



A Study of The Relationship Between Students' Belief and Attitude Toward Physics and GPA

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Abstract: The Grade Point Average (GPA) score is the average value of each student who has studied in several semesters. This value is considered as a representation of students' success in learning. Meanwhile, it is known that success in studying physics is not only influenced by cognitive abilities, but also related to other things including students' beliefs and attitudes towards physics. This study aims to examine the relationship between students' beliefs and attitudes towards physics on GPA scores. This study used a survey research design with a total of 69 students from the third-year physics education department as subjects. Spearman's Rank Correlation analysis was used to determine the relationship between students' beliefs and attitudes towards physics with GPA scores. The results of the study show that there is a relationship between the two but with a very weak relationship. The correlation coefficient value obtained is 0.132 while the significance value is 0.281. These results indicate that the relationship that occurs between the two variables is not significant.

INTRODUCTION

Each student has different attitudes, beliefs and expectations about learning physics which can influence behavior and performance in learning physics (May & Etkina, 2002; Perkins et al., 2005). For example, students believe that physics is built from a series of information that is not related to one another. As a result, many students study physics only by memorizing the formulas without connecting and understanding the deep basic concepts and principles that underlie them.

Through basic educational studies of "orientation" learning accompanied by interviews with physics students, Hammer, (1989, 1994) has developed a framework for characterizing the approaches students use in learning physics. First, the belief in the structure of physics knowledge (made up of pieces vs coherent), namely whether the structure of physics knowledge is considered as separate pieces of knowledge "pieces" or a coherent knowledge system. Second, belief in the content of physics material (formula vs concept), namely how students view physics whether only as a collection of formulas or a collection of in-depth concepts. Third, belief in learning physics (receiving knowledge vs actively making sense of new information), whether students believe that learning

physics is a learning process that only receives information directly from various sources (teachers, books, or other sources) or an active process to reconstruct their understanding independently.

The Grade Point Average (GPA) score is the average value of each student who has studied in several semesters. GPA is the sum of all your course grades divided by total number of credits. Most high schools (and colleges) report grades on a 4.0 scale. The highest-grade A is equivalent to 4.0. This value is considered as a representation of student success in learning and learning performance (Hattie & Anderman, 2012). Meanwhile, it is known that success in studying physics is not only influenced by cognitive abilities, but also related to other things including students' beliefs and attitudes towards physics.

There have been many studies exploring the relationship between student GPA and other variables in students. Among others are the effect of smartphone usage on learning interest and GPA of Physics Education students (Suwa et al., 2020), the correlation between anxiety and student GPA and English Proficiency Score (EPT score) during covid 19 pandemic (Akhdan & Aminatun, 2022), the relationship between GPA, length of study, and competency with the length of time to get a job (Amran et al., 2020), the relationship between higher order thinking skills and academic performance of student (GPA) in mathematics instruction (Tanujaya et al., 2017), the relationship between high school GPA and information literacy pre and post-test scores (Shannon, 2020), etc. Tetapi dari beberapa penelitian tersebut, there are not many studies that explore the relationship between GPA and students' beliefs in physics, so this research needs to be done.

THEORETICAL SUPPORT

Epistemological Belief and Attitude

Fishbein and Ajzen have defined beliefs as a person's subjective assessment of several aspects, they discuss the person's understanding of himself and his environment. Ajzen has also stated that individuals can have many beliefs in their minds (Ajzen, 1985). However, they are only interested in a small amount of faith. This belief is a prominent belief that refers to the direct determinant of a person's attitude. This belief has an influence on individual attitudes. As a result, this attitude influences the behavior (attitudes) of the individual. Minimal cognitive effort is required to activate such beliefs (Fishbein & Ajzen, 2011).

Epistemological beliefs introduced by (Perry, 1999) relate to individual beliefs related to the nature of knowledge (Hofer & Pintrich, 1997). The nature of knowledge concerns certainty (for example, whether knowledge is absolute or contextual) and simplicity of knowledge (for example, whether knowledge is simple or complex). Furthermore, the nature of knowledge concerns the source of knowledge (for example, does knowledge come from an authority) and justification for knowing, justification of knowing (for example, does knowledge require justification and examination). Hofer and Pintrich (1997) have considered these four dimensions of epistemology to be the core of individual theory. That is, epistemological beliefs influence individual beliefs in learning and teaching.

In the context of physics, epistemological beliefs are interpreted as students' beliefs about knowledge (nature of science) and learning processes that have a significant influence on the way they understand a material and on what they learn. Hammer (1994) classifies three dimensions to classify students' epistemological beliefs in the context of basic physics material. First, belief in the structure of physics knowledge, namely whether the structure of physics knowledge is considered as separate pieces of knowledge or a coherent knowledge system. Second, belief in the content of physics material, namely how students view physics whether only as a collection of formulas or a collection of in-depth concepts. Finally, the belief in learning physics, whether students believe that learning physics is a learning process that only receives information directly from various sources (teachers, books, or other sources) or an active process to reconstruct understanding independently.

Attitude itself is interpreted as a tendency to respond positively or negatively to things, people, places, events or ideas. There is a strong relationship between attitudes and individual beliefs. For example, belief is a prerequisite for the formation of attitudes. In addition, Pajares (1992) states that a series of beliefs that are arranged in an object or situation forms a certain attitude. In this case the intended attitude is different from self-efficacy. Self-efficacy or self-efficacy is a person's belief in himself that he is capable and capable of doing something. Self-efficacy is a person's perception of his capability to perform an action. A few research results show that self-efficacy can increase students' chances of success. While the beliefs referred to in this study are beliefs about physics and its learning.

Finally, the relationship between beliefs and attitudes has been noted by Fulmer (2014). Fulmer claims that his study is the main study investigating the relationship between beliefs and attitudes. Dulmer has shown that there is a significant relationship between students' attitudes towards science and their epistemological beliefs. When students have good beliefs, they (expected) have a positive attitude. In the context of this study, beliefs and attitudes are explored in depth with regard to the nature of science, especially physics and learning.

METHOD

Research Design

This study is a survey research design. The aim of this study is to find out the relationship between students' beliefs and attitudes towards physics with the GPA scores that have been obtained. Survey research is often done in educational research. Survey research design is a procedure in quantitative research in which the researcher administers a survey to a sample or to the entire population of people to describe attitudes, opinions, behaviors, or characteristics of the population (Creswell, 2012).

Participants

This survey was conducted at one of the educational universities in the Special Region of Yogyakarta. Participants are students of the Physics Education study program

in their third year of lectures. A total of 69 students, 16 boys and 53 girls, from two classes participated in this study.

Instrument and Data Collection

The instrument used in this study to explore student beliefs and attitudes was a questionnaire, The Colorado Learning Attitudes about Science Survey (CLASS), developed by Adams et al in 2006. This instrument was specifically designed to measure students' beliefs about physics and about learning physics. This instrument extends previous work by investigating additional aspects of students' beliefs and by using appropriate words for students in a wide variety of physics subjects (Adams et al., 2006). The questionnaire used consisted of 42 statement items with answer options in the form of a Likert scale 1-5, from strongly disagree to strongly agree. There are 8 dimensions in the CLASS questionnaire, including real word connections, personal interests, sense making/effort, conceptual connections, applied conceptual understanding, general problem-solving, problem-solving confidence, and problem-solving sophistication.

The following are some of the items in the CLASS questionnaire, "I think about the physics I experience in everyday life", "When I solve a physics problem, I locate an equation that uses the variables given in the problem and plug in the values", "Understanding physics basically means being able to recall something you've read or been shown", "In physics, it is important for me to make sense out of formulas before I can use them correctly", "In doing a physics problem, if my calculation gives a result very different from what I'd expect, I'd trust the calculation rather than going back through the problem", "When studying physics, I relate the important information to what I already know rather than just memorizing it the way it is presented" etc.

Data Analysis

Before conducting data analysis, the research data obtained was checked and sorted first so that there were no duplicate data. Furthermore, the data were analyzed using descriptive statistics and inferential analysis. Descriptive statistics include the mean, maximum, minimum, and Standard Deviation (SD). Furthermore, Spearman's Rank Correlation analysis was used to determine the relationship between students' beliefs and attitudes towards physics with GPA scores.

RESULT AND DISCUSSION

Descriptive Statistics

Descriptive statistics from data of the belief and attitude survey of students using the CLASS questionnaire and GPA values consisting of the average, minimum, maximum, and standard deviation values are shown in Table 1 below. From the table it can be seen that the student's GPA score is relatively high, namely 3.65, while the highest GPA score is 3.93. If it is in accordance with the GPA standard, then this value is very high because the full maximum score is 4.00. For the CLASS score, the minimum value is 1 and the maximum value is 5 because it uses a Likert scale. From the table above it is known that the average value is 3.72 with a standard deviation value of 0.24.

Table 1. Statistic Descriptive of CLASS Score and Students' GPA

	N	Minimum	Maximum	Mean	Std. Deviation
CLASS	69	3,24	4,36	3,7264	,24241
GPA	69	2,83	3,93	3,6583	,21126

The Relationship Between Students Belief and Attitude about Physics to Their Grade Point Average (GPA)

Spearman's rank correlation test was used to determine the relationship between students' beliefs and attitudes towards physics with GPA scores. Spearman test results show a correlation coefficient value of 0.132 (Table 2). These results indicate that the strength of the correlation between belief and attitude and GPA is very weak with a positive correlation. It's mean that if the belief and attitude variables increase, the GPA value also increases. Furthermore, the significance value obtained is 0.281. These results indicate that the relationship that occurs between the two variables is not significant because the value is more than 0.05. A relationship is said to be significant when it has a significant value <0.05.

Table 2. Result of Spearman Rank Correlation Test

	GPA - CLASS
Correlation Coefficient	0,132
Sig.	0,281
N	69

The overall test results show that students' beliefs and attitudes towards physics have a positive correlation with GPA scores but with a very weak correlation. The results of this study support the hypothesis that students who have beliefs and attitudes towards experts will also have good cognitive abilities (Grzimek et al., 2014). In this context, cognitive abilities are represented by GPA scores. The GPA, is a number that indicates how high you scored in the students courses on average. Using a scale from 1.0 to 4.0, your GPA tracks your progress during the studies. This number is used to assess whether the students meet the standards and expectations set by the degree programme or university. However, the results obtained have a weak relationship, this could be due to several factors including the seriousness of the students when working on the survey questionnaire.

Beliefs (views) and attitudes towards knowledge and learning have been studied in the world of physics education research for the last few decades (Gray et al., 2008; Hammer, 1994; Hofer & Pintrich, 1997; Lising & Elby, 2005). In particular, the research focuses on diverting students' views about beliefs and attitudes in a direction that is in line with the expert. The novicelike belief is characterized by viewing knowledge of physics as a collection of dismembered concepts, and this often results in students memorizing content knowledge. This differs drastically from the beliefs of experts and scientists who view the subject as a matrix of topics that are coherent and connected to one another.

Student learning success is not only influenced by cognitive factors, but also by several other factors such as beliefs, attitudes, and self-efficacy (McLure et al., 2020) and other affective factors. Studies that involve students, such as identifying students' attitudes and beliefs about learning physics are often conducted in conjunction with introductory physics courses. As with this study, belief and attitude surveys were given to students who were currently studying physics which were then correlated with the GPA scores achieved.

CONCLUSION

This studies related to the relationship between students' beliefs and attitudes towards physics and their relation to GPA scores, it can be concluded that there is a relationship between the two, but with a very weak relationship. The correlation coefficient value obtained is 0.132 while the significance value is 0.281. These results indicate that the relationship that occurs between the two variables is not significant. This could be due to the process of filling out the questionnaire when the survey was not appropriate so that the results were less than optimal. The next research is recommended to explore the strong reasons that influence why the results of the relationship between GPA and students' beliefs and attitudes have an insignificant relationship. In addition, it also explores relationships in more detail, for example the relationships between aspects in the CLASS questionnaire.

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