

PROBLEM SOLVING CONFIDENCE AND ATTITUDES IN PHYSICS OF FOURTH YEAR STUDENTS OF A PUBLIC SECONDARY SCHOOL: AN APPLICATION OF ONE- WAY MANOVA

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ABSTRACT

The study aimed to determine whether the problem solving confidence have an effect on the attitudes of students in solving problems in Physics. Specifically, it sought to find out if low and high problem solving confidence significantly differs in attitudes in Physics. Descriptive- comparative design was utilized in the study. The study was carried out in a Public Secondary School to forty fourth year students. Frequency or percentage, Mean, and One- Way MANOVA were used as tools in the analysis of data. Results revealed that there was greater number of students that have low confidence in problem solving in Physics; the level of attitudes in Physics of fourth year students was high and there was a significant difference in the problem solving confidence of fourth year students in terms of their attitudes in Physics. Further, there was a significant difference in attitudes in Physics associated with the difference in problem solving confidence of fourth year students. The only significant difference in the problem solving confidence was on their willingness to engage in Physics.

KEYWORDS: *Problem Solving Confidence, Attitudes in Physics, Public Secondary School, Philippines*

INTRODUCTION

Physics is considered as the most problematic area within the orbit of science and it conventionally attracts fewer learners than chemistry and biology (Rivard & Straw, 2000). In some countries, there has been debilitated in the number of students wishing to continue physics (Woolnough, 1994). Normah & Salleh (2006) indicated that attitude and interests play a substantial role among learners in studying science. Few studies such as Ajzen & Fishbein (2000), Wilson et al., (2000) and Gonen & Basaran (2008), report that students' positive attitudes towards science highly correlate with their achievement in science.

The theoretical underpinnings of the study are anchored on the idea of Muneyoshi (2004) which claims that the use of creative problem solving in class generate increased motivation and self-confidence of students and they find positive attitude that learn problem solving, also, it helps them to be active in

learning. In addition, Peterson (1996) reminds that an increase of concentration on critical thinking education and problem solving has caused review in syllabus of schools and these styles of skills, create foundation of all. Moreover, it is reinforced by cognitive style theory which claims that problem-solving is a personal -cognitive and innovative process that helps a person to develop effective and useful strategies to solve their everyday problems by using them.

In developed countries, it has been determined that the goals of science are never effusively realized, that student feat in physics is poorer than chemistry and biology that students do not like science lectures and that most have no preference for science, particularly physics (Boylan, 1996; Dieck, 1997; Mattern& Schau,2002;Neathery,1991; Rivard& Straw, 2000). To cite, Osborne et al., (1998) claimed that the Physics situation in schools in Englandrevealedthat the subject of physics and physics courses at school is only taken by students who do well and are not taken as incidental or added subjects. Most of the students in England perceived Physics as an elite discipline and regarded as conceptually difficult and only suitable for exceptionally talented and gifted pupils (Koballa, 1988; Osborne, et al., 1998; &Woolnough, 1994).

Statement of the Problem

This study aimed to determine whether the problem solving confidence has an effect on the attitudes of students in solving problems in Physics. Specifically, it sought to answer the following queries:

1. What is the problem solving confidence of students in Physics?
2. What is the attitude of students in solving problems in Physics in terms of: willingness to engage, passiveness and perseverance?
3. Is there a significant difference between high and low problem solving confidence in the attitudes in Physics of fourth year students?
4. Is there a significant difference in attitudes in Physics associated with the difference in problem solving confidence of fourth year students?

METHODS

Research Design

The study utilized descriptive- comparative research design which was concerned with and designed solely to explain the present distribution of variables, without regard to causal or other hypotheses. Meanwhile, it focused on testing the effect of one variable to other variables.

Research Respondents

Correspondingly, the simple random sampling design was employed where every individual in the population being sampled has an equal likelihood of being included. A total of forty fourth year students of a Public Secondary School in Davao City were selected as the respondents of the study.

Research Instruments

An adopted problem solving confidence survey questionnaire with five point Likert scale was used to gather responses from the respondents with regards to their problem solving confidence. Their responses were measured through mean rating and given descriptive interpretation. Mean ratings of 0 to 3.5 was classified as low confidence while 3.51 to 5 was categorized as high confidence. The questionnaire was originally made by TolgaGok. The questionnaire consisted of twenty- item questions. Another questionnaire which focused on the attitudes in physics were made and validated by a panel of experts. It consisted of 10- item questions measured in five point Likert scale.

Statistical Tools

The data were analyzed using percentage and frequency, mean and One- Way Multivariate Analysis of Variance (MANOVA). Frequency or percentage counts the number of students that were classified under low and high confidence, Mean was used to determine the attitudes of students in solving problems in Physics, and One- Way MANOVA aimed to determine the effect of problem solving confidence on the attitudes in physics of fourth year students a Public Secondary School.

RESULTS AND DISCUSSION

The problem solving strategies of students was checked prior to the experimental procedure to assess whether or not there was a significant difference in the attitude of students towards physics before exposing them to teacher-directed and self-directed problem solving techniques.

Problem Solving Confidence of Students

As can be shown in Table 1, it reveals the number of fourth year students with problem solving confidence. It depicts that there are 21 students' or 52.5 percent of the students have low confidence while 19 or 47.5 percent of the students mark with high confidence. This means that there are a greater number of students that have low confidence in solving problem in Physics.

Table 1. *Number of Students who have Problem Solving Confidence*

Variable	Frequency	Percentage
Problem Solving Confidence:		
1 (Low)	21	52.5
2 (High)	19	47.5
Total	40	100

Attitudes in Physics of Fourth Year Students

The Table 2 flaunts the attitudes in Physics of fourth year students of a Public Secondary School. It shows that the attitudes in Physics obtain a total mean rating of 3.58 and describe as high. Also, it reveals that perseverance records a mean rating of 3.70 which is higher among the three variables and described qualitatively as high. On the other hand, the willingness to engage tallies a mean rating of 3.41 which is the lowest among the three and can be described as moderate. The results indicate that the attitude in the physics of fourth year students is high. This implies that students often manifest perseverance and passiveness and they sometimes manifest willingness to engage in Physics.

Table 2. *Attitudes in Physics of Fourth Year Students*

Variables	N	SD	Mean	Descriptive Interpretation
Willingness to Engage		.3672	3.41	Moderate
Passiveness	40	.4420	3.65	High
Perseverance		.6241	3.70	High
Total		.4778	3.58	High

Significance of the Difference on Problem Solving Confidence in the Attitudes in Physics

Table 3 exposes the significance of the difference in problem solving confidence in the attitudes in Physics of fourth year students. Corresponding multivariate tests are depicted in the table; these are Pillai's Trace, Wilks' Lambda, Hotelling's Trace and Roy's Largest Root. The aim of the different tests is to test the significant differences among the groups on a linear combination of attitudes in Physics. Among the tests, the Wilks' Lambda is the commonly used multivariate test. Based on the result, Wilks' Lambda value marks .514 with a p- value of .000 which is lesser than .05 level of significance, hence, it indicates significant. This means that there is a significant difference in the problem solving confidence of fourth year students in terms of their attitudes in Physics. Most likely, students with high confidence have a better attitude in Physics. On the other hand, those students with low confidence demonstrated poor attitude in Physics.

This result is in line with the findings of Hedjazi et al., (2012) which reveals that confidence problem-solving style is a factor that affects academic achievement; idea of self-efficacy that means assessment of the individual confidence or his ability to accomplish a specific task (Bandura,1977). Hence, more confidence means more probability of starting a task and more readiness for facing its barriers. On the other hand, the findings of Reid &Skryabina, (2002); Gonen and Basaran, (2008) reveal that most students do not always know what to practice for solving of problems because they lack self-confidence and skill.

Table 3. *Test on the Significance of the Difference on Problem Solving Confidence in the Attitudes in Physics of Fourth Year Students*

Effect	Value	F	Sig	Partial Squared	Eta
Problem Solving Confidence					
Pillai's Trace	.486	11.359	.000	.486	
Wilks' Lambda	.514	11.359	.000	.486	
Hotelling's Trace	.947	11.359	.000	.486	
Roy's Largest Root	.947	11.359	.000	.486	

Significance of the Difference in Attitudes Associated with the Difference in Problem Solving Confidence

The Table 4 exemplifies the significance of the difference in attitudes in Physics associated with the difference in problem solving confidence of fourth year students. This table is possible only if the result of the multivariate test above is significant. In this table, assumptions of homogeneity and equality of variance are considered. It parades that Box's M test records 8.996 with a p- value of .223, hence, it suggests that homogeneity of variance is not violated. In this result, it is expected to have a p- value which is greater than .05. Similarly, Levene's Test reveals that the variables tally p- values which are greater than .05 thereby indicating that the equality of variance is not violated.

Correspondingly, the effect of problem solving confidence on the attitudes in physics is analyzed in the Test of Between- Subjects Effects. The Important thing is considered in analyzing the result. Bonferroni adjustment is introduced to determine the effect of one variable and reduce the chance of Type I error. This is done by dividing the alpha level to the number of analyses made. In this case, the alpha level is .05 and the number of analyses is 3, and the result is .017. Therefore a p- value which is lesser than .017 is considered significant.

Among the variables, willingness to engage marks a p-value of .000 which is lesser than .017 and the other variables obtain p- values higher than .017. The result indicates that the only significant difference in the problem solving confidence is on their willingness to engage in Physics. Further, the impact of problem solving confidence on willingness to engage in Physics is evaluated using the partial eta squared which marks as .422. This implies that only 42.2 percent of the variance in willingness to engage is explained by problem solving confidence. The effect size is considerably larger.

The findings of Morse and Morse (1995) sheds light of the findings above which states that students with positive attitudes towards science had positive attitudes towards their science teacher, curriculum and classroom climate. Therefore, achievement, motivation and student interest are influenced by positive and negative attitudes (Miller et al., 1961). Moreover, it is important to note that the effect of solving problem on a student's attitude toward science is incredibly significant, because problem solving involves patience, determination, perseverance and willingness to accept risk (Charles et al., 1997 and Udousoro, 2002).

Table 4. *Test on the Significance of the Difference in Attitudes in Physics Associated with the Difference in Problem Solving Confidence of Fourth Year Students*

Box's Test of Equality of Test of Between- Subjects Effects
Covariance Matrices

Box's M	p-value	Source	Dependent Variables	F	p-value	Partial Eta Squared
8.996	.223		Willing- Ness to Engage	27.74	.000	.422
		Problem Solving Confidence	Passive-ness Perseve- rance	.152	.699	.004
				.614	.438	.016
	.679					
	.213					

CONCLUSION

Based on the foregoing findings, the following conclusions were drawn:

1. There is a greater number of students that have low confidence in solving problems in Physics.
2. The attitude of students in solving problems in Physics is high.
3. There is a significant difference in the problem solving confidence of fourth year students in terms of their attitudes in Physics.
4. There is a significant difference in attitudes in Physics associated with the difference in problem solving confidence of fourth year students. The only significant difference in the problem solving confidence is on their willingness to engage in Physics.

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