STUDENT ATTITUDES TO PHYSICS LESSONS: A CASE STUDY IN BATANGHARI REGENCY JAMBI PROVINCE

Astalini, Dwi Agus Kurniawan, Siti Hadijah, dan Rahmat Perdana
Universitas Jambi
Email: dwiagus.k@unja.ac.id

Abstract: The purpose of this research is to know the attitude of students in Batanghari Senior High School toward physics learning. The type of research used in this quantitative research is survey research design. The study involved 926 students of Senior High School in Batanghari Regency, Jambi Province. The data are collected through interview and questionnaire as many as 54 statement and used Likert scale 5 points and interview as a contributor to the questionnaire. Data analysis used is descriptive statistical analysis. The results of the analysis obtained on the indicator of the normality of scientists are 50.6% of students categorized well. The attitude indicator in physics as much as 46% are categorized well. The indicator of enjoyment in learning physics of 55.5% is categorized as good enough attitude. Then the indicator of career interest in the field of physics by 45% is categorized quite well. Based on these results in part of students at Batanghari Senior High School have a poor attitude towards the learning of physics.

Keywords: *student attitudes, scientific normality, enjoyment in learning physics, career interests in physics*

SIKAP SISWA TERHADAP PELAJARAN FISIKA: STUDI KASUS DI KABUPATEN BATANGHARI PROVINSI JAMBI

Abstrak: Tujuan dari penelitian ini adalah untuk mengetahui sikap siswa di SMA Batanghari terhadap pembelajaran fisika. Jenis penelitian yang digunakan dalam penelitian kuantitatif ini adalah desain penelitian survei. Penelitian ini melibatkan 926 siswa Sekolah Menengah Atas di Kabupaten Batanghari Provinsi Jambi. Data dikumpulkan melalui wawancara dan kuesioner sebanyak 54 pernyataan dan menggunakan skala likert 5 poin dan wawancara sebagai kontributor kuesioner. Analisis data yang digunakan yaitu analisis statistik deskriptif. Hasil analisis yang diperoleh pada indikator normalitas ilmuwan adalah 50,6% siswa dikategorikan baik. Indikator sikap dalam fisika sebanyak 46% dikategorikan baik. Indikator kenikmatan belajar fisika sebesar 55,5% dikategorikan cukup baik. Indikator minat berkarir di bidang fisika sebesar 45% dikategorikan cukup baik. Berdasarkan hasil ini sebagian siswa di SMA di Kabupaten Batanghari memiliki sikap buruk terhadap pembelajaran fisika.

Kata Kunci: *sikap siswa, normalitas ilmuan, kesenangan dalam belajar fisika, ketertarikan berkarir di fisika*

INTRODUCTION

Education has important functions in a nation. Education must be improved and continually developed so that it is in line with the times. Through education it is hoped that the Indonesian people can improve the quality of human resources, both the source of funds and the sources of facilities and infrastructure (Aedy, 2009). The process of developing human resources in the form of potential self-owned by teenagers who are in the middle of high school education. Students in high school can improve knowledge through various kinds of subjects, one of them is physics learning. Physics is a science that deals with behavior and natural phenomena that are related to current phenomena or phenomena that occur today (Giancoli, 2014).

In physics learning it is expected to reflect three aspects in the learning process, namely aspects of attitudes, know-

ledge and skills. This is stated in Regulation of Minister of Education and Culture Number 20 of 2016, "It is explained that each subject including Physics is a means to develop and train students to have competencies in the dimensions of attitudes, knowledge, and skills". Attitudes are interpreted as evaluative responses, which are based on students to make conclusions on stimuli (Azwar, 2002). The attitude of students has an important function as a support to achieve the objectives of learning (Rijal & Bachtiar, 2015). Based on this, a good attitude towards physics learning is very necessary in the learning process.

Students who have a positive attitude towards physics learning will influence learning achievement. It can be said that students are positive when they are able to understand more deeply about the concepts of physics and make learning more effective in their environment (Veloo, Nor, & Khalid, 2015). Students also have a negative attitude towards learning physics, namely students do not like to learn it and their learning outcomes are low. When students have a bad attitude towards learning physics will affect the level of thought to look for information in solving a physics problem (Olusola & Rotimi, 2012). Based on this, the positive attitude of students is very much related to the Normality of scientists, Attitudes toward inquiry in physics, Fun in learning physics, and Interest in a career in physics.

Normality of a scientist is someone who looks ordinary and the same as ordinary people. A scientist is often portrayed in the media. According to students describing scientists as bearded/bespectacled parents who always work in the laboratory, record new findings and read books (Christidou, 2011:143). A scientist can solve problems and find something new. Attitudes drawn from scientists in solving problems and finding new discoveries that can be used as role models for students. In physics learning, for example, students in the class are diligent in writing and diligent in learning. In addition, during the practicum of physics students can assemble the equipment properly in accordance with the procedure and diligently conduct experiments.

In experimental experiments students need to have an attitude of inquiry in physics. Lederman, Lederman, & Antink (2013) experiment in inquiry refer to questions that are answered in a structured manner. Investigation in physics is able to identify from information. Students are asked to find out for themselves information related to the learning process or when conducting experiments. An investigation can improve the thinking of a problem (Welch, 2010:422). This attitude of inquiry in physics is very necessary and will have a positive impact on student learning pleasure.

Fun in learning physics greatly influences the learning process. Students love to learn physics will have high curiosity. To increase the pleasure of learning physics, namely by planning and applying learning strategies or methods (Guido, 2013). For example teachers can provide physics learning using interesting learning methods, so students have a sense of pleasure in learning. Students' enjoyment in learning can improve learning outcomes which will provide predictive effects (Ainley, 2011). Based on this, students' enjoyment in learning physics will lead to an interest in a career in physics.

A career interest in physics is something that students enjoy. For a career in physics students have critical thinking skills. A person who has the skills to think critically can make logical and appropriate

decisions in his work. Bybee, Mccrae, & Laurie (2009) said that a career in physics causes students to be interested in learning physics which will affect achievement and learning outcomes. Students who want a career in physics will add insight and high curiosity. Therefore, to be able to improve students in a career in the field of physics, it is necessary to pay attention to their interests, where interest greatly influences career achievement and personal life (Arslan, 2015).

This attitude includes indicators, namely attitudes toward inquiry in physics, adoption of scientific attitudes, pleasure in learning physics, and interest in multiplying when studying physics. The purpose of the study of the students attitude at Batanghari High School is as follows: (1) describe the attitude of students towards scientific normality; (2) describe students' attitudes toward inquiry in physics; (3) describe the attitude of students who have fun in learning physics; (4) describe the attitude of students who have an interest in a career in physics; (5) describe the obstacles faced to improve student attitudes in physics learning; and (6) describe the solution to improve the attitude of learning physics. The results of this study can contribute to further research also for the schools that we studied so that teachers in the school are able to improve students' attitudes in learning physics.

METHOD

Research Design

The type of research used in this quantitative research is survey research design. Surver research is a procedure in quantitative research where researchers administer surveys to a sample or to the entire population used to describe attitudes, opinions, behaviors, or special characteristics of the population (Creswell, 2012: 752).

Research Sample

The study sample was 926 students. Samples are designed and determined using sampling techniques in the form of purposive sampling. The research sample was conducted at SMAN 1 Batanghari, SMAN 6 Batanghari, SMAN 5 Batanghari, SMAN 10 Batanghari and SMAN 8 Batanghari at Jambi Province. The total consists of classes X, XI and XII each school. The total number of male students was 353 people (38.12%), the number of female students was 573 people (61.87%).

Data Collection Technique

Data collection in this research was used questionnaire and interview techniques. Questionnaire contained 4 indicators and the questionnaire instrument contained 54 items using 5 Likert scales (1 – strongly disagree, 2 - disagree, 3 - neutral, 4 - agree, 5 - strongly agree). Questionnaires were given as many as 926 students. In the interview instrument in the form of several questions given as many as 35 students.

Data Analysis

The data in this study used quantitative analysis data using the SPSS program to look for descriptive statistics. Descriptive statistics are a description or presentation of large amounts of data, consisting of mode, mean, median, minimum, maximum and standard deviation (Cohen, Manion, & Morrison, 2005). Followed by interviews intended to strengthen the results of quantitative data.

Steps that can be followed are first to calculate frequencies such as ideas, themes, pieces of data and words. Both pay attention to patterns and themes. The third tries to make good data, using intuition to reach

conclusions. Fourth, groups organize items into categories, types, behaviors and classifications. The fifth makes a metaphor that is using figurative and connotative language rather than denotative literals and languages, reviving data, thereby reducing data, creating patterns, straightening data, connecting data with theory. Sixth separates variables to describe, differentiate and 'dismantle' ideas, namely moving from drive to integration and blurring data. The seven submit specifically into the general, carrying a large number of variables under a small number (often) of unobserved hypothetical variables. Eighth identifies and records, relationships between variables. Ninth finds intervening variables: looking for other variables that seem to 'block' calculations for what is expected to be a strong relationship between variables. The tenth builds a logical chain of evidence: record causality and make conclusions. Making conceptual/theoretical coherence: moves from metaphor to construct to theory to explain phenomena. Materials and Methods should be described with sufficient details to allow others to replicate and build on published results. Please note that publication of your manuscript implicates that you must make all materials, data, computer code, and protocols associated with the publication available to readers. Please disclose at the submission stage any restrictions on the availability of materials or information. New methods and protocols should be described in detail while well-established methods can be briefly described and appropriately cited.

RESULT AND DISCUSSION

Result

Scientific Normality

The questionnaire results that have been disseminated and processed about Scientific Normality can be seen in the following Table 1.

In table 1 it can be described that, the dominant data is 50.6% of students in the good category for indicators of scientific normality. While 39.8% of students can be categorized enough. In this case the students do not seem to understand the workings of scientists, very bad attitude score of 0.3%, then the category of bad attitude towards students is 1.7%, and very good attitude 7.7%. This shows that, students still cannot see themselves as scientists.

Table 1. Scientific Normality of Students at Batanghari High School

Classification			Standard deviation	Mean	Modus	Median	Min	Max	%
Interval	Attitude	Total							
5 – 8	Very Not Good	1							0.3
9 – 12	Not Good	16							1.7
13 – 16	Enough	369	2.85	18.34	17	18	8	25	39.8
17 – 20	Good	469							50.5
21 – 25	Very Good	71							7.7
TOTAL		926							100

Attitude in Investigation of Physics

The results of the questionnaire that has been disseminated and processed about the attitude in the investigation of high school students towards physics can be seen in the following Table 2.

Table 2. Attitudes in Investigation of Physics at Batanghari High School

Classification			Standard deviation	Mean	Modus	Median	Min	Max	%
Interval	Attitude	Total							
9 – 16.2	Very Not Good	2	6.47	30.77	27	31	12	43	2
16.3 – 23.5	Not Good	34							3
23.6 – 30.8	Enough	417							45
30.9 – 38.1	Good	426							46
38.2 – 45.5	Very Good	47							4
TOTAL		926							100

In Table 2, it can be described that the attitude in investigation of physics which is categorized as dominant is 46%, which is good attitude. The category is not very good 25, then the category is not good 3%, the category is very good 4% and the category is quite good 45%. This explains that generally students have behaved well with the usual physical inquiry. But some students also do not really like solving problems themselves but ask experts or other alternatives.

Enjoyment in Learning Physics

The results of the questionnaire that has been processed about fun in learning physics, can be seen in the Table 3. In table 3, it can be described that the attitude of pleasure in learning physics is categorized as the dominant attitude is quite good with a percentage of 55.5%, the attitude of the lowest category is very bad attitude as much as 2.3%, then the bad category was 16.8%, good category 22.7% and very good category 2.7%. This is explained that only some students have a happy attitude towards learning physics, because students see physics is difficult to learn.

Table 3. Enjoyment in Learning Physics at Batanghari High School

Classification			Standard deviation	Mean	Modus	Median	Min	Max	%
Interval	Attitude	Total							
10 – 18	Very Not Good	25	6.47	32.3	31	32	10	50	2.3
19 – 27	Not Good	134							16.8
28 – 36	Enough	510							55.5
37 – 45	Good	232							22.7
46 – 54	Very Good	25							2.7
TOTAL		926							100

Career Interest in Physics

The results of the questionnaire that has been processed regarding indicators about Career Interest in Physics can be seen in the Table 4. In table 4 it can be described that the attitude of interest in a career in the field of physics is categorized as dominant as good as 45%. Then the lowest attitude as much as 4% is categorized very well. Furthermore, the bad category is 26%, the good category is 16%, and the very bad category is 9%. Based on these results it can be seen that only a few students are interested in a career in physics.

Table 4. Career Interests in Physics at Batanghari High School

Classification			Standard deviation	Mean	Modus	Median	Min	Max	%
Interval	Attitude	Total							
10 – 17	Very Not Good	11							9
18 – 25	Not Good	146							26
26 – 33	Enough	604							45
34 – 41	Good	141	5.69	32.06	32	30	10	55	16
42 – 50	Very Good	24							4
TOTAL		926							100

Problems Faced in Improving Attitudes

From the results that have been obtained from respondents who have filled out questionnaires distributed by researchers, researchers found there were 4 obstacles found by students towards their attitudes towards physics learning (Table 5): Normality of Scientists 17 people with (2%), Attitudes in Physics Investigation as many as 31 people with (3.3%), Fun in Learning Physics as many as 177 people with (19.1%), and Career Interest in Physics as many as 156 people with (35%).

Table 5. Constraints Found in Students Batanghari High School

Statement	Siswa (n=926)
Normality of Scientists	17 (2%)
Attitude in Physics Investigation	31 (3.3%)
Fun in Learning Physics	177 (19.1%)
Career Interest in Physics	157 (35%)

Based on the results above can be discussed, namely the attitude of students to learning is one part of the characteristics of students that can't be ignored in the learning process in the classroom (Sayfudin, 2015: 53). In physics learning, students tend to have poor learning interest, with the reason that they have to remember many formulas, if they have a high interest in learning, it will lead to a positive attitude towards physics subjects. Attitudes have factors that can influence social and internal conditions within themselves (Craker, 2006). Attitudes towards subjects, is one of the factors that can affect the student's learning outcomes. The positive attitude of students towards Physics has a positive integrase with student achievement (Arsaythamby, 2015). Therefore, important positive attitudes belong to students. From the results of identification that has been done, there are 4 (four) indicators of student attitudes that must be improved in physics learning. Namely Scientific Normality, Attitudes in Physics Investigation, Fun in Learning Physics, and Career Interest in Physics.

Discussion

Normality of Scientists

The attitude of normality of student scientists is the most dominant namely the Good category with a percentage of 50.6%. Students who approve it can place themselves like scientists with all kinds of life and habits. The results of the interviews that have been conducted show that all scientists have a normal life like humans who work and have a family. Here are the results of the interview.

Question : Do you know about physics scientists? If you find out, what do you think about the lives of these scientists in their daily lives?

Answer : I know. Like Einstein or Newton. For their lives, maybe the same as people in general. Eat, sleep, work, research on the laboratory as possible.

Question : In your opinion, can a scientist have a happy marriage or family? Explain the reason!

Answer : I don't know. But maybe it can. Because a scientist is also the same as the others. if scientists say they can't have a family or a happy marriage, there must be many who avoid becoming a scientist.

From the results of these interviews, students can imagine the daily lives of scientists and assume that a scientist also has a normal life side like a general human. This shows that, students have the view that scientists are normal people, do not accuse scientists of being quiet and unable to socialize so that they are kept away from the lives of the surrounding community. This is confirmed by students starting to think of scientists as realistic people (Leblebicioglu, *et al*., 2011: 160), inventors and problem solvers, doing many things, unique, working as thinkers (Balcin & Ergun, 2018:68). Scientific normality, assesses how students see scientists and place themselves as a science or scientist learner.

Attitude of Investigation Against Physics

The attitude in the investigation of physics in Batanghari District High School showed that the dominant students were in a good category with a percentage of 46%. Based on the results of interviews, good categorized pesetas do have an active attitude in doing, when finding things that conflict with the experimental results, students respond critically, have high curiosity and never give up.

Question : How do you feel and when doing experiments? Explain the reason.

Answer : I like it. Because by doing experiments, physics lessons that were boring, are not boring, and I can also know the applications of the laws of physics.

Question : If you are having difficulty in finding answers or certain things during the experiment, would you rather find your own answers or ask friends?

Answer : If I am still able, I would rather find out myself and read in the book where I know the answer. But if you don't know, I just asked the teacher or friend.

The results of the interviews that have been conducted, students like to conduct experiments, it shows that students like to think critically, find something interesting from physics through the investigation they do. Physics is based on concepts so that in learning abstract things there will be obstacles for students and teachers (Civelek, *et al*., 2014). By conducting experiments, abstract physics will become easier to understand and demand for students. Students who are still persistent in finding answers to problems that are difficult in investigation, and show students' confidence in their abilities. Students' confidence in their ability to study natural sciences and mathematics largely determines their involvement in investigative activities (Stefan & Ciomos, 2010). The attitude of students who like to ask after trying to find solutions or answers to these problems, it shows that the curiosity of students is very large, the investigation that he did. Forms of appreciation and support for scientific inquiry from students show that they value the scientific way of gathering evidence, thinking creatively, thinking rationally, responding critically, communicating, and making conclusions, because they face life situations related to science (Bybee, Mccrae, & Laurie, 2009).

Fun in Learning Physics

The attitude of pleasure in learning physics conducted at the Batanghari District High School addressing the most dominant attitude is a fairly categorized attitude with a percentage of 55.5%. From the results of these data, it can be said that the attitude of students' enjoyment in learning physics is sufficient or the average is positive. The results of interviews on students who are categorized quite well known that like to study physics for various reasons, for example because physics has something to do with everyday life, and because physics learning is very pleasant. This can be seen from the interview shown below:

Question : Do you like studying physics? What is the reason!

Answer : Yes happy because learning physics material has many advantages in daily life and comfortable classrooms that make me better understand physics lessons therefore I love learning physics.

A good attitude towards pleasure in learning physics, is one of the important elements in physics learning. Good physics learning outcomes are influenced by students' enjoyment of science and pleasure which provides predictive effects in science learning (Ainley, 2011). One of the positive attitudes held by students, in the indicator of the pleasure of learning physics caused by classrooms. Because comfortable classrooms can develop student skills and increase the pleasure of learning physics (Sharma, 2017). The attitude of happiness in learning physics that students have will make students enjoy the process of learning physics in class, so students succeed in physics learning. Those who experience positive emotions such as the relationship of pleasure and pleasure with successful learning and self-perception about increasing the level of preference of these students (Lucardie, 2014).

Career Interest in Physics

The attitude of interest in a career in the field of physics in Batanghari District High School shows the attitude of the most dominant students, in the category of enough, which was scored by 45%. The results of these data show that, on average, students have a positive attitude in a career in physics. Based on the results of interviews with students who are categorized as being sufficient, it is known that when they are adults they want to work in physics. This can be seen from the interview shown below:

Question : After you graduate, are you interested in a career in physics?

Answer : Yes, I want to have a career in physics, but not to become a teacher, because being a teacher is a hard job.

Interest and interest from students is the main key to improving students in a career in physics. To be able to improve students in a career in the field of physics needs to be considered interest, which interests greatly affect the achievement of career and personal life (Arslan, 2015). The interest in science possessed by students at the secondary school level affects careers related to science in the future (Juan, *et al*., 2016). Besides interest, having a positive attitude towards students in learning physics also influences students' careers in physics. Having a positive attitude and interest in physics can cause future career interest in physics to increase (Welch, 2010). The attractiveness of a career in the field of physics is one of the good capitals for improving physics learning outcomes. A career in physics causes students to be interested in learning physics which will affect achievement and learning outcomes (Bybee, Mccrae, & Laurie, 2009). Students who want a career in physics, will add to their insight and curiosity about physics.

From the results obtained by researchers based on the questionnaire that has been disseminated, there is a very dominant obstacle, namely Career Interest in Physics, which has a very high percentage of 926 high school students in the Batanghari district, which is 35%. From the results that the researchers found in the field, why is this interest in a career in the field of Physics very large, it is due to the lack of interest possessed by each student to deepen physics learning itself. Because a career in physics must be considered also the interest of students towards the lesson itself, because interest greatly influences the career achievement and personal life of students (Arslan, 2015). Then the obstacle that has a high percentage level of 926 students is the Fun in Learning Physics which is 19.1%. From the results the researchers have found,

namely why the percentage of physics learning is quite high, because in the learning process and learning are not good and also lack of support from facilities and infrastructure which in this case is the condition of the classroom that is quite inadequate, resulting in students are less happy to learn, especially in physics. Because, comfortable and decent classrooms can develop and foster student skills and the enjoyment of students in learning, especially in physics lessons (Maharaj-Sharma & Sharma, 2017).

In the results that have been obtained from the respondents, the researchers also found another obstacle, namely the attitude in investigation of physics, there were 31 respondents from 926 students who were categorized as not good attitude. Constraints faced by students in the form of thought patterns Students who prefer to get instant answers in physics and do not like structured activities because it is complicated and unpleasant. Students' assumption that physics is very abstract and very difficult is one of the problems (Pehlivan and Koseoglu, 2011). Furthermore, in Scientific Normality, there were 17 respondents or 1.8% of 926 students categorized as bad attitudes. The obstacle faced by students is that they think that physics is something complicated and abstract so it is difficult to find a solution to the problem. Students are often difficult to interpret the symbol of events in the equation (Kabil, 2015).

CONCLUSION

Attitude is a very important element in the learning process by the teacher, the teacher must know how the attitudes of students that occur in the learning process, the teacher will improve the design of learning in the classroom, according to the abilities that students have. Based on the description of the constraints that occur, the student attitude indicator shows that students who have a bad attitude due to the model or teaching method of the teacher cannot improve the positive attitude of students towards physics. To be able to increase the positive attitude of students towards physics teachers must learn using science skills. Students who have science skills will cause students to be positive about science. In addition, teaching methods can enhance students' positive attitudes towards science, and scientific attitudes. Teaching methods that provide an integrated learning environment with laboratory measurements can help students solve physics problems that can increase students' attitudes to be more critical.

ACKNOWLEDGMENT

Researchers would like to thank the Physics Education Study Program which has supported, and provided facilities to researchers so that this research can be completed. In addition, the researchers also thanked all those who helped the researcher in this research.

REFERENCES

Aedy, H.H. (2009). *Karya agung sang guru sejati*. Bandung: Alfabeta.

Ainley, M.A. (2011). A cultural perspective on the structure of student interest in science. *International Journal of Science Education*, *33*(2), 51-71. DOI: 10.1080/-09500693.2010.518640.

Arslan, N.I. (2015). High school students' educational and career interest (science–technology–mathematics) and career adaptabilities. *Australian Council for Educational Research*, *24*(3), 166-172. DOI: 10.1177/1038416215594633.

Azwar, S. (2002). *Sikap manusia: teori dan pengukurannya*. Yogyakarta: Pustaka Pelajar.

Balçın, M.D., & Ergün, A. (2018). Secondary school students' perceptions and attitudes about scientists. *European Journal of Education Studies*, *4*(4), 66-93. URL: https://oapub.org/edu/index.-php/ejes/article/view/1518.

Bybee, R., Mccrae, B., & Laurie, R. (2009). Pisa 2006: An assessment of scientific literacy. *Journal of Research In Science Teaching*, *46*(8), 865-883. DOI:10.1002-/tea.20333.

Christidou, V. (2011). Interest, attitudes and images related to science: combining students' voices with the voices of school science, teachers, and popular science. *International Journal of Environmental & Science Education, 6* (2), 141-159. URL: https://eric.ed.gov/-?id=EJ944846.

Civelek, T., Ucar, E., Ustunel, H., Aydin, M.K. (2014). Effects of a haptic augmented simulation on k-12 students' achievement and their attitudes towards physics. *Eurasia Journal of Mathematics, Science & Technology Education, 10*(6), 565-574. DOI: 10.12973/-eurasia.2014.1122a.

Cohen, L., Manion, L., & Morrison, K. (2005). *Research methods in education*. London: Routledge.

Craker, D.E. (2006). Attitudes toward science of students enrolled in introductory level science courses at UW-La crosses. *UW-L Journal of Undergraduate Research IX*, *9*, 1-6. DOI: 10.1.1.484.2322-&rep=rep1&type=pdf.

Creswell, J.W. (2012). *Educational research: planning, conducting, and evaluating quantitative and qualitative research.* New York: Pearson.

Giancoli, D.C. (2014). *Fisika: prinsip dan aplikasi edisi ke-7 jilid 1*. Jakarta: Erlangga.

Guido, R.M.D. (2013). Attitude and motivation towards learning physics. *International Journal of Engineering Research & Technology (IJERT)*, *2*(11), 2087-2094.

Juan, A., Reddy, V., Zuze, T.L., Wokadala, C., & Hannan, S. (2016). Does it matter whether students enjoy learning science? Exploring student attitudes towards science in South Africa. *Human Sciences Reseach Council*, 1-6. URI: http://hdl.handle.net/20.500.11910/9543.

Kabil, O. (2015). Phylosophy in physics education". *Procedia-Social and Behavioral Sciences, 197,* 675-679. DOI:10.1016-/7.sbspro.2015.07.057.

Leblebicioglu, G., Metin, D., Capkinoglu, E.Y., Cetin, P.S. (2011). The effect of informal and formal interaction between scientists and children at a science camp on their images of scientists. *Science Education International*, *22*(3), 158-174. URL: https://-eric.ed.gov/?id=EJ941681.

Lederman, N.G., Lederman, J.S., & Antink, A. (2013). Nature of science and scientific inquiry as contexts for the learning of science and achievement of scientific literacy. *International Journal of Education in Mathematics*, Science and Technology, *1*(3), 138-147. https://ijemst.net/index.php/ijem-st/article/view/19/19.

Lucardie, D. (2014). The Impact of fun and enjoyment on adult's learning. *Procedia-Social and Behavioral Sciences*, *142,* 439 – 446. DOI: 10.1016/j.sbspro-.2014.07.696.

Maharaj-Sharma, R. & Sharma, A. (2017). Using ict in secondary school science teaching–what students and teachers in trinidad and tobago say. *European Journal of Education Studies*, *3*(2), 197-211. DOI: 10.5281/zenodo.251163.

Olusola, O.O. & Rotimi, C.O. (2012). Attitudes of students towards the study of physics in college of education ikere ekiti, Ekiti State, Nigeria. *American International Journal of Contemporary Research*, *2*(12), 86-89. URL: http://www.aijcrnet.com/journals/Vol_2_No_12_December_2012/9.pdf.

Pehlivan, H & Koseoglu, P. (2011). The reliability and validity study of the attitude scale for physics course. *Procedia Social and Behavioral Sciences*, *15,* 3338-3341. DOI:10.1016/j.sbspro.2011.04.-296.

Rijal, S. & Bachtiar, S. (2015). Hubungan antara sikap, kemandirian belajar, dan gaya belajar dengan hasil belajar kognitif siswa. *Jurnal Bioedukatika*, *3*(2), 15-20. DOI: 10.26555/bioedukatika.v-3i2.4149.

Sayfudin, M.N. (2015). Pengaruh kebiasaan dalam belajar dan sikap siswa pada pelajaran terhadap prestasi belajar mekanika teknik siswa kelas x teknik gambar bangunan SMK Negeri 4 Semarang tahun ajaran 2014/2015. *Scaffolding*, *4*(1), 52-59. URL: https://journal.unnes.ac.id/sju/index.php/scaffolding/article/view/7972.

Stefan, M. & Ciomos, F. (2010). The 8th and 9th grades students' attitude towards teaching and learning physics. *Acta Didactica Napocensia*, *3*(3), 7-14. DOI: ?id=EJ1056130.

Undang-Undang Republik Indonesia Nomor 20 Tahun 2003 Tentang *Sistem Pendidikan Nasional*.

Veloo, A., Nor, R., & Khalid, R. (2015). Attitude towards physics and additional mathematics achievement towards physics achievement. *International Education Studies*, *8*(3), 35-43. DOI: -10.5539/ies.v8n3p35.

Welch, A.G. (2010). Using the TOSRA to assess high school students' attitudes toward science after competing in the first robotics competition: An exploratory study. *Eurasia Journal of Mathematics, Science & Technology Education*, *6*(3), 187-197. DOI:10.12973/ejmste/-75239.