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The Relationship of Religiosity with Students' Critical Thinking Skills on the Subject of Stoichiometry

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Abstract: Science and religion are two things that reinforce each other. Science is present is expected to provide evidence so that it will improve the quality of one's beliefs. Similarly, the presence of religion in science can make science more useful and increase its benefit. This study aims to see the relationship between religiosity and students' critical thinking skills in class XI IPA SMA Negeri 3 Binjai. The method used is an analytical method using the Pearson correlation test. The subjects in this study were grade XI students of SMA Negeri 3 Binjai which amounted to 107 students. The instrument used was a religiosity questionnaire with 15 statements and using critical thinking skills questions on stoichiometry material totaling 18 questions. The results of the study found that the average level of students' critical thinking skills on stoichiometric material was 29.71 and the average level of student religiosity was 42.94. The correlation coefficient between religiosity and critical thinking skills obtained is 0.809 which means that there is a strong relationship between religiosity and critical thinking skills of students in class XI IPA SMA Negeri 3 Binjai.

Keywords: Religiosity, Critical Thinking Skills, Stoichiometry

INTRODUCTION

In the current era of globalization, we really need quality Human Resources (HR). Education is one of the biggest factors that will affect the quality of human resources. In December 2019 a student ability survey conducted by PISA (Programme for International Student Assesment) stated that Indonesia is a country that ranks 72nd out of 77 countries (Risidiana et al., 2022). During the survey conducted by PISA, Indonesia is always ranked in the last 10 (Musayaroh et al., 2021). This shows that the low learning

achievement results achieved by Indonesian students (Netri et al., 2018).

Education is a learning process that is important for human life in producing quality humans. One of the efforts to improve the quality of human resources is through the learning process in schools or self-taught. Education aims so that we can develop our potential and can have skills and a sense of responsibility (Mulya & Sulaiman, 2021).

Chemistry is very appropriate if taught by using chemical concepts with an attractive appearance so it's easy to be understood (Ratno

et al., 2013). According to Trianto (2010), in Wardhani et al. (2014), Education is expected to be able to support future development in develop students' potential, so that students are able to face and solve the problems of life he faced (Panggabean & Susanti, 2015).

Chemistry is the branch of science that studies the properties of matter, the structure of matter, changes in matter, and the energy involved in reacts. A strong mastery of concepts is essential in studying chemistry. These concepts are interrelated with each other so that it is often difficult for students (Kurniawan & Jahro, I, 2021).

Stoichiometry is key in chemistry. Students should have a good ability to find calculations or analysis in mathematics so that later they can solve well the analytical problems in stoichiometry material (Rery & Anwar, 2021).

The word religion in English is religion. Religiosity comes from the word "religious" or known as religion in Indonesian (Utami et al., 2009). Science can be balanced with religion, if religion is not balanced with science, it will later dry up in spiritual aspects, but produce an advance both in physical and others. All characteristics in chemistry have philosophies and phenomena that all come from God Almighty (Asmara, 2016). In chemistry, there is a lot of religiosity in it, especially the values of beauty which will later lead to the value of divinity. In chemistry lessons, students really need religiosity as a provision for life in the world by balancing life in the afterlife (Zega & Darmana, 2019).

Activities carried out self-taught or through intermediaries such as teachers so that there are new experiences and have new knowledge from the learning results carried out is an activity process (Djamaluddin et al., 2019). Religiosity has five dimensions, including: (1) Intellectual or Knowledge Dimension, (2) Ideological Dimension, (3) Ritual or Practical Dimension, (4) Experimental or Experience Dimension, (5) Consequence or Practice Dimension (Solihat et al., 2019).

But in essence, learning is not always associated with religiosity, especially in general subjects, as is the case in chemistry lessons. If a man is very high in religiosity, then he must be able to carry out whatever is in the teaching. It can be said to be religiosity if you have religious knowledge, religious beliefs, religious experience and religious social attitudes and behaviors. So religion has rules or obligations that must be obeyed and subdued by everyone (Ilham et al., 2019).

LITERATURE REVIEW

A very important ability in the process of education and life is the ability to think critically. Through the understanding taught in each religion, good habits are given birth in the activities of each individual. This habit will improve students' critical thinking in learning (Pitaloka et al., 2022). To solve a problem, you must have a critical thinking pattern, namely by the way the right data is needed for the right decision. With the critical thinking ability of each student, they can organize, analyze, change and adjust so that they will be wiser in making decisions (Khasanah & Ayu, 2017)

A person's higher-order thinking ability is known through indicators that can be used to measure this ability. Indicators of HOTS questions generally consist of critical thinking skills, problem-solving or problem-finding processes, and creative thinking skills. The current 2013 curriculum, the government is implementing an application that requires students to think higher-order. To achieve students' ability to solve HOTS problems, the word "analyze" is needed in KI3. The method carried out is the development of a learning plan, conducting learning, and assessing learning on a full scale based on HOTS for daily learning (Putri et al., 2020).

Higher order thinking skills (HOTS) are thinking skills that can form children not only to retain knowledge, but already at the level of transferring. The application of HOTS for students is very urgent, considering the times with various extraordinary challenges. The development of the digital world that has

the potential to make dependence, pseudo-maturity of students, and globalization challenges need to be answered by applying HOTS in the world of education (Simamora, 2022).

To train the ability to think at a higher level a student (student) needs to have good reasoning power. Bloom's taxonomy is considered a high-level rationale. This thinking is based on the fact that some types of learning require more of a cognitive process than others, but have more general advantages. Bloom's taxonomy has six levels, divided from lower order thinking skills to higher order thinking skills. But in fact that in Indonesia the ability to think at a higher level (HOTS) students are still very low and are only able to do C1 – C3 questions including chemistry subjects (Riswanda, 2022).

METHODS

This research is a quantitative-research using analytical methods using the Pearson correlation test with one independent variable, namely Religiosity (X) and one dependent variable, namely Student Critical Thinking Ability (Y). This research is a quantitative research using analytical methods using the Pearson correlation test with one independent variable, namely Religiosity (X) and one dependent variable, namely Student Critical Thinking Ability (Y). The subjects studied were students of class XI IPA SMA Negeri 3 Binjai with a total of 107 students. There are 52 male and 118 female students, as well as 150 Muslim students and 20 Christian students.

In the variable of religiosity (X), the measuring instrument used is using questionnaires. The religiosity questionnaire consists of 15 questions. In this study using five dimensions of religiosity which include intellectual or knowledge dimensions, ideological dimensions, ritual or practical dimensions, experimental dimensions and consequences or practice dimensions. In the variable of students' critical thinking ability (Y), the measuring instrument used is using a test instrument. The test instrument used is the

HOTS question instrument. The HOTS questions in this study consisted of 25 multiple-choice questions with 5 choice options and with 1 correct answer.

In the HOTS question instrument, validity, reliability, difficulty and differentiating power are tested. The validity test carried out is a test of construct validity and empirical validity. The religiosity questionnaire has been validated by expert validators and each item of the religiosity questionnaire has been paraphrased. The religiosity questionnaire in this study was taken from one of Cahya Gioktavani's student theses.

It is argued by some researchers that critical thinking is a skill of higher-order thinking that can affect social development, moral development, cognitive development, spiritual development, and also scientific development (Hashemi et al., 2010).

In this study, descriptive statistical analysis and inferential statistical analysis were used. Descriptive statistical analysis is a statistic or calculation to analyze data in research by describing data that has been collected that does not intend to make conclusions (Sugiyono, 2009). This analysis is used to measure mean value, median, mode, frequency, standard deviation, variance, maximum value and also minimum value. This method is used to collect data according to religion, and also according to gender. The goal is to make it easier to process research data. In inferential statistical analysis it is used to test data with normality tests, homogeneity tests and hypothesis tests. The goal is to get results from the formulation of the problem contained in this study.

RESULT AND DISCUSSION

1. Validity of Test Instruments

Validation carried out using validation sheets has four aspects of assessment, namely material aspects, construction, language, and additional rules. The material aspect consists of 8 assessment categories, the language aspect consists of 4 categories, the language aspect consists of 4 categories, and the

additional rules aspect consists of 1 category. The results of the feasibility analysis of critical thinking problems of stoichiometric material by lecturer validators are contained in table 1.1 below.

Tabel 1. 1. Results of Question construct validity by Chemistry Lecturers

No	Assessment Aspect	Average
1.	Material	4,25
2.	Construction	4,5
3.	Language	4,25
4.	Additional rules	4
5.	Avarage	5
	Average Interpretation	4,4
	Average Analysis Validation Criteria	validity is well deserved

a) Empirical Validity

The problem of critical thinking skills stoichiometry material consists of 25 questions with 5 multiple-choice options. Question data processing is carried out by scoring each question item. True question items are scored 1, while incorrect question items are scored 0. The level of significance applied is 5% with the question declared valid if $r_{\text{calculated}} > r_{\text{tabel}}$. The acquisition of valid and invalid question items is presented in the following table 1.2:

Tabel 1.2. Empirical Validity Test Results of the Question

Criterion	Question Number	Sum	%
Valid	1,2,3,5,6,7,8,10,11,12,16,17,18,19,20,21,23,25	18	72
Invalid	4,9,13,14,15,22,24	7	28
Sum		25	100

Based on table 1.2, it can be seen that the percentage of validity test results obtained is 72% of 25 valid question items (18 question items) and 28% of 25 invalid question items (7 question items).

b) Reliability

The reliability of critical thinking skills on stoichiometry material is done with

the help of excel programs. The calculation of the reliability level is 0.594 with a significance level of 5%. This means that the questions that have been tested have moderate or medium reliability because the calculated r value is greater than the table r value which is 0.190. The reliability calculation data of the questions are presented in table 1.3 below.

Tabel 1. 3. Reliability Test Results

No	Number of Item	Reliability	Information
1.	18	0,594	Moderate reliability

c) Difficulty Level

The question qualifies if the P value ranges from 0.20-0.80. Data on the calculation of the level of difficulty of critical thinking skills in stoichiometric material are presented in table 1.4 below.

Tabel 1. 4. Results of Analysis of Question Difficulty Levels

Criterion	Number of Item	Sum	(%)
Easy	0	0	0
Keep	1,3,5,7,9,12,14,15,16,17,18,	11	61,1
Difficult	2,4,6,8,10,11,13	7	38,9
Sum		18	100

d) Differentiating power

The distinguishing power of the question is said to be good if it has at least 0.2 distinguishing power. The results of the differentiating power test are carried out with the help of the excel program. The data from the differentiating power analysis are presented in table 1.5 below.

Tabel 1.5. Results of the Problem Discriminating Power Analysis

Criterion	Number of Item	Sum	(%)
Good	1,2,5,6,7,15,16,18	8	44,4
Enough	3,4,8,9,11,12,13,14,17	9	50
Bad	1	1	5,6

The data in table 1.5 shows the results that there are 8 question items that have good category discriminating power, 9 question items have sufficient category discriminating power, and 1 question item has bad category discriminating power. It can be concluded that there are 17 questions that have a

distinguishing power that can distinguish high-ability students and low-ability students.

2. Descriptive Statistical Analysis

This study consists of two variables, namely independent variables and dependent variables. The independent variable in this study is student religiosity and the variable tied to this study is students' critical thinking skills. Descriptive statistical analysis of the data presented includes the number of students, highest grades, lowest grades, Mean, and Standard Deviation. Data processing is carried out with the help of the SPSS Version 22 program.

a) Critical Thinking Skills

Students' critical thinking skills were obtained through trials conducted on grade XI students of SMA Negeri 3 Binjai. Students do as many as 25 points of critical thinking skills questions on stoichiometry material with cognitive levels C4 and C5. Data on critical thinking skills are generally processed using the SPSS 22 program and are presented in table 1.6 below.

Tabel 1.6. Results of Critical Thinking Skills in General

Data	Result
Number of Students	107
Top Rated	83
Lowest Value	0
Mean	29,71
Standard Deviation	16,172

Based on table 1.6, the average student score is 29.71 with the highest score of 83 and the lowest score of 0 or it can be said that there is no correct answer. The standard deviation value is 16.172. Furthermore, students' grades are categorized to determine students' critical thinking skills. Data is obtained based on the results of student answers processed using excel. Table 417 shows the results of the analysis of students' critical thinking skills.

Tabel 1.7. Results of Critical Thinking Skills Analysis

No	Student Grades	Level of Critical Thinking	Sum	(%)
1	10 s.d 20	Very Lacking	32	29,9
2	20 s.d 40	Less	50	46,7
3	40 s.d 60	Enough	20	18,7
4	60 s.d 80	Good	4	3,7
5	80 s.d 100	Excellent	1	1

Based on the data in table 1.7, it shows that the average critical thinking ability of students is still relatively lacking. This is shown in the number of students who have scores in the range of 20 to 40 with less categories. While there is only 1 student who has excellent critical thinking skills.

b) Religiosity Variables

There are five dimensions presented in the religiosity questionnaire consisting of 15 statement items. The 5 dimensions consist of intellectual or knowledge dimensions, ideological dimensions, ritual or practical dimensions, experimental dimensions and consequences or practice dimensions. Data on the results of student religiosity questionnaires are generally analyzed with the aim of knowing student religiosity in the sample studied. The data from the calculation of the religiosity questionnaire are presented in table 1.8 below.

Tabel 1.8. Results of the General Religiosity Questionnaire

Data	Result
Number of Students	107
Top Rated	57
Lowest Value	29
Mean	42,94
Standard Deviation	6,843

The data in table 1.8 shows the total sample number of students as a whole as many as 107 students with the highest score of 57 and the lowest score of 29. The average score of the student religiosity questionnaire was 42.94. Data on student religiosity were generally classified with the aim of

categorizing the level of religiosity categories in all students in the study. The classification of religiosity is presented in the following table 1.9.

Tabel 1.9. General Classification of Religiosity

Score Interval	Frequency	(%)	Score Categories
51 s.d 60	11	10,3	Excellent
41 s.d 50	60	56	Good
30 s.d 40	35	32,7	Good enough
<30	1	1	Not Good
Sum	107	100	

The data shows that the tendency of students' religiosity level is in the good category. This can be seen from 56% of students obtaining religiosity scores at intervals of 41 to 50.

Tabel 1.10. Results of Religiosity Questionnaire Based on Dimensions

Data	Dimension 1	Dimension 2	Dimension 3	Dimension 4	Dimension 5
Number of Students	107	107	107	107	107
Top Rated	12	16	15	8	8
Lowest Value	5	6	5	2	3
Mean	9	12	11	5	6
Standard Deviation	1.562	2,419	2,273	1,310	1,279

Information:
 Dimension 1: Knowledge dimension (intellectual)
 Dimension 2: Belief dimension (ideological)
 Dimension 3: Practical dimension (ritual)
 Dimension 4: Experiment dimension (experience)
 Dimension 5: Dimension of consequences (practice)

Based on table 1.10, the highest average score was obtained in dimension 2 with a value of 12.42 which means that students have high beliefs / ideologies in their respective religions. While the lowest average is in dimension 4 with a value of 5.10 which means that students' experience in religion is still lacking.

Tabel 1.11. Classification of Religiosity Dimensions of Knowledge

No	Score Interval	Frequency	Score Categories
1.	10-12	36	Excellent
2.	7-9	61	Good
3.	5-7	10	Good Enough
4.	<5	0	Not Good
	Sum	107	

Based on table 1.11 data, it is obtained that the average dimension of student knowledge is in the good category with a frequency of 61 located in the interval 7-9.

Tabel 1.12. Classification of Religiosity Dimensions of Belief

No	Score Interval	Frequency	Category
1.	13-16	60	Excellent
2.	9-12	42	Good
3.	5-8	6	Good Enough
4.	<5	0	Not Good
	Sum	107	

Based on table 1.12 data, it was obtained that the average dimension of student confidence was in the very good category with a frequency of 60 located in the interval 13-16.

Tabel 1.13. Classification of Religiosity of Practical Dimensions

No	Score Interval	Frequency	Category
1.	12-15	51	Excellent
2.	8-11	51	Good
3.	4-7	5	Good Enough
4.	<4	0	Not Good
	Sum	107	

Based on the data of table 1.13, it is obtained that the average practical dimension of students is in the very good category with a frequency of 51 located in the interval 12-15.

Tabel 1.14. Classification of Religiosity of Experimental Dimensions

No	Score Interval	Frequency	Category
1.	7-8	12	Excellent
2.	5-6	61	Good
3.	3-4	32	Good Enough
4.	<3	2	Not Good
	Sum	107	

Based on table 1.14 data, it was obtained that the average dimension of student experiments was in the good category with a frequency of 61 located in the interval 5-6.

Tabel 1.15. Classification of Religiosity Dimension Consequences

No	Score Interval	Frequency	Category
1.	7-8	25	Excellent
2.	5-6	61	Good
3.	3-4	21	Good Enough
4.	<3	0	Not Good
Sum		107	

Based on table 1.15 data, it is obtained that the average dimension of student consequences is in the good category with a frequency of 61 located in the interval 5-6.

3. Data Recapitulation of Religiosity and Critical Thinking Skills

The calculation data obtained from the religiosity questionnaire and critical thinking skills are seen from 3 aspects, namely in general, based on religion, and based on gender. The recapitulation data of the calculation results are presented in table 1.16 below.

Tabel 1.16. Data Recapitulation of Religiosity and Critical Thinking Skills

	Category	n	Average	St. Deviation
Religiosity	Common	107	42,94	6,843
	Male	52	41,19	6,730
	Female	55	44,60	6,587
	Islam	87	43,34	7,054
Critical Thinking Skills	Christian	20	41,20	5,662
	Common	107	29,71	16,172
	Male	52	27,08	6,730
	Female	55	29,75	12,239
	Islam	87	28,05	11,694
	Christian	20	30,20	13,885

Based on the data in table 1.16, it is known that the average religiosity and critical thinking ability are respectively, namely 42.94 and 29.71. Then data based on sex differences showed that the average religiosity and critical thinking ability of female students was higher than the average of male students with scores of 44.60 and 29.75. Furthermore, data based on religion showed that Muslim students had a better level of religiosity than Christian students with an average score of 43.34 while on

critical thinking skills Christian students were better than Muslim students with an average gain of 30.20.

4. Inferential Statistical Analysis

a) Normality Test

The Normality Test is carried out to determine the distribution of data used is normal or not. The normality test used in this study was the Kolmogorof-Smirnov test using SPSS 22. The results of the normality test used data on the acquisition of student religiosity questionnaire scores and the number of critical thinking skills questions answered correctly by students.

The results of the normality test of student religiosity questionnaires in general and in accordance with the sample criteria are presented in table 1.17 below.

Tabel 1.17. Normality Test Results of the Religiosity Questionnaire and Critical Thinking Ability Questions

Data	In general	Result			
		Gender		Religion	
		Male	Female	Islam	Christian
Number of students	107	52	55	10	10
α	0,05		0,05		0,05
Sig	0,2		0,08		0,284

Based on the data in table 1.17, it is obtained that the religiosity questionnaire data generally has a sig > α the data is normally distributed because the signification value of 0.2 is greater than the α value of 0.05. Data on the religiosity questionnaire in terms of sex differences showed that the students' religiosity questionnaire was normally distributed due to a signification value of 0.08. It can be interpreted that the value of significance based on sex is greater than the value of α (0.05) then the two data are normally distributed. When viewed in terms of religion, the questionnaire shows a signification value of 0.284 and greater than the value of α then the data is normally distributed.

b) Homogeneity Test

A homogeneity test is performed to show two or more sample groups have the same or homogeneous variance. In this study, the Anova one-way homogeneity test was used with the help of the SPSS 22 program. The test was carried out by inputting all data in accordance with the sample criteria, namely sex differences and religious differences in the test using religiosity questionnaires and critical thinking skills. Table 1.18 presents the results of the homogeneity test of the religiosity questionnaire.

Tabel 1.18. Results of the Religiosity Questionnaire Homogeneity Test by Gender

Data	Gender	Religion
Number of Students/Sample	107	107
α	0,05	0,05
Significance	0,302	0,294

Based on the data in table 1.18, it is shown that the value of significance based on sex is obtained at 0.302 and based on religion is 0.294 greater than the value of α (0.05) or $\text{sig} > \alpha$, it can be said that the questionnaire of religiosity based on sex and religion comes from a homogeneous population.

Tabel 1.19. Results of the Homogeneity Test on Critical Thinking Skills

Data	Gender	Religion
Number of Students/Sampel	107	107
α	0,05	0,05
Significance	0,325	0,654

The data in table 1.19 shows that the significance value obtained in the variable of critical thinking skills based on gender 0.325 and based on religion is 0.654 greater than the value of α (0.05) or $\text{sig} > 0.05$. So it can be interpreted that the problem of critical thinking skills comes from a homogeneous population.

c) Test The Hypothesis

This study used the Pearson product moment correlation test in conducting hypothesis testing. This test is used to see the relationship between two variables, namely religiosity and critical thinking skills. This correlation test was performed using SPSS 22.

The relationship between religiosity and critical thinking skills can be known by looking at the value of the product moment correlation coefficient and the value of significance. H_0 is rejected if the significance value is < 0.05 which means there is a significant relationship between variables and H_0 is accepted if the signification value is > 0.05 which means there is no significant relationship between research variables.

1. The Relationship Between Religiosity and Critical Thinking Skills in General

The results of the correlation hypothesis test between religiosity and critical thinking skills in general are presented in table 4.20 below.

Tabel 1.20. Product Moment Correlation Test Religiosity and Critical Thinking Skills in General

Data	Religiosity	Critical Thinking
Religiosity Pearson Correlation	1	0.809
Sig. (2-tailed)		0.000
N	107	107
Critical Thinking Pearson Correlation	0.809	1
Sig. (2-tailed)	0.000	
N	107	107

The data in table 1.20 shows that the level of significance of the religiosity questionnaire and critical thinking questions is 0.000 or < 0.05 . Based on the test criteria of the product moment correlation test, if the value of Sig. (2-tailed) < 0.05 , then it concludes that there is a significant relationship or in other words, H_0 is rejected and H_a is accepted. Pearson's correlation data on the relationship between religiosity and critical thinking skills shows a range of 0.809 which means that it has a very strong level of relationship.

2. The Relationship Between Religiosity and Critical Thinking Skills Based on Religion

The results of the correlation hypothesis test between religiosity and students' critical thinking skills based on religion are presented in table 1.21 below.

Tabel 1.21. Product Moment Correlation Test of Religiosity and Critical Thinking Skills Based on Religion

Control Variables		Religiosit y	Critical Thinking
Religion	Religiosit	Correlation 1.000	0.810
	y	Significan ce (2- tailed)	0.000
		N 0	104
Critical Thinking	Religiosit	Correlation 0.810	1.000
	y	Significan ce (2- tailed)	0.000
		N 104	0

The data in table 1.21 shows that the level of significance of religiosity questionnaires and critical thinking questions based on religion is 0.000 or < 0.05 . Based on the test criteria of the product moment correlation test, if the value of Sig. (2-tailed) < 0.05 , then it concludes that there is a significant relationship or in other words, H_0 is rejected and H_a is accepted. Pearson's correlation data on the relationship between religiosity and critical thinking skills based on religion shows a range of 0.810-1, which means that it has a strong level of relationship.

3. The Relationship Between Religiosity and Critical Thinking Skills Based on Gender

The results of the correlation hypothesis test between religiosity and students' critical thinking skills based on gender are presented in table 1.22 below.

Tabel 1.22. Product Moment Correlation Test of Religiosity and Critical Thinking Skills Based on Gender

Control Variables		Religiosity	Critical Thinking
Gender Religiosity	Religiosity	Correlation 1.000	0.801
	y	Sig (2- tailed)	0.000
		N 0	104
Critical Thinking	Religiosity	Correlation .801	1.000
	y	Sig (2- tailed)	0.000
		N 104	0

The data in table 1.22 shows that the level of significance of religiosity questionnaires and critical thinking questions based on gender is 0.000 or < 0.05 . Based on the test criteria of the product moment

correlation test, if the value of Sig. (2-tailed) < 0.05 , then it concludes that there is a significant relationship or in other words, H_0 is rejected and H_a is accepted. Pearson's correlation data on the relationship between religiosity and critical thinking skills based on gender showed a range of 0.801-1, which means that it has a very strong level of relationship.

CONCLUSION

Based on the results of research on the relationship between religiosity and students' critical thinking skills on the subject of stoichiometry at SMA Negeri 3 Binjai, the following conclusions were obtained: There is a significant relationship between religiosity and critical thinking skills of SMA Negeri 3 Binjai students on stoichiometry material. There is a significant relationship between religiosity and critical thinking skills of SMA Negeri 3 Binjai students in stoichiometry material reviewed based on religious differences. There is a significant relationship between religiosity and critical thinking skills of SMA Negeri 3 Binjai students in stoichiometry material reviewed based on sex differences.

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