pretest and post-test scores in the recorded scores. The difference range which has the highest frequency is 4-5. It can also be observed that two pupils got negative differences which means that they got a lower score in the post-test than the pretest.

Table V. Frequency table of the gain scores from the pre-test and post-test scores of the control group

Difference of the Pre-Test and Post-Test Scores	Frequency	Percentage (%)
− 1 to − 2	2	8
0 − 1	8	31
2 − 3	4	15
4 − 5	6	23
6 − 7	2	8
8 − 9	3	12
10 − 12	1	4
TOTAL	**26**	**100**

A study with the same result was conducted by Douglas, Burton, and Reese-Durham (2008). In the study, the treatment group showed a significant difference in knowledge which is 25.48 points higher from the pre and post-tests. On the other hand, the control classroom only attained 17.25 points. The study concluded that teachers who created learning plans based on the MI profile of the learners meet the learning needs of the students. Consequently, it leads to students' improvements in terms of their academic, social and emotional well-being.

The third research question identified the difference in the performance of the experimental group and control group. The data collected from the study showed the differences of academic performance of the control and experimental group. The sources of the data include the pre and post-tests of both groups.

Figure 1 displays the difference of the post test of the control and experimental groups. The Table of

Specifications of the post-test illustrates that there are six items for the polygon, four items for both congruent polygon and solid figures and six points for the circle. It also shows that the first 15 items are under Analysis and the last five items are under Remembering. It can be observed that the experimental group has higher scores in the topics such as polygon, congruent polygon and solid figures. On the other hand, the control group has a higher average score in the topic Circle. The difference of the two average scores is 0.10. Another observation made is the differences of the scores of both groups. The experimental group has an average score of 4.04 out of six items as compared to the average score of the control group which is 2.69. The difference of the two average scores is 1.35 which is the highest recorded difference. For the topic Congruent Polygons, the difference of the two average scores is 0.64. while 0.26 is the recorded difference of the two groups in the topic Solid Figures. In general, it can be concluded that the experimental group performed better than the control group in the teaching learning process of Geometry.

Figure 1. The difference of the scores of the control and experimental group in different subtopics of Geometry

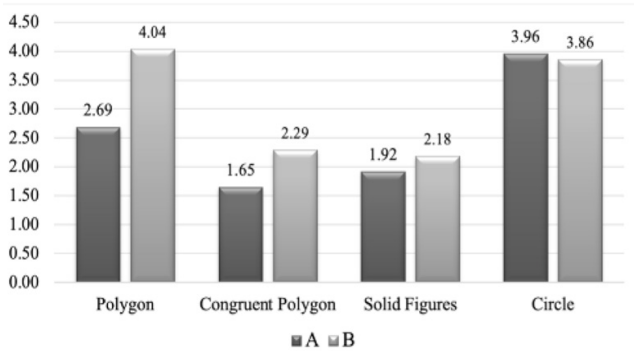

Table 6 shows the summary of the differences in the pretest and post-test scores of both groups. It is highlighted that the experimental group only maintained or increased their scores; none of the pupils have a lower post-test. On the other hand, two of the pupils from the control group had a lower post-test score than the pretest. Another observation is that ten pupils from the experimental group have increased their scores by six and above than the control group. The difference range with the highest frequency is 2-3, while the control group is 0-1. These observations can conclude that the experimental group performed better in the post-test than the control group.

Table VI. Summary of the Differences of the Pre-test and Post-test scores of the control and experimental groups

DIFFERENCE IN THE SCORES	EXPERIMENTAL GROUP	PERCENTAGE (%)	CONTROL GROUP	PERCENTAGE (%)
−1 to −2	0	0	2	8
0–1	6	21	8	31
2–3	8	29	4	15
4–5	4	14	6	23
6–7	7	25	2	8
8–9	0	0	3	12
10–12	3	11	1	4
TOTAL	**28**	**100**	**26**	**100**
MEAN	**4.32**		**3.31**	
MEDIAN	**3.5**		**3**	
MODE	**3**		**5**	

Figure 2 shows the gap of the mean pre-test and mean post-test scores of both experimental and control groups. Both display improvement from the pre-assessments. This means that the two sections learned Geometry through the two approaches, Differentiated Instruction and Traditional approach. Figure 4 also shows the difference of the two mean scores. It shows that the 1.01 gap of the mean pre-test scores of the two groups increases to 2.03. The experimental group has increased their mean scores by approximately 5 points.

Figure 2. Comparison of the Mean scores of Control and Experimental Group

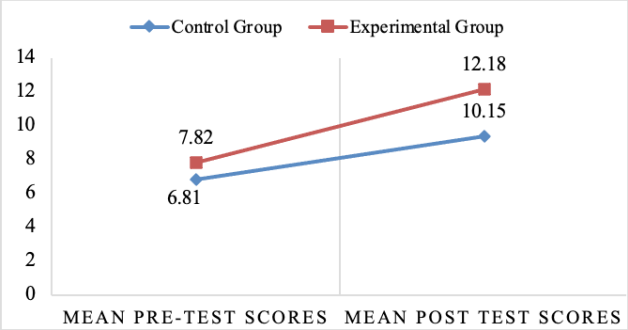

Table 7 shows that there is a difference between the post-test of the two groups. The experimental group has a higher post-test average score than the control group's post-test average score. The recorded difference is 2.02. An independent-samples t-test was conducted to compare the post-test scores of the control and experimental group, as shown in table 4. The results show that there is a significant difference in the post-test scores of the control group (M=10.15, SD=3.38) and experimental group (M=10.15, SD=3.87); t(53)=2.04, p=0.046. These results suggest a significant difference between the average post-test scores of the control and experimental group. These also imply a difference in the group's performance taught using the traditional instruction compared to the group taught using DI.

Table VII. Independent samples test results of the post-test scores of the control and experimental groups

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Posttest Score	Equal variances assumed	1.076	.304	2.039	52	.047	2.02473	.99317	.03179	4.01766
	Equal variances not assumed			2.049	51.800	.046	2.02473	.98804	.04189	4.00756

Specifically, the experimental group with the implementation of DI had a significantly higher mean post-test score than the control group taught by the traditional instructional approach. The experimental group had significantly improved their scores to a than the control group.

Also, the effect size of the two groups was determined. Effect size is the measure of the strength of the relationship between two variables on a numeric scale. Cohen's d effect size was used for the computation. The computed value was 0.60, which means that 73% of the students in the control group were below the students in the experimental group.

The results agree with the study of Muthomi (2014) who explored the differences between the experimental and control group. His results showed significantly better achievement in the experimental group than the achievement of the control group in math. It implies a gap between the performance of the two groups because of the implementation of DI. The students will achieve significantly better when their needs are addressed and the instruction is matched to their learning patterns.

These findings are also consistent with the study of Muthomi (2014). He found that DI is essential in improving the performance of learners. By analyzing the data collected, using DI in teaching a topic positively impacts learning and learner's performance. The group which learned through DI performed better than the group which learned through the tradition-

approach. DI has consistently proven that it has a positive effect because it supports the diverse needs of the students.

Saad (2013) conducted a study wherein he analyzed the effect of using DI by integrating MI and learning styles on solving given problems. Results showed that the DI that integrated MI effectively improved the learners' skill in solving problems and behavior of students towards math in the experimental group, compared to the control group whose learners were taught through the traditional approach.

Gangi (2011) also proved in his study that in implementing MI in DI, the classroom led to greater student achievement. Differentiating using MI will help the teachers incorporate varied activities in one lesson to teach a new topic and craft tools that allow the students to use their strengths and skills to finish the tasks given to them. Doing so will then help the learners be more engaged in learning, and their achievement levels increase. The collaboration among learners with the same or different skills will increase. Learners can help each other in finishing the tasks assigned to them.

Bal conducted another study in 2016. He studied the effect of the DI in the algebraic learning fields on students' achievements. It was found that this approach in a math class among grade 6 pupils had a positive effect on student achievement, and the learners exhibited development in terms of cognitive and affective skills.

The use of DI should be implemented in a classroom because it helps students who are experiencing difficulties and encourages teachers to identify and address the strengths and differences among learners. It is also an effective method in teaching math as it provides learners varied activities and opportunities to collaborate with their co-learners compared to the traditional approach.

The last research question is about evaluating the experimental group in the application of Differentiated Instruction (DI) in teaching Geometry.

The data collected from the study came from the survey that evaluated the ID. It was composed of the ratings of the pupils on the Objectives, Instruction, Activities, and Materials. It is in the form of a Likert scale that ranges from 1—4.

Table 8 displays the general summary of the result of the evaluation tool for Instructional Design. It shows that the Instruction was the lowest among the five items and the highest in the Activities. The Instruction is composed of the giving of instructions, involvement of the teacher, and the classroom environment. The highest which is the Activities is mainly concerned about their views on the different activities given to them. Overall, the student-respondents agreed that the Instructional Design was helpful in the teaching and learning process of Geometry.

Table VIII. Summary of the contents of the evaluation tool for the Instructional Design integrated with DI in teaching Geometry.

CONTENTS	RATE	PERCENTAGE (%)
Objectives	3.25	81
Activities	3.52	88
Instruction	3.11	78
Materials	3.17	79
Over-all Rate	3.26	82

The finding of the study also concurs with that of Douglas, Burton, and Reese-Durham (2008). They concluded in their study that using the concept of MI to create innovative learning plans that addressed the needs of learners led to advances in the learner's skills in terms of academic, social, and emotional well-being.

Another key finding is based on the evaluation of the students about the activities and instruction. The evaluation results agree with Dicker and Gouws (2011) that MI helps the learners be more participative and cooperative in their learning process, which makes them maximize their strengths and capabilities. This is beneficial for both the teacher and the learners.

The results of the study also agreed with the study of Willis and Johnson (2001), which showed that Multiple Instruction enables all learners to learn mathematics successfully and enjoyably.

The involvement of the teacher in the instruction was also observable based on the feedback of the students. This view is aligned to the study of Kagan and Kagan (1998, as cited in Dicker & Gouws, 2011) that the educator assists the learner in learning mathematics, learning about mathematics, and learning to do mathematics by maximizing the development of all the intelligences through the teaching-learning experiences.

The final objective of the study is to develop an Instructional Design (ID) with the concept of Differentiated Instruction in teaching Geometry among Grade 5 pupils. The instructional design followed the format given by the school. It is composed of the objectives of each lesson, the activities given to the students according to their MI profile, assessment tools, values integration, generalization activities, and the teacher's remarks. It is recommended to be used in Geometry teaching and learning process among the Grade 5 pupils of the school. They are proven to be effective in improving the academic performance of the pupils. The first ID is about polygons, followed by solid figures, congruent polygons, and circles.

CONCLUSION AND RECOMMENDATIONS

The purpose of the study is to integrate Differentiated Instruction in a Mathematics classroom. The quasi-experimental study aimed to identify the Multiple Intelligence profile of the Grade 5 experimental group, assess the effect of integrating differentiated Instruction in teaching Geometry, and find the difference in the two sections' academic performance. Evaluation of the Instructional Design was also done.

The study's findings showed that pupils vary in

one classroom since they have a different dominant type of intelligence. Also, in the class studied, the most dominant is bodily-kinesthetic, which may be explained by the fact that the pupils are all boys and the range of their age is 10-11, where boys tend to be more playful. Another explanation is that pupils in the school are encouraged to play even during break times. The school also offers different sports groups wherein pupils are free to join. These result in the development of their bodily-kinesthetic intelligence.

Another result of the study demonstrated that Differentiated Instruction (DI) is beneficial in improving academic scores. An increase in the mean scores of the pretest and post-test was observed. It was determined by analyzing the data collected that implementing DI positively affected pupils' academic performance.

The study's findings showed a significant difference in academic performance between the control and experimental groups. Students who were taught using Differentiated Instruction performed better than those taught using the traditional approach. Differentiated Instruction supports the learners' needs, for it positively affects student academic performance and achievement. It is therefore concluded that Differentiated Instruction has had a positive impact on the performance of the pupils.

Lastly, the objectives of the ID were viewed as relevant, clear, and aligned to the objectives mandated by the Dep Ed. The pupils also considered the activities and Instruction relevant to them. It was also observed that the pupils liked the different activities given to them. The role of the teacher is also believed to be significant in facilitating the activities and giving instructions. However, the classroom environment was not conducive for the pupils. The teacher also observed that pupils tend to become noisy because of their excitement about the activities.

The study encourages the use of DI because of its significant benefit to students who may be having difficulties or experiencing difficulties either in the assessments or instructions in the classroom. Proper implementation of DI challenges the diversity of the learners as it caters to their strengths and differences. With this, it ensures the achievement of the K-12 Policy, "No Child Left Behind".

Overall, Differentiated Instruction is an effective teaching method because it gives students experiential learning and more venues to learn with their classmates and teachers compared to the traditional approach. It is a student-centered approach that enables students to acknowledge their strengths, weaknesses, skills, and abilities to achieve a positive teaching-learning process.

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