

Self-Reported Difficulties in Physics as Predictor of Students Achievement

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Abstract- This study aimed to determine the self-reported difficulties and achievement in physics of the Second Year BSIE students, University of Northern Philippines. The students have an overall "average difficulty" in learning physics concepts. The most difficult physics concepts to learn by the respondents were explaining the elementary particles. The respondents' achievement in physics is low and those with higher self-reported difficulties in physics tend to have lower achievement in physics.

Index Terms: Self-Reported, Difficulty, Physics, Concepts, Predictor, Achievement, Bachelor of Science in Industrial Education

1 INTRODUCTION

Physics is considered as the most problematic area within the realm of science, and it traditionally attracts fewer pupils than chemistry and biology. Physics is perceived as a difficult course for students from secondary school to university and also for adults in graduate education.

Hence, teaching physics has always been a challenge for teachers both in the high school and college levels because of the impression of most students that physics is a difficult subject. Some students even have prior thoughts that physics is a mathematics subject so those who have fear of numbers would naturally fear physics also. Moreover there are students who have the impression that the subject is usually taught by boring professors who would just talk and lecture for the rest of the period.

The challenges for a physics teacher would then be to remove these impressions from the students that physics is a difficult subject and to show that it can actually be fun. Physics teachers must emulate Hewitt (2011) when he declared that he saw it as his mission to make the study of physics a delightful experience and to inspire students to realize that physics is a worthwhile study of nature's rules.

Erdemir (2009) cited that in developed countries, it has been determined that goals of science are never fully realised, that student success in physics is lower than chemistry and biology, that students do not like science lectures and that most have no preference for science, particularly physics. It is well known that both high school and college students find physics difficult, and as a scientific discipline it is avoided because of its negative reputation.

Physics is regarded by most students as one of the difficult subjects in college based on studies. Concepts of the field are still difficult for them to apply even if

discussions are done. Oftentimes, students still interpret the lessons in unexpected ways. For most students, the

subject is difficult because it involves computations and problem solving. Due to this, most of the Filipino students nowadays are hesitant to enroll the course. Others just enroll it because it is included in the program. Some enroll it and later drop it or in the end fail to pass the subject.

Science remains to be difficult to the learners as revealed from the National Achievement Test results given to the basic education, that is, the learners performed lowest in science. In addition to this, result of the performance in international assessments studies showed that the Philippines was ranked as one of the lowest performing county science and mathematics (TIMSS 1999) and supported by the findings of Mirasol (2011), Racoma (2009), Agup (2005), and Alicar (1989).

To the University of Northern Philippines, College of Teacher Education, the place of conduct of this study, determining the self-reported difficulties and Physics achievement of the Bachelor of Science in Industrial Education students is important because physics is the foundation of their major subjects most especially in electronics.

The UNP-CTE is offering two physics subjects only (3-unit, 2/1) BSIE. With this limited course offering, the understanding of the students in physics should be determined to find out if they are equipped with the content knowledge that should be accompanied with life-long skills and as stressed by Agup (2005), no matter what interests or fields of specialization students may have, an introductory course in Physics is always an essential component in their general education in college.

Findings of the study could be an input to the college particularly to the Physics instructors in improving or introducing other methods of teaching Physics that would make teaching and learning more meaningful, and

effective. Moreover, this could make the students better appreciate the subject and not considering Physics as a difficult subject.

The results of this study could also bring recognition to the administration, faculty and students that spatial ability is vital in the study of Physics. Furthermore, this study could also make the students identify their spatial ability and for the teachers to provide the necessary steps on how students can improve it.

This study aimed to determine the self-reported difficulties and physics achievement of the Second Year BSIE students, College of Teacher Education, University of Northern Philippines, Summer 2012.

Specifically, it attempted to answer the following questions:

1. What are the self-reported difficulties of the students in learning physics concepts?
2. What is the achievement of the respondents in physics?
3. Is there a significant relationship between the respondents' self-reported difficulties and their achievement in physics?

2 METHODOLOGY

2.1 Research Design. This study made use of the descriptive method of research that applied correlational techniques. Correlations were done to determine if the students' self-reported difficulties in physics are predictors of their achievement in physics.

2.2 Population and Sample. The respondents of this study were 51 Second Year BSIE students enrolled in General Physics 2 class of the researcher, College of Teacher Education, University of Northern Philippines, Summer 2012. Total enumeration was utilized.

2.3 Data Gathering Instrument. To determine the respondents' self-reported difficulties in physics, the researcher adopted the difficulty questionnaire of Gelacio (1996). It consisted of 42 item-lists of concepts/skills in physics. The respondents were asked to rate themselves in terms of their difficulty in learning the concepts or skills in physics using the rating scales as follows:

Numerical Rating	Descriptive Rating
4.21-5.00	-Extreme Difficulty (E)
3.41-4.20	-Much Difficulty (M)
2.61-3.40	-Average Difficulty (A)
1.81-2.60	-Slight Difficulty (S)
1.00-1.80	-No Difficulty (N)

The above numerical ratings were also used in interpreting the responses of the respondents.

The achievement of the respondents in physics was based from grades in their Physics 1 and 2 classes. It was interpreted using the norms below:

Numerical Rating	Descriptive Rating
1.00	Excellent (E)
1.01-1.5	Superior (S)
1.51-2.0	Very Good (VG)
2.01-2.50	Good (G)
2.51-3.00	Low (L)

2.4 Data Gathering Procedure. The researcher administered the self-reported questionnaire to the respondents before their scheduled final examination in General Physics 2 class during Summer 2012. The respondents' achievement in physics was based from their grades in their General Physics 1 and 2 classes.

2.5 Statistical Tools. Frequency, Percentages and Mean were used to describe the achievement of the respondents in physics. Mean was also used to determine the self-reported difficulties of the respondents in physics. Simple correlation was used to determine the relationship between the self-reported difficulties and their achievement in physics.

3 RESULTS AND DISCUSSIONS

3.1 Self-Reported Difficulties in Physics

As seen on the Table 1, the respondents reported an overall "average difficulty" in learning physics concepts/skills as supported by the mean rating of 3.03. Out of 51 concepts/skills rated, eight (15.7%) items were reported of "much difficulty", 37 (72.5%) items of "average difficulty", and six (11.8%) items of "slight difficulty".

It is also revealed in the table that the most difficult physics concepts/skills to the respondents were explaining the elementary particles, explaining on how light behave as a particle and as a wave, differentiating energy and power, interpreting line graphs, differentiating mass and weight, explaining nuclear reaction and radioactivity, solving problems on radioactivity and differentiating conductors, insulators and semi-conductors with mean ratings of 3.41-4.20 and interpreted as "much difficulty".

It is noted that the reported most difficult concepts/skills were topics in physics 1 (explaining elementary particles, differentiating energy and power, interpreting line graphs, differentiating mass and weight) while explaining the nuclear reaction and radioactivity, solving radioactivity and differentiating conductors,

insulators and semiconductors were content in physics 2. Similar observations were noted on the other concepts/skills which were claimed by the respondents of average and slight difficulty.

TABLE 1
ITEM MEAN RATINGS OF THE SELF -REPORTED
DIFFICULTIES OF THE RESPONDENTS
IN PHYSICS

Concepts/skills	Mean	DR
Explaining the elementary particles	3.75	M
Explaining on how light behave as a particle and as a wave	3.67	M
Differentiating energy and power	3.61	M
Interpreting Line Graphs	3.49	M
Differentiating mass and weight	3.43	M
Explaining nuclear reaction and radioactivity	3.41	M
Solving problems on radioactivity	3.41	M
Differentiating conductors, insulators and semi-conductors	3.41	M
Explaining the theory of relativity	3.39	A
Solving problems on Ohm's law	3.35	A
Explaining force and motion	3.35	A
Differentiating scalars and vectors	3.35	A
Demonstrating diffraction of waves	3.27	A
Explaining the principles of LASER	3.33	A
Solving problems on series and parallel circuit connection	3.33	A
Differentiating kinetic and potential energy	3.31	A
Solving problems related to Distance and displacement	3.22	A
Solving Problems related to speed and velocity	3.20	A
Explaining topics on physics electronics	3.18	A
Improvising apparatus and teaching materials for the experiments	3.14	A
Solving problems related to acceleration	3.14	A
Demonstrating reflection of waves	3.12	A
Differentiating magnetic field and electric field	3.06	A
Demonstrating refraction of waves	3.00	A
Solving problems related to Free fall	2.96	A
Differentiating electromotive force and potential difference	2.96	A
Demonstrating interference of waves	2.90	A

Explaining how colors are formed and seen	2.90	A
Explaining the operation principles of an electric generator and motor	2.88	A
Solving Problems on vectors using analytical method	2.86	A
Differentiating elastic and inelastic collision	2.86	A
Solving problems on heat loses and heat gains	2.86	A
Explaining on how electromagnetic waves are produced	2.86	A
Solving problems on heat engine/refrigeration	2.84	A
Explaining wavelength, frequency and velocity	2.78	A
Solving problems on electricity and magnetism	2.78	A
Explaining the law of gravitation	2.76	A
Solving problems on circular motion	2.76	A
Demonstrating polarization of waves	2.76	A
Solving Problems on vectors using Component method	2.71	A
Explaining the kinetic molecular theory of gases	2.69	A
Solving problems on waves	2.67	A
Explaining the principle of conservation kinetic energy	2.65	A
Solving Problems related to gravitation	2.63	A
Solving Problems involving Newton's three laws of motion	2.61	A
Solving problems on photoelectric effect	2.59	S
Solving problems on stress and strain	2.57	S
Differentiating heat and temperature	2.55	S
Explaining the principle of conservation of momentum	2.53	S
Solving problems on Projectile motion	2.53	S
Solving problems related to the principle of kinetic energy conservation and conservation of momentum	2.35	S

Norms:

Numerical Rating	Descriptive Rating
4.21 -5.00	-Extreme Difficulty (E)
1.81 -2.60	- Slight Difficulty (S)
3.41 -4.20	-Much Difficulty (M)
1.00 -1.80	- No Difficulty (N)
2.61 -3.40	-Average Difficulty (A)

The above findings imply that the BSIE students found physics difficult to learn. The reported difficulty of the students could be due to the involvement of

calculations or problem solving in the study of Physics, which students find to be difficult. It is also due to the students' poor understanding of the Physics concepts. This is supported by thereport of TIMSS (1999)that science remains to be difficult to the learners as revealed from the National Achievement Test results given to the basic education, that is, the learners performed lowest in science. In addition to this, result of the performance in international assessments studies showed that the Philippines was ranked as one of the lowest performing country in science and mathematics.

3.2 Achievement of Students in Physics

Table 2 shows the frequency distribution of the achievement of the respondents in physics.

TABLE 2
FREQUENCY DISTRIBUTION OF THE ACHIEVEMENT OF THE RESPONDENTS IN PHYSICS

Achievement	Physics 1		Physics 2		Overall	
	f	%	f	%	f	%
1.51-2.00-Very Good	1	2.00	-	-	1	2.00
2.01-2.50-Good	35	68.6	10	19.6	24	47.1
2.51-3.00- Poor	15	29.5	41	80.4	26	51.0
Total	51	100.0	51	100	51	100
Mean	2.52		2.79		2.65	
DR	Poor		Poor		Poor	

As seen in the table, the achievement of the respondents in physics 1, 2 and on the overall is "poor" as supported by the mean ratings of 2.51-3.00. The respondents have slightly higher achievement in physics 1 than in physics 2 as supported by the mean ratings of 2.52 and 2.79 respectively. This means that the achievement in physics of the respondents is poor. The students' poor achievement could be due to lack of understanding of Physics concepts taken in classes. Their low achievement could have been also due to their lack of cognitive skills and poor background in Mathematics which are essential in studying Physics.

This is supported by the findings of Mirasol (2011), Racoma (2009), Agup (2005), and Alicar (1989) who found out that the student-respondents of have a low or poor level of Physics performance.

3.3 Significant Relationship between the Respondents' Self-Reported Difficulties and their Achievement in Physics

Table 3 presents the correlation coefficients showing the relationship between the respondents' self-reported difficulties and their achievement in physics

TABLE3
CORRELATION COEFFICIENT SHOWING SIGNIFICANT RELATIONSHIP BETWEEN THE RESPONDENTS' ACHIEVEMENT AND SELF-REPORTED DIFFICULTIES IN PHYSICS

Achievement	Correlation	Probability
Physics 1	0.36**	p< 0.05
Physics 2	0.43**	p< 0.05
Overall	0.24**	p< 0.05

Legend: ** -significant at .05 level

The table reveals that there is a significant relationship between the self-reported difficulties and achievement in physics of the respondents (physics 1 $r=0.36$, physics 2 $r=0.43$, overall $r=0.24$). This means that the respondents with higher self-reported difficulties in physics tend to have lower achievement in physics. Though the data seems to reveal a positive relationship, it should be noted that the 2.0 grade in physics is higher than 3.0 while the self-reported difficulties of 5.0 is extremely difficult compared to 1.0 of no difficulty. Hence, the self-reported difficulties in physics are predictors of physics achievement.

4. CONCLUSIONS

It was concluded that the respondents reported an average difficulty in learning physics concepts/skills. Out of 51 concepts/skills rated, 8 items were reported of much difficulty, 37 items of average difficulty, and only 6 items of slight difficulty. The achievement of the respondents in physics is poor, and there is a significant relationship between the self-reported difficulties and achievement of the respondents in physics

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