Attitudes of College Students on the Subject of Mathematical Physics III in Physics Education Program of Jambi University

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Abstract

The aim of this research is to determine the students' attitudes toward physical mathematics III subjects in the Physics Education program at Jambi University. This study use the sequential explanatory model of mixed research with questions and interviews. The subjects were 89 students from physics education for quantitative data and 10 students for qualitative data. The results show the indicators of enjoyment in Mathematics Physics III and the indicators of social physics implications are in a good category with percentages for each data 45% and 52%, And then a fairly good attitude category for the normality of theoretical physicists with a percentage of 58%.

Keywords

Attitude, College Student Attitude, Mathematical Physics III

1. Introduction

Attitude is one of the factors that can influence the aim of learning achievement. Attitude is a behavior pattern that people have such as feeling or response towards a person, object or problem. Attitude plays an important factor in human behaviors' influencer. Newhouse says that personal opinion can influence attitude, and the opinion can be formed through the experience and education of personal life (Hacieminoglu, 2016). Attitudes toward science can affect the ending of result achievement. Students' good attitudes in the science learning certainly will have a good impact on students' learning outcomes (Freedman, 1997).

The differences between attitudes toward science and scientific attitude, where the scientific attitude is an attitude that must be possessed by students in learning science such as honest, curiosity, responsible, conscientious, discipline, and others, while attitudes toward science is only the attitude about likes or dislikes owned or perceived students towards science learning. In science learning, attitudes toward science can be defined as the feelings, beliefs, and values they have about the school science activity and the impact of science on society (Osborne, 2003). In the study of physics, students' attitudes toward the subject of physics are important because it can affect students' learning outcomes. A positive attitude will produce good results while negative attitudes will produce bad results (Stefan & Ciamos, 2010). Attitudes in studying physics are important in learning physics which is consider as a difficult subject for most of students (Veloo et al, 2015). Physics-Mathematics III as a prayer for a branch of physics which is studies about the various concepts and mathematical equations that will be used to assist the understanding of concepts in advanced physics courses and as a knowledge in the teaching of physics subject at school. Based on the achievement of learning in Physics-Mathematics lecture III where students are required to have knowledge insight and a

good understanding of equations and concepts in Mathematical Physics III and students are required to be able to solve problems surrounding Physics Mathematics III.

Some attitudes that must be possessed by students in Mathematics Physics III are enjoyment in Mathematical Physics III lesson, the social implication toward science, and normality of theoretical physicist. The students' attitudes that must have to the science are an enjoyment in science lessons, leisure interest in science, adoption from the scientific attitude, attitude in scientific inquiry, the normality of scientist, career interest in science, social implications of science (Fraser, 1981).

1.1. Enjoyment in Mathematical Physics III Lesson

The enjoyment of learning science is how pleasure or comfort in learning science (Fraser, 1981). Students who enjoy learning science will certainly have a good attitude in science, especially Mathematical Physics III. Students need to have a feeling of pleasure or comfort in learning Mathematical Physics III to enjoy.

1.2. Social Implication of Science

Social implications of Mathematical Physics III is the attitude of students to the benefits of studying Mathematical Physics III in social and in the educational fields. The social implications of science are related to the attitude towards social benefits or problems that accompany a progress and discovery in the scientific field (Fraser, 1981).

1.3. Normality of Theoretical Physicist

The attitude of normality to the theoretical physicist is the attitude of students who argue that a theoretical physicist is someone who has a normal life just like the people in general. The normality of scientists is about how students see the scientist as a normal person with a normal lifestyle rather than a strange person (Fraser, 1981).

These three attitudes will be very influential in students' motivation and their interest in studying Mathematical Physics III and it will affect the achievement of the results obtained in the lecture on Mathematical Physics III. Students' attitudes toward science can have an impact on students' motivation, interest, and achievement in science, as well as on their enrollment in effective science subjects and scientific-related scientific behavior (Morrell & Lederman, 1998). Therefore, teachers need to know what kind of problem that can affect the students' attitude. So students will have a good attitude and also have good results, interests, motivation, and interest in learning. A teacher who uses individual considerations and intellectual stimulation to transform the member's classroom into a group of clerics and the teachers show certain behaviors such as being sensitive to the students' need, building relationships with students, help them to become self-actualizing and by getting to know students more on a personal level, professors can direct students to what they needed to achieve their personal goals (Tahir, 2018). The nature of science tends to develop when science grows, as a human effort, tentative, empirical, including human inference (as distinct by observation), imagination), and creativity (put forward explanations), and socially and culturally embedded (Holbrook & Rannikme, 2007). Academic disciplines such as listening to teachers, staying in class, are perceived by students as their ideology to be relative to antithesis science practice in some way to be active, inquisitive, questionable, and flexible in view of science and science learning (Zhai et al, 2013).

By knowing the attitude of students who are taught then, the teacher will know how to treat each student by creating a transformational and effective learning. The results of creating a positive thing in learning environment of the classroom and the teachers with effective teaching influence the learning of students at all levels, including cognition, affection, satisfaction, and motivation. It also increases the credibility of teachers and leads to greater student engagement levels and in-depth learning experience in the classroom students prefer their teachers to have personal attributes such as caring, friendly, patient, and fair (Tahir, 2018). Students' attitudes also have an effect on student problem-solving skills in learning, students with low problem-solving skills will have an impact on low student learning outcomes as well. Problem-solving skills required someone to

adapt and survive successfully (Baines, 1984). Problem-solving ability necessary in learning all areas of study to obtain the empirical truth (Hennessy, 1993). Students with low-resolution skills may find it difficult to understand and they may not recognize congruent critical and transcendental critical, discipline, and discipline skills (Pisarik and Whelchel, 2018).

2. Method

2.1. Research Design

The method of this research is mixed method research that combines quantitative and qualitative methods together (Cresswell, 2015). This type of research uses a combination method of the sequential explanatory model, that is a mixed research model where the research begins by using a quantitative method and continued with qualitative method (Cresswell, 2015). Researchers use quantitative methods in the form of questionnaire data collection which is then analyzed. Qualitative method used is an interview. The resulting qualitative data aims to support and deepen the questionnaire results obtained.

2.2. Participant

The participant population is physics education students as many as 120 people. The number of questionnaire samples is 89 people taken based on the sample determination on tables Isaac and Michael with error rate 5% with the number of student class of 2015 counted 61 people and the number of student in the class of 2014 is 28 people. The researcher takes the sample from the student of the class of 2015 more than the student of the class of 2014 because of the student of the class of 2015 more active in campus than the student of the class of 2014. Samples of the interview as many as 10 people based on the result of all indicator questionnaire by taking the highest and lowest questionnaire value.

2.3. Instruments

These research using questionnaires and interview sheets. The questionnaire used is based on the questionnaire on the TOSRA (Test of Science Related Attitude) instrument that has been adopted by Ikhlas (2018) with seven reliable attitude indicators.

Table 1. Reliability value of student attitude indicator questionnaire on Mathematical Physics III.

Indicators	Reliability value of student attitude indicator questionnaire on Mathematical Physics III	
	Cronbach's Alpha	Composite Reliability
Enjoyment of Mathematical Physics Lesson (SF)	0.927	0.942
Adoption of Scientific Attitude in Mathematical Physics Learning (SI)	0.951	0.958
Attitude of Scientific Inquiry (PI)	0.921	0.935
Leisure of Mathematical Physics Lesson (MW)	0.929	0.941
Social Implication of Physics (IS)	0.963	0.969
Normality of Theoritical Physicist (NA)	0.944	0.952
Career Interest in The Field of Theoretical Physics (KB)	0.962	0.967

In this study only used three indicators of attitudes to be studied are the indicators of enjoyment of Mathematical Physics III lesson, the indicators of social implications of physics and normality of theoretical physicist. For interviews, semi-structured interviews were used to respondents based on the questionnaire instruments used.

2.4. Procedure

Data collection. The first data collection procedure, the researchers distributed questionnaires to 89 students of Physics Education class of 2014 and 2015. This questionnaire was given to find out how the attitude of students to the Mathematics Physics course III. The second stage of the researcher conducted a questionnaire analysis to find out the attitudes of the students to the subjects of Mathematical Physics III. From the results of this questionnaire, the analysis will be determined 10 people who become the sample to be interviewed based on the overall results of indicators of high and low. The third stage is to conduct interviews with 10 students and do documentation in the form of photos during interviews and recording interviews. The fourth stage, the results of interviews that have been obtained in the form of sound recording in the transcript into narrative texts. Interviews were conducted to find out the factors that cause students to have an attitude in Mathematical Physics III. The fifth stage, the results of qualitative data analysis of interviews and documentation is associated with the results of quantitative analysis of the questionnaire to see whether the results of qualitative data can support, deepen or refute the results of quantitative data. The data collection procedure of this study in accordance with the data collection design diagram by Creswell (2015) as follows:
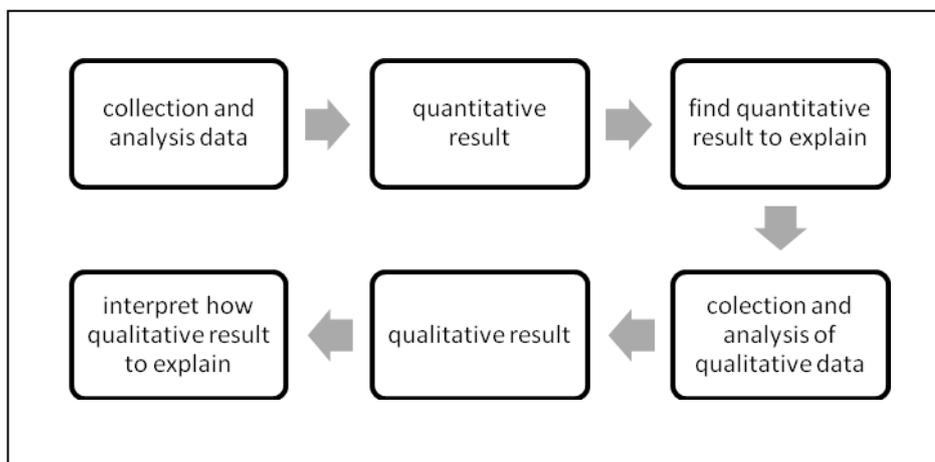

Figure 1. Example of a figure caption (figure caption).

Data analysis. Quantitative data analysis uses descriptive statistics. Descriptive statistics are statistics that describe or describe data that has been collected to make conclusions from the results of the data (Sugiyono, 2013). This descriptive statistic is used when the researcher wants to describe the sample data and does not make any conclusions in the population in which the sample was taken. Descriptive statistics usually including presentation of data through graphs, tables, pie charts, mode calculations, medians, mean (central tendencies' measurement), standard deviations and percentage calculations. The analysis for qualitative data using Miles and Huberman analysis. Miles and Huberman data analysis is divided into data reduction phase, data presentation and conclusion/verification. Data reduction is summarizing, choosing the essentials, focusing on the things that are important, sought the theme and pattern (Sugiyono, 2013). Reduced data will make it easier to collect the next data, and look for the necessary data. The presentation of data is the stage of data analysis where the researcher presents the results of research in the form of categories or grouping (Afrizal, 2016). In this study, the presentation of data is done in a way that is a narrative text for the results of interviews and documentation. The conclusion and verification is the stage where the researcher draws a conclusion from the data result and verifies the data result. After the conclusion is taken the researcher then checks the validity of the data by checking the process of reduction and presentation of data to ensure no errors (Afrizal, 2016).

3. Result

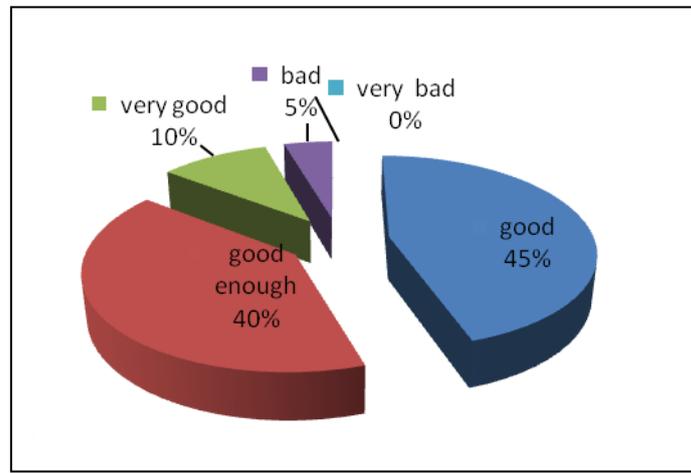## 3.1. Enjoyment in Mathematical Physics III Lesson

Figure 2. Diadram of enjoyment in mathematical physics III lesson.

Based on the graph above figure shows that for good attitude category has percentage 45%, have good enough attitude has percentage 40%, very good attitude has 10% percentage, bad attitude has percentage 5%. As for the attitude is not very good have a percentage of 0%. So from the graph can be known the most dominant attitude on the indicator of pleasure attitude to the Mathematical Physics course III is a good attitude. Based on interviews of students who are not so fond of Physics Math III because Mathematics Physics III subjects assessed as difficult subjects and the number of formulas used, their understanding of the less material, and the way the lecturers who teach less match with them that is not in accordance with students who rather slow in understanding the material. Students who like Mathematical Physics III argue that the way of teaching a pleasant lecturer makes them interested in studying Mathematical Physics III and enough of the basic knowledge gained so as to aid understanding in Mathematical Physics III.
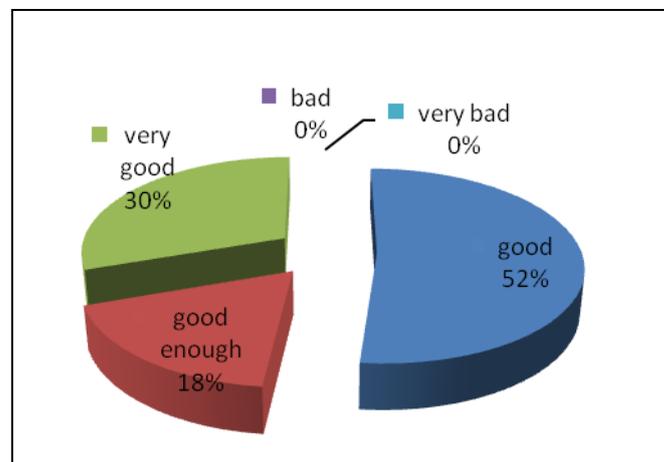
3.2. Social Implication of Science

Figure 3. Diagram of social implication of science.

Based on the graph above picture shows that for good attitude category has 52% percentage, good enough attitude has percentage 18%, attitude very good have percentage 30%. As for the attitude is not very good and bad attitude each has a percentage of 0%. So from the graph can be known the most dominant attitude on the indicator attitude social implications of physics is a good attitude. Based on the results of interviews students say that there are many benefits of learning Mathematical Physics III such as getting a more in-depth knowledge of physics, as stock of basic knowledge for advanced physics and as an adder to the concept of physics while teaching in school. All the students interviewed did not say that studying Mathematical Physics III did not get any benefit in life. This means that students have a good attitude in the social implications of Mathematical Physics III.

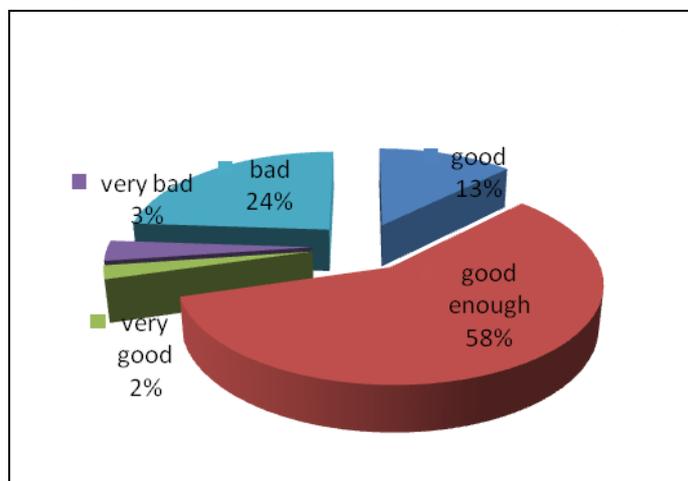## 3.3. Normality of Theoritical Physicist

Figure 4. Diagram of Normality of Theoritical Physicist.

Based on the graph above figure shows that for good attitude category has percentage of 13%, attitude is good enough has percentage 58%, bad attitude have percentage 24% and attitude is not very good have percentage 2%, attitude very good having percentage 3%. So from the graph can be known the most dominant attitude on the attitude indicator of normality of theoretical physicist is good enough attitude. Based on interviews students who have good attitudes argue that they think all physicists are cool and have extraordinary thoughts that can find a new theory that can be used until now. And students who have a bad attitude on the grounds that they think physicists are people who do not care about their appearance and they consider the life of scientists and physicists only struggling with knowledge and laboratory.

4. Discussion

4.1. Enjoyment in Mathematical Physics III

The indicator of pleasure attitude in studying Mathematical Physics III has the dominant attitude category that is good attitude. The results of interviews to students, said:

Q : Do you like the Mathematical Physics III courses?

A : I like the subject of mathematical physics III because it is very fun and interesting to learn, the way the lecturer teaches also makes me understand with the material being taught, if I study harder I will easily understand the materials that exist in mathematical physics III.

The results of the interview show that the students have a good attitude toward the learning of Mathematical Physics III and

enjoy the lesson of Mathematical Physics III. This is because the subjects of Mathematics Physics III felt fun and interesting to learn, how to teach the lecturers favored by students so that students understand the material presented, students are diligent in learning so that it can easily understand the materials in Mathematical Physics III. Student perceptions of material conformity, poor teaching, poor relationships between teachers and students and lack of self-management are among the factors that influence learning (Selcuk, 2010). From the results of interviews students say if the way of teaching lecturers and materials in Mathematics Physics III is one of the factors that can affect student attitudes toward Mathematical Physics III. In the process of physics learning, teacher teaching can influence students' belief in physics (Adam, 2006). In addition to influencing attitudes, how teachers teach can also influence learning outcomes. Student perceptions of the science instruction (what teachers do in the classroom) strongly influence attitudes, which in turn affect moderate achievement and the results also add to the specificity of what teachers can do to encourage students and make science more interesting, positively affecting attitudes students (Freedman, 1997). The students state that the professors who make the course more interesting and challenging the students academically regarded as effective teachers (Tahir, 2018). When students like the subjects then automatically students will be happy in learning. Students enjoy and are interested in learning science stating that students enjoy gaining new knowledge in science and students interested in learning science (OECD, 2016). Pleasure in learning is also determined by the classroom atmosphere suitable for students and the way of learning that suits the students and students who have fun in learning to assume that the subject matter is not too difficult (Pell, 1985).

4.2. Social Implication of Science

Indicator of social implication of science have dominant attitude category that is good attitude. Result of student interview, said:

Q : what do you think the benefits gained by studying Mathematical Physics III

A : many benefits gained by studying Mathematical Physics III. in addition to providing more in-depth knowledge of physics, can be a provision of knowledge for advanced physics courses, increasing the understanding of physics concepts to teach in schools.

The results of the interviews show that students think that studying Mathematical Physics III has many benefits such as knowledge provision for further physics, deepening the knowledge of concepts about physics and others. In addition to the provision of knowledge, studying Mathematical Physics III can assist in the work in the field of physics or the field of science because the science of Mathematical Physics III is a complex and fundamental science needed a science worker in the field of physics. Students insist that science lessons are important to learn because they are beneficial to life later, learning science in schools is valuable because it can help improve future career prospects, and science subjects will help students find employment in science (OECD, 2016). The results of the interviews also show that students have positive thoughts on the social implications of Mathematical Physics III. This positive thinking can affect attitudes toward things better. Positive thinking is a mental attitude that can open up thoughts, words, images, and conductive scientific behaviors toward growth, expansion, success and if positive thinking about the future has been linked to desired outcomes and succeeds in various settings in physical health human (Hong et al, 2012). The results of student interviews have shown that the student has an attitude towards the social implications of science by saying that there are many benefits of studying Mathematical Physics III. The social implications of science are attitudes related to one's view of social benefits and problems related to science (Fraser, 1981). In studying science students are required to play an active role in learning science so that students know all about science and its usefulness in life. They feel the need to see the importance and use what is taught to them from preschool and continue consistently throughout their schools, students must get to know the science so they will realize what science is, have knowledge of the nature of science, see how it affects and will continue to influence their lives, and realize that science

involves not only content but also processes (Morrell & Loderman, 1998).

4.3. The Normality of Theoretical Physicist

The normality indicator of theoretical physicist has the dominant attitude category that is good enough attitude. Based on the results of the interview, the student said:

Q: What is your opinion like what a physics scientist is?

A: the physicist is a impressive person because he can find commonalities and laws about a natural event but they also tend to be complicated, slightly closed than ordinary people and always look monotonous.

Interviews show that students consider that a physics scientist is a cool and great because it can find various physical and physical equations related to physics regarding a natural phenomenon. Some students have a positive outlook for cognitive aspects like intelligence and imaginative than any other aspect (Song & Kim, 2014). Scientists explore authentic scientific issues and develop knowledge (Zhai et al., 2013). Students also stated that scientists always look monotonous like a work in the laboratory. Some students have a negative view of becoming scientists and view scientists as scholars so many children try to avoid them (Zhai et al, 2013). The students stated that scientists should behave well, such as being responsible in the laboratory, being serious while doing experiments, and listening to the supervisor. their view of what a scientist has to do is more specific and related to science. Students state that the amount of time a scientist spends with his friends is greatly limited by the amount of time he spends in work-related activities (Parson, 1997). Scientists with lab coats are associated with dirty work but also with purity, beards can be seen as "unshaven" (Chambers, 1983). It shows that the images of scientists as an investment of their time in work and devote the remaining energy and time to the formation and nurture of personal relationships and scientists as one who is consistent with the social perspective of time and dimension of communalism (Parson, 1997). Some students claim that, for example, a good scientist should: find something useful that can help others, find a cure for cancer, and explain to the public what he finds so that we can all know things better (Zhai et al, 2013).

5. Conclusion

Based on the results of the indicator of enjoyment of Mathematics Physics III lesson have a good attitude with percentage 45% and attitude of social implication of physics have a good attitude with percentage 52%. The normality of theoretical physicist have a good enough category with percentage 58%. From the results of interviews conducted by the attitude of students who like Physics Mathematics III is like the subject of Mathematical Physics III either from the way of teaching the lecturer, likes Mathematical Physics III materials both easy and complicated, have the view that studying Mathematics Physics III useful both as additional knowledge for the eyes advanced physics lectures as well as in everyday life, has the view that theoretical physics scientists have a normal life just like other normal people.

Acknowledgements

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