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Analysis of Teacher-Learner Interpersonal Relationship and Learners' Attitudes Towards Biology

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Abstract

This study explored the interpersonal relationship between teachers' and students' attitudes toward biology. The research method used was a survey, where data were collected from 6 public senior high schools in Depok City, involving 88 grade 11 students selected through cluster random sampling. Two adapted and transliterated questionnaires were employed: the Questionnaire on Teacher Interaction (QTI) and the Test of Science-Related Attitudes (TOSRA). Data was analyzed using Rasch modeling with Winsteps software and other applications such as SPSS and Edraw.AI. The results indicated that the interpersonal relationship between biology teachers and senior high school students in Depok City was relatively positive. Biology teachers were perceived as somewhat dominant but highly cooperative with students in the classroom. On the interpersonal behavior scale, biology teachers exhibited higher leadership, helpful/friendly, and understanding behaviors than opposing behaviors. Furthermore, an analysis of the teachers' interpersonal behavior profiles revealed that biology teachers in Depok City were classified as directive. A two-variable relationship analysis showed a negative correlation between the closeness (CO) dimension, the Attitude Towards Scientific Inquiry dimension, and the influence (DS) dimension with students' career interest in biology.

Keywords: Teacher-Learner, Interpersonal Relationship, Learners' Attitudes, Biology Education, Rasch Model

INTRODUCTION

The National Science Teachers Association (NSTA) standards for Science Teacher Preparation state that science teachers are required to not only be able to master concepts and variations of teaching methods. However, it is expected to be able to create and maintain a comfortable and supportive learning environment psychologically and socially for students (NSTA, 2003). The creation of good learning begins with the interaction and communication relationship between teachers and students (Priadi, 2020; de Almeida Soares, 2008; Davis, 2001; Hagenauer *et al*., 2023; Amerstorfer & Freiin von Münster-Kistner, 2021). A crucial role of teacher-student relationships in the quality of teaching and learning has been demonstrated in many studies (Pennings *et al*., 2018). Learning activities will develop optimally in a learning environment with a favorable climate and will also improve the communication skills of students (Calp, 2020; Khalfaoui *et al*., 2021; Dörnyei & Muir, 2019; Calderón *et al*., 2020). Teacher interpersonal behavior is an essential indicator of the relationship between learners and teachers and plays a crucial role in the quality of teaching and learning (Pennings *et al*., 2018).

According to Maulana *et al*. (2014), the Model of Interpersonal Teacher Behavior (MITB) maps interpersonal behavior into two dimensions: influence and closeness. Some

teaching behaviors, particularly those that enhance learning and contribute to a positive work environment, are emphasized in the European context (Maluenda-Albornoz *et al*., 2023). Furthermore, interpersonal teacher behavior is closely tied to the relationship dimension of the classroom environment (Sivan, 2023). The Model of Interpersonal Teacher Behavior (MITB) offers a broader and highly praised framework for studying the interactions between students and teachers. Conversely, instruments designed to assess MITB in educational contexts have been explored by researchers such as Bahoo *et al*. (2020) and Misbah *et al*. (2022).

The nature of science learning - one of which is biology - contains four elements: processes (scientific processes), products (scientific knowledge), attitudes (scientific attitudes), and technology (Suryawati & Osman, 2018). Researchers have expressed concern about students' negative attitudes toward science and have investigated factors related to this problem (Telli *et al*., 2010). In Sibel Telli's research, it is stated that there is a relationship between teachers' interpersonal behavior with learners and learners' attitudes toward Science (Telli *et al*., 2010). The results of this study indicate that teachers must not only relate to students but also maintain interpersonal control by showing leadership and assertiveness in front of students.

There are still many teachers who admit to implementing learning by only being teacher-oriented and not involving students (Priyayi *et al*., 2018), even many students do not enjoy learning science (Rashifah *et al*., 2023) while the materials in biology include abstract things that not only contain scientific facts and natural phenomena that require high-level thinking skills. For students, it is clear that the affective quality of teacher-student relationships is an essential factor in their engagement, wellbeing, and academic success in school (Spilt *et al*., 2011). Therefore, the teacher's job is to create an interactive and comfortable learning environment in teaching and learning activities (Nadeem, 2013) and maximize higher-order thinking (Andriyatno *et al*., 2023). Students' perceptions of teacher-student interpersonal behavior are strongly related to students' attitudes in all subjects, especially in science (Biology) subjects (Wubbels *et al*., 1995). Another study by Sibel Telli revealed that all dimensions of influence did not have a significant relationship with the dimensions of attitudes on the Test of Science Related Attitudes (TOSRA) instrument. In contrast, the dimension of closeness had a significant relationship between teachers and students.

Students' motivation to become scientists, their attitudes toward learning experiences in science (biology) learning, and their interest in Science have long been studied by experts (den Brok *et al*., 2005). In Indonesia, science learning is an important step. It has the potential

to shape the character and attitudes of students, especially those related to environmental awareness contained in the integrity of conservation values (Zahro & Maulida, 2023). Suparya et al. (2022) research revealed low literacy and achievement in science lessons, especially biology, despite having qualified teachers and adequate science laboratories. This study investigated how teachers' interpersonal relationships with students can influence learners' biology-related attitudes. It uses existing instruments to map learners' perceptions of their biology teachers' behaviors and reveals how interpersonal relationships influence their attitudes toward biology. This research contributes to previous studies. Most previous studies only focused on the interpersonal relationship of biology teachers, whereas this study assessed the relationship of interpersonal behavior to students' attitudes in biology with Rasch modeling.

Research on teacher-student interpersonal relationships has been widely conducted. Studies show a strong relationship between students' perceptions of teacher-student relationships and their perceptions of assessment tasks (Schut *et al*., 2020). Additionally, research has explored students' perceptions of their teachers, the general interpersonal disposition of secondary school teachers in the Netherlands, and their perceptions of their interpersonal experiences with students in positive and problematic relationships (Claessens *et al*., 2017). One study reveals that the interpersonal relationships between teachers and students at Bekasi city school are good, with dominant and cooperative teacher behavior traits. The study also indicated that the typology profile of biology teachers at three senior high schools in Bekasi was predominantly directive (Aisy, 2021).

However, there is a lack of research on the impact of teacher-student interpersonal relationships on students' attitudes towards science, specifically Biology. Therefore, the author is interested in conducting research titled Analysis of Teacher-Learner Interpersonal Relationships on Students' Attitudes towards Biology. This study explores the interpersonal relationships between teachers and students and students' attitudes towards Biology at Depok city public senior high school. It is expected to provide teachers with valuable insights into teacher behaviors that positively and negatively relate to students' attitudes in science subjects, particularly Biology.

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METHOD

This research method is a survey method with a quantitative approach. Survey research is one of the research methods that aims to obtain an overview of the characteristics of the population described by the sample (Gable & Gable, 2016). Researchers conduct surveys by collecting information from a sample or population through questionnaires and interviews as the primary data collection tool. The data is then processed statistically to describe the trend of responses to questions and to test research questions or hypotheses (Creswell, 2019). In this study, the aspect to be investigated is the teacher-student interpersonal relationship on student's attitudes towards learning Biology at Depok city public senior high school, Indonesia.

This study used quantitative data processing techniques using Winstep with the Rasch Model approach, and the software used is Ministap. Rasch analysis obtained objective, fundamental, and additive measures from responses to ordered categories (Yeh *et al*., 2023). The advantages of Rasch modeling are identifying wrong answers, identifying inappropriate assessments, and predicting missing statement items based on systematic response patterns (Nurbaiti & Tenriawaru, 2024). Respondent and item reliability in Rasch modeling is done by looking at the logit value of the tested aspects (person and item) (Ravand & Firoozi, 2016). Person Reliability shows the consistency of respondents' answers, and Item Reliability shows the consistency of items that can provide reliable results when used for measurement. Meanwhile, Cronbach's Alhpa value is used to measure the reliability of the interaction between a person and the item (Ngadi, 2023). Research using the Rasch Model aims to determine the quality of statement items and student abilities.

This research stage includes the planning stage, which identifies problems and research statements (Pedaste *et al*., 2015). The implementation stage is taking care of licensing letters and collecting research instruments. The completion stage includes processing data, analyzing data, and drawing conclusions from research findings. The criteria for teacher-learner interpersonal relationships in biology lessons at public senior high schools in depok city can be seen in Table 1.

Table 1. Criteria for Teacher-Learner Interpersonal Relationships in Biology Lessons at Depok City Public Senior High School

Data Categorization	Ideal Score Interval	Criteria
>Mi + 1,5 SDi	>132	Very Good
Mi s.d Mi + 1,5 SDi	99 s.d 132	Good
Mi – 1,5 SDi s.d. < Mi	66 s.d <99	Good Enough
< Mi – 1,5 SDi	<66	Not Good

(Source: Rokhyati, 2015)

Meanwhile, the trend scores for dominance, compliance, cooperation, and resistance can be seen in Table 2. Each axis has a different value for the criteria of very good, good, good enough, and not good. The calculation of the score tendency is based on the number of statements for each axis of teacher interpersonal behavior.

Table 2. Teacher Interpersonal Behavior Score Tendency of Each Axis Parameter Score

Data Categorization	Ideal Score Interval				Criteria
	Dominance	Submission	Cooperation	Opposition	
>Mi + 1,5 SDi	>36	>34,5	>39,9	>24	Very Good
Mi s.d Mi + 1,5 SDi	27 s.d 36	24 s.d 34,5	30 s.d 39,9	18 s.d24	Good
Mi – 1,5 SDi s.d. < Mi	18 s.d <27	13,5 s.d <24	20,1 s.d <30	12 s.d <24	Good Enough
< Mi – 1,5 SDi	<18	<13,5	<20,1	<12	Not Good

The criteria for the level of the teacher interpersonal behavior scale vary for each behavior scale. This is based on the number of statements on each behavior scale that produce different scores with the same category. This tendency score can be seen in Table 3.

Tabel 3. Teacher Behavior Scalle Parameter Score Tendency

Behavior Scale	Data Categorization			
	Very Good	Good	Good Enough	Not Enough
	>Mi + 1,5 SDi	Mi s.d Mi + 1,5 SDi	Mi – 1,5 SDi s.d. < Mi	< Mi – 1,5 SDi
Leadership (DC)	>19,95	15 s.d 19,95	10,05 s.d <19,95	<10,05
Helpful (CD)	>19,95	15 s.d 19,95	10,05 s.d <19,95	<10,05
Understanding (CS)	>19,95	15 s.d 19,95	10,05 s.d <19,95	<10,05
Student Freedom (SC)	>12	9 s.d 12	6 s.d <9	<6
Uncertain (SO)	>19,95	15 s.d 19,95	10,05 s.d <19,95	<10,05
Dissatisfied (OS)	>7.95	6 s.d 7,95	4,5 s.d <7,95	<4,5
Admoshing (OD)	15,9	12 s.d 15,9	8,1 s.d <12	<8,1
Strict (DO)	15,9	12 s.d 15,9	8,1 s.d <12	<8,1

By the guidelines for the degree of relationship, if the Pearson Correlation value is 0.00 to 0.199, then there is no correlation. The correlation is weak if the Pearson Correlation value is 0.20 to 0.399. The correlation is moderate if the Pearson Correlation value is 0.40 to 0.599. The correlation is substantial if the Pearson Correlation value is 0.60 to 0.799. If the Pearson Correlation value is 0.80 to 1.00, it can be a perfect correlation. This can be seen in Table 4.

Tabel 4. Pearson Correlation Guidelines for the Degree of Teachers' Interpersonal Relationships with Learners' Attitudes in Biology

Ideal Score Interval	Desciption
0,00 s.d 0,199	No Correlation
0,20 s.d0,399	Weak Correlation
0,40 s.d 0,599	Medium Correlation
0,60 s.d 0,799	Strong Correlation
0,80 s.d 1,000	Perfect Correlation

(Source: Jabnabillah & Margina, 2022)

RESULTS AND DISCUSSION

The study was conducted to reveal the Teacher-Learner interpersonal relationship in Depok city public senior high school and the relationship between teacher interpersonal behavior and Learner Attitude in Biology. Good teacher-learner interpersonal relationships are a prerequisite for engaging learners in learning activities (Telli *et al*., 2007). Various studies indicate that teacher-student interpersonal relationships have become a potential and influential force in students' learning process, so teachers need to develop positive teacher-student interpersonal relationships and create close relationships with students to facilitate the learning process (Chiew, 1999). Based on the average results and data analysis with Rasch modeling, the information is presented in Table 5.

Table 5. Classification Of Teacher-Learner Interpersonal Relationships

Ideal Score Interval	Depok city public senior high school		Criteria
	Frequecy	Percentage	
>132	22	25%	**Very Good**
99 s.d 132	65	73,8%	**Good**
66 s.d <99	1	1,10%	**Good Enough**
<66	0	0	**Not Good**

The results of data calculations show the tendency of teacher-student interpersonal relationships in biology learning in Depok city public senior high schools. There are 22 very good students: 65 students are in the good category, one is in the good enough category, and no students are in the Not good category. Teacher-student interpersonal relationships in learning biology in Depok city public senior high schools obtained the highest score of 63% with an average of 104, which is in the interval (99 to 132) categorized as good, and the

lowest interpersonal relationship score with a score of 54% with an average of 89.8 which is in the interval (66 to <99) categorized as Good Enough. This difference is influenced by biology teachers' level of cooperation and dominance between schools with good and fairly good interpersonal relationships. Interpersonal relationships categorized as good are due to higher levels of cooperation and dominance between teachers and students in biology learning compared to other schools (den Brok *et al*., 2005).

In general, the results of the analysis calculation show that biology teachers in Depok city public senior high schools are perceived by their students on the axis of the high cooperation dimension (76.8%) in the biology learning process takes place and high in the dominance dimension axis (71.1%) as shown in Figure 1.

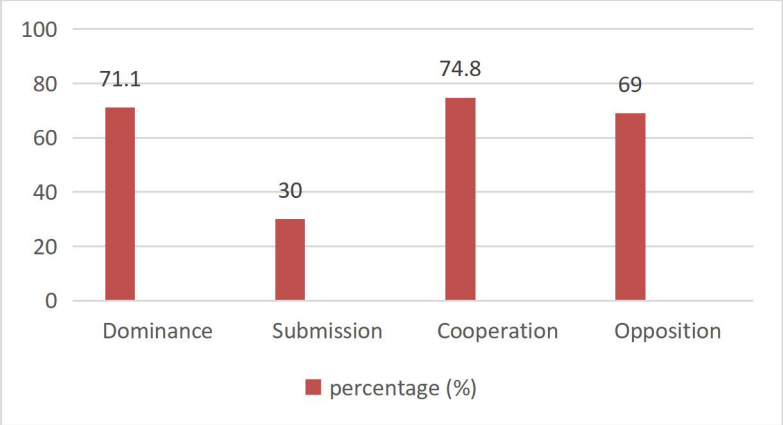

Figure 1. Graph of Teachers' Interpersonal Behavior in Depok City Public Senior High Schools based on Dimension Axis

The interpersonal relationships identified in the six public senior high schools in Depok City are dominated by the acquisition of scores at a pretty good level; from the six samples, only one school has a good level of interpersonal relationships. The level of cooperation and dominance of biology teachers between schools with good and fair interpersonal relationships influences this. Interpersonal relationships categorized as good are due to higher levels of cooperation and dominance between teachers and students in learning biology than other schools (den Brok *et al*., 2005). Based on observations, the score difference is suspected to be based on a different classroom climate. Starting from the learning methods and teacher attitudes during learning observed by the researcher and the number of students in the class. Differences in classroom climate that affect interpersonal relationships also exist in Fisher *et al*.'s research, which says that differences in interpersonal styles are partly due to differences in classroom climate (Fraser, 1981).

Overall, this data illustrates that Biology teachers have high levels of cooperation and dominance and, conversely, low levels of compliance and resistance. This indicates that

biology teachers tend to make students like Biology subjects. The results of this study are reinforced by the findings on chemistry science teachers who also obtained high scores on the dimensions of cooperation and dominance and low scores on the dimensions of resistance and compliance (Pratiwi, 2021).

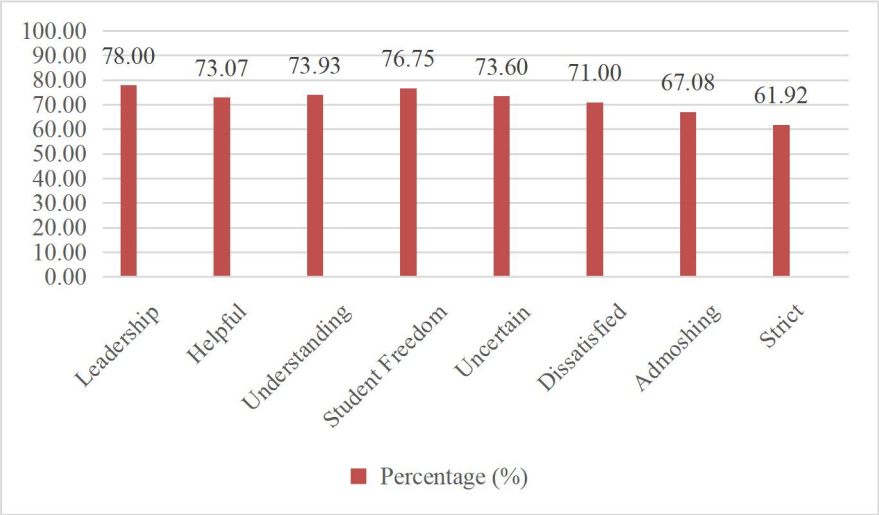

Figure 2. Graph of Interpersonal Behavior of Public Senior High School Biology Teachers in Depok City Based on Behavior Scale Levels

Based on the Figure 2, the calculation of the analysis on the scale of interpersonal behavior of biology teachers found that biology teachers in public senior high schools in Depok City have positive interpersonal behavior (leadership, helping/friendly, understanding, giving responsibility and freedom to students), which tends to have a more significant percentage than behavior that is considered harmful (hesitant behavior, dissatisfaction, reprimanding, and discipline). This indicates that Biology teachers in Depok City public senior high schools have a considerable tendency to help students achieve learning outcomes and have a positive influence on the biology learning process in the classroom, as described in the results of research conducted by Reid (2007), which suggests that teacher behavior that shows leadership, helping/friendly, understanding and giving freedom and responsibility to students has a positive influence on students to be motivated and successful in science lessons and has a positive influence on the science learning process in the classroom.

More detailed findings are shown in the Rasch modeling analysis construct map, which shows that the items of leadership behavior statements and teacher understanding are identified to be in a position below 0. This indicates that students perceive these behaviors to be easily or always seen by Depok city public senior high school teachers (Briggs, 2019). Meanwhile, the statement items of giving freedom, hesitation, dissatisfaction, reprimand, and discipline obtained different logit scores. Some items are below zero, and some score above

logit 0, indicating that these items are difficult to perceive by students and are rarely seen in teacher behavior during the learning process.

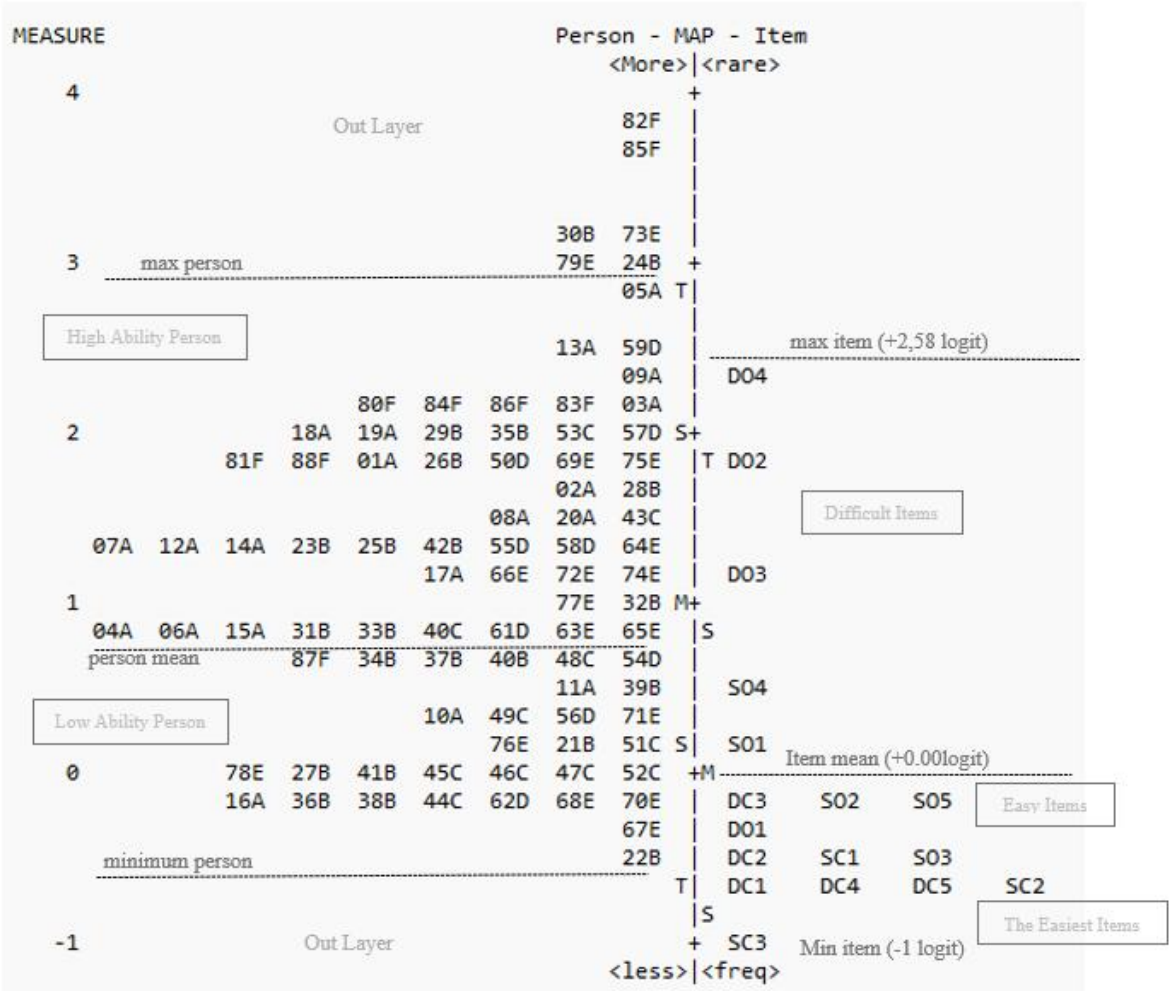

Figure 3. Construct Map of Teacher-Learner Interpersonal Relationship Influence Dimension

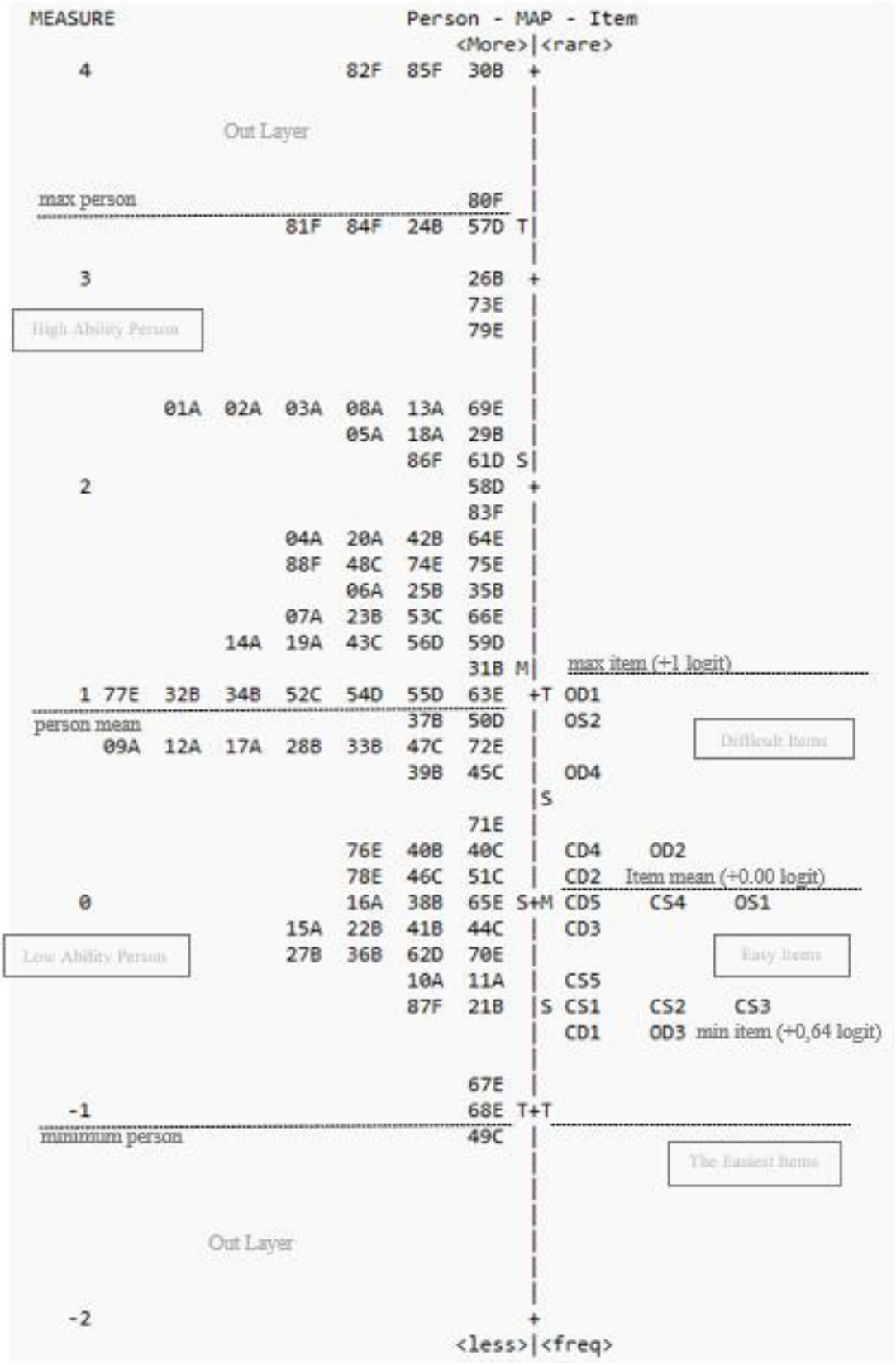

Figure 4. Construct Map of Teacher-Learner Interpersonal Relationship Proximity Dimension

The left side of the construct map shows the position of the respondents (learners) coded with numbers and alphabet: "A = Respondent from School A, B = Respondent from

School B, C = Respondent from School C, D = Respondent from School D, E = Respondent from School E, F = Respondent from School F". The position of learners is between logit scores -1 to 4, which indicates that the teacher-learner interpersonal relationship has a score that varies from the lowest to the highest (Mokshein *et al*., 2019).

The construct map of Rasch modeling analysis in Figure 3 and Figure 4 shows that three scales of interpersonal behavior of biology teachers are difficult to perceive by students in public senior high schools in Depok city, namely the DO scale (Discipline), the OS scale (Dissatisfied), and two statements on the CD scale (Helpful/Friendly). In the Rasch model, item analysis is carried out to the level of each item (Maslahul *et al*., 2022). In addition to the items, the Rasch model also simultaneously tests the person (respondent), which will show a consistent pattern of respondent answers, which tends to agree (in attitude instruments) or identify answers that are just (Ramli & Muslimahayati, 2021).

Figure 3 and Figure 4 also depict the distribution of student ability and the distribution of item difficulty with the same logit scale on the far left of the figure. The map to the left illustrates the ability of learners. The two figures show that more than half of the learner sample has a higher ability level than the item difficulty level of the statement and is out of the limit of two standard deviations (T), indicating a distinct high intelligence (outlier). Meanwhile, the 49C learner sample has the lowest ability level in understanding statement items because it has a logit score of less than -1 and is an outlier outside the T limit (Sumintono & Widhiarso, 2013).

The right-hand map depicts the level of item difficulty as perceived by learners. The logit value of the item indicates this level of difficulty. Item DO4 (Teachers make students afraid when they do not do biology assignments) in Table 6 is the item with the highest level of perceived difficulty, namely +2.58, which, according to Ramli & Muslimahayati (2021), means that the probability of all students who easily perceive this statement item is small. The statement item SC3 (Teachers care about their students) is the statement item with the smallest logit value below -1 (below a logit score of 0), which, according to (Muslihin *et al*., 2022), means that almost all students can easily perceive this statement.

This is based on the findings of research on teacher-student interpersonal relationships in the city of South Tangerang, which were analyzed using Rasch Measurement Pearson Map Item modeling. These findings show that the statement items of leadership behavior, helping / friendly, and understanding teachers are identified as behaviors often perceived by students or seen in chemistry teachers in public and private high schools in South Tangerang City. Meanwhile, the items of the teacher's hesitation and reprimanding behavior statement were

identified as behaviors that were rarely perceived, rarely seen in the behavior of chemistry teachers in public and private high schools in South Tangerang City (Maulidina, 2016). This finding implies that behavioral scales below logit zero, such as DC (Leadership), DO (Discipline), SO (Indecisive), SC (Giving freedom), CS (Understanding), and CD (Helping/Helping), are behaviors that are thought to be perceived as agreeing the most by students, also indicating that these behaviors are often seen in classroom learning.

Using the teacher-student interpersonal relationship questionnaire distribution data, eight behaviors were analyzed using Ministep for Windows with Rasch modeling. The percentage of each identified interpersonal behavior of public high school biology teachers in Depok City is shown in Table 6.

Table 6. Percentage of Biology Teacher's Interpersonal Behavior

Behaviour Scale	Percentage (%)
Leadership (DC)	78
Helpful (CD)	73
Understanding (CS)	76,7
Student Freedom (SC)	73,9
Uncertain (SO)	73,6
Dissatisfied (OS)	71
Admoshing (OD)	67
Strict (DO)	61,9

Based on the data listed in the calculation of Table 6 for each scale of teacher interpersonal behavior, a graphical representation of the biology teacher's interpersonal behavior profile can be drawn in a radar chart with the help of the Edraw.AI website as follows.

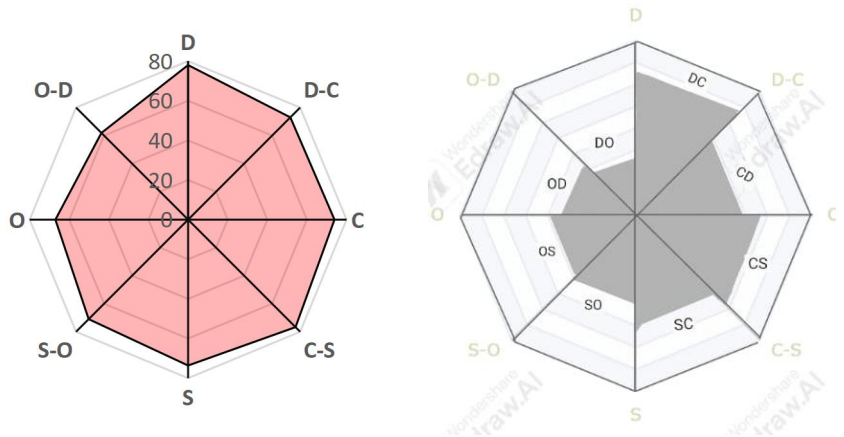

Figure 5. Radar chart and Graphic Representation of Interpersonal Behavior Profile of Biology Teachers in Public Senior High Schools in Depok City

The radar chart above shows the percentage of teacher behaviors identified. The D axis describes leadership behavior; the D-C axis describes helping/friendly behavior; the C axis describes understanding behavior; the C-S axis describes the behavior of giving freedom to learners; the S axis describes hesitant behavior; the S-O axis describes dissatisfied behavior; the O axis describes reprimanding behavior, and the O-D axis describes disciplinary behavior. Using the help of the Edraw.AI Website, each axis is drawn towards the other axes to form a shaded area, as shown in Figure 5. The D-axis and the D-C axis form the shading area of leadership behavior (DC), the D-C axis and the C axis form the shading area of helping/friendly behavior (CD), the C axis and the C-S axis form the shading area of understanding behavior (CS), the C-S axis and the S axis form the shading area of the behavior of giving freedom to students (SC), S-axis and S-O axis form the shading area of hesitant behavior (SO), S-O axis and O axis form the shading area of dissatisfied behavior (OS), O axis and O-D axis form the shading area of reprimanding behavior (OD). Finally, the O-D axis with the D axis forms the shading area of disciplinary behavior (DO).

The identified profile of teacher-student interpersonal behavior in learning biology in Depok city public senior high school from the results of graphical representation is interpreted into the profile of teacher interpersonal behavior according to (Wubbels & Brekelmans, 2005). It is included in the category of directive teacher profiles. Directive behavior is also found in research on interpersonal relationships and the typology of teacher profiles based on student perceptions of biology learning at the Bekasi city school, which is perceived as a teacher with a directive type by its students (Aisy, 2021). In addition, research on the Relationship between Teacher-Student Interpersonal Interaction and Biology Learning Outcomes at islamic senior high school in Medan City (Case Study during the Covid-19 Pandemic) The teacher's interpersonal profile owned by Biology teachers at islamic senior high school in Medan City is a Directive and Authoritative type teacher (Hashina, 2022). According (Wubbels & Brekelmans, 2005), the learning environment in a classroom with a teacher with a directive profile is well structured and task-oriented. A teacher with a directive profile is efficiently organized and usually completes all lessons on time. He/she dominates class discussions but generally keeps the students' interest. The teacher is usually not very close to the students, although he/she is sometimes friendly and understanding. He has high standards and is considered demanding. He likes to reprimand students who are misbehaving and not paying attention. This usually calms them down quickly (Wubbels *et al*., 1995).

Data from the survey results of 33 QTI statement items regarding the interpersonal relationship between Biology teachers and students and 32 TOSRA statement items regarding

students' attitudes in learning Biology to 88 phase F students (class XI) who took Biology specialization at Depok city school Depok city public senior high school were analyzed using the help of Winstep for Windows software application with statistical calculations using the logit score of the two instruments.

Tabel 7. Pearson Correlation of Teacher-Learner Interpersonal Relationships on Learners' Attitudes toward Biology in Depok City Public Senior High Schools

Dimensions	ATSI	EOSL	LIIS	CIIS
Influence	-0,058	0,297	-0,102	-0,485
Proximity	-0,034	0,413	0,053	0,053

Previous research has shown that learners' perceptions of teacher behavior are related to their affective outcomes. Brekelmans and Wubbels found a relationship between the proximity dimension and learner motivation (Wubbels *et al*., 1995). den Brok *et al*. (2005) found strong correlations between closeness and pleasantness, relevance, and confidence. Meanwhile, affect correlated less strongly with these outcomes (Tim Mainhard *et al*., 2011). an Amelsvoort found that elements of interpersonal behavior, such as helpfulness and understanding, were positively associated with these outcomes (Wubbels & Brekelmans, 2005). Brekelmans also reported that authoritative (authoritative) and directive (directive) teachers tend to have the most substantial effect on learners' attitudes in the study. The research suggests that the closeness dimension substantially affects affective outcomes or learner attitudes more than the influence dimension.

The fact that there is a negative relationship between the proximity dimension (CO), the Attitude Towards Scientific Inquiry dimension, and the influence dimension (DS) with career interest in biology. Table 7 shows that on the influence axis, there is a positive relationship with the Enjoyment of Science Lesson scale and a negative relationship between the influence axis and career interest in Science. These results align with the findings of (Telli *et al*., 2010) which obtained data that there is a positive relationship between the dimensions of influence and closeness with the EOSL scale, and there is a negative relationship between the dimensions of influence and the CIIS scale. This finding follows that the more dominant the teacher is perceived to be, the greater the students' enjoyment of Biology, but the lesser their career interest. However, the surprising fact that a negative relationship was also found between the closeness dimension (CO) and the ATSI scale is unlike the findings of Wubbels *et al*. (1995), where previous QTI studies universally found a positive relationship between the closeness dimension and learners' attitude towards inquiry. The score obtained from this relationship is -0.234, indicating a weak negative correlation between the proximity dimension and the ATSI scale. This discrepancy with Wubbels *et al*.'s findings was also

experienced by Sibel Telli *et al*., who explained that this discrepancy relates to other research factors and other covariates that were included (such as school type, mother's education level, and so on) in determining the effect of interpersonal behavior on the ATSI scale (attitude in the inquiry) (Telli *et al*., 2010).

An alternative explanation for this finding lies in the context of this study, where Indonesian education currently uses the Merdeka curriculum, which implements a Student-Centered approach to learning (Prasetyo, 2023). In addition, differentiated learning in the independent curriculum provides space for students to learn according to their learning styles, interests, and abilities, making them more comfortable and motivated to learn. The relevance of the independent curriculum to the findings showing a negative relationship between the closeness dimension of the teacher-learner interpersonal relationship and the ATSI scale lies in the focus on learning activities that emphasize project-based learning. According to (Shin, 2018), the impact students feel from this project-based learning process is that they interact less with teachers and more with peers because of the demand to work on projects together. Because of this, the ambiguity of student responses in answering statement items on the cooperation and resistance dimension (closeness axis) is thought to be one of the things causing a negative relationship in the closeness dimension with the ATSI scale or the incompatibility of these findings with previous findings to the contrary.

Government policies in Turkey are also the reason for (Telli *et al*., 2010) findings showing a negative relationship between the closeness dimension and the ATSI scale - inconsistent with previous QTI findings.Turkey has embarked on significant innovations in science education and teacher education, such as a stronger emphasis on self-directed learning and a policy push to improve science education. From these policies, teachers and learners have to adjust to new roles in such contexts, which may cause uncertainty and changes in classroom processes, ultimately affecting the relationship between teacher-learner interpersonal relationships and learner attitudes.

This study has several limitations. First, during data collection, the teachers had already decided which classes to sample. They may have had classes with a "good relationship, " which may have led to the high dimensional scores in this sample. Second, the data in this study was only quantitative. Future research could add data and analysis on interviews and video recordings of lessons to provide a broader description of teachers' interpersonal behavior.

From this finding, the more dominant the teacher is perceived to be, the greater the learners' enjoyment of Biology, but the lesser the career interest. A positive relationship was

found between the Proximity axis and Leisure interest in Science. At the same time, a negative relationship was found between proximity and Attitude Towards Science Inquiry. The results show that it is important for teachers to relate to students and maintain interpersonal control (by showing leadership and assertiveness and limiting uncertain behavior) in classroom communication. The literature consistently shows that leadership behavior significantly influences learners' voice behavior in business and educational settings (Zhang *et al*., 2021). Both perceptions of influence and closeness are primarily determined by teachers' non-verbal and verbal behaviors in the classroom (Telli *et al*., 2010), making eye contact, making a clear tone of voice, and using serious facial expressions. With this research, teachers can get advice on changing teacher behavior, especially Science or biology teachers, to create a higher student attitude in Science (Biology) lessons.

CONCLUSION

The study shows good interpersonal relationships between teachers and students. Teacher behavior based on MITB shows positive behavior. This is indicated by the dominant and cooperative nature of the teacher with his students. The behavior profile of biology teachers in public senior high schools in Depok City is perceived as a teacher with a directive type. In addition, this research reveals the fact that there is a negative relationship between the closeness dimension (CO), the Attitude Towards Scientific Inquiry dimension, and the influence dimension (DS) with career interest in biology.

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