



Peer tutoring day: Perceptions and its effectiveness on the academic performance of students in learning high school physics

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ABSTRACT

This study looked at how well high school students performed academically in physics when using the Peer Tutoring Day (PTD) approach. Specifically, it assessed students' perceptions of PTD in terms of helpfulness, confidence, and motivation, as well as its implications on achievement scores. A mixed-methods, one-group pretest-posttest quasi-experimental design was used. High-performing students served as tutors, while lower-performing students were tutees. Data were collected through a 15-item achievement test, a Likert-scale survey, and focus group discussions (FGDs). Results showed that students rated PTD as very helpful (mean = 3.58), very empowering (mean = 3.38), and very motivating (mean = 3.44). The favorable contribution of PTD to the learning outcomes was confirmed by the Wilcoxon signed-rank test, which showed a substantial improvement in posttest results ($p=0.000$). Qualitative findings revealed that PTD fostered collaborative learning, deepened conceptual understanding, and strengthened interpersonal relationships. However, challenges such as limited tutor preparation time and initial discomfort in tutor-tutee interactions were mentioned. The study concludes that PTD is a helpful, motivating, and confidence building strategy, which enhances students' understanding of physics. It recommends allocating sufficient preparation time for tutors and fostering a supportive classroom environment to optimize the intervention's benefits.

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INTRODUCTION

Peer tutoring has been widely recognized as an effective instructional strategy that enhances student learning through collaboration. Peer tutoring, which has its roots in collaborative learning, is consistent with Vygotsky's Social Learning Theory, which highlights the importance of social interactions in cognitive growth (Vygotsky, 1978). According to this theory, learning occurs when students engage in meaningful interactions with more knowledgeable peers, facilitating the internalization of concepts through the Zone of Proximal Development (ZPD) (Wertsch, 1985). In the context of physics education, where abstract concepts and problem-solving skills pose challenges, peer tutoring offers a promising approach to making learning more interactive and student-centered.

Despite extensive research on peer tutoring, most studies have focused on its impact in mathematics and language learning, leaving a gap in understanding its effectiveness in physics education (Topping, 2005; Roscoe & Chi, 2008). While physics requires conceptual understanding and problem-solving abilities, traditional teaching methods often fail to engage students effectively, contributing to low motivation and achievement (Dockett & Mestre, 2014). Although previous studies have established the benefits of peer tutoring in fostering motivation, confidence, and cognitive development (Fantuzzo, Riggio, Connelly, & Dimeff, 1989), its specific impact on students' performance in high school physics remains underexplored.

By assessing the efficacy of Peer Tutoring Day (PTD) in high school physics, this study seeks to close this research gap. It specifically looks into how students view PTD in terms of its value, motivation, and ability to boost confidence, as well as how it affects academic performance. This study aims to give empirical evidence on the function of peer tutoring in improving students' physics learning experiences by looking at both quantitative and qualitative data. Furthermore, it offers insights into how structured peer interactions can be optimized to improve physics education outcomes.

OBJECTIVES OF THE STUDY

The following are the goals of this study: (1) to determine the perceptions of students regarding peer tutoring when it comes to its helpfulness, confidence, and motivation; and (2) to find out whether the 10th graders' pretest and posttest results under the peer tutoring day (PTD) approach differ significantly.

MATERIALS AND METHODOLOGY

This study employed a one-group quasi-experimental design with pretest and posttest. It also utilized a mixed-methods strategy for gathering and examining both quantitative and qualitative data to assess the effectiveness of the peer tutoring day (PTD) on their academic performance through survey questionnaires and focus-group discussions (FGD) to substantiate the quantitative findings.

Research Instruments

Three research instruments were administered to collect data: a 15-item researcher-made achievement test, a 15-item survey instrument categorized into three (helpfulness, confidence, and motivation), and 4 open-ended questions in the focus group discussion (FGD). The 15-item achievement test had undergone content validity testing with 2 physics teachers to ensure its alignment to the lesson objectives in work, power, and energy. The achievement test was applied to assess the shift in students' conceptual comprehension prior to and following the PTD intervention.

Conversely, preliminary assessment was conducted on the 15-item survey tool that employed a 4-point Likert scale. The pilot testing involved 60 grade 10 students, and coefficient alpha reliability was utilized to gauge internal reliability, yielding a coefficient of 0.925. This score suggests a notably strong internal consistency among the survey items. The survey instrument had undergone content validity among the researchers and one expert with a graduate degree, where suggestions and comments were applied to the instrument.

Research Context and Participants

The study was conducted in a private junior high school in Cagayan de Oro, Philippines, which follows a discipline-based curriculum with an emphasis on a different science area for each grade level: earth science in seventh grade, biology in eighth grade, chemistry in ninth grade, and physics in tenth grade.

Since this study is centered on physics learning, only 1 section with 43 enrolled students was selected purposely out of the 11 sections in the grade 10 level due to the logistical challenges posed by different class schedules across sections for the consistent implementation of the peer tutoring day intervention. All of the 43 students provided their agreement and signed the consent forms for the study, yet only 40 were able to actively participate in the peer tutoring day sessions due to few absences.

Selection of Tutors and Tutees

Based on the Department of Education (DepEd) Philippines' grading system, the students' grades typically range between 65 to 100. Tutors were carefully selected among high-performing students, while tutees were chosen from low-performing students. The selection of peer tutors was based on the students' numerical grades in the first-quarter for the school year 2023-2024. The grades were collected from official school records to ensure accuracy and consistency.

Strategically, the peer tutors were selected among the students with very satisfactory (85-89) and outstanding (90 above) grades. Meanwhile, the tutees were selected based on their grades and classroom performance observed by the teacher. All in all, after carefully assessing their classroom performance and grades, there were 20 peer tutors as well as tutees.

Data Gathering Procedure

The data was collected during the second quarter of the school year 2023-2024 in 2 weeks in November, focusing on the topics of work, power, and energy. The pretest was given on day one, and the same achievement test was used as the posttest using the Zip-Grade answer sheet. The PTD was divided into 2 sessions due to time constraints: one PTD session for the topic 'Work', and one session for 'Power and Energy'. Each session has a duration of fifty (50) minutes. A day before the PTD session, the peer tutors were given a teacher-made tutorial guide and a selected video lesson sourced from YouTube for them to watch as a piece of additional information about the topic

The PTD is administered a day before the mastery quiz after three days of lecture and laboratory activities. The survey questionnaire on students' perceptions was carried out via Google Forms and disseminated through MS Teams for students' easy access.

Although measures were taken to ensure objectivity, potential biases may have affected the results of this study such as social desirability bias that could have influenced the students to provide positivity due to school setting and presence of the teacher. To add, teacher expectancy bias may have been present. To reduce these biases, a standardized questionnaire implementation guide for peer tutoring was followed, and survey responses were collected through online forms and analyzed the data objectively.

Data Analysis

In this research, descriptive statistics were used to analyze the data with the aid of IBM SPSS version 25. The data were analyzed using Percentage, Weighted Mean, Normality Test (Shapiro-Wilk Test), and Wilcoxon Signed-Rank Test. To determine whether a significant difference existed between the pretest and posttest scores of

the students participating in the peer tutoring day (PTD) intervention, the Wilcoxon signed-rank test was suitable to be applied.

RESULTS AND DISCUSSIONS

This study had sought the perceptions of the students regarding peer tutoring quantitatively and qualitatively via survey questionnaire and focus group discussion. The findings were organized based on the outlined objectives. The following are the results along with the discussion:

QUANTITATIVE RESULTS

(1) Perceptions of students regarding peer tutoring when it comes to its helpfulness, confidence, and motivation.

Table 1. Helpfulness of the Peer Tutoring Day

Statement	Weighted Mean	Description
1.) I find the peer tutoring session helpful to me in supporting my conceptual understanding (facts or information) in the topics work, power, and energy.	3.52	Very Helpful
2.) I have a better understanding of the topics work, power, and energy because of the peer tutoring session.	3.60	Very Helpful
3.) The peer tutoring session allows me to clarify points that I could not raise during the class discussion.	3.50	Very Helpful
4.) I find peer tutoring to be a supportive method where mistakes are seen as opportunities for learning and improvement.	3.75	Very Helpful
5.) I find peer tutoring to be a helpful support to traditional classroom learning methods (lecture done by the teacher).	3.57	Very Helpful
Overall Weighted Mean	3.58	Very Helpful

Legend: *Very Helpful* (4.00 - 3.25), *Slightly Helpful* (3.24 - 2.50), *Not Helpful* (2.49 - 1.75), *Very Unhelpful* (1.74 - 1.00)

Table 1 shows the overall weighted mean of perceptions of the students on the helpfulness of peer tutoring day. Students find the peer tutoring ‘Very Helpful’ to them in learning the concepts of work, power, and energy with an overall weighted mean of 3.58. Students find the peer tutoring session as a support to their conceptual understanding and an opportunity to address questions that they could not raise during the class discussion, which appears to them as a beneficial support aside from teacher-led lectures.

The findings documented by recent studies uphold this result where grade 10 learners perceived peer tutoring as a helpful strategy that allowed them to engage better and felt comfortable in reaching out to their peers when learning with complex mathematical problems, creating a supportive learning environment (Macapayad et. al, 2023). Cooperative learning under the internet reciprocal teaching (IRT) approach improves STEM literacy in physics among secondary high school students due to its beneficial effects on student learning. This approach promotes a collaborative environment, encourages critical thinking, and fosters active participation which could prepare students not only for potential careers in STEM fields but also cultivates a positive attitude towards STEM learning (Mafarja et. al, 2024).

Table 2. Perceived Confidence of Students on Peer Tutoring Day

Statement	Weighted Mean	Description
1.) I feel prepared to take the mastery test because of the peer tutoring session.	3.40	Very Empowering

2.) I am more confident in my ability to recall the concepts in work, power, and energy because of the peer tutoring session.	3.47	Very Empowering
3.) I am more academically prepared to participate in class discussions after receiving peer tutoring support.	3.27	Very Empowering
4.) I feel more confident in getting high scores because of the peer tutoring session.	3.32	Very Empowering
5.) I find peer tutoring beneficial in improving my analytical (situational problem that involves understanding skills) and problem-solving skills (involves mathematical tasks) in the topic of work, power, and energy.	3.47	Very Empowering
Overall Weighted Mean	3.38	Very Empowering

Legend: Very Empowering (4.00 - 3.25), Slightly Empowering (3.24 - 2.50), Not Empowering (2.49 - 1.75), Very Unempowering (1.74 - 1.00)

Table 2 shows the overall weighted mean of perceived confidence of the students on peer tutoring day. Students feel very empowered that peer tutoring improved their confidence in learning the concepts of work, power, and energy, with an overall weighted mean of 3.38. Students feel academically prepared and more confident when taking the mastery test because of the peer tutoring session, and that they feel more confident that it improved their analytical skills and problem-solving skills resulting in improved mastery test scores.

This finding further supports the conclusions reached by previous studies, revealing the importance of improving the self-confidence among students as it impacts their learning process emphasizing that when students' have improved self-confidence, it also leads them to improved participation, enjoy the learning process, reduce their test anxiety, as well as a growth of comfort with their classmates and lecturers (Akbari & Sahibzada, 2020). Peer tutoring programs enhance students' understanding of mathematical concepts through peer interaction and collaborative learning, which in turn build their confidence in their mathematical skills and abilities (Muitange, 2024).

Table 3. Perceived Motivation of Students on the Peer Tutoring Day

Statement	Weighted Mean	Description
1.) I find peer tutoring engaging, because it encourages collaborative learning.	3.47	Very Motivating
2.) I feel interested in learning the concepts in work, power, and energy because of the peer tutoring session.	3.35	Very Motivating
3.) I find myself actively participating in peer tutoring sessions, because I believe it enhances my understanding of the subject matter.	3.50	Very Motivating
4.) I feel more encouraged to take on academic challenges in learning the topics work, power, and energy with the support of peer tutoring.	3.45	Very Motivating
5.) I feel more connected to the class and my peers because of the peer tutoring.	3.47	Very Motivating
Overall Weighted Mean	3.44	Very Motivating

Legend: Very Motivating (4.00 - 3.25), Slightly Motivating (3.24 - 2.50), Unmotivating (2.49 - 1.75), Very Unmotivating (1.74 - 1.00)

Table 3 shows the overall weighted mean of perceived motivation of the students on peer tutoring day. Students appear to be very motivated that peer tutoring improved their motivation in learning the concepts of work, power, and energy, with an overall weighted mean of 3.44. Students were very motivated in all aspects that peer tutoring encourages collaborative learning, makes them feel interested in learning, participates actively, and encourages them to take on academic challenges in learning the concepts.

Meanwhile, Ohadugha et. al (2020) revealed that secondary high school students’ motivation were significantly positive with Peer-Mediated Learning (PML) when you compare them to students who were taught using conventional methods in learning computer skills. Farooq et. al (2020) conducted an experimental investigation on peer tutoring, they found that the experimental group’s intrinsic motivation was significantly impacted by peer tutoring. This was in contrast to the control group’s result on the Intrinsic Motivation Scale (IMS).

This result also agreed with the study of Onah (2022) in quantum physics which discussed that students who are involved in reciprocal peer tutoring had increased their motivation in oral reading engagement as well as improved their cooperation skills. On a similar sense, in Mathematics and Computer Science subjects, these results reinforce the findings of Noperta & Sari (2023) focusing on the impact of humanistic mathematics education based on peer tutoring on high school students motivation to learn mathematics showed a significant increase of 14% in student motivation from an average of 60% to 74%.

Table 4. Overall Perception of Students on Peer Tutoring Day

Category	Mean	Description
(1) Helpfulness	3.58	Very Helpful
(2) Confidence	3.38	Very Empowering
(3) Motivation	3.44	Very Motivating
Overall Mean	3.46	Very Effective

Legend: Very Effective (4.00 - 3.25), Slightly Effective (3.24 - 2.50), Not Effective (2.49 - 1.75), Not Very Effective (1.74 - 1.00)

Table 4 shows the perception of students toward peer tutoring in learning physics was computed using the average weighted mean. Overall, students thought PTD was ‘Very Effective’ in every category indicating that peer tutoring improved their academic performance and boosted their self-esteem and desire to learn the material.

While all categories fall within the ‘Very Effective’ range, the ‘helpfulness category’ gained the highest rating, which suggests that students found peer tutoring day most valuable in enhancing their understanding of the concept. In contrast, ‘confidence category’ had the lowest rating among the 3, which could mean that while peer tutoring improved comprehension, students may not have built independent practice to solidify and scaffold their confidence.

Similar trends have also been noted in Kholmetov’s (2024) study on the efficacy of peer teaching and collaborative learning in optics discussions, which found that students’ conceptual understanding significantly improved and that they were more motivated, engaged, and confident when handling challenging optics topics. This result is further supported by the study of Dosoftei and Alexa (2024) in the field of engineering education in a mixed-method case study in which they examined and revealed that 87% of students have positive and valuable perceptions towards peer-teaching showing better communication, increased attention, practicality, as well as providing remedy to student-teacher interaction anxiety.

(2) Investigate if there is a significant difference between the pretest and posttest results of the 10th graders students under the peer tutoring day (PTD) strategy.

Table 5. Normality Test of Pretest and Posttest Results

Factor	Shapiro Wilk Test			Distribution
	Statistics	df	p-value	
Pretest	.994	40	.047	Non-normal
Post-test	.865	40	.000	Non-normal

Table 5 shows the normality of the pretest-posttest data was checked using the Shapiro-Wilk test. The Wilcoxon signed-rank test was employed to examine whether there was a significant difference between the pretest and posttest results since p-values below the significance level suggest a non-normal data distribution.

Table 6. Difference in the Pretest and Posttest Results Using the Wilcoxon Test

Factor	Mean	p-value	Z-statistics	Sum of Ranks	
				Negative Rank	Positive Rank
Pretest	6.6000	.000	-5.436	1.50	778.50
Post-test	13.1500				

Table 6 shows that the difference between the physics students' pretest and posttest results was ascertained using the Wilcoxon signed-rank test. The standard significance level of 0.05 is exceeded by the p-value of 0.000. This suggests a significant influence or effect between the pretest and posttest data, indicating that the observed changes in scores are unlikely to have happened by accident. A statistically significant rise in scores from the pretest to the posttest can be inferred from the huge difference in ranks and the resulting p-value of 0.000.

This finding is significantly aligned with the existing studies, which showed that learners who received peer tutoring exhibited substantial improvement in post-test mean scores in science (chemistry and physics) after the intervention outperforming those who were not exposed to peer tutoring program (Arzaga, 2021; Luminoque, 2022; Offordile et. al, 2021). Additionally, it was noted that senior high school students' performance in physics projectile motion has greatly increased through the class-wide peer tutoring (CWPT), which has produced additional possibilities for practice of particular abilities and improved idea retention (Akanbi, 2022). Cooperative learning model with peer tutoring showed promising increase in conceptual understanding indicating mastery in terms of interpreting aspects of wave physics concept among high school students (Kartikasari, 2024). As such, students' academic performance significantly improved when exposed to peer tutoring intervention highlighting it as an additional and supportive tool to scaffold the students' learning (Maguate & Rabacal, 2023).

QUALITATIVE RESULTS

Table 7. Student's Qualitative Perception on Peer Tutoring

Theme	Coded Response	English Equivalent
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Helpfulness	<p>Student 1: <i>“My experience with the peer tutorial session as a tutor was actually really great because not only was I able to help a fellow classmate with their academics, but it also, in a way, serves as a review before the exam.”</i></p> <p>Student 2: <i>“I observe that my grade really went up when the peer tutorial got implemented. In the first quarter I got a line of 7 but in the second quarter, I almost got 90. It really helped me.”</i></p> <p>Student 3: <i>“It was very helpful kay whenever maglisod ko, mag-ask ko sa akong tutor and he would help me. Because of it nakareview ko and I got good scores.”</i></p> <p>Student 4: <i>“It’s really helpful because teaching is really a great way to review a lesson or topic, so when I was to teach or tutor my tutee, I was able to review the subject and properly digest the material and information.”</i></p> <p>Student 5: <i>“Very helpful kay as a tutee kay if naa kay wala nasabtan any part sa lesson kay pwede nimo i-ask sa imo tutor and tabangan ka niya.”</i></p> <p>Student 6: <i>“Peer tutorial helped me understand the lesson better, especially sa mga parts na confused ko.”</i></p>	<p>Student 3: <i>“It was very helpful because whenever I’m having a hard time, I would ask my tutor and he would help me. Because of it, I was able to review and I got good scores.”</i></p> <p>Student 5: <i>“Very helpful because as a tutee, if I have something I wasn’t able to understand from any part of the lesson, I can ask my tutor and he/she will help you.”</i></p> <p>Student 6: <i>“Peer tutorial helped me understand the lesson better especially on the parts that I find confusing.”</i></p>
Student Challenges & Feedback	<p>Student 1: <i>“It was awkward at first [with the tutee]. At the same time, teaching while learning.”</i></p> <p>Student 2: <i>“Firstly, I had to think of a way to explain the material without making it too complicated or overwhelming in a way that it could be digested by my tutee. Secondly, I guess the time, the nature of the second quarter is a bit shortened and chaotic, making it seem like there was a really short time to prepare.”</i></p> <p>Student 3: <i>“At first, di kaayo mi close niya (tutor) and sige ra sya’g smile. Kung maglibog sya, maglibog pod ko, and then manguta dayon mi sa lain.”</i></p> <p>Student 4: <i>“i-pair up gyod tong mga close gyod and i-pair up pod tong makatudlo gyod, sir.”</i></p> <p>Student 5: <i>“More time to be given for the tutors to properly prepare and understand the lesson so they can easily teach and present the information in a way that is digestible for the tutees.”</i></p> <p>Student 6: <i>“If ang tutor nga kabalo ug di kabalo, imo sa siya tudloan [before the the peer tutorial session].”</i></p>	<p>Student 3: <i>“At first, my tutor and I were not really close and he just keeps on smiling. If he gets confused, I also get confused, so we then ask other students.”</i></p> <p>Student 4: <i>“Those students who are close to each other should be paired up and students should be paired with those who can really teach.”</i></p> <p>Student 6: <i>“Before the tutorial session, the tutors should be given more time to prepare and be taught by you [the teacher]”</i></p>

Table 7 shows further support for the quantitative results in which researchers conducted an FGD asking the perceptions of the students regarding PTD. Based on the responses, there are two major themes that were generated: Helpfulness and Challenges and Feedback.

When it comes to the ‘Helpfulness’ of PTD, tutors find it really helpful since aside from helping their classmates, they were able to properly review and internalize the physics concept by teaching it to them. In the perspective of the tutees, they find it very helpful too because they were able to understand the topic better as they can freely ask questions and address their confusions of the lesson to their tutors, thus, reflecting a high score in the mastery test.

For instance, *student 1* mentioned that being a tutor not only helped their peers but also allowed them to recall the key concepts before the exam. This suggests that teaching others can deepen and strengthen a tutor’s comprehension skills, which is consistent with the learning by teaching principle. Correspondingly, *student 6* acknowledged that peer tutoring helped clarify concepts they found confusing, while *student 2* directly linked the peer tutoring day to a significant improvement of their grades, demonstrating positive impact on their academic outcomes.

As reported by Akbar et. al (2022), the peer-assisted learning did not only help students achieve high assessment scores, but also attained attributes essential in life such as compassionate attitude, leadership and communication skills and gained confidence. A related study by Macapayad et. al (2024) showed that peer-tutoring allowed students to have an avenue to freely ask questions and seek clarifications from their knowledgeable peers in a supportive setting. Consistent with the observations of Mama et. al (2024), they showed that tutees appreciate the thought of openly expressing their struggles of the concept to peers who can relate to them in a less intimidating learning environment, which enables them to interact with the learning content in an efficient manner.

On ‘Student Challenges and Feedback’, one common feedback emerged regarding PTD such that tutors should be given more time to prepare and be further trained by the teacher before the tutoring day, so that they will give more precise information and answer to the queries of the tutees. On top of that, tutors are challenged to think of a way to explain the concept in a less complicated way to their tutees despite the short time to prepare. It was also raised that students who are close to each other should be paired, but of course, to those who can really teach the concept well.

According to comparable findings based on student feedback and challenges, peer tutoring programs can be difficult because of individual student differences. To ensure successful tutoring, they should be properly organized, closely monitored, and with strict supervision (Ullah et. al, 2018). One thing to put in mind is the selection of peer tutors requires a well-structured process as well as by providing training to peer tutors are essential to make the peer tutoring effective (Widoro et. al, 2024).

CONCLUSION AND RECOMMENDATION

The study’s conclusions highlight the significance of Peer Tutoring Day (PTD) as an effective intervention in the classroom. PTD has demonstrated its potential to enhance students’ academic performance, foster collaborative learning, and develop interpersonal skills by promoting mutual understanding and confidence in the learning environment. However, while the post-test scores indicate improved academic outcomes, it is essential to recognize that PTD contributes beyond academics—it serves as a formative experience that nurtures motivation, confidence, and peer engagement.

Establishing a welcoming and inclusive learning environment is essential to maximize the advantages of peer-to-peer contact in the classroom. While peer tutoring can be an effective learning tool, certain classroom dynamics and relationships may hinder its success. Therefore, educators should actively cultivate a positive classroom environment that encourages respectful and productive interactions among students.

The effectiveness of PTD depends significantly on the competence of the tutors and the quality of their relationship with the tutees. As noted in the focus group discussion (FGD), some student-tutors expressed the need for better preparation before facilitating peer tutoring sessions. To address this, teachers may consider conducting

separate training sessions for student-tutors to equip them with the necessary skills and strategies to explain concepts clearly and effectively.

Based on the study's findings and limitations, the following recommendations are proposed for the long-term implementation and further exploration of PTD:

- Future studies should explore ways to integrate PTD into the curriculum as a sustained and structured instructional approach rather than a one-time intervention. Examining its impact over multiple academic terms could provide insights into its long-term effectiveness in enhancing student learning and engagement.
- Since this study focused solely on high school physics, further research may investigate PTD's applicability and effectiveness in other subjects, such as mathematics, chemistry, and language learning. This will help determine whether PTD's benefits extend beyond physics and assess its scalability across various disciplines.
- Further studies should involve a bigger and more varied sample of individuals from various academic levels and institutions in order to increase the generalizability of the results. Exploring PTD's effectiveness in different educational contexts can provide valuable insights into how it can be adapted to various learning environments.
- Longer peer tutoring sessions spread over several weeks could provide students with more time to adapt and fully benefit from the intervention. Additionally, setting PTD at least two days before major assessments could enhance knowledge retention and mastery of concepts.
- When assigning tutors and tutees, educators should consider pairing students who share a comfortable and supportive rapport. Ensuring a positive tutor-tutee dynamic can contribute to a more productive and engaging learning experience.

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