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Acquiring Knowledge of Physics through Inspiration and Attitude

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Abstract

In the field of science, physics is one of the most popular and challenging subjects for students. When they are in high school, students think that physics is a challenging topic, and when they are in college, they are more evasive. This study examines and assesses the link between attitude and motivation of engineering and technology students toward learning physics based on a survey of 446 students. It demonstrates that there are no appreciable differences in the perspectives and motivations of students when it comes to learning physics. Furthermore, there is barely any correlation between attitude and motivation. The correlation between motivation and attitude is accidental. This statement indicates that the majority of students think learning physics won't be enjoyable for them.

Keywords: *Physics Through, Inspiration, Attitude, Motivation*

INTRODUCTION

Physics is one of the most prevalent disciplines in the world of engineering. Its importance in the academic and specialised range of engineering students makes it more than a mere learning aid for the duration of the engineering curriculum. It is the fundamental basis for all engineering disciplines and holds instructional value for all engineering students.

Physics is regarded as the most difficult branch of science, and it has generally attracted fewer students than disciplines such as chemistry and biology. In high school, the majority of students saw physics as a demanding subject, a

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perception that only intensified in college and grew even more challenging in graduate school. Historically, physics has had a poor image in the Philippines, making it more challenging for the majority of Filipino students to pursue the subject. Students who perform well in high school physics, as well as those who are highly smart and gifted in mathematics and science, will be able to grasp the importance of physics in everyday life.

Students in the Philippines have a negative attitude about learning physics due to the computational demands of every problem set, and if they dislike the topic, they dislike the instructor more frequently than not. Among the most prevalent teaching-learning tactics and approaches utilised by physics instructors is making physics enjoyable and engaging in the classroom. Several pedagogical approaches may be utilised to impart physics knowledge successfully and efficiently. Such impacts in teaching physics may boost students' ability to absorb and comprehend more than usual, hence facilitating their learning process.

It was noticed that students with unfavourable views about physics lack desire for class participation, whereas students with good attitudes possess drive for class participation (Cracker, 2006 [7]).

LITERATURE REVIEW

Students' Attitude towards Learning

A person's disposition might alter their perception of information and influence their capacity to retain it. In addition, it was confirmed that students' attitudes and interest might play a significant influence among students studying science, where attitude refers to an individual's views, emotions, or intended behaviours in response to something, an event, a programme, etc. It also demonstrates a strong correlation between students' good attitudes toward science and their science achievement.

A student's attitude toward school, classes, and academic accomplishment is one of the most influential variables on his or her academic progress. Attitude is the disposition of humans to arrange their thoughts, feelings, and behaviours in relation to a psychological object. Attitudes are not innate to humans; they are acquired over time. Some attitudes are founded on an individual's own experiences, knowledge, and abilities, while others are acquired from other sources. However, the attitude does not

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remain constant; it evolves throughout time (Erdemir, &Bakirci, 2009).

The attitude of the learner toward the subject influences his or her drive to study. The relationship between motivation and attitudes has been regarded as one of the most important aspects of learning. According to Gardner and Lambert (1972), an individual's desire to learn is influenced by his sentiments about the other group and his orientation toward the learning activity. Only when coupled with motivation can appropriate attitudes correlate with student involvement in learning and achievement?

Gardner (1980) defines attitude as the totality of a person's instincts and sentiments, prejudice or bias, preconceived beliefs, anxieties, threats, and convictions about any particular subject.

According to the study conducted by Shuib (2009), the attitudes of students revealed that the majority of students had positive attitudes regarding the social value and educational status of learning. Moreover, the findings revealed that students had a positive orientation toward language learning. Ajzan (1988) defines attitude as the propensity to react positively or negatively to an item, person, organisation, or event.

The evaluation of students' attitudes toward physics should consider their perspectives on the learning environment (Crawley & Black, 1992). Because problem solving takes patience, determination, endurance, and a willingness to accept risk, the influence of a student's attitude toward science is quite significant (Charles, Lester, and O'Daffer, 1987, p. 6).

Pintrich and Maehr (2004) divide students into three categories: those who wish to avoid failure, those who wish to fulfil their curiosity, and those who wish to get excellent grades. The study demonstrates that students' motivation levels and classroom techniques vary. When pupils have good attitudes, they demonstrate positive actions and meet academic requirements.

Eryilmaz, Yildiz, and Akin (2011) studied the association between high school students' opinions regarding physics laboratory and whether or not they are motivated to participate in class. Students that are highly motivated to participate in class also have good opinions regarding physics laboratory, the researchers

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observed. In contrast to this result, students with poor willingness to participate in class hold unfavourable opinions regarding physics laboratory.

Positive and negative attitudes affect student achievement, motivation, and interest (Miller, Abraham, Cohen, Graser, Harnack, & Land, 1961). In addition, children with good views toward physics also had positive sentiments regarding their scientific professors, science curriculum, and classroom atmosphere. Students' attitude toward science is more likely to affect their achievement in scientific courses than the success of attempts to modify students' attitudes (Morse and Morse, 1995).

If students have a poor view of science, they dislike physics classes and physics instructors. Numerous studies have been undertaken to discover the elements that influence students' attitudes toward science on the basis of this concept. Teaching-learning approaches, the use of presentation graphics, the type of science courses taken, studying methods, intelligence, gender, motivation, attitudes, science teachers and their attitudes, self-adequacy, previous learning, cognitive styles of students, career interest, socioeconomic levels, parental influence, social implications of science, and achievement are fundamental factors (Craker, 2006).

Numerous studies thought that if students were permitted to display greater cognitive ability through problem solving, either through a teacher-centered or a student-centered method, their views about physics would improve (Erdemir, 2009). In addition, his study indicated that the bad student attitudes about physics in the control group were attributable to a lack of information, lack of problem-solving abilities, lack of self-confidence, erroneous use of a formula, and failure to behave like experts while addressing physics issues.

Students' Motivation towards Learning

According to Gardner (2006), motivation is a multifaceted, very complicated phenomena. This is due to the fact that the term motivation has been interpreted differently by many schools of thought. In addition to defining motivation as the anticipation of a reward, Brown (2000) [5] says that the motivation of learners frequently refers to a contrast between instrumental and integrative motivation.

Due to a lack of attitudes and desire in the physics course, the majority of engineering graduates had a weak background in

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physics; nonetheless, studying prerequisite courses made it difficult for them to comprehend subsequent topics.

The motivation of students might be external or inner. Generally, external motivation consists of acknowledgment and appreciation for excellent effort. In the case of a college student, this may take the shape of scholarship renewal or a positive reputation in the classroom and at home. The students' grades are one of the most important factors in determining their extrinsic goal orientation.

While intrinsic motivation often consists of an internal desire to learn about a given topic, extrinsic motivation consists of an external desire to learn about that topic. According to Vansteenkiste, Simons, Lens, Soenens, Matos, and Lacante (2004) [30], students with intrinsic motivation displayed a deeper comprehension of reading content, higher grades, and more perseverance than students with extrinsic drive.

It is commonly acknowledged that learner motivation is a crucial aspect that determines the rate and success of learning. There are several possible causes for pupils' low competency, one of which may be their lack of interest in the topic. According to McDonough (1983), student motivation is one of the most influential determinants of their success or failure in learning.

A deeper knowledge of students' motivation and attitudes may help curriculum and instruction designers create language teaching programmes that foster the attitudes and motivation most conducive to the development of more effective language learners.

One of the characteristics identified by Maehr and Midgley (1991) is the incentive for class participation. Motivation has an important part in instruction and learning. Today, however, according to the motivational approach, kids are viewed as people who are able to reach a decision by weighing the possibilities and repercussions that might help them achieve their goals and create meaning in their lives. If students are motivated to participate in class activities, it indicates that they have the desire to do so.

Based on Eryilmaz, Yildiz, and Akin's (2011) investigation of the links between views about physics laboratories, motivation, and lack of desire for class participation, the following is proposed: Students' inability to understand abstract

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or tangible topics accurately or effectively is the most major challenge teachers face in physics classes. Numerous strategies and procedures are employed to manage this condition. Learning is most effective when students apply any approach or method, but their attitudes toward the lesson and prior knowledge are most influential.

If students lack desire to engage in the class, they are likely to become bored, unable to concentrate on the material, and unable to make a link between their schoolwork and the real world. As a result of the pupils' boredom and waning interest in the class, it is possible to observe their departure (Pintrich & Maehr, 2004).

Students' Learning

Educational research shows that promoting meta cognition in the science classroom prompts students to refine their ideas about scientific concepts and improves their problem-solving success (Rickey and Stacy, 2000).

Most learning strategy theories are based on the constructivist perspective of learning which contends that meaning and knowledge are constructed by the learner through a process of relating new information to prior knowledge and experience (Olgren, 1998).It also emphasizes that the quality of learning outcomes depends on how well the learner organizes and integrates the information.

Zuscho, Pintrichand Coppola(2003) investigated how students' level of motivation and use of specific cognitive and self-regulatory strategies changed over time, and how these motivational and cognitive components in turn predicted students' course performance. The result showed that there is an overall decline in students' motivational level overtime. There was also a decline in students' use of rehearsal and elaboration strategies over time; students' use of organizational and self-regulatory strategies increased overtime.

Deep approach intends to understand material for one self, vigorous and critical interaction with knowledge content, relating ideas to one's pervious knowledge and experience, discovering and using organizing principles to integrate ideas, relating evidence to conclusions, and examining the logic of arguments (Knowles and Kerkman, 2007). For deep learning to occur, students should use a combination of organization and elaboration strategies to analyze and synthesize information in ways that build a

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mental model linked to prior knowledge in memory.

Studies reviewed suggest that there is a relationship between attitude and methods of instruction and between attitude and achievement. Therefore, it is possible to predict the level of achievement from attitude scores. Although many researchers argue that teaching method shave a great impact on students' attitude to learn a subject, students' attitudes towards physics have not yet been examined. In this study, the effects of the problem-solving strategy on students' attitudes were investigated (Eridemir,2009).

Students' Attitude and Motivation in Science Education

It was observed that the students who have negative attitude towards physics have lack of motivation for class engagement, and also the students who have positive attitudes towards physics have motivation for class engagement.

Craker (2006) demonstrated that attitudes towards science change with exposure to science, but the direction of change may be related to the quality of that exposure, the learning environment, and teaching method. Similar results were obtained in the study conducted by Mattern and Schau (2002) after exposing students to a self-learning device.

On the study conducted by Seery (2009), here commended that relevant stake holders to continue promoting positive attitude towards chemistry and motivate students to work hard in order to achieve better in the subject as it cuts across all science related careers. Aiken (2000) relates that attitude affects people in everything they do and in fact reflects what they are, hence a determining factor of students' behaviour.

Wilkinson and Maxwell (1991) affirmed that problem solving using ill-structured problems motivates students and encourages understanding the epistemology of the discipline.

On the study conducted by Haussler and Hoffman(2000), regarding the development, comparison with students' interests, and impact on students' achievement and self-concept revealed that as a result of the comparison between the features of the curricular frame, the interest structure of students, and the current physics curriculum, has are markable congruency between students' interest in physics and the kind of physics

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education identified in the Delphi study as being relevant.

However, there is considerable discrepancy between students' interest and the kind of physics instruction practiced in the physics classroom. It also appears in the Regression analysis that students' interest in physics as a school subject is hardly related to their interest in physics, but mainly to the students' self-esteem of being good achievers.

Physics Education

In the study of conventional teaching and traditional teaching methods, results shows that in order to increase the level of attitude and success in physics education, new teaching methods and technology need to be implemented into physics education (Adesoji, 2008).

There are several teaching methods can be used in teaching physics. Problem solving is one approach that is most in practice due to its mathematical facets of the concepts. In this approach, it involves knowing what to do in the situation of not knowing what to do. Problem solving is not only finding the correct answer, but also is an action which covers a wide range of mental abilities. Students should realize what and why they are doing, and know the strengths of these strategies, in order to understand the strategies completely and be able to select appropriate ones.

A positive attitude influences expected achievement and is heavily influenced by attitudes towards science As would be expected, positive heavily influenced by attitudes towards science also lead to better results on achievement influencing attitude (Craker, 2006).

Knowledge and skills related to solving physics problems are essential to ensure a positive attitude toward physics. This result agrees with Tooke and Lindstorm's (1998) opinion that students who have a positive attitude towards and beliefs about physics will succeed at a higher level.

On the study conducted by Guido and De la Cruz (2012), shows that the astronomy students are very optimistic about their academic performance. Exploratory research has revealed the reason associated with students' attitudes towards physics courses and methods of teaching (Craker, 2006). It is also expressed that pleasures in physics course if the students know how to plan and implement the strategies of solution to the question through teaching methods.

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Physics education research has demonstrated that knowledge and skill of students taught problem solving techniques or methods can play a powerful role in how they use the knowledge they have learned in their physics courses. Student attitudes towards physics also play a powerful role in how they think about using problem-solving method in their physics or any science class (Hammer, 1996).

METHODOLOGY

Research Method

The research indicates the inherent characteristics with the gathering of data. It purports and presents facts concerning the Attitude and Motivation Scale of Physics Students. It also involves in the analysis on the assessment of the result of data gathered from questionnaires distributed to the respondents. It gives significance to the quality and standing facts.

A survey technique correlational research design measures variables for a large number of cases to see relationship. It is a procedure in which subjects' scores on two variables are simply measured, without manipulation of any variables, to determine whether there is a relationship. The study also involves selecting subjects when it is very difficult to locate which shows characteristics of the study and uses the fastest way of getting their opinion, reaction, responses to the Instrument in Attitude Inventory Test and Achievement Motivation Scales of the physics students.

Participants of the Study

The samples are 290 engineering students, and 156 technology students taking up engineering physics during the second semester of 2011-2012 in Rizal Technological University. This study is delimited on the Department which has both Engineering and Technology offerings; these are Civil Engineering and Technology, Computer Engineering and Technology.

Electrical Engineering and Technology Electronics and Communications Engineering and Technology Instrumentation and Control Engineering and Technology and Mechanical Engineering and Technology.

Instrument

The instrument used standardized Attitude Inventory Test and Achievement Motivation Scale to measure the achievement of the students. It is designed and patterned to obtain adequate information regarding the attitudes and

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motivations of the students. The Attitude Inventory Test and Motivation Scale survey questionnaire has five degrees of intensity with weights of 5 being the highest and1being the smallest rating. The scale of the statistical value adopted to assess their attitude and motivation is as follows:

Weighted Mean	Arbitrary Value	Verbal Interpretation
4.51–5.00	5	Very True to Me
3.51–4.50	4	True to Me
2.51–3.50	3	Somewhat True to Me
1.51–2.50	2	Untrue to Me
1.00–1.50	1	Very untrue to Me

Research Procedure

The evaluation of the students' learning toward physics subject has two parts: one through Attitude Inventory Test and the other which entails the Achievement Motivation Scale.

The assessment of 446 physics students' responses toward the survey questionnaire in Attitude Inventory Scale and Achievement Motivation Scale yielded a scientific investigation.

The respondents were given questionnaires in their physics class to identify their assertiveness and enthusiasm towards their physics subject. This was done at Rizal Technological University in the College of Engineering and Industrial Technology taking the physics subject second semester 2011- 2012.

Data Analysis

Student responses to the instrument were coded based on the 5-point Likert Scale determination per criteria so that higher scores embodied more positive responses. Using SPSS program, a one-way analysis of variance (ANOVA) was conducted to determine the significant difference in the attitudes and motivation. Pearson's Product Moment Correlation to determine the significant relationship between the attitudes and motivation of the respondents.

RESULTS AND DISCUSSION

Significant Difference in the Attitudes of the Respondents in Physics Subject

Table1 reveals the ANOVA on the attitudes of the respondents in physics subject. This shows that the tabular value of 4.098172 is greater than the computed value of 0.038304 at correlation significance at 0.05 levels. The approximate significance is 0.845877.This

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indicates that it failed to reject the null hypothes is and therefore concludes that there is no significant difference in the attitudes of the respondents in the physics subject.

Studies reviewed suggest that there is a relationship between attitude and methods of instruction and between attitude and achievement. Therefore, it is possible top redict the level of achievement from attitude scores (Eridemir,2009).

Table 2 reveals the ANOVA on the motivation of the respondents in physics subject. This shows that the tabular value of 4.098172 is greater than the computed value of 1.16395 at correlation significance at 0.05levels.

The approximate significance is 0.287449. This indicates that it failed to reject the null hypothesis and therefore concludes that there is no significant difference in the motivation of the respondents in the physics subject.

Table1: Analysis of Variance on the Attitudes of the Respondents in Physics Subject

Source of Variation	***SS***	***df***	***MS***	***F***	***P-Value***	***F Crit***
Between Groups	0.006	1	0.006	0.038	0.845	4.098
Within Groups	5.954	38	0.156			
Total	5.960	39				

Table2: Analysis of Variance on the Motivation of the Respondents in Physics Subject

Source of Variation	***SS***	***df***	***MS***	***F***	***P-Value***	***F Crit***
Between Groups	0.422	1	0.422	1.163	0.287	4.098
Within Groups	13.78	38	0.362			
Total	14.20	39	14.20			

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It was observed that the students who have negative attitude towards physics have lack of motivation for class engagement, and also the students who have positive attitudes towards physics have motivation for class engagement. Research has shown that attitudes towards science change with exposure to self-learning strategies in science (Craker, 2006 [7]; Mattern and Schau, 2002 [20]).

Significant Difference between Attitude and Motivation of the Respondents towards Learning Physics

Table 3 reveals the ANOVA on the attitudes of the respondents in physics subject. This shows that the tabular value of 2.724944 is greater than the computed value of 1.08549 at correlation significance at 0.05 levels. The approximate significance is 0.360449. This indicates that it failed to reject the null hypothesis and therefore concludes that there is no significant difference in the attitudes and motivation of the respondents in the physics subject.

Similar results were obtained in the study conducted by Mattern and Schau (2002) after exposing students to a self-learning device.

Source of Variation	***SS***	***df***	***MS***	***F***	***P- Value***	***F Crit***
Between Groups	0.845	3	0.281	1.085	0.360	2.724
Within Groups	19.741	76	0.259			
Total	20.587	79	20.58			

Significant Relationship between Attitude and Motivation of the Respondents towards Learning Physics

Table4: Pearson Product Moment Correlation on the Attitude and Motivation of the Respondents in Physics Subject

Correlation	***Attitude***	***Motivation***
Attitude	1	
Motivation	0.923852	1

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Table 4 shows the Correlation of attitude and motivation of the respondents towards learning physics. There is a high to very high positive relationship between the attitude and motivation of the students. The relationship is positive; as the attitude increases, the motivation also increases. The value of r = 0.923852 indicates a high to very high positive relationship between the attitudes and motivation of the 446 physics students at correlation significance at 0.05 level. The coefficient of determination is r2 = 0.85350252, this presents that attitude improves prediction of the rated factors by 85.35%. The relationship between attitude and motivation is statistically significant.

This result agrees with Tooke and Lindstorm's (1998) and Cracker (2006) that positive attitude influences expected achievement and the opinion that students who have a positive attitude towards and beliefs about physics will succeed at a higher level.

CONCLUSION

According to the conclusions of the study, the majority of pupils feel pleased when they are successful in physics. When this work is productive, individuals feel they have achieved success in the topic. This is evidenced by the fact that their lecturers explain a great deal per detail in class and that they found it fun to study because it was applicable to everyday concerns. This also demonstrates that there are no statistically significant differences between the attitudes of engineering and technology students, the motivation of respondents in both samples, and the attitudes and motivation of respondents in the physics subject. In addition, the link between attitude and motivation is random.

REFERENCES

1. Cracker, D. (2006). "Attitudes towards science of Students enrolled in Introductory Level Science Courses". UW-L Journal of Undergraduate Research IX, 1-6.

2. Crawley, F. & Black, C. (1992). "Casual modelling of secondary science students' intentions to enrol in physics". Journal of Research in Science Teaching,9,585-599.

3. Eridemir, N. & Bakirci, H. (2009). "The Change and the Development of Attitudes of Science Teacher Candidates towards branches". Kastamonu Education Journal, 161-170.

Page 22-36 © MANTECH PUBLICATIONS 2022. All Rights Reserved

4. Eryilmaz,A.,Yildiz,I.&Akin,S.(2011).“Investigating of Relationship between Attitudes towards Physics Laboratories, Motivation and A motivation for the Class Engagement”. Eurasian Journal of Physics and Chemistry Education.59-64

5. Erol,M.,Selcuk,G.Sand Calishan,S.(2006).“Evaluation of Problem solving behaviours of physics teachers’ candidates, H.U”.JournalofEducation,30,73-81.

6. Gardner, R. (1980). “On the validity of affective variables in second language acquisition: conceptual and statistical considerations”, Language Learning, 30 (2),255-270.

7. Adesoji, F.A.(2008).“Managing Students’ Attitudes towards science through problem-solving instructional strategy”. Anthropologist, 10(1). 21-24

8. Aiken, L.R.(2000).“Psychological Testing and Assessment (10thEd.)”.Boston, MA: Allyn and Bacon.

9. Ajzan, I.(1988).“Attitudes, Personality and Behavior”. Chicago: Dorsey Press.

10. Brown, H.(2000).“Principles of Language Learning and Teaching”. New Jersey: Prentice Hall.

11. Charles, R., Lester, F., O’ Daffer, P. (1987). “How to evaluate progress in problem solving”. The National Council of Teachers of Mathematics, Inc: Reston, VA, USA.

12. Gardner, R., & Lambert, W. (1972). “Attitudes and motivations in second language learning”. Rowley, Massachusetts: Newbury House.

13. Gardner, R. (2006). “The Socio-Educational Model of Second Language Acquisition: A Research Paradigm”. EUROSLA, 237-260.

14. Guido, R.M. and Dela CruzR. (2011).“Factors affecting Academic Performance of BS Astronomy Technology students”. RTU-Academic Journal.4,205-238.

Page 22-36 © MANTECH PUBLICATIONS 2022. All Rights Reserved

15. Hammer, D. (1996). "The Physics Teacher". American Journal of Physics.64,13-16.

16. Haussler, P. & Hoffman, L. (2000). A curricular frame for physics education: Development, comparison with students' interests, and impact on students' achievement and self-concept". Wiley & Sons, Inc., 84,6,689-705.

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