

SCIENTIFIC ATTITUDE IDENTIFICATION AND INTEREST OF PURSUING CAREER IN THE PHYSICS

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ABSTRACT

The purpose of this study was to determine the attitudes of students of SMAN 08 towards Physics on two indicators, namely the adoption of scientific attitudes and career interests in Physics. The sample used was 150 students. This type of research is quantitative with survey methods. The instrument used was an attitude questionnaire. Data analysis in this study uses descriptive statistics. The results obtained showed that the Adoption Indicator of scientific attitudes had the highest percentage of 69.3% with a good category and indicators of career interest in Physics had the highest percentage of 55.3% with a fairly good category. So with a good student scientific attitude, students will easily understand physics and improve their affective. In addition, an interest in a good career in physics will increase the activity and enthusiasm of students when learning takes place and have the desire to be a scientist in the future.

Key Words: Scientific Attitudes, Careers in Physics, Education, Student Character

INTRODUCTION

Education is a evident form of human culture that is dynamic and undergone alteration. According to Darmaji, Kurniawan & Suryani (2019), Education is an on going process that aims to increase the quality of human resources. Based on Farmi (2019), education is a very important element in life. This is because education is believed to improve the quality of life that may be obtained through various aspect such as: knowledge, skills and experience. Furthermore, education also plays key role in the development of civilization, this can be seen by science and technology advancement. According to Kurniawan, Astalini & Sari (2019), in education, learning activity is one of the important factors in influencing the result of learning.

Astalini, Kurniawan & Sumaryanti (2018) stated that education is basically a

mindful effort to develop the potential of human resources, especially students, which is done by guiding and facilitating their learning activities. During the learning process, specifically in physics, the students attitude is very important. In the opinion of Putra, Lumbantoruan & Samosir (2019), If students are interested and delighted while spending their time to study physics, then they will possibly decide to be consistent and to continue their career in Physics as well. Interest to pursue a career in Physics cannot be separated from determination the individual possesses towards the field as one of future career options.

The existence of education can improve potential and character of human resources to achive their ideal future carreer. In accordance with students development, character education comes up with a process of establishing a school environment that helps students develop

character for the better. In case of the teachers, they are expected to improve students' character through teaching and educating activities (Mandriasa, 2019). Therefore, character education is very important to support the education process. One of the features that directly relates to character is attitude. Hardiyanti, Astalini & Kurniawan (2018), believe that attitude refers to thoughts and feelings that control how we behave. Attitudes can be detected when we are fond of something or not. In addition, attitude contains three components, there are cognitive, emotion and behavior. Implementation of attitudes can be consistent and temporary, depending on what problem is encountered.

In reality, education in the field of physics, especially at the secondary level is still very concerning. There are several factors that cause the concern to occur, such as the relevance of physics education quality that does not fulfill the needs of the community that their ways of thinking and life also have not been influenced by physics as the result of low quality of learning and the lack of teachers' mastery and understanding about physics (Herayanti & Habibi, 2015). To tackle this issue, Athtibby & Salim (2015) proposes physics learning in schools must involve students in real-life situation that provides facts through direct activities in the field. In addition, teachers must have a good grip of non-conventional learning methods in order to be able to prove the concepts of physics well (Kurnianto, Dwijananti, & Khumaedi, 2010).

Astalini, Kurniawan, Perdana & Kurniawan (2019) stated that attitude comes from within the learner himself, namely the feeling of an object that is shown in feelings of like or dislike. Attitude holds dominant influence during the learning process, especially for students. Their attitudes can be observed

from their manners toward subjects in school. One of the school subjects that is often considered as strenuous by students is physics. Not only physics is difficult to learn, but physics also become one of the subjects that students commonly do not take into their liking (Samudra, Suastra & Suma, 2014). The fact of our teaching system at this time is that learning still tends to be based on memorization of theory instead of students' experience, so that the emphasize are only focused on students ability to memorize. This kind of learning process would likely to face difficulties when it comes to development of cognitive learning outcomes and scientific attitudes. Students are given less opportunity to develop sense of responsibility, curiosity, self-confidence, honesty, creativity, tolerance, independence in learning, positive self-concept, to recognize the relationship between society and science, and to interpret natural phenomena from scientific principles (Restami, Suma & Pujani, 2013). Therefore, the efforts that need to be applied to manage these problems can be inserted through upgraded implementation of scientific attitudes of studying physics.

Astalini, Kurniawan, Perdana & Kurniasari (2018) argue that students' positive attitude in physics may be incorporated through scientific attitude in learning physics to engage students to study physics and stimulate their interest in the field of physics. Physics learning is complicated and abstract so that it requires students to be scientific. Students who have a high scientific attitude will give a positive attitude towards physics. Up to the present, physics is one of the subjects that is difficult for students to master. The reason is that students' cognitive levels differ from one to another, some are able to understand the lesson faster while the rests are rather slower (Arief, Handayani, & Dwijananti, 2012). So far, education has

only focused on how students' cognitive development can be achieved well, but improving students' cognitive understanding of physics needs to be improved not only from the cognitive aspect, but also from the affective one, which is student's scientific attitude. According to Gunada, Hairunnisyah, Sutrio (2015), scientific attitude must be possessed by a person in order to face scientific problems. Physics, as a part of the scientific field, requires a good scientific attitude so that in the learning process students can understand the context of learning well which emphasizes the importance of positive attitude in learning physics. Based on Astalini, Kurniawan, Perdana & Kurniasari (2018), positive attitudes of students in physics will be related to scientific attitudes, which influences their engagement while learning physics, the amount of time they spend to study the subject, and their interests towards physics field. As physics is complicated and abstract, it requires students to be scientific. Students who have a high scientific attitude may behave positively towards physics, hence, they would likely to be interested in learning the subject.

Students' interests to pursue career in the field of physics are influenced by their learning outcomes and attitudes, because positive interests and attitudes towards the field will trigger their interest to take physics into their account as future career. Interest is moment or tendency that is intensively directed at certain goal or object that is considered important, which attracts attention and can attract curiosity, to obtain or to explore and to achieve the desired goal (Gulo & Sulandari, 2016). Besides of the fact that students disfavor on the subject of physics from the start, they revealed that careers in physics require more understanding of science and being a scientist will be boring because they often spend time in the laboratory. Students whose score pretty well stated

that they do not want to pursue a career in physics, even though physics is one of their favorite subjects since there are other areas they want to explore in the future. Someone who has interests, abilities, and trust in particular field will tend to have a desire to pursue a career in it (Astalini, et al, 2019). Interest to build career in physics means students have the desire to make physics a part of their future (Putra, Lumbantoruan, Samosir, 2019). The importance of career in physics is very valuable for students to be able to participate in science improvement that is useful for themselves and their country.

The implementation of scientific attitudes occurs during the learning process in the classroom and practicum. During practicum, students are required to work in a structured, organized and conceptual way. Adoption of scientific attitudes will encourage students to use scientific strategies or methods in solving problems both in learning areas and their daily lives. When learning in the class, students can also apply scientific attitudes when they are comprehending the concepts of the lesson, deriving formulas and others (Astalini, Kurniawan, Sumaryanti & Effendi, 2019). Indicators of student attitudes toward physics are very crucial to investigate as it is a depiction of the characteristics of students who behave well or not towards the subject. One way to do so is by looking at students' scientific attitudes so that their interest to study physics arises.

Hereby, to measure students' scientific attitudes and career interests in the field of physics, the authors conducted a study of students who attend SMA Negeri 08 Baataghari. This study aims to find out how students' scientific attitudes and career interests in the field of physics with modification to find out students' attitudes when learning, in terms of scientific attitudes and their interest in learning physics. In addition this research

also helps teachers of SMA Negeri 08 Batanghari to find out how scientific attitudes and students' interest in learning Physics.

RESEARCH METHOD

This research was conducted in SMA Negeri 08 Batanghari which is located on Jambi Street- Ma. Bulian KM 37, Jembatan Emas, Sub-District of Pematang, Regency of Batanghari, Province of Jambi. The research sample was taken from class X, XI and XII Science with the total of 150 students. This research was designed by using quantitative approach and survey method. Research through quantitative approaches is the type of research which examine objects from populations or samples that are arranged systematically, planned and structured using numerical data. Hamdi dan Bahruddin (2014), stated that the quantitative research approach emphasizes objective phenomena which is studied quantitatively. The investigation of the object under this study uses a quantitative research design in the form of numbers, which is carried out statistically, structured and controlled tests. The survey method aims to find out a general description of the population's characteristics. Basically, what researchers want to find is how members of a population are spread out in one or more variables. On the other hand, Rukajat (2018) stated that survey research methods gathers data in the form of written questions, not oral questions.

The sampling technique of this study is the total sampling technique. Based on Nuraeni (2016), the sampling technique of total sampling refers to the number of sample that equals the population. Therefore, the total of sample in this study were 150 students of SMA negeri 08 Batanghari. The study used a test assessment instrument in the form of questionnaire. The type of test instrument

chosen was a questionnaire using indicators of adoption regarding with scientific attitudes and career interests in the field of physics. The type of questionnaire used is closed-type because it involves statement about students' awareness of scientific attitudes and interests in the field of physics. The research questionnaire was adopted from thesis (Darmawangsa, 2018) consists of 54 statements with 7 indicators that have passed the validation test and have a Cronbach alpha reliability value of 0.9. However, in this study only 7 statements were taken from indicators of adoption of scientific attitudes and 10 statements from indicators of career interest in physics. This was done to find out students' scientific attitudes and their interests to pursue career in the field of physics. From the data, data analysis is then performed to determine the categories of each variable.

The instrument used was the Attitude Questionnaire. One of the attitude instruments that is commonly used is TOSRA - Test of Science Related Attitudes which was developed by Fraser (1981) in Australia (Astalini, Maison, Ikhlas & Kurniawan, 2018). TOSRA is used in measuring attitudes focused on science, for instance, scientific attitudes and attitudes towards science. Regarding with attitudes towards science, there are seven dimensions of attitude included in TOSRA. The dimensions of attitude consists of social implication of science, normality of scientists, attitude to scientific inquiry, adoption of scientific attitudes, enjoyment of science lessons, leisure interest in science, and career interest in science (Astalini & Kurniawan, 2019). This test instrument utilizes 5 point of Likert scale. Astalini, Kurniawan & Putri (2018) stated that the scale used in this attitude questionnaire instrument is a five-point Likert scale consists of STS "strongly disagree", TS "disagree", N

"neutral", S "agree", and SS "strongly agree".

Based on Hardiyanti, Astalini & Kurniawan (2018), decision to apply the five scale response was made since it has better or more complete response variability than the four scale so that it is possibly able to express more complete information when it comes to attitude differences of the respondents. The data obtained were processed and analyzed using data processing software called SPSS. The likert scale of positive statement in this research consists of 5 points with the value of strongly agree as 5, agree as 4, neutral as 3, disagree as 2, and strongly disagree as 1 (Astalini, Kurniawan & Sumaryanti, 2018). On the other side, the likert scale of negative statement consists of 5 points with the value of strongly disagree as 5, disagree as

4, neutral as 3, agree as 2 and strongly agree as 1.

The data resulted of the questionnaire is then converted into numerical form, analyzed or calculated in percentage, then interpreted according to predetermined categories. The data analysis technique in this research is descriptive statistics. According to Ghazi dan Sunindyo (2015), descriptive statistics are statistics that is constituted to collect, process, analyze data and present it in good form. Therefore, descriptive statistical technique takes place to describe data and present large amounts of data. These data were analyzed by using SPSS 23 program to draw the mean, median, maximum, minimum, standard deviation percentage and frequency of each variable.

FINDINGS AND DISCUSSIONS

Findings

The novelty of this research is knowing the attitudes of students when learning in terms of scientific attitudes and students' interest in learning physics. In addition, this research also helps teachers of SMA Negeri 08 Batanghari to find out how scientific attitudes and students' interest in learning physics. Students who have this view will have different values from students who are more positive during the learning process. Positive attitudes of students in process learning can produce good learning achievement

and instead (Astalini, Kurniawan, Perdana & Kurniasari, 2018). The scientific attitude itself works toward discovering the development of students in the physics learning process and shape their character of while promoting positive attitudes towards learning, especially in physics, and increasing their interest to pursue career in physics. Furthermore, how students' learning attitudes, in terms of the indicators of scientific attitude adoption, are shown in table 1.

Table 1. Students' attitude according to scientific attitude adoption's indicator :

Variable	Interval	Frequency	Percentage (%)	Category		
Scientific Attitude Adoption	7,0 – 12,6	0	0	Very Bad	Mean	25,58
	12,7 – 18,2	1	0,7	Bad	Median	26
	18,3 – 23,8	33	22	Fairly Good	Std. Deviation	2,95
	23,9 – 29,4	104	69,3	Good	Minimum	15,0
	29,5 – 35,0	12	8	Very Good	Maximum	34,0

Based on table 1, the description of students' attitudes in terms of the adoption indicators of scientific attitudes of students, obtained data shows that students who were categorized as not good were 1 out of 150 students with a percentage of 0.7%, students who were categorized fairly good are 33 out of 150 students with a percentage of 22%, students with a good category are 104 out of 150 students with a percentage of

69.3% and students with a very good category are 12 out of 150 students with a percentage of 8%. The results of data analysis obtained are the mean value of 22.58, the median value of 26, the standard deviation of 2.95, the minimum value of 15.0 and the maximum value of 34.0. Furthermore, learning attitudes of students based on indicators of career interest in physics are shown in table 2.

Tabel 2. Students' attitude according to interest of pursuing career in the physics field's indic

Variable	Interval	Frequency	Percentage (%)	Category		
Interest of Pursuing Career in the Physics Field	10,0 – 18,0	1	0,7	Very Bad	Mean	33,36
	18,1 – 26,0	11	7,3	Bad	Median	33
	26,1 – 34,0	83	55,3	Fairly Good	Std. Deviation	5,17
	34,1 – 42,0	47	31,5	Good	Minimum	18,0
	42,1 – 50,0	8	5,3	Very Good	Maximum	47,0

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 Based on table 2, the description of students' attitudes viewed from the students interests to pursue career in physics shows that students who were categorized as very poor were 1 out of 150 students with a percentage of 0.7%, students who were categorized as not good were 11 out of 150 participants students with a percentage of 7.3%, students who were categorized fairly good were 83 out of 150 students with the percentage of 55.3%, students who were categorized good were 47 out of 150 students with a percentage of 31.5% and students who are categorized very well as many as 8 out of 150 students with a percentage of 5.3%. The results of data analysis obtained are the mean value of 33.36, the median value of 33, the standard deviation value of 5.17, the minimum value of 18.0 and the maximum value of 47.0.

Discussions

Attitude is an action, thought or feeling that occurs when there are stimuli from within or from other people to get to know

Based on table 1. it shows the results of the students' attitudes questionnaire analysis of students' scientific attitude adoption are dominant in the good category which means students can apply scientific attitudes in learning physics, either through tests or experiments. While based on the table. 2, it shows the results of the students' attitudes questionnaire analysis from career interest indicators in the field is dominant in the fairly good category which means the average attitude of students are neutral in learning physics, some are fond of the subject and the rests are not too fond of it. In addition, the values acquired from table 2's data shows that the standard deviation is smaller than the mean value. Thus, the mean value which is a representation of all sample shows that the research data is valid.

certain aspects of the surrounding. While the attitude in physics is a reaction carried out by someone when there is an action influenced by several factors in studying physics either in the form of rejection or

acceptance towards concepts or theories. So that it can be concluded that the indicator of scientific attitude adoption in this study shows that students' attitudes are more dominant in good categories and show students' positive attitudes toward science are in a good category. the results of data analysis show good attitude categories are supported by the main factors, that is first students have the attitude of reading pleasure towards new things even though those that do not fit their thinking (Astalini, Kurniawan, Kurniawan & Anggraini, 2019). Selanjutnya menurut Kurniawan, Astalini & Anggraini (2018), Low level of interest to pursue career in the field of science or physics commonly is triggered by the experience of failure to study science in school and everyday life. The reason is that, most of the time, science instruction fails to attract students' interests by providing materials that are irrelevant with their daily context.

In order to learn scientific attitude, participants should work hard, be responsible, discipline, honest and curious. This is because scientific attitude would likely to allow effective learning to achieve the learning objectives and desired learning outcome. In addition, students are expected to be able to be active, innovative and creative throughout the learning process. The scientific attitude possessed by students is considered as an indicator that shows their positive attitude towards physics subjects. Lumbantoruan & Jannah (2019) stated the urgency of conducting an assessment of students' scientific attitudes is to find out the extent to which students can explore and implement scientific attitudes through physics learning. As a result, students can understand the concepts of physics study and understand scientific methods to solve certain problems in everyday life. Therefore, the teacher must know how students' attitudes during the learning process because by taking it into account,

teacher can improve the learning design in the classroom, regarding with the abilities students have (Astalini, Kurniawan, Perdana & Phatoni, 2019).

Scientific attitude shows the curiosity of students both in obtaining information and even in processing the knowledge itself. With a high level of scientific attitude, students may gather curiosity to discover and create new things, work in teams, and take responsibility. The result of students' attitude improvement towards science in this study indicates that scientific project-based learning may be able to support students to carry out scientific investigations of a given problem. In consequence, it increases students' understanding in learning and instilling self-efficacy in the community (Hidayati, et al., 2017)

Self-assessment aims to train students to be honest in determining their own attitudes. In addition, self-assessment, can be used by teachers as a comparison to fill the gap left by teacher's observations. Peer-to-peer assessment, is not only beneficial as a complementary information of teacher observations, it also aims to get students used to be honest and responsible (Mulyasa & Warta, 2019). Besides of that, the attitudes assessment can also be observed during the learning process. Learning is defined as the result of behavioral changes experienced by someone through learning activities experience that have been conducted repeatedly. Hence, the results of learning physics are considered as a person's ability to understand physics to reach the cognitive, affective, and psychomotor domains in physics learning (Ernawati, Anomeisa & Seputra, 2019).

Attitudes toward science are attitudes that can turn out to be acceptance or rejection of science itself, specifically physics. Therefore, attitude in learning is

very important, so as the attitude toward school subjects such as physics (Darmawangsa, Astalini & Kurniawan, 2018). Cognitive attitude refers to how information is processed, the use of knowledge and changes to choices in the human mind that occur consciously or unconsciously. Therefore, cognitive attitudes are reactions based on knowledge to clarify concepts that will be felt and practiced (Veloo, Nor & Khalid, 2015). An individual who interacts with other individuals are always aware of what he is doing and the situation around him. This awareness is not only related to the action that is happening, but also the actions that might happen. Awareness to determine what is being done and what is going to be done is called attitude. Someone's attitude may differ in responding to certain stimulus. The difference is caused by various interests, experiences, knowledge, intensity of feelings, surrounding situations and so on (Sutarto, 2018).

In fact, there are still many students experiencing learning difficulties which may be observed from their dissatisfaction toward their achievements and slow task progress. Learning difficulties can be caused by several factors including internal factors, such as concentration, intelligence, attitudes toward learning, learning motivation and students' interests. While there are also external factors, involving teachers, facilities and infrastructure, social environment and students' families. Therefore, one of the elements that must be taken into teacher's consideration in teaching is to recognize students, know their abilities, interests, and learning styles in advance so that certain way of delivering subject can be determined and adjusted based on students' situation (Hartati, 2013).

Essentially, education is a guidance given by someone for the sake of others' development in order to achieve certain ideals that determine human beings to achieve their safety and happiness. However, in today's world of education, there are still obstacles experienced by students while carrying out their learning activities. This is because some teachers still prioritize the fulfillment of Minimum Master Criterion targets and maximum learning outcomes, for example, the drill learning system implementation which does not pay attention to the possibilities that there are some students who face difficulties to learn. In general, learning difficulties is a certain condition which can be indicated by obstacles during goals attainment process, so it requires more activities that engage students to overcome these milestones (Abbas & Hidayat, 2018).

The difficulty of students in learning physics is because students always assume that physics is a difficult subject even though they have not dig it deeper. That the subject is over students' head can be observed when physics assignments are given, it appears that students still face difficulty dealing with the task. This also prompts students' lack of interest to learn physics and eventually begets negative responses to their teachers, by not paying attention to material explanation and eventually despising the physics teacher because of the lackluster class activity. In addition, there are still a number of schools that do not provide adequate facilities to support physics learning process. In order to serve large numbers of students with complex needs, the use of media and other facilities will probably pitch in improving students' interest in physics.

The development of science and technology has led to a process of change in all aspects of life, including the world

of education. The need for services and opportunities for improving learning for students is the driver of the emergence of education reform (Syahrial et al, 2019). Therefore, upgraded learning methods and models are essential to be brought up into the classroom, such as discussion methods and group work using discovery learning models, inquiry learning and problem base learning. One of the factors to support the implementation of the 2013 curriculum is that both teachers and students participate actively and creatively.

In order to increase students' scientific attitude, teacher is expected to apply various of learning models. The involvement of students in the process of discovering physics concept and solving problems related to phenomena in physics will be more meaningful compared to just listening to teacher. Furthermore, facilities availability and fun learning media may increase students' interest to pursue career in physics. Although physics seems difficult and boring, it is an important subject to learn as it can be applied in daily basis. Without physics, it is difficult for students to use the tools available around them. Hence, it is very crucial to study physics.

CLOSURE

Adoption indicator of scientific attitudes is resulting in the highest percentage of 69.3% with a good category and indicator of career interest in the field of Physics is resulting in the highest percentage of 55.3% with a fairly good category. In conclusion, adoption indicator from scientific attitudes is categorized better compared to indicator

of career interest in physics. This proves that students are able to implement scientific attitudes and apply positive attitudes towards learning, especially physics subjects, so that their interest to pursue a career in the field of Physics formed.

When applying scientific attitudes, in other words, adopting scientific attitudes in physics, it will promote short-term effects that allow students to easily understand physics while learning activities take place. The long-term effects is that students' affective side will be improved, especially in their daily lives, once scientific attitude has been adopted. The scientific attitude that students must adopt includes a sense of responsibility, curiosity, self-confidence, honesty, creativity, tolerance, independence in learning, positive self-concept, recognizing the relationship between society and science, and interpreting natural phenomena by utilizing scientific principle.

Career interest in the field of physics signifies students' willingness to continue their careers in physics, one of which is as a physics scientist. The percentage shown by students is 55.3% which suggests it is quite good. Short-term effects of students having high interest in a career of physics is that they would likely to step up their learning participation, and they will be excited when teachers give assignments and conduct learning activity. The long-term effect is that the more research in the field of physics can boost science improvement and develop sources of information technology rapidly.

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