

# INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY: APPLIED BUSINESS AND EDUCATION RESEARCH

2023, Vol. 4, No. 8, 2830 – 2846

<http://dx.doi.org/10.11594/ijmaber.04.08.21>

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## Research Article

### Differentiated Instruction for an Enhanced Students' Academic Performance in Science 10 (PHYSICS)

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#### Article history:

Submission July 2023

Revised August 2023

Accepted August 2023

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#### ABSTRACT

The study aimed to determine the effectiveness of Differentiated Instruction strategy using selected Multiple Intelligences activities on the students' performance in Science 10 (Physics). The researcher employed quasi-experimental research and a descriptive method utilizing questionnaires as the principal tool to gather the data. The respondents involved in the study were the One Hundred Twenty (120) Grade 10 Junior High School students of Bagong Nayon II National High School, Antipolo City, during the school year 2022-2023. They were grouped according to their dominant Multiple Intelligence. The study revealed that among the first five dominant multiple intelligences of the students, the majority of the students are more on intrapersonal intelligence rather than the other. This implies that some of the respondents perform more in intrapersonal tasks and skills which would then indicate that teachers should assess each learner's multiple intelligence to know and enhance students' performance in academics. The use of Differentiated Instruction in teaching Science 10 (Physics) greatly improved the performance of the students in terms of their academics. This was shown on the pretest and posttest performance of the students in which their posttest performance increased greatly after the utilization of differentiated instruction in teaching Science 10. It can also be noted that the Intrapersonal Group of students got the highest increase in mean score. The average mean score in the pretest is 19.49 and 35.69 in the posttest with the mean increase of 16.20. This implies that although the students were given different activities, they all performed well. Based on the findings of the study, teachers can use differentiated instruction for the purpose of enhancing the academic performance of the students. This also implies that the prepared activities intended for these groups of students were effective. Therefore, a student-focused approach of teaching fosters an effective learning environment and excellent academic performance.

**Keywords:** *Approaches to teaching, Differentiated instructions, Multiple intelligence*

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#### How to cite:

Toledo, F. L. (2023). Differentiated Instruction for an Enhanced Students' Academic Performance in Science 10 (PHYSICS). *International Journal of Multidisciplinary: Applied Business and Education Research*. 4(8), 2830 – 2846. doi: 10.11594/ijmaber.04.08.21

## **Introduction**

The Philippines has been constantly combating to improve the students' academic achievement across major learning areas. Its academic achievement statement was observed in numerous national and international assessments crediting the failure to its blocked Basic Education Curriculum (BEC) with various capabilities to be learned in a restricted time period. Regardless of the passionate and intensive observation that the Department of Education (DepEd) has been offering, several changes in the Philippine curriculum, a similar academic achievement result is reflected in the ensuing years (Bibon, 2022). Each student has various approaches to learning, and understanding instructions. Science is considered as one of the major subjects in the Philippine educational system. Physics, as part of the Science Education Curriculum, is one of the most interesting fields to study.

However, most students have considered Physics as a tough and difficult subject, they tend to lose interest and do not put in any effort to learn it. Due to the numerous equations and mathematical problem-solving involved, some of the students consider physics to be one of the most difficult and important subjects. In view of the above mentioned scenarios, the researcher has conceived the idea of finding out whether Differentiated Instruction (DI) is effective in teaching Physics. According to Demir (2021), students' enthusiasm to learn science is increased more by varied teaching practices than by standard teaching techniques; students who are interested in teaching, support these practices. The students see the value of the teaching methods in the class in which they can have the option to see and perform a topic introduced by the teacher (Kleichmann, 2020).

As stated by Dr. Howard Gardner, the proponent of the Multiple Intelligence Theory, he said that every student is unique and that each student has their distinct level of intelligence and their own learning styles. Multiple intelligences, a theory made by Harvard Developmental Psychologist Howard Gardner in 1983, which refers to the different sorts of learning capacities of each and every student. In addition, it refers to the different ways students learn and acquire information. Furthermore,

McCoog (2020) said that teachers who have implemented Multiple Intelligence (MI) in their classroom have found when students are permitted a choice of activities to complete, students will generally pick those activities in which they will utilize their strongest intelligence region. Therefore, they are more motivated to complete their work and eventually, increases their achievement and success.

Research has shown that students learn in more ways than one, which additionally affects student engagement and motivation. Instruction ought to be differentiated to benefit every individual student. Aside from the students and their preferred methods of learning, teachers need instruction and need to have tools available for them to implement differentiated instruction into their classroom. By enabling instructors the necessary time and training, they may become more at ease adopting differentiated teaching, which would significantly impact student learning (Bogen et al., 2019). As Gentry (2013) explained, it is clear that all learners are different and this creates the need for all teaching approaches to be differentiated. Hawkins (2018) said that differentiated teaching offers a range of techniques that provide assistance and supervision while students are just starting to practice their instructional choices. Additionally, Bondie, et al. (2019) explained that, in contrast to one-size-fits-all training, differentiated instruction enables teachers to develop lessons to target specific challenges where students are, and give a variety of approaches to comprehend, acquire, and apply learning.

Different instruction strategies can immensely affect the students' academic performance and its impact can be both positive and negative contingent on the learners. Thus, in order to enhance the students' academic performance, assessment on each learner's multiple intelligence is important, to know and enhance each and their academic performance. Additionally, Levy (2017) explains that the goal of differentiated instruction is to ensure that all students achieve the same objectives, despite the fact that each student's journey to those objectives is unique with the tools of differentiated instruction. As stated by Gayeta and Ramos (2019), in differentiated instructional practices, teachers ought to know about

designing lessons based on students' learning styles, gathering students by shared interest, topic and ability and furthermore permitting them to jump into their own individual learning styles. Furthermore, Pham (2019) believes that using differentiated instruction to accommodate students' shifting academic levels is a successful teaching strategy.

The researcher wants to work with educators to create more ways that will support instructors' efficient use of differentiated instruction. Besides, this study empowers the science teachers to have a deeper understanding of differentiated instruction, its tendency and parts. Separated instruction is a way for teachers to give specialized and individualized instructions and track progress at each student's instructional level to meet these standards. It is with the above premise that the researcher was motivated to conduct this study.

### The Purpose of the Study

This study aimed to determine the effectiveness of Differentiated Instruction (DI) strategy using selected Multiple Intelligences activities on the students' performance in Science 10 (Physics), at Bagong Nayon II National High School during the school year 2022-2023. Specifically, it sought answers to the following questions:

1. What are the first five dominant multiple intelligences of the target groups of students based on the results of the Multiple Intelligence Survey Questionnaire?
2. What teaching/learning activities for differentiated instruction strategy may be used to teach the Most Essential Learning Competencies in Science 10 (Physics) based on Multiple Intelligences of the target students?

3. What is the academic performance in the pretest and posttest of the target groups of students in Science 10 (Physics) before and after utilization of Differentiated Instruction strategy?
4. Are there significant differences between the mean score in the pretest and posttest of the different groups of students?
5. How do the target groups of students perceive the use of differentiated instruction in learning Science 10 (Physics) with respect to:
  - a. Content
  - b. Process
  - c. Product

### Research Design

The researcher employed quasi-experimental research and a descriptive method utilizing questionnaires as the principal tool to gather the data. According to Campbell and Stanley (1963) a quasi-experimental study is a research design that provides the opportunity to compare, collect and analyze data on intact groups; a control group and an experimental group. The researcher used this research design to be able to compare, collect and analyze data.

### Participants

The respondents involved in the study were the One Hundred Twenty (120) Grade 10 Junior High School students of Bagong Nayon II National High School, Antipolo City, during the school year 2022-2023. They were the two regular sections handled by the researcher. They were grouped according to their dominant Multiple Intelligence.

Table 1 below presents the distribution of respondents.

Section	Spatial	Linguistic	Musical	Interpersonal	Intrapersonal	Total
<b>A</b>	9	9	12	10	20	<b>60</b>
<b>B</b>	8	8	13	15	16	<b>60</b>
<b>Total</b>	<b>17</b>	<b>17</b>	<b>25</b>	<b>25</b>	<b>36</b>	<b>120</b>

### Data Gathering Instrument

To be able to gather sufficient data for analysis from the respondents, the researcher utilized pretest and posttest as the primary tool to gather the data needed.

(1) The pretest was used to determine students' readiness before subjecting them into differentiated instruction. This test questionnaire where a selected test from the Most Essential Learning Competencies (MELC's) in K to 12 Grade Ten Science (Physics) which was administered at the beginning of the second grading. A posttest which is parallel in form as the pretest was also utilized. The test is composed of 50 multiple choice questions. The pretest/posttest and the survey questionnaire were validated by the Physics teachers, master teacher, and the chairman of the science department.

(2) The second instrument used in the study was the Multiple Intelligence Survey Questionnaire by Thomas Armstrong. This was used to determine the Multiple Intelligences of the target students in this study.

(3) The third instrument used to gather the needed data was the survey questionnaire on Students' Perception on the Use of Differentiated Instruction which was administered to determine what the students believe, think and feel about the instruction in Physics using the Multiple Intelligence activities.

### Statistical Analysis

Data were gathered through the questionnaire which was then subjected to ranking, percentage, weighted mean and paired t-test. Ranking was used to determine the first five dominant multiple intelligences of the students. Weighted Mean was used in the gathered scores for the perception of students on the use of the prepared activities for the differentiated instruction. It was used to measure the general response of the survey samples, whether they agreed on the statement or not. Paired t-test was used for determining the pretest and posttest mean scores of the different groups of students.

### Results and Discussion

This chapter comprises the analysis, presentation and interpretation of the findings resulting from this study.

Table 2 shows that among the total of 120 students, the majority of the students are more on intrapersonal intelligence rather than the other four namely, interpersonal, musical, spatial and linguistic. This implies that some of the respondents perform more in intrapersonal tasks and skills. This would then indicate that teachers should assess each learner's multiple intelligence to know and enhance students' performance in academics. Given that all areas of multiple intelligence will be catered.

Table 2. Ranking of the First Five Dominant Multiple Intelligences of the Target Students

Multiple Intelligence	Frequency	Percentage	Rank
Intrapersonal	36	30.00	1
Interpersonal	25	20.83	2.5
Musical	25	20.83	2.5
Spatial	17	14.17	4.5
Linguistic	17	14.17	4.5
<b>Total</b>	<b>120</b>	<b>100.00</b>	

Table 3. Teaching/Learning Activities for Differentiated Instruction Strategy that were Utilized to Teach the Most Essential Learning Competencies to Groups of Students

LEARNING ACTIVITIES					
	MELC 1	MELC 2	MELC 3	MELC 4	MELC 5
	EM Spectrum	Practical Application of EM waves	Effects of EM Waves	Mirrors and Lenses	Motors and Generators
INTRAPERSONAL	Essay	Journal Making	Personal Notes	Concept Making	Individual Research

		LEARNING ACTIVITIES				
		MELC 1	MELC 2	MELC 3	MELC 4	MELC 5
		EM Spectrum	Practical Application of EM waves	Effects of EM Waves	Mirrors and Lenses	Motors and Generators
INTERPERSONAL	Mentoring or Peer teaching	Cooperative Learning	Poster Making	Talk Show	Hands On	
MUSICAL	Creating Songs/Raps	Putting tune to the lyrics	Musical play	Song Parody	Composing songs	
SPATIAL	Diagram Sentences	Comic Strip	Coding & Shaping	Mind Map	Comic Strip	
LINGUISTIC	Word games & Riddles	Poster and Slogan Making	Picture and Article Review	Riddle Making	Jumbled Letters	

It can be seen in Table 3 the different instruction activity of the five identified multiple intelligences group of student. Which are appropriate for them in order to have a better understanding of the different learning competencies in Science 10 (Physics). Students who belong in intrapersonal intelligence, activities like essay, journal making, personal notes,

concept making and individual research activities were used. The musically inclined group of students used song parody, musical play, song composition, adding tune to the lyrics of the song as their activities. The use of Differentiated Instruction in teaching Science 10 (Physics) greatly improved the performance of the students in terms of their academics.

**Performance in the Pretest and Posttest of MI Group of Students**

Table 4. Performance in the Pretest and Posttest of the Intrapersonal Group of Students

Intrapersonal	Pretest	Posttest
Mean Score	21.00	40.50
Standard Deviation	5.76	6.72

Table 4 shows the performance of the students in the pretest and posttest of the Intrapersonal group of students. The students' performance in the pretest has a mean score of exactly 21 and a standard deviation of 5.76. The students' performance in the intrapersonal posttest has a mean score of 40.5 and a standard deviation of 6.72. Additionally, it shows that the students' performance had increased between their performance on the pretest and posttest. The results stated that the students are more focused on concentration, setting objectives and goals, thinking and solving problems with reasoning as well. This shows further that the students learn better through the

activities given to them since they try to understand their inner feelings, dreams, and relationships with others.

Furthermore, according to Munna and Kalam (2021), classrooms are full of various students, hence teachers should use a variety of teaching techniques. Utilizing a variety of tactics that can aid in the accomplishment of the teaching goals and objectives may be the best way to deal with this. Along these lines, the evaluation sought to identify the diversified instructional strategies that science teachers employ to meet the needs of diverse students in today's classrooms.

Table 5. Performance in the Pretest and Posttest of the Interpersonal Group of Students

Interpersonal	Pretest	Posttest
Mean Score	18.24	34.32
Standard Deviation	3.44	6.28

Table 5 shows the performance of the students in the pretest and posttest of the Interpersonal group of students. The students' performance in the pretest has a mean score of 18.24 with 3.44 standard deviation. On the other hand, the performance of the students in the posttest has a mean score of 34.32 with a standard deviation of 6.28. Moreover, it shows that the interpersonal group of students' performance was enhanced from their pretest performance compared to their posttest. This means that the students understood the lesson well using the activity for their group.

This indicates that the respondents with interpersonal skills include being a good listener, understanding what's being said, and providing a positive, useful response. Someone with good interpersonal skills might decide to resolve an argument among colleagues that's preventing them from getting an important task done. Moreover, Tomlinson (2017) underscored three important strategies while carrying out differentiated instruction which can make it all the more powerful, emphasizing learner's interests, contingent upon the right beginning stage and allowing students to work depending on their own pace.

Table 6. Performance in the Pretest and Posttest of the Musical Group of Students

Musical	Pretest	Posttest
Mean Score	18.96	32.64
Standard Deviation	3.95	8.41

Table 6 shows the results of the students' musical pretest and posttest. According to the data acquired, the students' pretest performance had a mean score of 18.96 and a standard deviation of 3.95. On the other hand, the students' posttest performance in music had a mean score of 32.64 and a standard deviation

of 8.41. This shows that the students understood their lessons very well when taught using the activities intended for their multiple intelligence. Moreover, every single student can have these types of human intelligence modalities like musical-rhythmic.

Table 7. Performance in the Pretest and Posttest of the Spatial Group of Students

Spatial	Pretest	Posttest
Mean Score	19.33	35.63
Standard Deviation	4.39	10.43

The spatial students' performance in the pretest and posttest are displayed in table 7. A mean score of 19.33 with a standard deviation of 4.39 is shown for the students' performance in the pretest based on the data collected. A mean score of 35.63 and a standard deviation of 10.43 are associated with the students' performance in the posttest. The concept of many intelligences, put out by Harvard Developmental Psychologist Howard Gardner in 1983, describes the various types of spatial learning abilities that each learner possesses. These learners tend to think in pictures and need to create vivid mental images to retain information. They enjoy looking at maps, pictures, videos and movies. This further proves that the activities used by these groups of students are effective.

tal Psychologist Howard Gardner in 1983, describes the various types of spatial learning abilities that each learner possesses. These learners tend to think in pictures and need to create vivid mental images to retain information. They enjoy looking at maps, pictures, videos and movies. This further proves that the activities used by these groups of students are effective.

Table 8. Performance in the Pretest and Posttest of the Linguistic Group of Students

Linguistic	Pretest	Posttest
Mean Score	19.90	35.35
Standard Deviation	4.98	7.77

Table 8 shows the performance of the students in the pretest and posttest of the linguistic group of students. Based from the data gathered, it depicts that the students' performance from the pretest has a mean score of 19.90 with 4.98 standard deviation. On the other hand, the performance of the students in the posttest has a mean score of 35.35 with a standard deviation of 7.77. Therefore, it can be observed that the academic performance of the student increased after utilizing the instructional material intended for their group.

For instance, students who have solid verbal-linguistics intelligence learn better by hear-

ing, talking, reading, discussing and communicating and interacting with others. According to Yavich and Rotnitsky (2020), students with strong logical intelligence learn more effectively by laying out the logical connections between events, digitizing and calculating the properties of items quantitatively, and carefully considering the conceptual connections between events. Students can develop their potential and concern for the climate, learn about normal peculiarities, and have the option to understand and take care of issues they experience in the encompassing scene (Kose & Arslan, 2017).

Table 9. Summary of Students' Performance in Pretest and Posttest Per Multiple Intelligence Group

MI Group	Pretest Mean Score	Posttest Mean Score	Mean Increase
Intrapersonal	21.00	40.50	19.50
Interpersonal	18.24	34.32	16.08
Musical	18.96	32.64	13.68
Spatial	19.33	35.63	16.30
Linguistic	19.90	35.35	15.45

The summary of the students' performance in the pretest and posttest is presented in Table 9. It can be seen in Table 9 that the performance of all groups of multiple intelligence (MI) students have greatly increased. It can also be noted that the Intrapersonal group of students got the highest increase in mean score. The average mean score in the pretest is 19.49 and 35.69 in the posttest with the mean increase of

16.20. This implies that although the students were given different activities, they all performed well. The increased in all students posttest scores were brought by the utilization of the specific instructional material suited for their intelligences. With that, differentiated instruction is effective in teaching the Most Essential Learning Competencies in Grade 10 Science (Physics).

**Test of Significant Difference Between the Pretest and Posttest Mean Scores of the Different MI Group of Students**

Table 10. Paired t-test for Pretest and Posttest Mean Scores of the Intrapersonal Group of Students

Intra personal	Mean Difference	SD	t computed	t critical value	Decision	Interpretation
Pretest-Posttest	-16.250	5.940	-16.415	1.697	Reject Ho	Significant
df = 35			***Significant at 0.05			

Table 10 illustrates the results of the paired t-test for the pretest and posttest mean scores of Intrapersonal groups of students. The mean difference between the pretest and posttest total scores looks to be -16.250 with a standard deviation of 5.940. The true mean difference for

the students, with a 95% confidence level, is between -18.260 and -14.240. The paired t-test findings showed that, with a computed t-value of -16.415 and a critical value of 1.697, the null hypothesis that there is no significant difference between the students' pretest and

posttest was rejected at a 5% significance level. Therefore, it is acceptable to infer that the student's intrapersonal pretest and posttest results differ or have a statistically significant

difference. This means that the use of the activity for the intended group is effective in learning the lesson.

Table 11. Paired t-test for Pretest and Posttest Mean Scores of the Interpersonal Group of Students

Interpersonal	Mean Difference	SD	t computed	t critical value	Decision	Interpretation
Pretest-Posttest	-13.400	6.934	-9.662	1.711	Reject Ho	Significant
df = 24				***Significant at 0.05		

Table 11 shows the test of significant difference between mean scores in the pretest and posttest of the Interpersonal group of students. With a standard deviation of 6.934, the mean difference between the pre-test and post-test total scores appears to be -13.400. According to statistics, the true mean difference for the students is between -16.262 and -10.538, with a 95% confidence level. The results of the paired t-test indicate that, at a 5% significance level, the null hypothesis that there is no significant

difference between the students' pre-test and post-test was rejected with a computed t-value of -9.662 and a critical value of 1.711. Therefore, it is reasonable to conclude that there is a statistically significant difference between the pretest and posttest results of the interpersonal group of students. This signifies that the students' conceptual understanding of the lesson was facilitated when they were taught according to their multiple intelligence.

Table 12. Paired t-test for Pretest and Posttest Mean Scores of the Musical Group of Students

Musical	Mean Difference	SD	t computed	t critical value	Decision	Interpretation
Pretest-Posttest	-11.400	7.708	-7.395	1.711	Reject Ho	Significant
df = 24				***Significant at 0.05		

Table 12 shows the results of the paired t-test for the pretest and posttest mean scores of the musical group of students. With a standard deviation of 7.708, the mean difference between the pretest and posttest total scores looks to be -11.400. According to statistics, the true mean difference for the students falls between -14.582 and -8.218 with a 95% confidence level. The null hypothesis that there is no significant difference between students' pretest and posttest is rejected at a 5% significance

level according to the results of the paired t-test, which yielded a computed t-value of -7.395 and a critical value of 1.711. As a result, it is possible to draw the conclusion that there is a statistically significant difference between the students' pretest and posttest mean scores. This means that the students performed well after they were taught using the musical activities such as song composition, song parody, putting tunes to the lyrics of the song and playing musical instruments.

Table 13. Paired t-test for Pretest and Posttest Mean Scores of the Musical Group of Students

Spatial	Mean Difference	SD	t computed	t critical value	Decision	Interpretation
Pretest-Posttest	-13.588	8.544	-6.557	1.746	Reject Ho	Significant
df = 16				***Significant at 0.05		



Table 13 shows the test of significant difference between mean scores in the pretest and posttest of musical groups of students.

Table 13 displays the results of the paired t-test for the pretest and posttest mean scores of the spatial group of students. The mean difference between the pretest and posttest total scores appears to be -13.588 with a standard deviation of 8.544. Statistics show that, with a 95% confidence level, the true mean difference for the students is between -17.981 and -9.195.

The paired t-test findings showed the computed t-value of -6.557 and the critical value of 1.746, rejecting the null hypothesis that there is no significant difference between students' pretest and posttest mean scores at a 5% significance level. As a result, it is reasonable to infer that the spatial group of students' pretest and posttest mean scores exhibit a statistically significant difference. This shows that after the students were taught using the desired activity, they were able to comprehend the lesson well.

Table 14. Paired t-test for Pretest and Posttest Mean Scores of the Linguistic Group of Students

Linguistic	Mean Difference	SD	t computed	t critical value	Decision	Interpretation
Pretest-Posttest	-12.882	8.054	-6.595	1.746	Reject Ho	Significant
df = 16				***Significant at 0.05		

Table 14 shows the result of the paired t-test for the pretest and posttest mean scores of the linguistics students. The mean difference between the pretest and posttest overall scores appears to be -12.882, with a standard deviation of 8.054. Furthermore, statistics show that there is a 95% certainty that the population's true mean difference falls between -17.023 and -8.742. The paired t-test obtained a computed t-value of -6.595 with a critical value of 1.746, indicating that at a 5% significance level, the null hypothesis that there is no significant difference between students' pretest and posttest is rejected. Hence, it is possible to conclude that

there is a statistically significant difference between the pretest and posttest mean scores of the linguistics group of students. This shows that the activities used for this group of students suited their Multiple Intelligence. Hence, learning is facilitated.

According to Ahvan and Pour (2016), multiple intelligences should be formally integrated into the teaching and learning processes in Iran, especially in schools in southern cities like Bandar Abbas, so that students can have the opportunity to develop all types of intelligences, not just verbal-linguistic intelligence.

Table 15. Summary of Paired t-test for Pretest and Posttest Score of the Different Group of Students' Multiple Intelligences

MI Group	Mean Difference	SD	t computed	t critical value	Decision	Interpretation
Intrapersonal	-16.250	5.940	-16.415	1.697	Reject Ho	Significant
Interpersonal	-13.400	6.934	-9.662	1.711	Reject Ho	Significant
Musical	-11.400	7.708	-7.395	1.711	Reject Ho	Significant
Spatial	-13.588	8.544	-6.557	1.746	Reject Ho	Significant
Linguistic	-12.882	8.054	-6.595	1.746	Reject Ho	Significant
						*** Significant at 0.05

The summary of paired tests of the students for pretest and posttest mean scores in different multiple intelligences is presented in Table 15.

It can be seen in Table 15 that the intrapersonal group of students got the highest mean difference score of -16.250 with a standard deviation of 5.940 among all other multiple intelligences while the musical group of students has the lowest mean difference scores of

-11.400 with a standard deviation of 7.708. This only shows that the intrapersonal group of students have performed well and have the conceptual understanding of the lesson better than the other group of students. This also implies that the prepared activities intended for these groups of students were effective. Nevertheless, all group of students performed well after the implementation of Differentiated Instruction.

**Students' Perception on the Use of Differentiated Instructions in Learning Science 10 (Physics) Per Multiple Intelligence**

Table 16. Perception of Intrapersonal Group of Students on the Use of Activities According to their Multiple Intelligence

	<b>Weighted Mean</b>	<b>Verbal Interpretation</b>
<b>A. Content</b>		
1. I easily understand our topic in Electromagnetic Spectrum by using an essay as an instruction.	3.04	Agree
2. I easily remember the lesson about the Applications and Effects of EM waves by journal making as an instruction.	2.86	Agree
3. I easily understand the topics about EM waves by doing personal notes as a learning instruction.	3.38	Strongly Agree
4. I easily understand the topic about Mirrors and Lenses by making a concept map as an instruction.	3.28	Strongly Agree
5. I easily understand the topics about Motors and Generators by individual research activities as an instruction	3.11	Agree
<b>Average Weighted Mean</b>	<b>3.13</b>	<b>Agree</b>
<b>B. Process</b>		
1. My teacher gives us the opportunity to work as a group.	3.58	Strongly Agree
2. My teacher prepares and modifies learning activities based on my interests.	3.44	Strongly Agree
3. I easily understand the topics about EM waves by group research activities as a learning instruction.	3.53	Strongly Agree
4. My teacher utilizes the TV, laptop and other technology driven material in teaching.	3.55	Strongly Agree
5. My teacher lets us demonstrate what we know and are able to do in different ways.	3.47	Strongly Agree
<b>Average Weighted Mean</b>	<b>3.51</b>	<b>Strongly Agree</b>
<b>C. Product</b>		
1. I got higher scores in my summative tests now than before.	3.14	Agree
2. I can express and share my ideas and opinions during activities.	3.19	Agree
3. I can showcase my talents in front of my classmates.	3.17	Agree
4. I can present to the class the assigned task given.	3.19	Agree
5. I can collaborate with my groupmates.	3.47	Strongly Agree
<b>Average Weighted Mean</b>	<b>3.23</b>	<b>Agree</b>

The perception of an Intrapersonal group of students on the use of activities according to their multiple intelligence is shown in Table 16.

It can be seen in Table 16 that the Intrapersonal group of students' perception on the use of activities according to their MI gained an average weighted mean of 3.13 in terms of content, 3.51 in terms of process and 3.23 in terms of product, which are interpreted

as agree, strongly agree and agree respectively. This shows that the Intrapersonal group of students believe that they understood the lesson when they were asked to prepare an essay, had journal writing, write personal notes and conducted research on the topics taught to them such as electromagnetic spectrum, mirrors and lenses and motors and generators. This is also why they got higher scores in the posttest.

Table 17. Perception of Interpersonal Group of Students on the Use of Activities According to their Multiple Intelligence

		<b>Weighted Mean</b>	<b>Verbal Interpretation</b>
<b>A. Content</b>			
1.	I easily understand our topic in Electromagnetic Spectrum by mentoring or peer teaching.	3.44	Strongly Agree
2.	I easily remember the lesson about the Applications and Effects of EM waves by cooperative learning.	3.24	Agree
3.	I easily understand the topics about EM waves by poster making activities as a learning instruction.	3.40	Strongly Agree
4.	I easily understand the topic about Mirrors and Lenses by using talk show and panel discussions.	3.04	Agree
5.	I easily understand the topics about Motors and Generators by role playing as an activity.	3.32	Strongly Agree
<b>Average Weighted Mean</b>		<b>3.29</b>	<b>Strongly Agree</b>
<b>B. Process</b>			
1.	My teacher gives us the opportunity to work as a group.	3.76	Strongly Agree
2.	My teacher prepares and modifies learning activities based on my interests.	3.68	Strongly Agree
3.	I easily understand the topics about EM waves by group research activities as a learning instruction.	3.60	Strongly Agree
4.	My teacher utilizes the TV, laptop and other technology driven material in teaching.	3.72	Strongly Agree
5.	My teacher lets us demonstrate what we know and are able to do in different ways.	3.60	Strongly Agree
<b>Average Weighted Mean</b>		<b>3.67</b>	<b>Strongly Agree</b>
<b>C. Product</b>			
1.	I got higher scores in my summative tests now than before.	3.24	Agree
2.	I can express and share my ideas and opinions during activities.	3.56	Strongly Agree
3.	I can showcase my talents in front of my classmates.	3.16	Agree
4.	I can present to the class the assigned task given.	3.40	Strongly Agree
5.	I can collaborate with my groupmates.	3.60	Strongly Agree
<b>Average Weighted Mean</b>		<b>3.39</b>	<b>Strongly Agree</b>

The perception of Interpersonal group of students on the use of activities according to their multiple intelligence is shown in table 17.

It shows that the perception of Interpersonal group of students on the use of activities according to their multiple intelligence gained an

average weighted mean of 3.29 in terms of content, 3.67 in terms of process and 3.39 in terms of product. All interpreted as Strongly Agree.

A closer look at the table, in terms of content, understanding applications and effects of Electromagnetic (EM) waves by cooperative learning, mirrors and lenses through talk show and panel discussion, got a weighted mean of 3.24 and 3.04 both interpreted as Agree. Although the students only agreed in terms of their understanding of the lesson, they strongly

agreed that they learned the lessons through workgroup, research and utilization of technology driven activities. Additionally, according to research, good communication is the most crucial component of interpersonal intelligence. When you're able to understand others, you find it easier to communicate with them. In a professional situation, reading someone and recognizing subtle signs like their facial expressions is quite beneficial whether you're speaking or listening (Gardner, 2000).

Table 18. Perception of Musical Group of Students on the Use of Activities According to their Multiple Intelligence

	Weighted Mean	Verbal Interpretation
<b>A. Content</b>		
1. I easily understand our topic in Electromagnetic Spectrum by creating songs or raps as an instruction.	3.29	Strongly Agree
2. I easily understand the topic about EM waves by putting tunes to the lyrics and playing musical instruments.	3.20	Agree
3. I easily understand the topic about EM waves using musical play as an instruction.	3.21	Agree
4. I easily understand the topic about Mirrors and Lenses by creating a song parody as an instruction.	3.17	Agree
5. I easily understand the topic about Motors and Generators by creating or composing songs.	3.25	Strongly Agree
<b>Average Weighted Mean</b>	<b>3.22</b>	<b>Agree</b>
<b>B. Process</b>		
1. My teacher gives us the opportunity to work as a group.	3.75	Strongly Agree
2. My teacher prepares and modifies learning activities based on my interests.	3.82	Strongly Agree
3. My teacher gives us a pre-test to determine what we already know prior to introducing any new topic.	3.79	Strongly Agree
4. My teacher utilizes the TV, laptop and other technology driven material in teaching.	3.70	Strongly Agree
5. My teacher lets us demonstrate what we know and are able to do in different ways.	3.78	Strongly Agree
<b>Average Weighted Mean</b>	<b>3.77</b>	<b>Strongly Agree</b>
<b>C. Product</b>		
1. I got higher scores in my summative tests now than before.	3.56	Strongly Agree
2. I can express and share my ideas and opinions during activities.	3.33	Strongly Agree
3. I can showcase my talents in front of my classmates.	3.40	Strongly Agree
4. I can present to the class the assigned task.	3.37	Strongly Agree
5. I can collaborate with my groupmates.	3.48	Strongly Agree
<b>Average Weighted Mean</b>	<b>3.43</b>	<b>Strongly Agree</b>

The perception of Musical group of students on the use of activities according to their multiple intelligence is shown in Table 18.

It can be noted in Table 18 that the perception of the Musical group of students on the use of activities according to their MI has an average weighted mean of 3.22 in terms of content, 3.77 in terms of process and 3.43 in terms of product all interpreted as Strongly Agree.

The findings show that the musical group of students have better understanding of the lessons if they were asked to create raps or

compose songs on EM spectrum, put tunes to lyrics and play musical instruments, and create song parody on the topics taught to them. They also agreed on the way the lessons were presented as they used their personal interest in the activities. Further, this was manifested by their high scores in the posttest and being able to work collaboratively with their group mates and share his/her personal ideas and opinions. Musical intelligence broadens the appreciation for one's knowledge and capabilities.

Table 19. Perception of Spatial Group of Students on the Use of Activities According to their Multiple Intelligence

	Weighted Mean	Verbal Interpretation
<b>A. Content</b>		
1. I easily understand our topic in Electromagnetic Spectrum using diagram sentences as an instruction.	3.50	Strongly Agree
2. I easily remember the lesson about the Applications and Effects of EM waves by using comic strip activities as an instruction.	3.75	Strongly Agree
3. I easily understand the topics about EM waves by coding and shaping activities as a learning instruction.	3.26	Strongly Agree
4. I easily understand the topic about Mirrors and Lenses by journal making as an instruction.	3.25	Strongly Agree
5. I easily understand the topics about Motors and Generators by creating a comic strip activity as a learning instruction.	3.44	Strongly Agree
<b>Average Weighted Mean</b>	<b>3.44</b>	<b>Strongly Agree</b>
<b>B. Process</b>		
1. My teacher gives us the opportunity to work as a group.	3.53	Strongly Agree
2. My teacher prepares and modifies learning activities based on my interests.	3.35	Strongly Agree
3. My teacher gives us a pre-test to determine what we already know prior to introducing any new topic.	3.41	Strongly Agree
4. My teacher utilizes the TV, laptop and other technology driven material in teaching.	3.35	Strongly Agree
5. My teacher lets us demonstrate what we know and are able to do in different ways.	3.41	Strongly Agree
<b>Average Weighted Mean</b>	<b>3.41</b>	<b>Strongly Agree</b>
<b>C. Product</b>		
1. I got high scores in my summative tests now than before.	3.53	Strongly Agree
2. I can express and share my ideas and opinions during activities.	3.23	Agree
3. I can showcase my talents in front of my classmates.	3.06	Agree
4. I can present to the class the assigned task given.	3.41	Strongly Agree
5. I can collaborate with my groupmates.	3.64	Strongly Agree
<b>Average Weighted Mean</b>	<b>3.37</b>	<b>Strongly Agree</b>

The perception of the Spatial group of students on the use of activities according to their multiple intelligence is shown in Table 19.

It can be seen in Table 19 that the perception of the Spatial group of students on the use of activities according to their multiple intelligence gained an average weighted mean of 3.44 in terms of content, 3.41 in terms of process and 3.37 in terms of product all interpreted as strongly agree.

This means that the spatial group of students learn and easily understand the lesson in EM waves, mirrors and lenses using diagrams, motors and generators using comic strip and coding-shaping activities. It also shows that during these activities, they had the opportunity to work as a member of a group. They perceive that they got high scores because of the activities given by the teacher, which make them confident in learning the subject.

Table 20. Perception of Linguistic Group of Students on the Use of Activities According to their Multiple Intelligence

		<b>Weighted Mean</b>	<b>Verbal Interpretation</b>
<b>A. Content</b>			
1.	I easily understand our topic in Electromagnetic Spectrum using word games and riddles as an instruction.	3.17	Agree
2.	I easily remember the lesson about the Applications and Effects of EM waves by creating a poster and slogan as an instruction.	3.15	Agree
3.	I easily understand the topics about EM waves using picture and article review as a learning instruction.	3.11	Agree
4.	I easily understand the task on Mirrors and Lenses by riddle making activity	3.16	Agree
5.	I easily understand the lesson about Motor and Generator by arranging jumbled letters as instructions.	3.10	Agree
<b>Average Weighted Mean</b>		<b>3.14</b>	<b>Agree</b>
<b>B. Process</b>			
1.	My teacher gives us the opportunity to work as a group.	3.38	Strongly Agree
2.	My teacher prepares and modifies learning activities based on my multiple intelligence.	3.31	Strongly Agree
3.	I easily understand the topics about EM waves by group research activities as a learning instruction.	3.31	Strongly Agree
4.	My teacher utilizes the TV, laptop and other technology driven material in teaching.	3.36	Strongly Agree
5.	My teacher lets us demonstrate what we know and are able to do in different ways.	3.30	Strongly Agree
<b>Average Weighted Mean</b>		<b>3.33</b>	<b>Strongly Agree</b>
<b>C. Product</b>			
1.	I got higher scores in my summative tests now than before.	3.40	Strongly Agree
2.	I can express and share my ideas and opinions during activities.	3.33	Strongly Agree
3.	I can showcase my talents in front of my classmates.	3.53	Strongly Agree
4.	I can present to the class the assigned task given.	3.34	Strongly Agree
5.	I can collaborate with my groupmates.	3.47	Strongly Agree
<b>Average Weighted Mean</b>		<b>3.41</b>	<b>Strongly Agree</b>

The perception of the Linguistic group of students on the use of activities according to their multiple intelligence is presented in Table 20.

Table 20 illustrates that the perception of the Linguistic group of students on the use of activities according to their multiple intelligence have gained an average weighted mean of 3.14 in terms of content, 3.33 in terms of process and 3.41 in terms of product interpreted as agree for content and strongly agree for both

process and product. These findings show that the linguistic group of students' conceptual understanding of the lesson is facilitated using word games, riddles, arranging jumbled letters, creating poster and slogan and picture and article review. It further connotes that the students believe that the teacher's use of the activities gave them the opportunity to work as members of a group and allows them to make research and use technology during class.

Table 21. Summary of Perception of the Different Groups Students on the Use of Activities Per Multiple Intelligence with Respect to Content, Process and Product

Group Per MI	Content		Process		Product		Overall	
	AWM	VI	AWM	VI	AWM	VI	WM	VI
Intrapersonal	3.13	A	3.51	SA	3.23	A	3.29	SA
Interpersonal	3.29	SA	3.67	SA	3.39	SA	3.45	SA
Musical	3.22	A	3.77	SA	3.43	SA	3.47	SA
Spatial	3.44	SA	3.41	SA	3.37	SA	3.41	SA
Linguistic	3.14	A	3.33	SA	3.41	SA	3.29	SA
Overall Weighted Mean	3.24	A	3.54	SA	3.37	SA	<b>3.38</b>	<b>SA</b>

It can be seen in Table 21 that in terms of content the spatial group of students obtained the highest average weighted mean of 3.44 interpreted as strongly agree while the intrapersonal group attained the lowest average weighted mean of 3.13 interpreted as agree. In terms of process, the musical group got the highest average mean score of 3.77 while the lowest is the linguistic group with an average mean score of 3.33 both interpreted as strongly agree. In terms of product, the musical group got the highest average weighted mean of 3.43 interpreted as strongly agree while the intrapersonal group got the lowest average weighted mean of 3.23 interpreted as agree.

The table also shows that the overall weighted mean of the different groups of students are 3.24, interpreted as Agree for Content, 3.54 interpreted as Strongly Agree for Process and 3.37 interpreted as Strongly Agree for Product. The overall weighted mean for the different MI groups with respect to content, process and product is 3.38 interpreted as Strongly Agree. Moreover, Martin and Pickett (2020) noticed that students were more engaged in the classwork when Differentiated Instruction strategy was utilized, students excelled, loved

the variety of activities, rather than simply preferred working with a partner or alone for specific activities.

### Conclusion

The salient findings of the study were as follows.

1. As revealed in the study, the utilization of the Multiple Intelligence Survey Questionnaire led to the identification of the first five dominant multiple intelligences of the target group of students which were intrapersonal, interpersonal, musical, spatial and linguistic intelligences.
2. Based on the findings of the study, the teaching/learning activities that were used for the differentiated instruction were as follows: (a) For Intrapersonal- essay writing, journal making, doing personal notes, independent research, writing stories, playing vocabulary games and concept mapping. (b) For Interpersonal- mentoring or peer teaching, cooperative learning, poster making activities, talk show and panel discussion, and role-playing activities. (c) For Musical- creating songs or raps, putting tunes to the lyrics and playing

musical instruments, musical play, and creating song parody. (d) For Spatial- using diagram sentences, comic strip activities, coding and shaping activities, journal making, and comic strips. (e) For Linguistics- word games and riddles, poster and slogan making, picture and article review, reading and taking down notes and arranging jumbled letters.

3. The academic performance of the target groups of students in the pretest has an average mean score of 19.49 and 35.69 in the posttest with a mean difference of 16.22. Results showed that students' scores increased dramatically after implementing the differentiated instructions.
4. Paired t-test stipulated that there were significant difference between the mean score of the pretest and posttest of the different groups of students. Furthermore, Levy (2017) explains that the goal of differentiated instruction is to ensure that all students achieve the same objectives, despite the fact that each student's journey to those objectives is unique with the tools of differentiated instruction.
5. Finally, the perception of students on the use of differentiated instruction strategy obtained an overall weighted mean of 3.38 interpreted as Strongly Agree in terms of content, process and product. With this in mind, it is noteworthy to explore differentiated instruction material in teaching to foster student-centered approach of teaching. Thus, the different activities intended and prepared for the students were effective. Differentiated instruction strategy is effective and was able to improve the academic performance of the students.

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