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The Relationship between Teacher Interpersonal Interaction and the Biology Learning Environment in Senior High Schools

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Abstract

Biology learning that focuses more on conveying material concepts results in less classroom interaction. Each teacher's interaction skills vary, thus creating a different quality of learning environment. An ideal learning environment should stimulate curiosity and encourage active student involvement. To achieve this condition, the interpersonal interaction factor of teachers is an important variable that needs to be examined. This study was conducted with the primary focus of analyzing the relationship between teacher interpersonal interaction and the biology learning environment in Senior High Schools in South Tangerang City. The research method used was a survey with correlational techniques. There were 96 students as samples from seven different schools using the Cluster area sampling technique. Data were collected through questionnaires, specifically the Questionnaire on Teacher Interaction (QTI) and "What Is Happening In This Class?" (WIHIC). The study's results showed a positive and significant relationship between teacher interpersonal interaction and the biology learning environment. Teacher interpersonal interaction accounted for 5.85% of the quality of the biology learning environment, with the remaining quality influenced by other factors. The teacher's interpersonal interaction and the biology learning environment were categorized as moderate, with percentages of 80% and 73%, respectively. It is recommended that teachers develop interpersonal interaction skills and implement more interactive teaching approaches to improve the quality of the biology learning environment.

Keywords: Interpersonal Interaction, Learning Environment, Biology Learning.

INTRODUCTION

Learning is carried out by involving actors. These actors consist of teachers and students. Teachers have teaching behaviour, while students have learning behaviour. These teaching and learning behaviours are inseparable from the learning materials (Darari & Firdaus, 2020; Edy & Wahid, 2023). The learning environment in schools includes the physical and social environments, as well as anything related to learning activities. The physical environment is the environment that is directly visible and can be used in learning activities. The social environment itself cannot be seen physically, but it is related to the patterns of interpersonal interactions that occur in learning activities (De Felice et al., 2023; Harso & Seku, 2023; Meagher, 2020). Achievement in educational tasks is strongly connected to the educator's responsibility in structuring the learning atmosphere. Teachers must be creative in designing the learning environment so that students are aware of their role as learners (Al-Mahasneh, 2018; Harjali, 2019). This includes developing teaching materials and using practical methods (Zulfiani et al., 2025).

The pandemic that hit Indonesia several years ago brought major problems to various aspects of life, one of which was education. Student learning outcomes declined by as much as

50% compared to normal learning due to a less conducive learning environment (Anggraini, 2022). The engagement between educators and learners has diminished in comparison to the educational environment before the pandemic. Under normal learning conditions, a typical day lasts approximately six hours. This short interaction makes it difficult for students to understand the material (Cerelia et al., 2021). Many students lose interest in learning due to a less conducive learning environment, boredom with online learning, and a lack of innovation in teaching methods. As a result, student participation in learning declines, thereby affecting learning outcomes (Tsabitah & Hanif, 2025). Furthermore, teachers must adapt to the curriculum changes in Indonesia, necessitating updated teaching methodologies. Full control of the classroom atmosphere is the teacher's responsibility (Hadisaputra et al., 2024). Biology instruction, which focuses more on conveying concepts, results in a lack of interaction within the classroom. Each teacher's interaction skills vary, creating a different quality of learning environment.

Classroom learning activities need to be built on good interaction between teachers and students. Good interaction will create a comfortable and conducive learning atmosphere (Harjali, 2019). A conducive learning environment needs to be cultivated and developed to optimally achieve learning objectives (Yusuf, 2024). Educators have a vital role in education, particularly in establishing a high-quality classroom atmosphere (learning environment). A conducive learning environment can be started by increasing social interactions between teachers and students and vice versa (Latief, 2023). The lack of clarity in teacher-student interactions reduces closeness in communication, which in turn reduces students' interest in engaging with and exploring the knowledge being studied (Anggoro & Ningsih, 2023; Shakoor et al., 2025). Thus, there needs to be research on the learning process, which does not occur solely through cognitive processes but also through social processes such as interactions and the quality of the learning environment.

Interaction means carrying out an activity that is action-reaction in nature. This inevitably leads to reciprocal influence and mutual influence between teachers and students (Saputra & Fernandes, 2023). Interpersonal interaction is communication that occurs between one individual and another, mutually influencing each other. Interpersonal interaction specifically examines the interactions of two or more people, both verbally and nonverbally (Fiteriana, 2023). Therefore, in learning, interpersonal interaction between teachers and students is the core of the educational process, which focuses not only on the transfer of knowledge but also on shaping students' attitudes, motivations, and perceptions of the material and the learning environment as a whole (Fadilah & Zulfiani, 2025).

Good interpersonal skills can be developed by a teacher who is naturally influenced by the teacher's own interpersonal skills. Interpersonal relationships between educators and learners can be measured using the Questionnaire on Teacher Interaction (QTI) developed by Wubbles et al., based on the Model for Interpersonal Teacher Behaviour (MITB) (Maulana et al., 2012). The interpersonal interactions between teachers and students in the classroom will influence the learning environment, especially during instruction. Aspects of the learning environment can be measured using the "What Is Happening In This Class?" questionnaire. (WIHIC). WIHIC is capable of conducting measurements that include assessment and review in the field of education related to the learning environment, which is divided into 7 categories: student cohesiveness, teacher support, investigation, involvement, task orientation, cooperation, and equality (Wahyuni et al., 2025).

The Questionnaire on Teacher Interaction (QTI) and What Is Happening In This Class? (WIHIC) Instruments are widely applied at various levels and learning areas, one of which is science. Science learning is largely one-way and teacher-centred. This lack of student interaction and activity leads to a lack of social interaction. Low social interaction can lead to decreased student learning outcomes (Yusuf et al., 2022). By fostering positive interpersonal interactions with students, teachers can create a supportive classroom environment for learning.

The learning environment is not just about facilities; it is also about a peaceful, comfortable environment that helps students focus on their learning activities. An ideal learning environment fosters student effectiveness, enabling them to learn without obstacles while achieving their stated educational goals (Wulandari & Nurjaman, 2023). An ideal learning environment should stimulate curiosity and encourage active student involvement. To achieve this, teacher interpersonal interaction is a crucial variable that requires careful consideration. Based on this background, this research examined the relationship between teacher interpersonal interaction and the biology learning environment in a public high school in South Tangerang City.

METHOD

This research is a quantitative study using survey methods and correlational techniques. The survey method is used in the study to test hypotheses based on opinions regarding the problem topic through data collection with a questionnaire. The correlational method is a method used to understand how two or more factors are related. Measurement of the variables will show the level of relationship expressed as a correlation coefficient (Gay et al., 2003). This study will examine the relationship between two variables: the relationship between teacher

interpersonal interactions and the Biology learning environment at a State Senior High School in South Tangerang City.

The research was conducted at a public high school in South Tangerang City. The research took place in the second semester of the 2024/2025 school year. Cluster area sampling was used for sampling. This technique involves grouping samples in a specific area. The sample was divided into seven clusters based on the number of sub-districts across South Tangerang City. The sample size was randomly selected from eleventh-grade students studying biology.

In this research, information was gathered using survey documentation. Data on teacher-student interpersonal interactions were collected using questionnaires. Teacher-student interpersonal relationships can be determined from student perceptions using the Questionnaire on Teacher Interaction (QTI) and What Is Happening In This Class? (WIHIC) instruments. The questionnaire used a Likert scale, namely a scale of never, rarely, sometimes, often, and always. The questionnaire was distributed to grade XI students online using Google Forms. In addition, documentation is also needed to obtain data regarding teacher learning and the atmosphere of the biology educational setting in the classroom.

The interpersonal interaction questionnaire, the Questionnaire on Teacher Interaction (QTI), and the learning environment questionnaire, the What Is Happening In This Class (WIHIC). The Questionnaire on Teacher Interaction (QTI), developed by Wubbles et al., is based on the Model for Interpersonal Teacher Behaviour (MITB). The MITB consists of two dimensions: Influence, centred on Dominance-Submission, and Proximity, centred on Cooperative-Opposition (Maulana et al., 2012). The QTI instrument consists of eight dimensions, represented by three to six statements per dimension. These dimensions include leadership, student freedom, understanding, helpful/friendly, dissatisfied, admonishing, uncertain, and strict.

The questionnaire used to evaluate the educational setting employs What Is Happening In This Class (WIHIC), which is divided into seven dimensions, represented by six to sixteen statements per dimension. These dimensions include student cohesiveness, task orientation, teacher support, involvement, investigation, and equity (Wahyuni et al., 2025).

The collected research data is presented through measurements such as averages, scores, standard deviations, percentages, and score categorization. The research data is categorized by presenting the highest and lowest scores to provide meaning or significance to each score obtained (Saifuddin, 2020). The questionnaire score categorization can be seen in Table 1.

Table 1. Score Categorization of the Questionnaire

Formula	Score QTI	Score WIHIC	Category
X > M + 1,8SD	X > 173	X > 214	Very High
M + 0,6SD < X ≤ M + 1,8SD	155 < X ≤ 173	211 < X ≤ 214	High
M - 0,6SD < X ≤ M + 0,6SD	136 < X ≤ 155	180 < X ≤ 211	Medium
M – 1,8SD ≤ X ≤ M - 0,6SD	117 ≤ X ≤ 136	149 ≤ X ≤ 180	Low
X < M - 1,8SD	X < 117	X < 149	Very Low

The data analysis technique used in this study is correlation analysis. The correlation between two variables generally ranges from +1 to -1. A positive coefficient indicates that a favorable connection exists between the factors. However, a negative signifies an adverse relationship. A coefficient equal to 0 shows that there is no correlation between the two factors (Rosalina et al., 2023). The correlation coefficients can be interpreted in Table 2 as follows.

Table 2. Interpretation of Correlation Coefficient

Value Interval (+)	Category	Value Interval (-)
0,000 – 0,199	Very Low	(-0,800) – (-1,000)
0,200 – 0,399	Low	(-0,600) – (-0,799)
0,400 – 0,599	Medium	(-0,400) – (-0,599)
0,600 – 0,799	High	(-0,200) – (-0,399)
0,800 – 1,000	Very High	(-0,000) – (-0,199)

A normality test was also conducted in this study to verify that the data were normally distributed and therefore representative of the population. The Kolmogorov-Smirnov test was conducted using a significance threshold of 0.05. A linearity test was also employed to assess the connection between factors, serving as a prerequisite for correlation analysis or linear regression. This study was conducted using the SPSS software package, version 26.

RESULTS AND DISCUSSION

Perception data regarding teacher interpersonal interactions were obtained through questionnaires and interviews. The questionnaires were distributed to 96 students at public high schools in South Tangerang City. The Questionnaire on Teacher Interaction (QTI) consists of 48 items representing eight indicators: leadership, student freedom, understanding, helpful/friendly, dissatisfied, admonishing, uncertain, and strict. The questionnaire data regarding teacher interpersonal interactions based on student perceptions are shown in Table 3 below.

Table 3. Results of the Teacher Interpersonal Interactions Questionnaire at SMAN South Tangerang City

Sample Research	Score	Average	Standard Deviation	Percentage (%)	Category
SMAN A	2004	143,14	14,940	80%	Medium
SMAN B	1918	132,78	17,651	73%	Low
SMAN C	1312	145,79	16,379	81%	Medium

Sample Research	Score	Average	Standard Deviation	Percentage (%)	Category
SMAN D	1349	149,98	9,649	83%	Medium
SMAN E	1718	143,16	17,060	80%	Medium
SMAN F	1702	154,72	14,886	86%	Medium
SMAN G	3829	147,26	11,948	82%	Medium
Total	**13832**	**145,26**	**15,643**	**80%**	**Medium**

According to the table provided, the average score for student perceptions of teacher interpersonal interactions at public high schools in South Tangerang City was 145,26, which is classified as moderate. Each school showed varying questionnaire results. The highest average score was shown by SMAN F, and the lowest was at SMAN B. A description of interpersonal interactions can be seen based on the questionnaire indicators. The questionnaire results for each indicator are presented in Table 4 below.

Table 4. Results of the Indicator Teacher Interpersonal Interactions Questionnaire at SMAN South Tangerang City

Indicator	Score	Average	Standard Deviation
Leadership	2349	24,61	2,998
Helpful/Friendly	1820	18,95	2,779
Understanding	2258	23,52	2,817
Student Freedom	411	4,28	0,66
Uncertain	1984	20,67	2,86
Dissatisfied	1992	20,76	3,43
Admonishing	2052	21,03	3,133
Strict	1042	10,85	1,863

The highest average score for every indicator in the teacher interpersonal interaction questionnaire was 24,61 for the "Leadership" indicator. Meanwhile, the lowest average score was 4,28 for the "Students' Freedom" indicator. The highest average score for the "Leadership" indicator indicates that biology teachers at public high schools in South Tangerang City are capable of leading their classes and capturing students' attention during the learning process. The leadership traits of every teacher will significantly influence the ability of students to develop their own leadership skills (Mansyur & Hasibuddin, 2022). Leadership makes teachers more open, creating a collaborative space with students that can foster efficient learning. Teacher leadership makes them individuals with a strong sense of responsibility in carrying out their duties (Harapan & Fitria, 2021).

The lowest average score for the indicator "Student Freedom" indicates that some biology teachers at public high schools in South Tangerang City do not provide students with sufficient opportunities to take responsibility for themselves. Students tend to be passive and unwilling to make their own decisions. Students are urged to engage actively in their education and

highlight the idea of "freedom". This freedom allows students to independently determine specific learning goals, as well as the time required and what effective strategies to use (Lee, 2024). The average results for each indicator can be seen in the following figure.

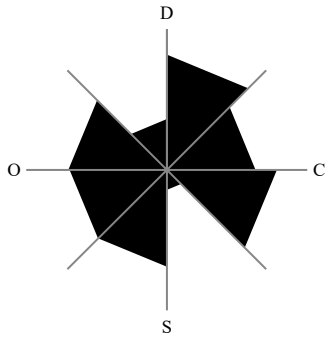

Figure 1. Typology of Teachers at SMAN South Tangerang City

Based on the image above, a combination of dominant (D-axis) and cooperative (C-axis) behaviour is obtained with the highest average on both axes. The model of teacher interpersonal behaviour determined by an orthogonal coordinate system has a shape skewed to the top and right, which indicates the Authoritative teacher typology type. Teachers with an authoritative type are able to show clear leadership and manage the class firmly but fairly. Teachers with an authoritative type try to build warm and open relationships. They like to enforce learning rules and standards firmly and consistently, and accept student participation in making decisions (Bjerga Pettersen et al., 2024). A caring educator could gently place their arm around a student and express, "You know you shouldn't have done that, let's talk about how you can handle situations like this better in the future." Children who have authoritative teachers are socially competent, self-confident, and socially responsible (Haditono, 2001).

Authoritative teachers are also able to show a caring, friendly, and helpful attitude towards students, thereby building a positive environment in learning. The authoritative teacher's parenting style has many positive impacts on student development, such as shaping their attitudes and behaviour by giving them freedom but with boundaries and attentive guidance from the teacher (Suhartono et al., 2024). This finding contrasts with Yuliana & Zulfiani (2025) research, which identified a directive typology in high school biology teachers in Depok. Teachers with this profile are organized, complete lessons on time, dominate class discussions, and maintain student interest. Though they are not particularly familiar with students, they sometimes show friendliness, establish elevated expectations, and are viewed as strict (Yuliana & Zulfiani, 2025).

The data on perceptions regarding the learning environment, obtained through the WIHIC (What Is Happening In This Class?) questionnaire, consisted of 56 statement items representing

seven indicators: student cohesiveness, teacher support, investigation, involvement, task orientation, cooperation, and equality. The findings from the survey data about the learning environment, according to how students view it, are presented in Table 5 below.

Table 5. Results of the Learning Environment Questionnaire at SMAN South Tangerang City

Sample Research	Score	Average	Standard Deviation	Percentage (%)	Category
SMAN A	2738	195,57	31,517	72%	Medium
SMAN B	2954	196,93	13,817	73%	Medium
SMAN C	1718	190,89	26,112	71%	Medium
SMAN D	1925	213,89	26,074	79%	High
SMAN E	2437	203,08	23,546	75%	Medium
SMAN F	2088	174	28,954	70%	Low
SMAN G	5008	192,61	25,752	71%	Medium
Total	**18868**	**195,28**	**25,539**	**73%**	**Medium**

Table 5 shows that students' perceptions of the learning environment at public senior high schools in South Tangerang City averaged 195,28, which is considered moderate. Each school showed different questionnaire results. The highest average score was shown by SMAN D, and the lowest by SMAN F. A description of the learning environment can be seen based on the questionnaire indicators. The questionnaire results for each indicator are presented in Figure 2 below.

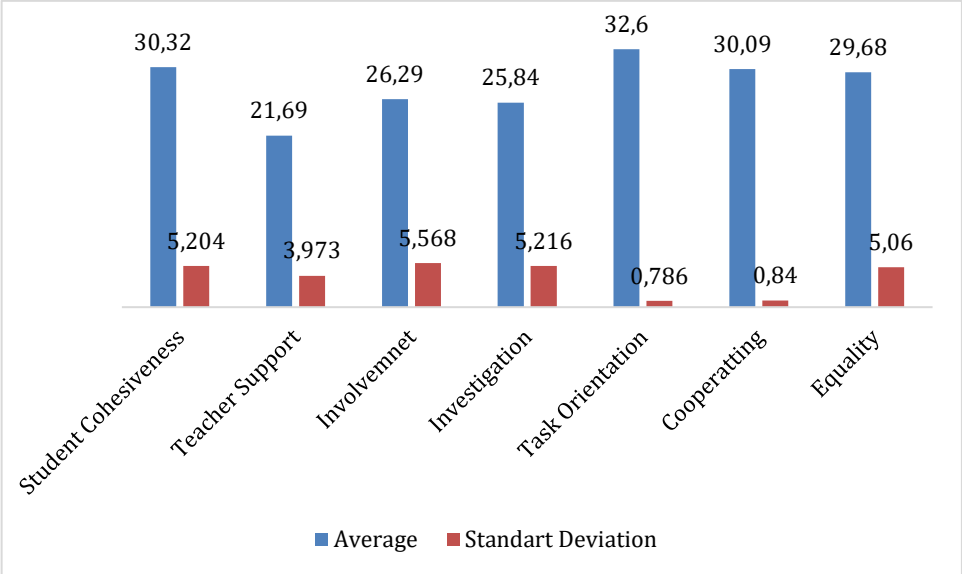

Figure 2. Results of the Indicator Learning Environment Questionnaire at SMAN South Tangerang City

Figure 2 shows the average results for each indicator on the WIHIC (What Is Happening In This Class?) questionnaire. The biology learning environment test indicator scored the highest with an average score of 32,6 for the "Task Orientation" indicator, indicating that students at public senior high schools in South Tangerang City are able to complete assignments

and maintain focus on the lesson. A strong task orientation encourages students to use strategies that support self-regulation, such as setting learning goals, developing learning plans, and reflecting on learning outcomes. Task orientation helps students focus on the learning process and outcomes, rather than simply on activities without a clear purpose. This dimension is key for teachers in creating a productive and effective classroom environment (Elliot & McGregor, 2001).

Task orientation can improve student well-being in the classroom, as evidenced by positive interactions between teachers and students and in-depth, efficient learning (Wahyuni et al., 2025). Task orientation in the classroom learning environment is a crucial factor in improving student well-being. Task orientation is defined as the motivation to complete learning tasks (Kexin & Buang, 2024).

The lowest score, with an average of 21,69 on the "Teacher Support" indicator, indicates a gap between what students expect and what they experience from their interactions with teachers. Teachers provide less assistance and are less likely to be good friends in the classroom. Educators offer additional assistance to learners from less affluent backgrounds compared to those from wealthier families. Support can also be seen in other student characteristics, such as gender, teacher perceptions of academic ability, and student behaviour in class (Bloem et al., 2024). Teacher support can help students become more engaged in learning activities (Savitri et al., 2024). Support is embedded in communication between teachers and students and serves as a mutually beneficial tool for creating areas of close development related to student engagement in building their conceptual understanding (Ingulfsen et al., 2023).

The variables in the study required a Kolmogorov-Smirnov test to determine whether the distributions were normal. The statistical results obtained using the Kolmogorov-Smirnov test are shown in Table 6.

Table 6. Results of the Kolmogorov-Smirnov Test

		Teacher Interpersonal Interactions	**Learning Environment**
N		96	96
Normal Parameters[a,b]	Mean	144,73	196,5417
	Std. Deviation	15,644	14,24764
Most Extreme Differences	Absolute	,080	,082
	Positive	,080	,082
	Negative	-,076	-,047
Test Statistic		,080	,082
Asymp. Sig. (2-tailed)		,152[c]	,108[c]

Based on the Kolmogorov-Smirnov test in Table 6 above, it is known that both variables have a significance value greater than 0,05, indicating that they are normally distributed. Next, a test for linearity was performed to find out if a linear connection exists between the independent and dependent variables. The outcomes of the linearity assessment are presented in Table 7 below.

Table 7. Results of the Linearity Test

ANOVA Table							
			Sum of Squares	**df**	**Mean Square**	**F**	**Sig**
Learning Environment Teacher Interpersonal Interactions	Between Groups	(Combined)	61453,833	92	667,976	3,914	,143
		Linearity	18138,728	1	18138,728	106,282	,002
		Deviation from Linearity	43315,105	91	475,990	2,789	,217
	Within Groups		512,000	3	170,667		
	Total		61965,833	95			

Based on the linearity test results in Table 7, the calculated F-value was 2,789 < F-table value of 3,94. This indicates that there is a linear relationship between the variables of teacher interpersonal interaction and the biology learning environment. The probability value at the 5% significance level is 0,217 > 0,05, thus concluding that the two variables have a linear relationship. Hypothesis testing was performed to evaluate the connection between the independent and dependent variables through statistical methods. The findings from the analysis of the regression equation are displayed in Table 8.

Table 8. Results of the Simple Linear Regression Test

Model	**Unstandardized Coefficients B**
(Constant)	170,134
Teacher Interpersonal Interactions	0,182

The linear regression equation resulting from the statistical technique can be written as Y = 170,134 + 0,182X, where a is 170,134, a constant value. This figure indicates that if there is no teacher interpersonal interaction (X), the biology learning environment reaches an average value of 170,134. Furthermore, the regression coefficient (b) is 0,182. This value means that for every 1% increase in teacher interpersonal interaction, the biology learning environment will increase by 0,182. The coefficient is positive, indicating that teacher interpersonal interaction has a positive effect on the biology learning environment.

The next test is the product-moment correlation test. The results of the correlation test between teacher interpersonal interaction and the biology learning environment can be seen in Table 9.

Table 9. Results of the Correlation Test Between Variables X and Y

Variable	r calculate	r table (5%)	Sig. (2-tailed)	Description
Teacher Interpersonal Interactions and Learning Environment	0,242	0,201	0,017	Positive Correlation

The correlation test results for the relationship between teacher interpersonal interaction and the biology learning environment yielded an r-value of 0,242 and a significance level of 0,017 < 0,05 at the 5% significance level. This indicates a positive and significant relationship between teacher interpersonal interaction and the biology learning environment in public high schools in South Tangerang City.

The positive correlation coefficient shows that as a teacher's interpersonal engagement increases, so does the quality of the biology learning setting. In the classroom, communication involves more than just delivering information; it also entails fostering a welcoming atmosphere where students are at ease to inquire, express their thoughts, and engage actively (Mines, 2024). The results showed that both variables—teacher interpersonal interaction and the biology learning environment—were in the moderate category, indicating a positive relationship. This favorable connection is shown by alterations in the independent variable that affect the dependent variable. In this research, if teacher interpersonal interaction (the independent variable) was classified as moderate, then the biology learning environment (the dependent variable) was also in the moderate category.

The correlation test data also showed a value of 0,242, which is considered low (Table 9). This indicates a weak relationship between teacher interpersonal interactions and the biology learning environment in public high schools in South Tangerang City. To determine the magnitude of the influence of teacher interpersonal interactions on the biology learning environment, it can be expressed as a percentage: KD = 0,2422 × 100% = 5,85%. This indicates that 5,85% of teacher interpersonal interactions influence the biology learning environment in the classroom, while the remaining 94,15% is influenced by factors outside this study.

Data analysis in the previous statement can also be performed using a t-test. This test is performed by comparing the calculated t-value with the t-table. The results of the t-test can be seen in Table 10 below.

Table 10. Results of t_{table}

Variable	t calculated	t table (5%)
Teacher Interpersonal Interactions and Learning Environment	2,422	1,985

The calculation results in Table 10 show that the calculated t value > t table value, which is 2,422 > 1,985. These results indicate that Ho is rejected and Ha is accepted, indicating a

significant relationship between teacher interpersonal interaction and the biology learning environment in public senior high schools in South Tangerang City.

The relationship between teacher interpersonal interaction and the biology learning environment is due to the communication that occurs between teachers and students during the learning process, which can influence the learning environment in the classroom. Students perceive their interpersonal communication with teachers as positive and mutually beneficial, and they are more motivated to learn and develop, thus creating a supportive learning environment (Johnson & Johnson, 2008). A teacher can improve their performance by consistently updating their insights with the latest research on instructional communication, reflecting on their classroom relationships, and conducting ongoing assessments of their interactions with students, both during teaching sessions and after (Xie & Derakhshan, 2021). How students view the atmosphere in the classroom significantly influences their involvement in the learning process (Anwar, 2025).

Based on the calculations described, there is a significant relationship between teacher interpersonal interaction and the biology learning environment in public senior high schools in South Tangerang City. From these calculations, it can be concluded that teacher interpersonal interaction has a significant relationship with the development of the biology learning environment. Increased teacher interaction leads to an improved quality of the biology learning atmosphere, and the opposite is also true.

The results of this research will certainly enhance the area of education, particularly in Indonesia. The results indicate that positive interpersonal interactions between teachers are instrumental in creating a high-quality learning environment. Thus, it is crucial to focus on educators, particularly concerning how they engage with learners in the classroom, to guarantee that the educational experience positively affects both the students and their surroundings. The aim is for these results to be applied throughout schools to improve the overall educational standard in Indonesia.

CONCLUSION

Based on the results of the research and analysis conducted in the previous chapters, it can be concluded that there is a significant relationship between teacher interpersonal interaction and the biology learning environment in Senior High Schools in South Tangerang City in the low category. The contribution of teacher interpersonal interaction to the biology learning environment is 5,85% and the rest is influenced by other factors. Most teachers are able to direct and attract students attention towards their learning interests. Thus, it can be concluded that there is a positive and significant relationship between teacher interpersonal

interaction and the biology learning environment in Senior High Schools in South Tangerang City.

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