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Exploration of Students' Attitudes Towards Science: A Case Study Research in Junior High Schools

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ABSTRACT

This research aims to explore students' attitudes towards science in junior high school. The method used in this research is a survey. The instrument used was the BRAINS questionnaire and open-ended questions. The sample participants in this study consisted of 190 students aged 12-16 years from North Sumatra and West Java, Indonesia. Students' attitudes toward science have an average of 3.78, which is categorized as having a high attitude toward science. However, based on the results of the Mann-Whitney test (p = 0.436) on the gender variable and the Kruskal-Wallis test, the significance value of each factor is attitude (0.858), intention (0.996), behavior (0.248), control (0.476), and normative (0.287) is greater than the significance level of 0.05. There were no significant differences in attitudes towards science between male and female students. This research provides the benefit of seeing how students' attitudes towards science at the junior high school level in Indonesia. Thus, teachers can use it to improve learning in science subjects in junior high schools.

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1. INTRODUCTION

One of the assessments of the education system, especially secondary education, is through the Program for International Student Assessment (PISA). PISA measures student performance in three main areas: reading, mathematics, and science. PISA is part of the Organization for Economic Cooperation and Development (OECD) program, which operates in economic cooperation and development. PISA members consist of 72 countries around the world. PISA tests students aged 15 years, namely when they are in grade 9 of Junior High School (SMP) or the beginning of Senior High School (SMA), through basic tests, namely reading, mathematics, and science, by focusing on one subject every 3 years (Yusmar, 2023).

The 2018 PISA results in the field of scientific literacy placed Indonesia in 72nd place out of 77 participating countries. The score obtained by Indonesia for scientific literacy was 396, far below the average score set by PISA, namely 500. Scientific literacy is related to attitudes toward science. The results of previous research imply that reading comprehension skills, creative thinking abilities, and attitudes toward science play an important role in increasing students' scientific literacy.

According to the Big Indonesian Dictionary, attitudes are actions, and so on that are based on a stance or belief, student attitudes emerge as a result of the education and teaching that has been implemented. For example, students' attitudes towards science or natural sciences (IPA) will emerge when they have received information and carried out science learning. Attitudes are divided into positive or accepting attitudes and negative or rejecting attitudes. Students' attitudes towards science subjects at school can be shown by their reactions to science subjects. In the learning process, teachers should not only focus on students' cognitive aspects but also focus on students' affective aspects, namely attitudes toward students (Astalini & Kurniawan, 2019).

The results of research Kurniawan *et al*. (2019a) indicate that student's attitudes towards science in junior high school are in a good category because the three indicators measured, namely social implications, enjoyment of learning, and interest in a career in science, show a good category which shows a positive attitude. In line with this (Wassalwa *et al*, 2022), through research results, students' attitudes toward science are based on five indicators (enjoyment of learning, interest in spending time, interest in a career, investigative attitudes, and social implications) with the highest response found in the criteria of agreeing with the attitude category positive in SMP and MTsN Aceh Jaya Regency.

Factors influencing students' attitudes towards science include gender, where they live, age and level of education, socioeconomic conditions, and the teaching methods used. Previous research (Smith *et al*., 2014; Lu *et al*., 2016; Said *et al*., 2016; Toma *et al*., 2019; Suryadi *et al*., 2020; Emily & Subramaniam 2023) explains that overall gender differences significantly affect attitudes, such as students towards science. Also, boys are more confident and like science than girls (Smith *et al*., 2014). The average attitude score toward science for men is significantly higher than the average score for attitude toward science among women (Lu *et al*., 2016). In addition, men show more positive attitudes towards science than women (Emily & Subramaniam, 2023). Age or level of education also influences students' attitudes towards science. Findings from research (Said *et al*., 2016) show that students' attitudes toward science decrease with age. The level or level of education also has a significant effect on students' attitudes (Suryadi *et al.*, 2020). The school location factor also influences students' attitudes toward science, as research (Astalini *et al*., 2020) found differences in attitudes between students in rural areas and students in urban areas, and there are significant differences between students in science subjects. Students who go to school in

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rural areas perform better than those in urban areas (Fasasi, 2017). Research conducted in Pakistan (Anwar *et al*., 2014) showed positive student attitudes towards science, regardless of province. However, the comparison between regions favors students from Sindh province compared to students from Balochistan. Similar patterns were observed for all constructs except future participation in science, where both areas showed similar trends.

Knowledge does not always lead to greater public support for science. At the same time, a lack of knowledge is unlikely to mean less support. Conversely, knowledge has positive or negative effects, depending on the type of mediator and the type of knowledge involved in producing the effect (Lee *et al*., 2018). Several studies state that gender has no effect on students' attitudes toward science, such as no gender gap in scientific competence (Chi *et al*, 2017), and no significant influence was found by gender and type of school (Montes, 2018).

Research on students' attitudes towards science has been conducted in Indonesia using various instruments and indicators. The instrument that has been used is the Test of Science-related Attitude (TOSRA), which was developed by Fraser in 1981 with five indicators, namely enjoyment in learning science, interest in increasing time studying science, interest in a career in science, scientific inquiry, and the social implications of science (Wassalwa *et al*., 2022). Another study adopted the TOSRA survey, which was developed into seven indicators, namely the social implications of science, teacher normality, attitudes towards investigations in science, the adaptation of scientific attitudes, enjoyment in learning science, interest in increasing time studying science, and interest in a career in science (Astalini *et al*., 2019). Some only use three indicators from the survey: the social implications of science, enjoyment of learning science, and interest in a career in science/science (Kurniawan *et al*., 2019b).

Other researchers used the My Attitude Toward Science (MATS) instrument developed by Hillman (2016) with four indicators, namely attitude toward science lessons, desire to become a scientist, the value of science in society, and perceptions of scientists (Hilman *et al*., 2016; Suryadi *et al*., 2020). However, there has been no research regarding students' attitudes towards science in Indonesia that uses the TRAPB (Theories of Reasoned Action and Planned Behavior) framework in the form of the BRAINS (Behavior, Related Attitudes and INtentions toward Science) instrument, which is the latest instrument developed by Summers (2018) The instrument focuses on five factors, namely students' attitudes towards science, intention or willingness to be involved in science, behavioral beliefs, control beliefs, and normative beliefs. This research aims to explore students' attitudes towards science with the BRAINS instrument and adapt it to Indonesian to provide an overview of students' attitudes towards science. The following research questions guided this study:

(i) What are students' attitudes towards science in junior high school?
(ii) Are there significant differences in students' attitudes toward science between men and women?

2. METHODS

2.1. Research Design

This research is research using a survey method. Survey research is a quantitative approach to social science and health research. Survey research design is a set of research procedures in which the researcher surveys a sample or entire population to describe attitudes, opinions, beliefs, perceptions, behaviors, or characteristics of the population. The survey used aims to collect information about student characteristics in the form of students' attitudes towards science. This survey was completed online using Google Forms, which participants can fill out anytime and anywhere. Participants were directed to fill out a questionnaire based on their

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perceptions and feelings about being safe in taking science subjects at school. The survey was carried out by students who filled out a questionnaire using their smartphones.

2.2. Participants

The sample participants in this study consisted of 190 students aged 12-16 years who were students in grades VII, VIII, and IX who came from two provinces in Indonesia, namely North Sumatra and West Java, Indonesia. The samples taken came from several schools in North Sumatra, namely Yapendak Kebun Ajamu Private Middle School, Al-Washliyah 8 Middle School Medan, Dr. Wahidin Sudirohusodo, and SMPN 4 Kualuh Hulu, as well as one school from West Java, namely SMPN 3 Parongpong. The percentage comparison of the number of participants based on gender can be seen in **Table 1**.

Table 1. Percentage comparison of the number of participants based on gender.

Gender	Grade	Participants	Percentage
Male	VII	40	21%
	VIII	21	11%
	IX	22	12%
	Number	83	44%
Female	VII	54	28%
	VIII	27	14%
	IX	26	14%
	Number	107	56%
Total (N)		190	100%

2.3. Research Instrument

This research is survey research using a questionnaire instrument developed by Summers (2018). This research adopted the BRAINS (Behavior, Related Attitudes and INtentions toward Science) survey and adapted it into Indonesian. The BRAINS survey was developed based on the TRAPB (Theories of Reasoned Action and Planned Behavior) framework, which consists of 30 statement items that focus on five factors, namely students' attitudes towards science (Attitude), intention or willingness to be involved in science (Intention), behavioral beliefs (Behavior), control beliefs (Control), and normative beliefs (Normative). This survey uses a 5-point Likert scale, where each point indicates whether you agree or disagree with the statement given. The score range starts from "1" (strongly disagree) to "5" (strongly agree), with a score of "3" (undecided) indicating that the student is not sure about the statement given. The instrument also includes two open-ended questions regarding students' interest in science and questions used to collect information about students' backgrounds, such as gender, age, education level, and school of origin. Overall reliability for a questionnaire with a Cronbach alpha value greater than 0.6 is considered acceptable, and a value between 0.7 and 0.9 is considered good.

2.4. Data Analysis

The questionnaire in this study uses five scales of agreement with each statement (strongly agree, agree, doubtful, disagree, and strongly disagree). The statements given consist of positive and negative statements. The questionnaire adopted the BRAINS survey, which consists of five factors. The first is the attitude, which consists of 6 statement items: Q1, Q7, Q15, Q23, and Q24 are positive statements, while Q30 is negative. The second factor is intention, which consists of 6 statement items, namely Q4, Q13, Q16, Q20, and Q28, which

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are positive, while Q11 is negative. The third factor is Behavior, which consists of 9 statement items, all of which are positive statements, namely Q2, Q3, Q8, Q19, Q21, Q25, Q26, Q27, and Q29. The fourth factor is control, which consists of 6 statement items, namely Q5, Q10, Q14, and Q18, which are positive, while Q6 and Q12 are negative. The fifth factor is Normative, which consists of 3 positive statement items, namely Q9, Q17, and Q22. Data obtained via Google Forms were then analyzed using the Statistical Package for The Social Sciences (SPSS v.29). The analysis was carried out descriptively by calculating the average scores given by participants regarding the five factors of student attitudes toward science. These results are presented in a bar chart. Each factor will be assigned a category using conditions based on the following range: 1.00-1.50 = very low; 1.51-2.50 = low; 2.51-3.50 = moderate; 3.51-4.50 = high; 4.51-5.00 = very high (Orawiwatnakul & Wichadee, 2017).

Research data was also analyzed using a difference test. The difference test used is non-parametric statistics, namely using the Mann-Whitney test on the gender variable and the Kruskal-Wallis test on student attitude factors. The Mann-Whitney test is used to measure the size of the effect, which can be found by considering the confidence interval on the median (Perme & Manevski, 2019). Kruskal-Wallis is a non-parametric statistical test that assesses differences between three or more independent sample groups on one continuous variable that is not normally distributed. Data that is not normally distributed, for example, ordinal or ranking data. This test determines significant variations between the average value of students' attitudes towards science based on gender (gender as a grouping variable and average value as a test variable). In this study, the significance level used was 5% (α=0.05) which was used to interpret the research results. Provided that if the significance value is <0.05, then there is a significant difference, and if the significance value is >0.05, then there is no significant difference (Azwar, 2005).

3. RESULTS AND DISCUSSION

3.1. Results of the first research question: "What are students' attitudes towards science in junior high school?"

This survey research was carried out by providing a questionnaire in the form of a Google Form. Thus, students could respond online regarding their feelings and perceptions towards science. Based on the results of student responses by filling in the BRAINS questionnaire given, the average attitude of students towards science in junior high school can be seen in **Figure 1**.

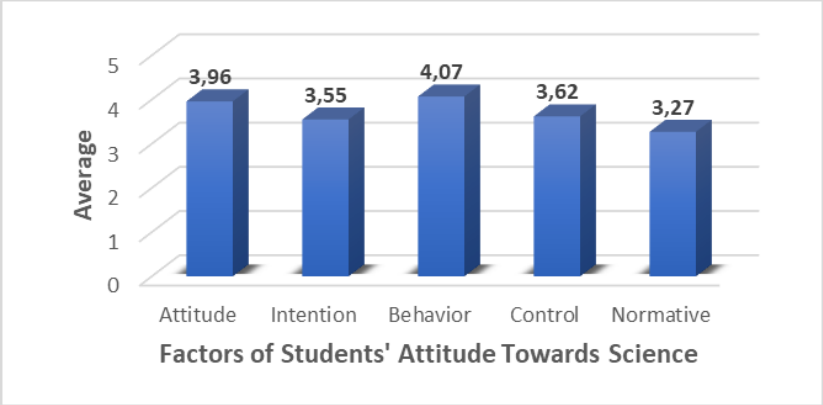

Figure 1. Average score of students' attitudes towards science based on the BRAINS questionnaire

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This research aims to determine the profile of students' attitudes toward science in junior high school using the BRAINS questionnaire. The results depicted via the graph in Figure 1 show that the Behavior factor has the highest average of 4.07 and the Normative factor has the lowest average of 3.27. Based on the theory of planned behavior, human actions are guided by three kinds of factors: beliefs about the results of behavior and evaluation of the results of behavior (behavior beliefs), beliefs about normative expectations from other people, and motivation to comply with expectations. (normative beliefs), and beliefs about the presence of factors that facilitate or inhibit behavior, as well as the perception of the strength of these factors (control beliefs). Based on this perspective, behavioral beliefs give rise to positive (favorable) or negative (unfavorable) attitudes toward certain behaviors, normative beliefs result in the formation of perceptions of social pressure to carry out subjective actions or norms (norm), and control beliefs give rise to perceptions of behavioral control (perceived behavior control). The combination of attitudes towards behavior, subjective norms, and perceptions of behavioral control, results in the formation of behavioral intentions (Machrus, 2012). Students believe that science will shape their behavior and impact their studying science, such as through science, they understand the world around them and believe that scientists are highly respected by society.

In this research questionnaire, there are also open-ended questions totaling 2 items which are used to investigate more deeply regarding students' interest and disinterest in science subjects. Students' opinions regarding this interest are presented below:

Question 1: *What made you interested in science subjects?*

Student 1: *What makes me interested in science subjects is that science helps me learn about the outside world, whether it's nature, health, or so on, and there are happiness, and practical activities in science material, especially if done directly in the laboratory, and science also helps me get to know the living creatures around me in my daily activities.*

Student 2: *Science lessons can help me maintain health, protect the environment, and learn a lot about various diseases I did not know about before. Science lessons also contain material that is systematically related to nature.*

Through students' opinions regarding their interest in science subjects, student 1 and student 2 have the same opinion, namely that they are related to science because they believe that science will help them get to know the surrounding environment and existing living creatures, as well as help students maintain their health and the surrounding environment. This is related to behavioral beliefs that give rise to positive attitudes.

Question 2: *What makes you less interested in science subjects?*

Student 1: *What makes me less interested is if practical activities are only explained in class, but not directly practiced in the laboratory room.*

Student 2: *Because science material also includes physics, I don't like physics because it does calculations and has many formulas.*

Through the second question, students think that what makes them not interested in science subjects comes from external factors. According to student 1, the thing that made him not interested in science lessons was the lack of practical activities in the laboratory. Student 2 believes that he doesn't like physics material in science subjects because there are many formulas, and he doesn't like calculating. These external factors also influence students' attitudes. In previous research, laboratory experience strongly impacted middle school students' attitudes toward science (Kapici *et al*., 2020).

The BRAINS survey is divided into five factors, namely: attitude, intention, behavior, control, and normative, each factor consisting of different statement items. Profiling students' attitudes towards science in junior high school through the BRAINS survey for each

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factor, namely: the attitude factor is in **Table 2**, the intention factor is in **Table 3**, the behavior factor is in **Table 4**, the control factor is in **Table 5**, and the normative factor is in **Table 6** explained as follows.

Table 2 above presents a statistical description of the average score and standard deviation of students' attitudes towards science in junior high school according to attitude factors. **Table 2** shows that the average score for the attitude factor is 3.96. Thus, the attitude factor can be categorized as high. Several statement items have scores above average: Q1, Q7, Q15, and Q24. Students stated that they enjoyed studying science and liked it. They also agree that science subjects are the most interesting subjects. Statements that have scores below the average are Q23 and Q30. Students expressed doubts about carrying out science experiments at home. In this study, students' attitudes towards science had the second highest average score, meaning that students already had a positive attitude towards science subjects. These results are in line with previous research concluding that students' attitudes are more dominant in the good category, and students show positive attitudes towards science in the good category (Kurniawan *et al*., 2019b).

Table 2. Statistical description of participant scores for the Attitude factor.

Factor	Item	N	Mean	SD
Attitude	Q1	190	4.30	0.67
	Q7	190	4.06	0.69
	Q15	190	4.06	0.75
	Q23	190	3.62	0.91
	Q24	190	3.97	0.84
	Q30	190	3.76	1.12
Average			3.96	0.83

Table 3 above presents a statistical description of the average score and standard deviation of students' attitudes towards science in junior high school according to the intention factor. **Table 3** shows that the average score for the intention factor is 3.55. Thus, the intention factor can be categorized as high. Several statement items have scores above the average, namely Q4, Q11, Q13, and Q20. Students stated that they wanted to study science when entering university and would pursue science-related goals. Apart from that, they also agreed to enjoy activities/work related to science, and they wanted to become scientists in the future. Statements that have scores below the average are Q16 and Q28. Students expressed doubts about continuing to study science after school and felt hesitant about taking additional lessons/science courses. The average value of the intention factor ranks second lowest of the five factors. Behavioral intention is formed from a combination of attitudes toward behavior, subjective norms, and perceptions of behavioral control (Machrus, 2012). Behavioral intentions are closely related to discipline and independence. The results of previous research explain that there is a positive and significant relationship between independence and students' disciplinary intentions. Individuals who have a high level of independence have a higher level of discipline. Likewise, vice versa, the lower the individual's independence, the lower the level of discipline (Fauzan, 2023).

Table 4 above presents a statistical description of the average score and standard deviation of students' attitudes toward science in junior high school according to behavioral factors. **Table 4** shows that the average score for the behavior factor is 4.07. Thus, the behavioral factor can be categorized as high. Several statement items have scores above the average, namely Q2, Q3, Q21, Q26, and Q27. Students stated that they agreed that scientists are highly respected in society. They also agreed that science impacts their lives by helping them make

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better choices about health, protecting the environment, and helping students understand the world around them. Statements that have scores below the average are Q8, Q19, Q25, and Q29. Students still hesitate to believe that teachers encourage them to understand science concepts in the classroom, and they also doubt that they live better in the world because of science. Students do not agree that scientists like to go to work even though scientists are on vacation, and students still doubt that people who have jobs related to science have a normal family life. The average value of the behavior factor ranks first and highest of the five factors. This factor (behavior belief) is a belief about behavioral outcomes and evaluation of behavioral outcomes gives rise to positive or negative attitudes (Machrus, 2012). This behavioral belief arises because students' perceptions of science are influenced by external factors such as the professional competence of science teachers influencing students' perceptions of science learning and the quality of teachers in delivering material influences students' perceptions of science learning (Siswandoko, 2013). The perceptions that arise in students are due to internal factors that originate from within the student. Students have abilities in the field of science. Thus, students have an interest in science subjects (Agustami, 2017).

Table 3. Statistical description of participant scores for the Intention factor.

Factor	Item	N	Mean	SD
Intention	Q4	190	3.56	1.00
	Q11	190	3.58	1.07
	Q13	190	3.60	0.92
	Q16	190	3.39	0.94
	Q20	190	3.72	0.83
	Q28	190	3.45	0.94
Average			3.55	0.95

Table 4. Statistical description of participant scores for the Behavior factor.

Factor	Item	N	Mean	SD
Behavior	Q2	190	4.39	0.60
	Q3	190	4.24	0.72
	Q8	190	4.01	0.93
	Q19	190	3.71	0.85
	Q21	190	4.25	0.66
	Q25	190	3.70	0.89
	Q26	190	4.31	0.68
	Q27	190	4.27	0.66
	Q29	190	3.74	0.88
Average			4.07	0.76

Table 5 above presents a statistical description of the average score and standard deviation of students' attitudes toward science in junior high school according to control factors. **Table 5** shows that the average score for the control factor is 3.62. Thus, the control factor can be categorized as high. Several statement items have scores above the average, namely Q5 and Q18. Students stated that they believed that students could understand science and were confident they could do well on the science exam. Statements that have scores below the average are Q6, Q10, Q12, and Q14. Students expressed doubt that science was easy for them and doubted their ability to understand difficult science concepts. Apart from that, they also doubt that when students try to understand a science concept, they will give up and will not

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be able to understand even if they try hard. The average value of the control factor ranks third of the five factors. Perception of behavioral control or what can be called behavioral control is an individual's perception regarding the ease or difficulty of realizing a certain behavior (Ramdhani, 2011). The concept of perceived behavioral control proposed by Ajzen was influenced by research conducted by Bandura regarding self-efficacy. In previous research, the relationship between behavioral control (control belief) and self-efficacy (self-efficacy) is fairly strong (Iskender, 2009).

Table 5. Statistical description of participants' scores for the Control factor.

Factor	Item	N	Mean	SD
Control	Q5	190	4.10	0.77
	Q6	190	3.17	1.06
	Q10	190	3.59	0.86
	Q12	190	3.40	1.04
	Q14	190	3.34	0.91
	Q18	190	4.15	0.73
Average			3.62	0.90

Table 6 presents a statistical description of the average score and standard deviation of students' attitudes toward science in junior high school according to normative factors. **Table 6** shows that the average score for the normative factor is 3.27. Thus, the normative factors can be categorized as moderate. Several statement items have scores above the average, namely Q17 and Q22. Students stated that their families supported their interest in science and encouraged them to have a job related to science. The statement that has a score below the average is Q9. Students expressed doubt that there were members of the student's family who worked in jobs related to scientific activities. The average value of the normative factor was the lowest, namely the fifth of the five factors. This factor is related to the role of the people around the student who encourage him. Previous research confirms that a more positive parental attitude toward science benefits children's science achievement. Parental attitudes can positively impact students' science achievement by influencing their children's attitudes towards science (Perera, 2014).

Table 6. Statistical description of participants' scores for the Normative factor.

Factor	Item	N	Mean	SD
Normative	Q9	190	3.06	1.20
	Q17	190	3.36	1.03
	Q22	190	3.39	1.00
Average			3.27	1.08

3.2. Results of the second research question: "Are there significant differences between men and women in students' attitudes toward science?"

For the second research question, researchers investigated significant differences between boys and girls regarding students' attitudes toward science in middle school. Statistical analysis was carried out to determine significant differences in data between participants based on the gender variable, which was analyzed using inferential statistics. Normality tests using the Kolmogorov-Smirnov and Shapiro-Wilks tests (**Table 7**) were carried out on student response scores to calculate whether the variables conformed to a normal probability distribution.

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Table 7. Normality Test Results.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Male	0.405	83	<0.001	0.677	83	<0.001
Female	0.368	107	<0.001	0.747	107	<0.001

a. Lilliefors Significance Correction

The results for the gender variable were significant ($p < 0.001$) in both tests, indicating a nonconformity with the assumption of normality distribution. Therefore, the gender variable was analyzed using non-parametric statistics. **Table 8** shows students' attitudes towards science in junior high schools based on gender using descriptive statistics, namely mean and standard deviation. Descriptive statistics of participant scores based on gender are presented in **Table 8**.

Table 8. Statistical description of participant scores based on gender.

Gender	N	Mean	Std. Deviation
Male	83	3.79	0.86
Female	107	3.76	0.88
Average		3.78	0.87

Table 8 above shows that the number of male respondents was 83, and the number of respondents was 107. Male respondents, namely 3.79, obtained the highest average participant score; the average score for female participants was 3.76. Meanwhile, the highest standard deviation value of 0.88 was obtained by female students, and the standard deviation value for male students was 0.86. Overall, the average participant score based on gender was 3.78. This research shows that male students have a higher attitude towards science than female students. Previous research shows mixed results; male students are more confident toward science and show a greater liking for science than female students (Smith *et al*., 2014), and male students show more positive attitudes toward science than women (Emily & Subramaniam, 2023). However, other research explains that male students do not show significant differences compared to female students (Said *et al*., 2016).

The difference test for the gender variable was carried out using the Mann-Whitney test. This test is carried out with medians based on survey data. With the Mann-Whitney test, several options regarding what should be reported as a measure of effect size can be found in the literature. One option is to consider the confidence interval for the median (Perme & Manevski, 2019). **Table 9** shows the mean rank values for each gender and the significance results using the Mann-Whitney test.

Table 9. Mann-Whitney test results respondent scores based on gender.

	Gender	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Asymp. Sig. (2-tailed)
Students' Attitudes towards Science	Male	83	98.61	8184.50	4182.500	0.436
	Female	107	93.09	9960.50		
	Total	190				

Table 9 above shows the mean rank results based on gender. It is known that the mean rank value of male students is higher, 98.61. Meanwhile, the mean rank value of female

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students is 93.09. This situation illustrates that male students' attitudes towards science are higher than female students. However, based on the significance value greater than the significance level (0.436>0.05), the difference is insignificant between the two sexes.

Furthermore, different tests were carried out based on each factor of student attitudes towards science to clarify more specifically. The Kruskal-Wallis test was used to see significant differences in attitudes toward science between male and female students based on student's attitudes towards science. **Table 10** below shows the mean rank values for each gender and the significance results using the Kruskal-Wallis test.

Table 10. The results of the Kruskal-Wallis test resulted in respondents' scores based on student attitude factors.

	Gender	n	Mean Rank	Kruskal-Wallis H	Asymp. Sig.
Attitude (N=190)	Male	83	94.69	0.032	0.858
	Female	107	96.13		
Intention (N=190)	Male	83	95.48	0.000	0.996
	Female	107	95.52		
Behavior (N=190)	Male	83	100.71	1.332	0.248
	Female	107	91.46		
Control (N=190)	Male	83	92.29	0.507	0.476
	Female	107	97.99		
Normative (N=190)	Male	83	100.29	1.132	0.287
	Female	107	91.79		

Table 10 shows the mean rank results for each factor and each gender. The mean rank value in the attitude factor of female students is higher than that of male students, which means that female students have a higher attitude towards science than male students. The value of the intention factor does not differ too much between genders, both male and female, which means that both genders have the same perception regarding intention and willingness to be involved in science. The behavioral factor for male students is ranked the highest, and simultaneously the behavioral factor for female students is ranked lowest when compared to other factors for both male and female students. This means that male students have high confidence in science, which greatly influences their lives. However, for the control factor, the highest score was obtained by female students, which means that female students have higher confidence in understanding science than male students. For normative factors, the highest scores were obtained by male students, which means that support from external elements around the students such as encouragement from the family for male students is higher than for female students.

Apart from that, **Table 10** also shows the results of the Kruskal-Wallis test, indicating no significant difference. The significance value of each factor, namely attitude (0.858), intention (0.996), behavior (0.248), control (0.476), and normative (0.287), none of them has a significance value below the significance level of 0.05. Therefore, there is no significant difference in attitudes towards science between male and female students. Previous research conducted at the high school level using The High School Science Questionnaire (HSSQ) showed that the average score of attitudes toward science for boys was significantly higher than the average score for attitudes toward science for girls on all subscales (Lu *et al*., 2016). Other research conducted at the high school level using the My Attitude Toward Science (MATS) questionnaire and analyzed using the Mann-Whitney test showed that statistically, gender differences significantly affect student attitudes toward science (Suryadi *et al*., 2020).

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This difference needs to be studied further regarding the influence of the questionnaire and the data analysis type used.

4. CONCLUSION

Students' attitudes towards science at junior high school (SMP) level in Indonesia have an average of 3.78 which is categorized as having a high attitude towards science. Meanwhile, the average for each factor, namely attitude, is 3.96 in the high category, intention is 3.55 in the high category, behavior is 4.07 in the high category, control is 3.62 in the high category, and normative is 3.27. with the medium category. Based on gender, the behavior factor for male students is ranked the highest (mean rank = 100), and simultaneously, the behavior factor for female students is ranked the lowest (mean rank = 91.46) compared with other factors in both male and female students. Male respondents, namely 3.79, obtained the highest average participant score, and the average score of female participants was 3.76. Thus, both can be categorized as having a high attitude toward science based on gender. However, based on the results of the Mann-Whitney test ($p = 0.436$) on the gender variable, the significance value is still greater than the significance level ($p>\alpha$). Likewise, with the results of the Kruskal-Wallis test, the significance value of each factor, namely attitude (0.858), intention (0.996), behavior (0.248), control (0.476), and normative (0.287), none of them has a significance value below the significance level value of 0.05.

Therefore, in this study, there is no significant difference in attitudes towards science between male and female students. This research provides the benefit of seeing the picture of students' attitudes towards science at the junior high school level in Indonesia. Thus, teachers can improve learning in science subjects in junior high schools and increase students' intentions toward science. In future research, it is recommended that research be conducted on a wider scope, such as a range of classes/levels and sample locations that are more representative of Indonesia. Apart from that, it is also recommended that solutions be found to improve students' attitudes towards science through media, methods, or strategies that can be used in science learning.

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6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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