The Effect of Multiple Intelligence of Students to Their Performance in Physics

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Abstract – The study was conducted to determine the effect of the dominant multiple intelligence of students on their performance in Physics, particularly Physics 7. Two sections of the grade 7 students (Helium and Hydrogen) who were enrolled at Pangasinan State University – Bayambang Campus, in the Junior High School Department for the A.Y. 2017 – 2018 were the subjects of the study. The descriptive-inferential type of research was used in the study. Descriptive – cross sectional is the design of the study. Descriptive statistics and analysis of variance (ANOVA) were used in the statistical treatment of data. Findings reveal that majority of the grade 7 students belong to the Musical Intelligence group and that minority of them belong to the Verbal Intelligence group. In addition, the posttests' level of performance of the students in Physics 7 when grouped according to their multiple intelligence have revealed that Kinesthetic Intelligence group performed significantly better than the other multiple intelligence groups which are Existential Intelligence, Interpersonal Intelligence, Intrapersonal Intelligence, Musical Intelligence, Naturalist Intelligence, Verbal Intelligence, and Visual Intelligence, except for Logical.

Keywords – Multiple Intelligence (MI), Posttest Performance, Physics 7

INTRODUCTION

Science has been considered as one of the major subjects in the Philippine educational system and includes the fundamental aspect of both physical and life sciences. Physics, as part of the Science Education Curriculum is one of the most interesting fields. Physics is considered as the most fundamental of all sciences for all other sciences derive from basic principles of forces, motion, electromagnetism, and thermodynamics. The study of Physics is important because it is one of the most fundamental sciences (Montoya, 2009) [9].

As adopted by the International Union of Pure and Applied Physics (IUPAP, 1999) [11], Physics is an exciting intellectual adventure that inspires young people and expands the frontiers of our knowledge about nature. It improves the quality of life by providing the basic understanding necessary for developing new instrumentation and techniques for medical applications, such as computer tomography, magnetic resonance imaging, positron emission tomography, ultrasonic imaging, and laser surgery.

Since most students have considered physics as a tough subject, they tend to lose interest and don't exert effort in learning it. Teachers also think that only the students who have high Intelligence Quotient (IQ) are said to be the ones capable of learning this subject.

Intelligence refers to a general mental capability to reason, to solve problems, to think abstractly, to learn and understand new material, and to profit from experience. Moreover, this can be measured by many kinds of tasks.

The "Theory of Multiple Intelligences," as introduced by Howard Gardner argued that the traditional educational model favored verbal and mathematical intelligence, but that every person possessed several types of intelligence, some stronger than others, and that teachers should expand their teaching techniques and content to draw upon these multiple intelligences (Douglas, 2004) [1]. Al-Wadi also suggested that students in schools that adopted Multiple Intelligence (MI) theory increased their achievement on standardized tests. Researchers also demonstrated that when teachers understand MI theory and the type of relationship between MI and students' academic achievement, they look differently at how they provide student instruction and develop their curriculum (Sulaiman, Hassan & Baki, 2011; Sulaiman, Hassan & Yi, 2011) [10].

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As a teacher of Physics for the past four years, the observation is that not all students share the same interest to Physics. Some of them see Physics classically as one of the most difficult and critical subjects in school. It has a reputation of difficult mathematical problem solving and seemingly nonsensical equations (Giancoli, 2008) [4]. Bearing such impressions, their minds are already closed to the beautiful and interesting world Physics has to offer to them. At Pangasinan State University, Integrated Schools – Junior High School Department, Physics is part of the science subjects in the K-12 Curriculum designed for students to appreciate how Physics relates to their everyday lives.

In view of the foregoing scenarios, the researcher has conceived the idea of identifying the dominant Multiple Intelligences of the students and relate that to their performance in Physics. 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 his/her intelligence and that they have their learning styles. This study is conceived to predict which among the nine multiple intelligences could perform well in Physics. Through this, there can be multi-disciplinary and multi-approaches to teaching with the different techniques that are suited for the specific type or group of students.

This study focused on the dominant multiple intelligence of students and their performance in Physics. This also dealt with the performance of students in Physics, their significant difference when grouped according to multiple intelligences and the development of a Strategic Intervention Material (SIM) that can enhance the performance of the students in particular intelligence type.

The subjects of the study were the two intact classes of Grade 7 students at Pangasinan State University – Integrated Schools – Junior High School, Bayambang Campus enrolled during the Academic Year 2017 – 2018. The topics covered were topics 1 to 4 of the Physics Science Curriculum of the grade 7 students. Topic 1 was all about Force and Motion, topic 2 was all about Waves, topic 3 was all about Sound and Light, and topic 4 was about Heat and Electricity. The researcher himself taught the two sections and constructed the strategic intervention material.

The results of this study are beneficial to the Physics community because it is geared towards upgrading the quality of Physics instruction and in relating the importance of the dominant multiple intelligence of the students as part of their performance in Physics. As a teacher of Physics for the past three years, the observation is that not all students share the same interest to Physics. Some of them see Physics classically as one of the most difficult and critical subjects in school. It has a reputation of difficult

OBJECTIVES OF THE STUDY

This study aimed to determine the Multiple Intelligence (MI) Status of the Students and their Performance in Physics 7. The study answers the following: More specifically, it sought to answer the following questions:

1. What is the dominant multiple intelligence of the grade 7 students according to sex?

2. What is the level performance of the grade 7 students in Physics when grouped according to their multiple intelligence?

3. Is there a significant difference in the performance of the grade 7 students in Physics when grouped according to multiple intelligence?

With the foregoing problems, this study tested this hypothesis at .05 level of significance:

There is no significant difference in the performance of the grade 7 students in Physics when grouped according to multiple intelligence.

MATERIALS AND METHODS

The descriptive-inferential type of research was used in the study. Participants were grouped according to their dominant multiple intelligence using an adopted multiple intelligence inventory. The research design is descriptive-cross sectional. With this design, the two intact grade seven sections were divided into Nine (9) Multiple Intelligence groups according to their dominant multiple intelligence. Each group took the same set of evaluative tests every end of a chapter for a total of four chapters.

The subjects of the study were the grade 7 students belonging to the two sections of the Pangasinan State University – Integrated Schools - Junior High School Department that were enrolled during the

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Academic Year 2017 – 2018. Both the two grade 7 sections (7 - Helium and 7 – Hydrogen) have 30 students each for a total of 60 students as part of the study. The researcher himself taught the two sections in Physics, and focused on the following topics: forces and motion; waves; sound and light; and heat and electricity.

The instrument that was used to identify the dominant multiple intelligence of the students was based upon a Multiple Intelligence Inventory developed by Walter McKenzie that is a tool, approved and validated by the International Education Community and has a primary purpose of identifying an individual's perceived MI preferences. This Multiple Intelligence Inventory is part of his book entitled "Multiple Intelligences and Instructional Technology, Second Edition (2005)" under the publication of International Society for Technology in Education (ISTE) (McKenzie, 2005) [8]. The researcher has adopted this inventory in such a way that it will match the preferences of the grade 7 junior high school Filipino students through the aid of an expert psychometrician. Descriptive statistics and analysis of variance (ANOVA) were used in the statistical treatment of data.

RESULTS AND DISCUSSION

Table 1: Dominant Multiple Intelligence of the Grade 7 Students

MULTIPLE INTELLIGENCE	MALE		FEMALE		TOTAL		RANK
	Frequency	Percent	Frequency	Percent	Frequency	PERCENT	
Musical	5	8.3	6	10.0	11	18.3	1
Intrapersonal	4	6.7	6	10.0	10	16.7	2
Interpersonal	6	10.0	1	1.7	7	11.7	3
Logical	0	0	6	10.0	6	10.0	4
Naturalist	4	6.7	2	3.3	6	10.0	4
Visual	3	5.0	3	5.0	6	10.0	4
Existential	4	6.7	1	1.7	5	8.3	7
Kinesthetic	4	6.7	1	1.7	5	8.3	7
Verbal	0	0	4	6.7	4	6.7	9
Total	30	50.0	30	50.0	60	100.0	

Table 1 shows the dominant multiple intelligence of the Grade 7 students in terms of frequency and percentage across sex. In males, out of the 30 students, the majority of the male students are classified under the interpersonal intelligence group having 6 students, while both Logical and Visual Intelligence groups having 0 students each. In females, out of the 30 students, a majority of the female students are classified under the Intrapersonal and Logical Intelligence groups each having six students, while the minority of them are under the intelligence groups of Existential, Interpersonal, and Kinesthetic, each having one student.

Moreover, taken the total population of the 60 grade seven students collectively, it can be noticed that most of the students fall under the musical intelligence group, while the minority are under the verbal intelligence group. Since musical intelligence talks about the ability to produce and appreciate rhythm, pitch, and timbre and appreciation of the forms of musical expressiveness (Hatch and Gardner, 1996) [5], a majority of the teenagers nowadays consider music as an integral part of their lives.

In addition to that, due to the quick access to the internet at this age, teenagers can play music anytime and anywhere (Lipter, 2016) [7]. Whereas, verbal intelligence refers to the ability to use language masterfully to express oneself rhetorically or poetically. It allows one to use language as a means to remember information. People who are strong in verbal intelligence are able to use words well, both when writing and speaking (Gardner, 1993) [2], since teaching and learning science subjects, specifically Physics requires students to speak in English as required by the DepED Order No. 36, s. 2006 (Implementing Rules and Regulations on Executive Order No. 210, Establishing the Policy to Strengthen the Use of the English Language as a Medium of Instruction in the Educational), and since English is not their mother tongue or first language they tend not to speak anymore due to the fear of not be able to express themselves properly. Moreover, the ranking of the multiple intelligence groups according to the number of students from highest to lowest is as follows: Musical (11), Intrapersonal (10), Interpersonal (7), Logical (6), Naturalist (6), Visual (6), Existential (5), Kinesthetic (5), and Verbal (4).

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Table 2: Performance of the Grade 7 Students according to their Dominant Multiple Intelligence

Multiple Intelligence	Quiz 1 Force and Motion	Quiz 2 Waves	Quiz 3 Sound and Light	Quiz 4 Heat and Electricity	Total Quiz	Rank
	Mean Score					
Kinesthetic	21.2	23.4	21.2	21.2	92.4	1
Logical	22.2	20.5	20.5	20.3	83.5	2
Naturalist	22.2	20.2	20.1	21.2	81.2	3
Visual	19.2	19.8	20.7	20.5	80.0	4
Musical	19.4	19.8	19.5	19.5	78.9	5
Existential	17.2	19.6	18.4	19.4	78.6	6
Verbal	18.8	19.5	19.2	19.0	76.5	7
Interpersonal	18.7	19.3	20.0	20.0	76.1	8
Intrapersonal	18.6	19.5	17.8	18.6	76.0	9
Minimum	15	15	15	15	68	
Maximum	25	27	26	26	120	
Mean	19.63	20.07	19.65	19.92	79.88	
Std. Deviation	2.57	2.50	2.60	2.24	8.58	
Skewness	.330	0.557	0.208	-0.014	1.970	
Kurtosis	-.700	0.637	-0.495	0.214	7.244	

It is shown in table 2 that among the nine multiple intelligence groups, Kinesthetic Intelligence group performed best, and Intrapersonal Intelligence group performed least. Based from the levels of performance rating scale developed by the researcher:

Level of Performance	Score
Very High	96 – 120
High	73 – 96
Average	49 – 72
Low	25 – 48
Very Low	0 – 24

Out of the 120 tests items found in the four tests given to the grade seven students, Kinesthetic Intelligence group got a total mean score of 92.40 which is equivalent to very high level of performance, followed by Logical Intelligence with an overall mean score of 83.50 equivalent to high, Naturalist Intelligence with a total mean score of 81.20 equivalent to high, Visual Intelligence with a total mean score of 80.00 equivalent to high, Musical Intelligence with an overall mean score of 78.90 equivalent to high, Existential Intelligence with an overall mean score of 78.60 equivalent to high, Verbal Intelligence with a total mean score of 76.50 equivalent to high, Interpersonal Intelligence with a total mean score of 76.10 equivalent to high, and Intrapersonal Intelligence with an overall mean score of 76.00 equivalent to high, respectively.

Table 3A: Difference in the Performance of the Grade 7 Students

Multiple Intelligence	Quiz 1 Force and Motion	Quiz 2 Waves	Quiz 3 Sound and Light	Quiz 4 Heat and Electricity	Total Quiz
	Mean Score				
Existential	17.2	19.6	18.4	19.4	78.6
Interpersonal	18.7	19.3	20.0	20.0	76.1
Intrapersonal	18.6	19.5	17.8	18.6	76.0
Kinesthetic	21.2	23.4	21.2	21.2	92.4
Logical	22.2	20.5	20.5	20.3	83.5
Musical	19.4	19.8	19.5	19.5	78.9
Naturalist	22.2	20.2	20.1	21.2	81.2
Verbal	18.8	19.5	19.2	19	76.5
Visual	19.2	19.8	20.7	20.5	80.0
F-value	3.599**	1.436^{ns}	1.419^{ns}	1.396^{ns}	2.415*
Sig.	.002	.205	.211	.221	.027

Table 3A presents the difference between the performances of the nine (9) multiple intelligence groups of the students in the tests along the topics of Force and Motion, Waves, Sound and Light, and Heat and Electricity. It can be noticed that Kinesthetic Intelligence group got the highest mean score of 92.40 and Intrapersonal Intelligence group got the lowest mean score of 76.00. This means that Kinesthetic intelligence group performed best along the four tests, while the Intrapersonal Intelligence group performed least. It is also shown in the table that the corresponding F-value along the topic of Force and Motion together with the total mean score of the four tests are less than 0.05. This implies that the null hypothesis that there is no significant difference in the performance of the grade 7 students in Physics when grouped according to multiple intelligence must be rejected. This means that there is a significant difference in the performance of the grade 7 students in Physics when grouped according to multiple intelligence on the said topics.

As Hoerr examined, he said that everyone possesses each of the Multiple Intelligences. But there are individual differences, and each learns differently with each other. Under these circumstances, Gardner posited that intelligence was multifaceted because each human had definite intelligence/s, similar to having a distinct personality (Gardner, 1998) [3]. Thus, it can be said that students learn an issue via different means, different intelligence areas and different senses, and in

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different circumstances through Multiple Intelligence Theory(Kuo, Maker, Su, & Hu, 2010; Maddox, 2002) [6].

The difference within each group's performances is explained in table 3B below which shows the post-hoc analysis of the mean scores along the topic of force and motion, and the total mean score.

Table 3B: Post-Hoc Analysis of the Mean Scores of the Students

	Quiz 1			
	Force and Motion		Total Quiz	
Multiple Intelligence	Mean Score			
Existential	17.2	a	78.6	b
Interpersonal	18.7	a	76.1	b
Intrapersonal	18.6	ab	76.0	b
Kinesthetic	21.2	bc	92.4	a
Logical	22.2	bc	83.5	ab
Musical	19.4	bc	78.9	b
Naturalist	22.2	bc	81.2	b
Verbal	18.8	c	76.5	b
Visual	19.2	c	80.0	b

Means with the same letter are not significantly different at .05 level.

Table 3B presents the Post-Hoc Analysis of the nine (9) multiple intelligence groups across the topic of Force and Motion and the Total Mean Score of the four posttests. It implies that for the topic of Force and Motion, the groups of Existential and Interpersonal intelligence performed significantly lower than Kinesthetic, Logical, Musical, Naturalist, Verbal, and Visual intelligence, while the Verbal and Visual intelligence groups performed significantly higher compared to intelligence groups of Existential, Interpersonal, and Intrapersonal.

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the study, the following conclusions were drawn:

1. The Grade 7 Students have varied dominant multiple intelligences, ranging from Musical Intelligence with 11 students (five males and six females), Intrapersonal Intelligence with 10 students (four males and 6 females), Interpersonal Intelligence with seven students (six males and one female), Logical Intelligence with six students (six females), Naturalist Intelligence with six students (four males and two females), Visual Intelligence with six students (three males and three females), Existential Intelligence with five students (four males and one female), Kinesthetic Intelligence with five students (four males and one female), and Verbal Intelligence with four students (four females), as arranged from the most to the least number of students.
2. The Kinesthetic Intelligence group performed best in the subject of Grade Seven Physics than the other eight multiple intelligence groups while the Intrapersonal Intelligence group performed least compared to the other multiple intelligence groups.
3. The Kinesthetic Intelligence group performed significantly better than the other seven multiple intelligence groups which are Existential, Interpersonal, Intrapersonal, Musical, Naturalist, Verbal, and Visual Intelligence except for the Logical Intelligence.

With the conclusions drawn as bases, the following recommendations are given:

1. For students, they should be able to identify and maximize their full learning potential using their dominant multiple intelligence in the entire learning process.
2. For school teachers, they should be encouraged to identify the dominant multiple intelligence of their students to vary their approaches in teaching a specific subject.
3. For school administrators, they should implement ways to conduct trainings and workshops for teachers regarding the use of different techniques to cater to students with different dominant multiple intelligence.

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