

## A QUANTITATIVE DESCRIPTIVE ANALYSIS OF STUDENTS' PERCEPTIONS OF TEACHING STRATEGY EFFECTIVENESS AND TEACHER INTERACTION PATTERNS AT SMAN 1 KUTA BARO

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### ABSTRAK

This research is motivated by the significance of student perception as an evaluation indicator for the quality of mathematics instruction at the secondary school level. The objective of this study is to analyze students' perceptions regarding the effectiveness of teaching strategies and teacher interaction patterns at the Senior High School level 1 Kuta Baro. This study employs a quantitative descriptive approach, involving a sample of 26 students from the tenth and eleventh grades, selected through a purposive sampling technique. Data were collected using a closed-ended questionnaire instrument consisting of 44 items on a five-point Likert scale. The results indicate that students' perceptions of teaching strategies and teacher interaction patterns fall into the 'good' category, with an overall mean score of 3.93. The dimensions of classroom interaction and motivational support received the highest ratings; however, findings suggest that learning grouping strategies and teacher dominance in classroom communication still require improvement. This study concludes that although the learning process is considered effective, innovation in group management and a shift in teaching patterns toward student-centered learning are necessary to optimize active participation in the classroom.

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### INTRODUCTION

Education serves as the primary pillar in developing human resource potential, where mathematics stands as one of the core subjects that cultivates logic and critical thinking skills in students. However, at the Senior High School level (SMA), mathematics is frequently perceived as a difficult and tedious subject. The success of mathematics instruction does not rely solely on the curriculum but is heavily influenced by how teachers implement teaching strategies in the classroom and the quality of the interactions established with students.

SMAN 1 Kuta Baro, as one of the educational institutions in Aceh Besar, continuously strives to enhance the quality of its learning processes. In this context, student perception serves as a highly valuable evaluation indicator. Perception is the process by which students interpret the stimuli they receive in the classroom, which subsequently shapes their attitudes and learning motivation (Syed Ghazanfer Abbas et al. 2025). If students perceive the teacher's instructional strategies as tedious or the interaction as rigid, the effectiveness of knowledge transfer will be hindered. Consequently, a clear mapping is required to determine the extent to which current teaching strategies and interaction patterns meet the expectations and learning needs of students at SMAN 1 Kuta Baro.

Several previous studies indicate that innovative teaching strategies significantly influence learning outcomes. (Sara Serlina Aulia and Hermansah 2024) stating that the Contextual Teaching and Learning (CTL) approach is effective in enhancing problem-solving skills by linking the material to real-life situations. However, in its implementation, there is often a difficult transition from teacher-centered instructional patterns toward student-centered learning (Arifin and Hanif 2024)

In addition to strategy, the aspect of interaction is also crucial (Afrisno Udil, Lupa Bole, and K. Ekowati 2021) concluded in their study that students' positive perceptions of teacher characteristics and interaction styles have a significant influence on mathematics learning motivation. On the other hand, the use of teaching aids and digital media has also become a focal point in modern education to help abstract complex mathematical concepts into more concrete forms (Andinasari, Yanti, and Sistyawati 2024). These studies serve as the theoretical foundation for analyzing student perception data at SMAN 1 Kuta Baro, particularly concerning the balance between teacher emotional support and the variety of teaching methods employed.

This research generally aims to explore and describe students' perceptions at SMAN 1 Kuta Baro regarding the effectiveness of teaching strategies implemented by mathematics teachers in the classroom learning process (Hettinger, Lazarides, and Schiefele 2023). Through this analysis, the researcher aims to evaluate how the interaction patterns established between teachers and students influence students' comfort and active engagement during teaching and learning activities (Yang et al. 2021). Furthermore, this study is intended to identify various instructional aspects perceived as successful by students, as well as specific areas that still require improvement, such as learning group management and the level of teacher dominance in two-way communication. Consequently, the results of this research are expected to provide an objective overview

that serves as a basis for enhancing pedagogical quality and interpersonal relationships within the SMAN 1 Kuta Baro environment. Although numerous studies on mathematics teaching strategies have been conducted, this research fills a research gap that has remained overly generalized by exploring the specific synergy between instructional strategies and teachers' emotional interaction patterns within a suburban school environment, such as SMAN 1 Kuta Baro. The novelty of this study lies in its in-depth analysis of how students' perceptions of teacher interpersonal support serve as a determining variable in the successful adoption of modern teaching methods – a dimension often overlooked in purely cognitive research. (Yang et al. 2021).

This research contributes to the strengthening of pedagogical interaction theory by demonstrating that the effectiveness of mathematics teaching is not solely determined by subject matter mastery, but also by the extent to which students feel emotionally engaged in two-way communication. Practically, the specific contribution of this study is to provide a recommendation model for teachers in the Aceh Besar region to transform their teaching patterns into more inclusive and adaptive ones, aimed at enhancing numeracy literacy through a student-centered approach rooted in local interaction wisdom. (Asante Britwum, Ntow, and Smith 2024).

## **RESEARCH METHODOLOGY**

This research employs a quantitative approach with a descriptive method. This design was selected to provide a systematic, factual, and accurate overview of students' perceptions regarding the effectiveness of mathematics teaching strategies and teacher interaction patterns at SMAN 1 Kuta Baro, without providing any specific treatment to the research subjects (Mijar 2024).

The population of this study consists of all students at SMAN 1 Kuta Baro who are enrolled in mathematics courses. The sampling was conducted using a purposive sampling technique, in which sample members were selected based on specific considerations to achieve the research objectives (Memon et al. 2025). The selected sample consists of 26 students, comprising 17 students from Grade X and 9 students from Grade XI.

The primary instrument of this research is a closed-ended questionnaire featuring 44 items based on a 5-point Likert scale. To ensure data quality, the instrument underwent validity and reliability testing. Validity was tested in two stages: content validity through expert judgment by the supervising lecturers, and empirical item validity testing to ensure that each statement accurately measures the established indicators (Arbeni et al. 2025).

Furthermore, the reliability test was conducted using the Cronbach's Alpha formula (Taber 2018). Based on the test results, the instrument has a reliability coefficient above the standard threshold of 0.70, thus categorized as having high and consistent reliability for use as a research measurement tool (Sugiyono, 2018).

Prior to the final data collection, the questionnaire underwent a content validity stage through expert review (supervising lecturers) to ensure that the items were relevant to the variables under study. Data reliability was ensured through the internal consistency of respondent answers, where the collected data showed stable response patterns across each grade category (X and XI).

The data analysis was conducted using a descriptive quantitative method by calculating the mean score of each statement item and research dimension. The formula used is:"

$$Mean(\bar{x}) = \frac{\sum x}{n}$$

**Description:**

$\sum x$  = Total score

$n$  = Total number of respondents

The calculation results were then converted into assessment categories based on the following score ranges:

- 1,00 - 1,80 : Very Poor
- 1,81 - 2,60 : Poor
- 2,61 - 3,40 : Fair
- 3,41 - 4,20 : Good
- 4,21 - 5,00 : Very Good

In addition to descriptive analysis, this study also applies simple inferential statistical tests to strengthen the findings. The Pearson Product-Moment Correlation test was used to identify the strength and direction of the relationship between the teaching strategy variable ( $X_1$ ) and the teacher interaction pattern variable ( $X_2$ ). The correlation formula used is:

$$r_{xy} = \frac{n \sum XY - (\sum X)(\sum Y)}{\sqrt{[n \sum X^2 - (\sum X)^2][n \sum Y^2 - (\sum Y)^2]}}$$

**Description:**

$r_{xy}$  : Correlation coefficient

$n$  : Number of respondents

$X$  : Teaching strategy score

$Y$  : Teacher interaction pattern score

The data analysis procedure was conducted systematically, starting from the collection of questionnaires, data tabulation in Microsoft Excel, and calculation of mean scores for each dimension, to correlation testing using statistical software to ensure data accuracy (Mijar 2024). This step was taken to ensure that the generated description of perceptions is supported by strong statistical evidence of the relationship between the instructional and interpersonal dimensions of the teacher.

## RESULTS AND DISCUSSION

### Descriptive Statistical Results

Based on the data processing of 26 respondents at SMAN 1 Kuta Baro, a descriptive statistical overview was obtained, including the mean and standard deviation (SD) for each dimension. The use of standard deviation in this table serves to determine the extent of the distribution of students' responses relative to the average scores obtained.

**Table 1.** Recapitulation of Average Students' Perception Scores by Dimension

No	Key Indicators	Mean Score	Category
1	Teaching Strategies & Methodological Variety	3.85	Good
2	Interaction Patterns & Two-Way Communication	4.10	Good
3	Emotional Support & Learning Motivation	4.18	Good
4	Individual Assistance in Learning Difficulties	4.52	Very Good
	<b>Combined Average</b>	<b>3,93</b>	<b>Good</b>

The data in Table 1 indicate that the level of student perception has low variation (SD < 1.0), which suggests that the respondents' answers tend to be homogeneous or consistent. The lowest SD value is found in the Individual Assistance dimension (0.32), meaning that almost all students provided similar positive assessments regarding the teacher's willingness to assist with learning difficulties.

### Correlation Analysis Between Dimensions

To address the inquiry regarding the relationship between variables, a simple correlation test was conducted to determine the extent of the connection between teaching strategies and the interaction patterns established by the teacher.

**Table 2.** Correlation Matrix Between Research Dimensions

Dimension	Teaching Strategies	Interaction Patterns	Teacher Support
Teaching Strategies	1.00	0.68*	0.55*
Interaction Patterns	0.68*	1.00	0.72*
Teacher Support	0.55*	0.72*	1.00

**Significance level 0.05 (2-tailed)**

Based on Table 2, a significant positive correlation was found between Interaction Patterns and Teacher Support (Zhou et al. 2025). This scientifically indicates that the better the two-way communication patterns established by teachers at SMAN 1 Kuta Baro, the higher the students' perception of the emotional support provided. This correlation reinforces the argument that the effectiveness of mathematics learning cannot be separated from the quality of interpersonal relationships between teachers and students in the classroom (Gamlem 2019).

### Analysis of Dominant Instrument Items

A more in-depth analysis of the statement items reveals several crucial findings. Within the individual assistance dimension, item P32 ("The teacher is willing to help when students face difficulties") recorded a near-perfect score of 4.96. This proves that the interpersonal dedication of teachers at SMAN 1 Kuta Baro is exceptionally high, which theoretically serves as an important social capital for reducing students' mathematics anxiety (Zhou et al. 2025).

However, a gap exists in the aspect of collaboration management. Item P19 regarding grouping strategies only obtained a score of 3.12 (Fair). Students tend to feel less comfortable with homogeneous grouping (based on rank), which from a pedagogical perspective often inhibits the occurrence of peer-tutoring (Olsher, Abdu, and Shalata 2025). Furthermore, item P34 regarding teacher talk dominance (score 3.61) indicates that although interaction is functioning well, the instructional pattern still tends to be teacher-centered. (Bature 2020).

### Discussion of Findings and Scientific Implications

The research findings reveal a disparity in perception between Grade X students (3.71) and Grade XI students (4.36). This significant difference of 0.65 points is rooted in academic adaptation factors. Grade XI students have developed "relational maturity" and familiarity with the teacher's instructional rhythm, whereas Grade X students are still in a

transition phase from Junior High School mathematics to more abstract Senior High School material (Byiringiro 2024).

The scientific implications of this research emphasize that the effectiveness of mathematics teaching does not solely depend on subject matter mastery, but rather on the synergy between instructional strategies and interpersonal support. (Mosimege and Winnaar 2021). The low score regarding the relevance of material to real-life applications (P4: 3.64) poses a challenge for the development of numeracy literacy. Teachers are encouraged to integrate digital media and interactive teaching aids to bridge the gap between abstract concepts and real-world phenomena (Lo and Hew 2021).

### **Broad Implications and Technology Integration**

Theoretically, the connection between teaching strategies and teacher interaction at SMAN 1 Kuta Baro forms a learning ecosystem. The social capital in the form of positive interaction (score 4.10) is a valuable asset possessed by this school. However, this asset will not yield maximum impact on students' numeracy achievement if it is not accompanied by the renewal of teaching strategies toward a more inclusive approach.

One of the solutions that can be integrated is the utilization of digital teaching aids. According to modern pedagogical theories, the integration of digital tools not only enhances students' visualization of abstract mathematical concepts but also fosters a more interactive and student-centered environment. (Nurhaswinda 2025) The use of interactive media can serve as a bridge to transform teacher dominance into active student participation. Digital media is capable of visualizing abstract mathematical concepts into more concrete forms, thereby naturally triggering students' curiosity. With the presence of such media, the focus of students' attention is no longer solely directed at the teacher as the ultimate authority of truth, but rather on the process of exploring the problems presented before them.

In conclusion, the effectiveness of teaching at SMAN 1 Kuta Baro has achieved an adequate standard of quality. However, to reach the "Very Good" category, a paradigm shift is required – moving from the teacher as a "Sage on the Stage" to a "Guide on the Side." Transformations in grouping methods and a reduction in teacher talk dominance will be the primary keys to enhancing students' satisfaction and mathematics learning outcomes in the future.

### **Comparative Analysis of Perceptions Based on Educational Level**

The research data reveals a significant disparity between the perceptions of Grade X and Grade XI students. Grade XI students demonstrate a much more optimistic mean score (4.36) compared to their juniors in Grade X (3.71). This difference of 0.65 points cannot be regarded as a mere statistical coincidence but is rather the result of several fundamental factors that require scientific dissection.

First is the factor of academic interaction duration. Grade XI students have surpassed an adaptation period of more than one year at SMAN 1 Kuta Baro. During this period, they have built a deeper understanding of their mathematics teacher's teaching style, communication rhythm, and personal characteristics. As explained in social perception theory, familiarity tends to increase trust and comfort within interactions. This explains why the scores for the classroom interaction dimension among Grade XI students reach the "Very Good" category.

Second is the factor of material complexity and cognitive maturity. Grade X students often experience a transitional shock from Junior High School mathematics patterns to the much more abstract Senior High School level. This lack of readiness is frequently projected as a perception that the teacher's instructional strategies are "less suitable," when the primary issue lies within the material adaptation phase. Conversely, Grade XI students have become more accustomed to the Senior High School cognitive load, making them better able to appreciate the individual assistance provided by the teacher (Item P32).

### **Correlative Analysis between Interaction and Learning Motivation**

The correlation between positive interaction patterns (4.10) and motivational support (4.18) creates a "Safe Learning Environment" at SMAN 1 Kuta Baro. Psychologically, when a teacher provides individual assistance with a score as high as 4.96 (P32), students feel they have a safety net when making logical errors during mathematical problem-solving (Wulandari et al. 2021).

The importance of this is emphasized by relevant educational research, which suggests that a supportive teacher-student relationship acts as a primary catalyst for student engagement and academic resilience (Emma et al. 2024) who state that positive perceptions of teacher characteristics are directly proportional to academic achievement. At SMAN 1 Kuta Baro, high motivation (P30: 4.17) acts as a catalyst. Students who feel valued (P29: 4.19) are more courageous in taking risks to attempt difficult numeracy problems

without the fear of being judged (Setiyaningsih 2020). This interaction pattern serves as an absolute prerequisite before technical teaching strategies can operate effectively.

### **Implications of Findings for the Development of Numeracy Literacy**

The results of this study have serious implications for how numeracy literacy is established. Numeracy literacy is not merely the ability to calculate, but rather the capacity to apply mathematical concepts within real-life contexts. The finding that item P4 (relevance of material to real life) only reached a score of 3.64 indicates an obstacle in the development of meaningful numeracy literacy.

Based on references from (Nurhaswinda 2025) mathematics teachers need to integrate more teaching aids and digital media capable of bridging abstract theories with real-world phenomena. For instance, in teaching statistics, teachers could utilize real data regarding the economic conditions around Kuta Baro. By increasing the score in the relevance aspect, it is expected that students' perceptions of the effectiveness of teaching strategies will also rise to the 'Very Good' level.

Furthermore, teacher dominance in the classroom (P34: 3.61) must be addressed immediately. Numeracy literacy demands that students actively argue and solve problems. If the teacher is too dominant, students become merely passive recipients of formulas rather than critical problem solvers. A transformation toward Student-Centered Learning, as suggested by (Sara Serlina Aulia and Hermansah 2024) is an absolute necessity to produce graduates from SMAN 1 Kuta Baro who possess reliable numeracy competence in the digital era

### **Psychological Analysis and Transitional Phases in Student Perception**

The striking score disparity between Grade X (3.71) and Grade XI (4.36) students requires a review from the perspectives of adolescent developmental psychology and academic transition. Grade X students are in an entry-level phase of Senior High School, where they experience a shift in learning paradigms—from Junior High School patterns, which are more procedural, to Senior High School patterns that demand Higher Order Thinking Skills (HOTS). This lack of readiness in facing mathematical abstraction at the initial level often biases their perception of the teacher's instructional strategies (Wen and Dubé 2022). They tend to perceive the complexity of the subject matter as an 'incompatibility' of instructional strategies.

Conversely, Grade XI students have surpassed that critical adaptation phase. Their high perception scores (Very Good) indicate a state of 'relational maturity.' In educational psychology, this is known as academic belonging, where students who have developed emotional proximity and understand their teacher's work rhythm tend to provide more objective and positive evaluations. This proves that the effectiveness of mathematics teaching is determined not only by a teacher's proficiency in explaining formulas but also by their ability to nurture long-term interpersonal relationships with students. The teachers at SMAN 1 Kuta Baro have successfully gained student trust over time, which serves as the primary capital for the sustainability of the educational process.

### **Critical Evaluation of the Gap Between CTL Theory and Classroom Reality**

Although the overall results are positive, this research identifies an "interesting contradiction" between the theory of Contextual Teaching and Learning (CTL) and the reality on the ground. Based on references from (Sara Serlina Aulia and Hermansah 2024), CTL is intended to demand active student involvement in discovering concepts. However, data from items P34 (score 3.61) and P19 (score 3.12) reveal that at SMAN 1 Kuta Baro, the teacher remains the 'center of gravity' of the learning process, and grouping strategies have not yet been optimized.

This gap occurs due to the burden of curriculum targets, which often force teachers to revert to the lecture method to ensure materials are completed on time. Teacher dominance (P34) is, in fact, a reflection of the teachers' anxiety that students might fail to achieve competency targets if left to explore on their own. However, referring to (Sara Serlina Aulia and Hermansah 2024), technological literacy and student autonomy can only flourish if teachers have the courage to 'release' control and allow students to make mistakes during the process of discovery.

The findings regarding the low effectiveness of grouping (P19) also indicate that classroom group formations are often merely administrative rather than functional. Teachers need to be retrained to organize heterogeneous groups that foster peer-teaching dynamics. If this strategy is improved, the teacher's burden of repeatedly explaining materials—which leads to speech dominance—can be reduced, as that role is partially assumed by peer tutors within the groups (Selvianiresa and Prabawanto 2017). Consequently, the synchronization between CTL theory and classroom practice will elevate the overall student perception scores toward the 'Very Good' level.

## CONCLUSION AND RECOMMENDATIONS

### Conclusion

Based on the data analysis, it can be concluded that students' perceptions of the effectiveness of teaching strategies and the interaction patterns of mathematics teachers at SMAN 1 Kuta Baro generally fall into the "Good" category (3.93). The primary findings indicate a strong synergy between teachers' interpersonal support and students' learning motivation, where the individual assistance dimension recorded the highest score (4.52).

Critically, the results of this study show a slight divergence from common findings in urban secondary schools, which typically place greater emphasis on technological innovation. At SMAN 1 Kuta Baro, the core strength lies instead in "teacher care" or personal concern. This is attributed to the cultural characteristics of interaction in suburban areas, which still highly value the emotional bond between educators and students. However, this research also reveals a stagnation in the aspect of collaboration management (score 3.12), indicating that while students feel emotionally comfortable, they have not yet been fully challenged cognitively through student-centered methods.

This study confirms that the mathematics teaching model at SMAN 1 Kuta Baro is successful in establishing an "emotional safety net," yet still requires a radical transformation in heterogeneous grouping strategies and a reduction in instructional teacher dominance to achieve independent and adaptive learning effectiveness.

### Recommendations

Based on the findings of this study, several strategic recommendations should be considered by relevant parties to enhance the quality of mathematics learning. For mathematics teachers at SMAN 1 Kuta Baro, it is recommended to deconstruct the existing homogeneous student grouping patterns into heterogeneous ones to trigger more effective peer-tutoring processes and reduce student dependency on dominant teacher instructions. In line with this, the school administration should facilitate training or workshops on developing Problem-Based Learning (PBL) instructional materials that integrate the local Acehese context, ensuring that mathematical concepts are no longer perceived as foreign by students. Lastly, for future researchers, given the limited sample size of this study, it is highly recommended to employ a mixed-methods approach to confirm whether high scores in teacher emotional support correlate directly with improvements in cognitive learning outcomes or merely enhance students' affective satisfaction in the classroom.

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