Students' Attitudes towards Science in Junior High Schools and State Madrasah Tsanawiyah

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Abstract: Attitudes towards science are attitudes that appear in students before and after learning science. The higher the attitude of students towards science subjects, the higher their learning outcomes will be. On the other hand, the lower the students' attitudes towards science subjects, the lower their learning outcomes will be. This study aims to analyze how students' attitudes towards science. This research method is survey research using the Test of Science Related Attitude (TOSRA) instrument with a 5-point Likert scale on 161 students as the research sample. Data analysis was done by statistical descriptive. The results of the study on five indicators of students' attitudes towards science obtained the highest response, namely the pleasure of learning science was in the agreed criteria (39.40%) and was in the positive category (47.2%); Interest in spending time studying science is in the agreed criteria (37.29%) and is in the positive attitude category (54.7%); Interest in a career in science is found in the agreed criteria (34.43%) and in the positive attitude category (50.3%); The attitude of scientific investigation was obtained with the criteria of agreeing (29.71%) and was in the category of positive attitude (77%); and the social implications of science are obtained on the agreed criteria (37.04%) and are in the positive attitude category (72%). Overall, students' attitudes towards science with the highest responses were found in the agreed criteria (35.56%) with the category of positive attitudes (75.8%) in SMP and MTsN Aceh Jaya District.

Keywords: Attitudes; Science; Test of Science Related Attitude (TOSRA).

Introduction

One's attitude towards learning is very important. So that the higher the attitude of students towards a subject, the higher their learning outcomes. Conversely, the lower the attitude of students towards a subject, the lower their learning outcomes will be. This is in line with the opinion of Sakti and Sukardi (2020) that attitude has a significant relationship with learning outcomes. Attitude is a form of a person's perception of an object that is described with an expression of liking or disliking (Kurniawan, et al., 2018). Attitudes tend to encourage people to act toward certain objects in certain ways (Calhoun & Acocella, 1978).

Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 22 of 2016 states that the attitude aspect consists of accepting, carrying out, appreciating, living, and practicing (Kemendikbud, 2013). Attitude objects that need to be assessed in learning activities consist of attitudes in the subject matter, attitudes towards educators or teachers, and attitudes towards the learning process (Jihad and Haris, 2008). These three attitude objects are an important part that must be prioritized in learning activities in order to achieve educational goals. The

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attitude that is the focus of this research is the attitude towards science.

Attitudes towards science are self-beliefs, values, feelings and impacts on social life, technology and society (Akcay, et al., 2010). Aspects of the attitude of science show interest in science, support in carrying out scientific investigations, responsibility, and discipline in action (Dezaneru & Kurniawan, 2021). Thus, the attitude of students towards science is the attitude that appears in students towards science before and after learning science. This attitude can be in the form of curiosity about science, scientific practice including a career in science (Dinata, et al., 2018).

The positive attitude of students towards science is the determinant of the future. In fact, based on the results of initial observations in five schools in Aceh Jaya, it is known that there are still students who show negative responses during science learning activities, such as being less active and tending to accept from educators and lack of attitude towards the social implications of science. Based on the results of interviews with science educators, information was also obtained that the ability of students to conduct observations, investigations and experiments and the ability to actively solve problems has recently been decreasing. These changes have been felt especially since the COVID-19 pandemic hit, so that creativity and scientific attitudes are less formed in students.

The attitude of students towards science is low not only in Indonesia but also abroad. The ratio of students who qualify for higher education in the UK has been a cause for concern (Dearing, 1996). Negative attitudes towards mathematics and science subjects are a serious threat to economic prosperity (Collins, et al., 2003). This situation proves that students' attitudes towards science must be considered. The test of science related attitude (TOSRA) from Fraser (1981) is an instrument that measures students' attitudes towards science on 7 attitude indicators. This study examines five indicators of students' attitudes towards science, namely enjoyment of science lessons, leisure interest in science, career interest in science, attitude to scientific inquiry, and social implications of science.

Research related to students' attitudes towards science has been carried out by previous researchers, but the difference between this study and previous research is the instrument used. The questionnaire used by previous researchers was the development of TOSRA by Astalini, et al (2019). In this study, the questionnaire used was a direct adoption questionnaire from TOSRA which was translated into Indonesian. Another difference lies in the time, place and research indicators. Based on the literature study, it is also known that most of the attitudes towards science research use 3 out of 7 studies on the TOSRA scale. Meanwhile, in this study, 5 of the 7 TOSRA research indicators were used. The

selection of these 5 indicators is based on a higher level of reliability value than the other 2 remaining indicators.

Another update in this study, before analyzing the data on the research instrument. The instrument will be tested for validity, reliability test and data normality test on the responses obtained from the research results. The purpose of this test is to ensure that the data is valid, reliable and normally distributed. The re-examination of each item was due to ethnic and cultural differences between students in the TOSRA study and students in Aceh Jaya Regency, thus allowing for differences in the results obtained. In accordance with (2019), the diversity of the culture of each person, place, and language will shape, strengthen, influence, and at the same time change the attitudes and behavior of individuals and social groups in the cultural environment concerned.

Based on the description above, the researcher wants to conduct a study with the title of students' attitudes towards science in SMP and MTsN Aceh Jaya Regency. The purpose of this research is to produce a study that is able to analyze students' attitudes towards science, so that the results of this research can be used as material for improvement for science learning in the future.

Method

The method used in this research is survey research with a descriptive approach. This research was conducted in SMP and MTsN Aceh Jaya Regency. The population of this study was all students of SMP and MTsN Aceh Jaya Regency, totaling 4,631 students distributed in the sub-districts in Aceh Jaya. The sample of this study consisted of 161 class VIII students spread across 6 schools in Aceh Jaya Regency.

The instrument used in this research is the adoption of the Test of science related attitude (TOSRA) questionnaire from Fraser (1981) which is composed of 50 questions composed of positive and negative statements. The research questionnaire statement items based on attitude indicators can be seen in the following table.

Table 1. Research Questionnaire

Indicator	Number of Items
Fun in learning Science	10
His interest in increasing the time to study Science	10
Interest in a career in science	10
Science Investigation	10
Social implications of science	10

Each statement item is composed of five answer choices based on a Likert scale with the criteria "Strongly Agree (SA), Agree (A), Disagree (NA), Disagree (D), and Strongly Disagree (SD)". The rating scale for each item

varies depending on the statement, if the statement is positive the answer is "SD is worth 1", "D is worth 2", "NA is worth 3", "A is worth 4" and "SA is worth 5", while the negative statement is value otherwise. The criteria for the answers obtained were included in 5 categories of attitudes, namely very negative, negative, positive and very positive. The survey data obtained were tested for validity, reliability and normality of the data and then analyzed descriptively the attitudes of students towards science.

Result and Discussion

Attitude to science in general

Attitudes towards science greatly affect the continuity and achievement of science learning. Someone happy or not with science can be observed from the responses given. Someone who is not happy with science will show a negative response, on the contrary those who are happy with science will show a positive response at school and in the social environment. A positive attitude is a person's tendency to act towards approaching, liking, and expecting certain objects. while a negative attitude is a tendency that leads a person's actions to be careless, wasteful, undisciplined, lazing about certain objects (Sari, et al., 2019). Thus, a positive attitude is expected to appear in students. Attitudes towards science will help students understand nature and what is in it (Ardianto & Rubini, 2016).

Based on the results of research conducted on 161 respondents in SMP and MTsN in Aceh Jaya District about the attitudes of students towards science in the TOSRA research questionnaire with a total of 50 statement items, the following percentage of responses was obtained.

Table 2. Criteria for student attitude responses towards science

Indicators of Attitude Towards Science	SD	D	NA	A	SA
The fun of learning science	57	161	399	634	358
Interested in spending time studying science	69	188	427	600	326
Interested in a career in science	82	194	448	554	332
Scientific investigation	101	297	475	478	259
Social implications of science	74	157	449	596	334
N	383	997	2198	2862	1609
%	4.76	12.3	27.3	35.5	19.9

Based on Table 2, it is known that the attitude of students towards science in general obtained the highest

response on the criteria of agreeing with a percentage of 35.56%, while the lowest response was on the criteria of strongly disagreeing with a percentage of 4.76%. The results of data analysis on the category of students' attitudes towards science in general can be seen in Figure 1.
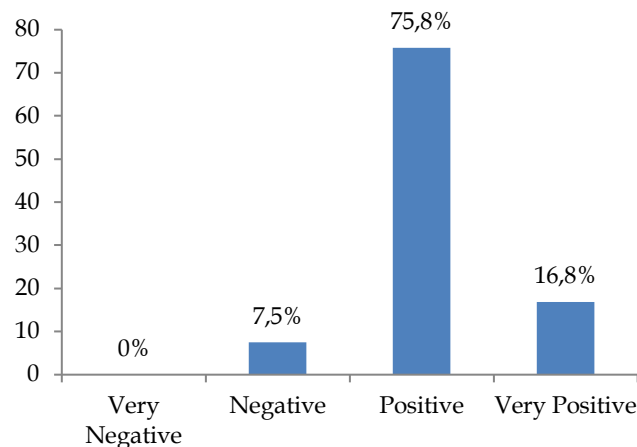
Figure 1. Categories of students' attitudes toward science

The data in the diagram above shows that the attitude of students towards science in general in the very negative category is obtained by a percentage of 0%. This means that overall, none of the students have a very negative attitude towards science. While the highest category of student attitudes is in the category of positive attitudes with 75%. Based on the results of the data analysis in Table 3 and Figure 1, it is concluded that the attitudes of students towards science were obtained with a response with agreed criteria and the data analysis showed that the attitudes of students were in the category of positive attitudes in SMP and MTsN Aceh Jaya Regency. In line with Astalini, et al (2020) the attitude towards science at SMP Muaro Jambi is dominantly good and has a positive attitude category. Thus, it can be understood that students in SMP and MTsN have a good attitude towards science in general on the five indicators studied, namely enjoyment of learning science, interest in spending time studying science, interest in a career in science, scientific investigation and the social implications of science.

Attitude towards science based on indicators

The results of the research data analysis of students' attitudes towards science based on the five attitude indicators measured can be observed below.

enjoyment of science lessons

According to the Big Indonesian Dictionary, pleasure is a person's response to what is indicated by a sense of satisfaction, happiness and relief, so that they will show a positive response. Enjoyment of science lessons is the feeling that students have to continue to

study science because they are driven by a high desire to acquire more in-depth scientific knowledge (Kurniawan, et al. 2019). The attitude of the pleasure of learning science is very much determined by the teaching and learning process (Astalini, et al., 2019).

The attitude of pleasure in learning science is determined by how an educator teaches and motivates students to enjoy learning science. Educators who are able to motivate and cultivate a happy attitude to learning science in students will support students in improving their learning achievement. In line with Astalini, et al. (2020) the happy attitude towards science that exists in students is able to improve their achievement and performance in learning. Students with high interest in learning science will usually show more effort than those with less interest in science (Putra & Wiza, 2019). More effort will demand more achievement and performance.

Based on the results of research in SMP and MTsN Aceh Jaya Regency on the indicators of the pleasure of learning science towards 10 statement items out of a total of 50 statements, the percentage obtained is as shown in Table 3.

Table 3. Criteria for responses to enjoyment of science lessons indicators

No Q	SD	D	NA	A	SA
3	2	3	18	75	63
13	3	16	54	71	17
23	8	13	23	78	39
33	4	10	32	78	37
43	5	18	37	70	31
8	4	17	37	63	39
18	7	19	43	51	41
28	5	12	48	45	51
38	4	19	54	61	23
48	15	34	53	42	17
N	57	161	399	634	358
%	3.54	10.01	24.80	39.40	22.25

Based on Table 3, it can be seen that the indicators of the pleasure of learning science students' attitudes are in the criteria of the highest score, namely "A" (Agree) with a percentage of 39.40% and the lowest response is in the "SD" (Strongly Disagree) category with a percentage of 3,54% in SMP and MTsN Aceh Jaya District. The results of the research questionnaire data analysis can be seen in Figure 2.

The diagram above shows that the attitude of students in the highest category is positive, namely 47.2% (76 students), while the lowest criterion is very negative with 0% (0 students). Thus, none of the students had a very negative attitude of pleasure. Based on Table 3 and Figure 1, the students gave the highest response to the "A" criteria (Agree) and the students' attitudes were in the positive category. That is, students have a happy attitude and enjoy learning science. Students who have

a positive attitude towards students also have enthusiasm and are open to science outside or in the classroom. According to Anggraini, L. & Perdana, R. (2019), every student who has a positive attitude towards science will feel happy and comfortable in learning science. The desire to increase the time to study science is also because they think science is important and learning science is not something in vain (Astalini, et al., 2018).
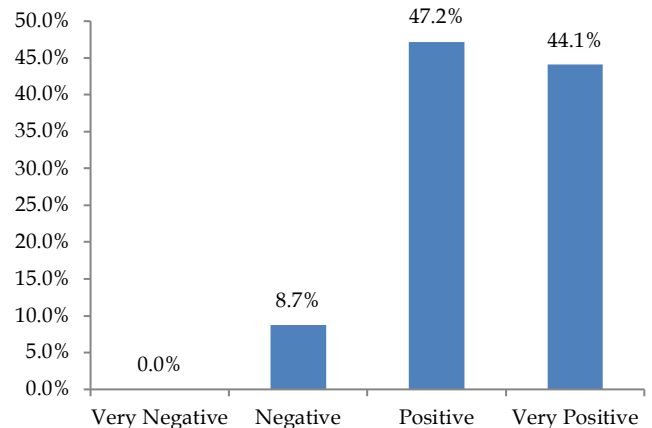
Figure 2. Categories enjoyment of science lessons

Fun learning cannot be separated from the interactions that occur between educators and students. So, in this case educators have an important role in shaping effective learning in schools (Sulthon, 2016). The interaction process can be carried out by educators through activities that involve students directly, creating a comfortable classroom atmosphere, choosing interesting methods and media (Syahid, 2019). Relaxed, stress-free learning also really supports the formation of a sense of pleasure in science (Mintasih, 2015).
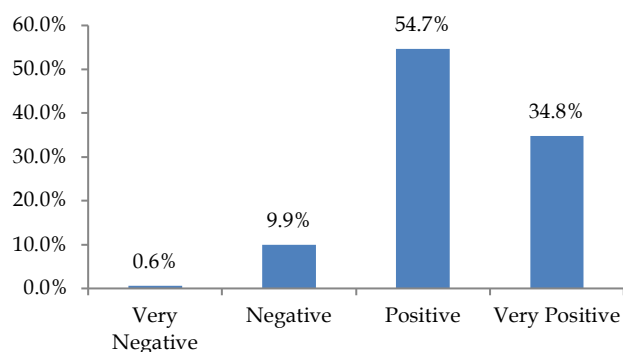
Leisure Interest in Science

Interest is an expression of feeling happy or interested in learning science (Astalini, et al., 2018). Leisure Interest in Science is the feeling that students have towards so that they are willing to provide their free time to continue to explore science. Exploring science can be done by seeking information from various sources through reading books, articles, journals, newspapers and so on (Putra, et al., (2019)).

The attitude of students on the indicator of interest in spending time learning science is spread out in 10 statement items. The percentage results obtained can be seen in Table 4.

Table 4. Response categories on indicators of Leisure Interest in Science

No Q	SD	D	NA	A	SA
4	5	20	34	70	32
14	6	14	24	71	46
24	8	26	43	64	20
34	10	14	52	62	23
44	5	13	38	71	34
9	4	17	38	63	39
19	7	19	43	51	41
29	5	12	48	45	51
39	4	19	54	61	23
49	15	34	53	42	17
N	69	188	427	600	326
%	4.29	11.68	26.54	37.29	20.26

Based on the data in Table 4. it was found that the highest percentage was found in the agree criteria with 37.27% while the lowest percentage of responses was found in the strongly disagree criteria with a percentage of 4.29%. Based on the results of the research questionnaire data analysis, it can be seen in Figure 3.

Figure 3. Categories of Leisure Interest in Science

The diagram above shows that the attitude of students in spending time learning science with the lowest category is in the very negative 0.6% category (1 student). The highest attitude on this indicator lies in the positive category with 54.7% (88 students). Based on Table 4 and Figure 2, it can be understood that on the indicator of interest in spending time studying science, the attitude with the highest response is in the agree criteria and is in the positive attitude category. This means that participants want to provide their free time to study science outside school hours by reading or seeking information from various sources at SMP and MTsN Aceh Jaya Regency. This is in accordance with Rahmayanti & Vina (2016) children who have an interest in learning, it will foster a sense of pleasure in the child. This situation is different from the research of Putra, et al., (2019) the attitude of spending time studying science at Ferdy Feri High School is in the sufficient category with a percentage of 72%. Thus, students prefer to spend time other than to study science.

Students who are willing to spend time on science will understand science material much better because they continue to repeat what they have learned and explore what they do not understand. This opinion is in line with Astalini, et al., (2019) students who want to spend time studying science are students who view science positively, so that what is shown is a positive attitude in learning. This is because the addition of time can provide new experiences for individuals in improving skills and give them opportunities to gain new insights and understandings (Astalini, et al., 2018).

Career interest in science

Career is preparation or desire for future life (Setiawan, 2021). choosing a career goal must have maturity and skills in making decisions and (Kurniawan, 2018). Career interest in science is a desire to continue studies in the field of science (Putra, et al., 2019). Interest in a career in science can be marked from the positive response of students to science, a sense of wanting to live a future career in the field of science, and assuming that science is in accordance with what is needed in the present and in the future. Based on research conducted at SMP and MTsN Aceh Jaya Regency on the indicators of interest in a career in science represented by 10 out of 50 statement items, the response criteria were obtained as shown in Table 5.

Table 5. Criteria for responses to indicators of interest career in science

No Q	SD	D	NA	A	SA
10	5	20	34	70	32
20	5	5	23	69	59
30	7	23	46	60	25
40	7	9	30	76	39
50	15	19	36	50	41
5	8	24	49	47	33
15	10	30	52	40	29
25	7	21	50	59	24
35	8	17	61	48	27
45	10	26	67	35	23
N	82	194	448	554	332
%	5.10	12.06	27.84	34.43	20.63

Table 5 shows that the attitude of students on the indicator of interest in a career in science obtained the highest response on the agree criteria with a percentage of 34.43% while the lowest response was on the criterion of strongly disagree with a percentage of 5.10%. Based on the results of data analysis, the results are as shown in Figure 4.
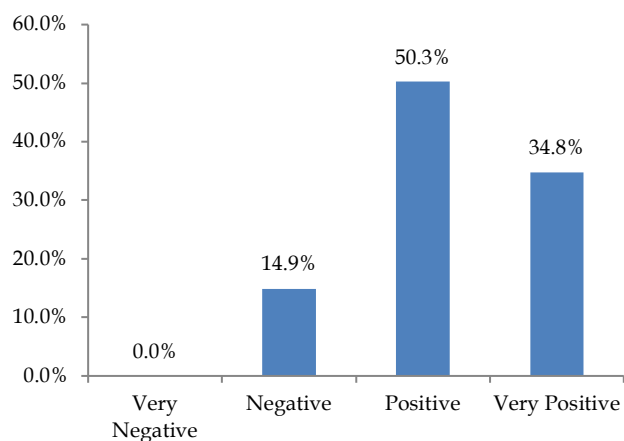
Figure 4. Categories career interest in science

Figure 4 shows that from the results of the analysis on interest in spending time learning science, the lowest category is very negative with 0% (0 students), while the highest category is positive with a percentage of 50.3% (81 students). Based on the results of data analysis, it was found that the dominant response of students on the indicators of interest in a career in science was in the agreed criteria, and the results of data analysis were in the positive category. The positive category in this study indicates that most of the students have an interest and willingness to explore the field of science further.

This shows that students want to continue their education and careers related to science at SMP and MTsN Aceh Jaya Regency. According to PISA, students' attitudes towards science can be measured by interest and motivation to end up in the field of science (OECD, 2016). This is inversely proportional to Sari's research (2020) on the indicators of career interest in science, showing the dominant response of students in the moderate category at SMPN 3 Batanghari. This is due to a lack of interest in a career in science after completing his studies.

Career interest is very important to note, because interest greatly affects the career achievement and personal life of students (Bybee, et al., 2009). Career interests need to be instilled in students from the start, the goal is for students to have time to search for information, and to rethink their future through determining talents and interests in taking the next education (Priyanto, 2016). This is because a person's interest in a career cannot be separated from the wishes and beliefs of the individual for his future life. Students who have a positive attitude towards a career in science will be motivated to study science, resulting in a higher curiosity and a more solid choice for a career in science.

Attitude to scientific inquiry

Investigation is an attempt to obtain information through processes, procedures and data collection. The attitude of scientific inquiry is an attitude that

encourages independence and exercises understanding and experience in seeking knowledge and finding scientific ideas and information. A high investigative attitude is strongly driven by the curiosity that a person has about something. Attitudes towards scientific investigations will help students improve their attitudes and skills in conducting scientific investigations (Astalini, et al., 2018).

Based on the results of data analysis on students in SMP and MTsN Aceh Jaya Regency on the indicators of attitude towards science inquiry, responses are obtained as shown in Table 6.

Table 6. Criteria for Responses to Indicators Science Investigation

No Q	SD	D	NA	A	SA
2	2	10	24	73	52
12	5	14	39	61	42
22	13	22	46	54	26
32	12	11	36	65	37
42	9	17	45	66	24
7	9	55	54	35	8
17	8	30	58	36	29
27	19	51	55	20	16
37	10	47	48	43	13
47	14	40	70	25	12
N	101	297	475	478	259
%	6.28	18.46	29.52	29.71	16.10

Based on Table 6 above, it is known that the highest response was obtained on the agree criteria with a percentage of 29.71%. The percentage of the lowest value of scientific inquiry attitude was obtained on the criteria of strongly disagree with the percentage value of 6.28%. The results of the data analysis of students' attitudes towards science on the indicators of investigation can be seen in Figure 5.
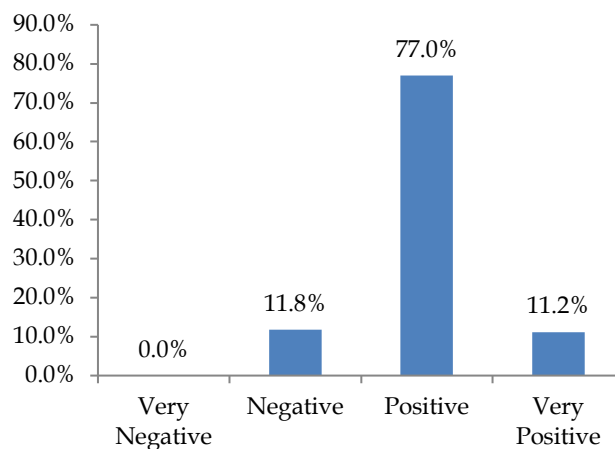

Figure 5. Categories of attitude to scientific inquiry

The data in Figure 5 above shows that on the indicators of scientific investigation, the attitudes of students are spread out in several categories with

different percentages. The very negative category was obtained with a percentage of 0% (0 students), meaning that none of the students had a very negative attitude towards scientific investigations. The highest category was obtained on a positive attitude with a percentage of 77% (124 students).

Based on the results of data analysis, it is known that the indicators of scientific investigation in SMP and MTsN Aceh Jaya Regency responses are more dominated by the agreed criteria and on average the students have an attitude with a positive category, so it is known that students have a desire to practice their abilities by independent experimentation rather than ask or be told to solve the problem. In accordance with Hardiyanti, et al., (2018) students prefer to do experiments to get results than what others give to solve or solve problems.

The attitude of inquiry will encourage active and independent students and practice skills. This is because conducting an investigation requires skills. The ability of students to use reason, thoughts, and actions carried out effectively and efficiently so that a result is obtained is called a skill (Sari, 2020). A person's independence can be developed optimally through a good self-learning process (Merona, 2019). This research is inversely proportional to Darmaji, et al., (2018) that students are less skilled in doing practicum so that the physics learning process is low. The low attitude of scientific inquiry will have a negative impact on learning (Tursinawati, 2016).
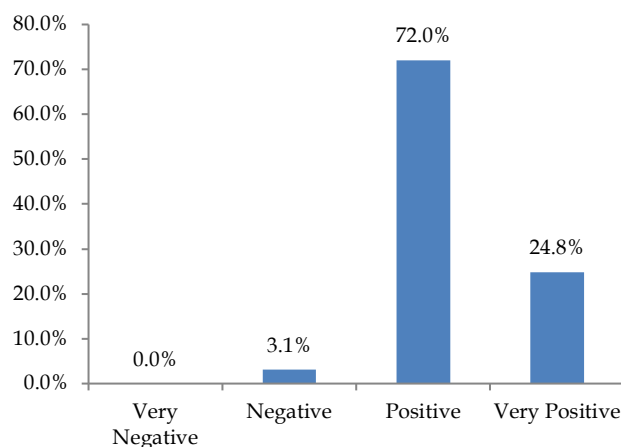
Social implications of science

The social implication of science is an attitude caused by a person due to social instincts. According to Kurniawan, et al., (2019) instincts will arise when students learn and are directly involved with science. The social implications of science are also defined as the influence of science learning on social life (Narmadha & Chamundeswari, 2018). The benefits of the social implications of science for students are to form independence and good cooperation in learning activities (Kurniawan, et al., 2018).

The results of the study of students' attitudes towards science on indicators of the social implications of science in SMP and MTsN Aceh Jaya Regency obtained the following responses.

The data in Table 7. it is known that the indicators of the social implications of science obtained the highest response of students' attitudes on the agreed criteria, namely 37.04% and the lowest response was in the category of strongly disagree with a percentage of 4.60%. Based on the results of the analysis can be seen in Figure 5.

Table 7. Categories of Responses to the Indicators of the Social Implications of Science

No Q	STS	TS	KS	S	SS
1	1	9	33	104	14
11	10	25	43	61	22
21	8	14	55	62	22
31	4	9	30	84	34
41	8	11	26	70	46
6	6	5	28	43	79
16	4	14	68	48	27
26	13	33	62	31	22
36	7	24	60	44	26
46	13	13	44	49	42
N	74	157	449	596	334
%	4.60	9.76	27.91	37.04	20.76

Figure 5. Categories of social implications of science

The data above shows that there is no lowest response to the social implications of science so that the percentage of 0% (0 students) is in the very negative category, while the highest positive response is obtained with a percentage of 72% (116 students). This shows that the attitudes of students with the highest responses are in the Positive category (72%).

Based on the results of data analysis, it is known that the highest score on the social implications of science for students is obtained with the criteria of agreeing and showing the attitude with a positive category in SMP and MTsN Aceh Jaya Regency. This indicates that students have a sense of love for the environment, considers science to be important and needs attention from the government and society to continue to develop in the future. According to Hardiyanti, et al., (2018) a positive attitude towards the social implications of science will also foster a positive attitude towards science lessons.

Students who have positive social implications are supported by their living environment and family. In line with Azwar (2011) the formation of a person's attitude is influenced by the culture that grows in the environment where he lives. Therefore, environmental

and cultural factors must be considered in order to facilitate efforts to foster positive attitudes towards the social implications of science for students. Science must be related to everyday life in order to make it easier for students to imagine abstract concepts becoming real (Astalini, et al., 2018).

Conclusion

Based on the results of research and data analysis, it can be concluded that the attitudes of students on the five indicators of attitudes towards science that were studied obtained the results, namely the pleasure of learning science, the highest response was in the agree criteria (39.40%) and was in the positive category (47.2%). Interest in spending time learning science, agreed criteria (37.29%) as the highest response and was in the category of positive attitude (54.7%). Interested in a career in science, the highest response was obtained on the agreed criteria (34.43%) and was in the category of positive attitude (50.3%). The attitude of scientific inquiry, the highest response was obtained with the criteria of agreeing (29.71%) and being in the category of positive attitude (77%). and the social implications of science, also obtained the highest response on the agreed criteria (37.04%) and was in the category of positive attitude (72%). Overall, the students' attitude towards science was the highest response to the criteria for agreeing (35.56%) with a positive attitude category (75.8%) in SMP and MTsN Aceh Jaya District.

Acknowledgements

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