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Students' Perceptions of Peer Feedback in Learning Mathematics

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ABSTRAK

Penelitian ini bertujuan untuk mengetahui persepsi mahasiswa terhadap umpan balik teman sebaya dalam pembelajaran matematika. Metode yang digunakan adalah deskriptif kuantitatif, dengan pengumpulan data melalui angket skala likert. Partisipan penelitian terdiri dari 20 mahasiswa yang dipilih secara acak di beberapa perguruan tinggi di Banten. Hasil penelitian menunjukkan bahwa sebagian besar mahasiswa memiliki persepsi positif terhadap umpan balik teman sebaya. Persentase persetujuan yang tinggi terlihat pada aspek kegunaan 82%, efektivitas 82%, dampaknya terhadap pemahaman 81,25% dan penguasaan materi matematika 82,5%. Dukungan dosen juga dinilai penting 77,5% dalam memfasilitasi umpan balik. Namun, 60% mahasiswa mengaku mengalami tantangan dalam memberi dan menerima umpan balik, terutama karena kecanggungan atau ketidakpastian. Temuan tersebut menegaskan bahwa umpan balik teman sebaya meningkatkan keaktifan, kolaborasi, dan pemahaman konsep matematika. Oleh karena itu, perlu dilaksanakan umpan balik teman sebaya yang terstruktur dan didukung secara aktif oleh dosen, disertai dengan pelatihan yang memadai dan penggunaan teknologi yang efektif sehingga praktik ini dapat berjalan lebih optimal.

Kata Kunci: Umpan balik; Pembelajaran Matematika; Persepsi Siswa; Pembelajaran Sosial

ABSTRACT

This study aims to determine students' perceptions of peer feedback in mathematics learning. The method used is quantitative descriptive, with data collection through a Likert scale questionnaire. The research participants consisted of 20 students randomly selected at several universities in Banten. The results showed that most students had a positive perception of peer feedback. High percentages of agreement were seen in the aspects of usefulness 82%, effectiveness 82%, its impact on understanding 81,25%, and mastery of mathematics material 82,5%. Lecturer support was also considered necessary 77,5% in facilitating feedback. However, 60% of students admitted to experiencing challenges in giving and receiving feedback, mainly due to awkwardness or uncertainty. The findings confirm that peer feedback increases activeness, collaboration, and understanding of mathematical concepts. Therefore, it is necessary to implement peer feedback that is structured and actively supported by lecturers, accompanied by adequate training and effective use of technology so that this practice can run more optimally.

Keywords: Peer feedback; Mathematics Learning; Student Perception; Social Learning

INTRODUCTION

Mathematics is often considered a complex subject because it involves abstract concepts. According to Lagria & Pañares (2023), the highest level of difficulty was found in the aspect of concept understanding (4.04), followed by mathematical skills (3.97) and attitude toward mathematics (3.97). Furthermore, Rahma et al. (2024) also found that 20% of students had difficulty connecting visual representations of fractions with abstract concepts, and 40% of students had trouble performing arithmetic operations with fractions, such as addition, subtraction, multiplication, and division. The lack of

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understanding of these concepts was identified as the leading cause of difficulties in learning mathematics (Salsabila et al., 2024; Waswa & Al-kassab, 2023).

Thus, mathematics learning requires appropriate strategies to develop students' logical and critical thinking skills to overcome mathematics difficulties. Mangarin & Caballes (2024) state that learning strategies can significantly impact students' learning experiences. Given the learning challenges during the COVID-19 pandemic, using inappropriate strategies can decrease students' participation in mathematics and negatively affect their achievement (G.C., 2024). Meanwhile, appropriate learning strategies can increase student commitment to deeply explore mathematical concepts, thus strengthening motivation, interest, and long-term mathematical knowledge (نوري, 2024).

Therefore, peer feedback is the chosen strategy to improve student learning outcomes in mathematics. The study results indicate that students who learned using this method experienced a significant improvement in their understanding of mathematical concepts, with an average post-test score of 88.50 compared to 67.10 in conventional learning (Yoviyanti et al., 2023). According to Husband & Nikfarjam (2022), Peer feedback can help students connect their mathematical ideas with their friends' thinking, thus strengthening students' understanding through discussion and comparison in problem-solving. Student understanding gained through peer feedback helps educators identify common errors so that teachers can adjust teaching to improve learning outcomes (Vanoli & Luebeck, 2021).

Similarly, peer feedback is a strategy and a social form of interaction that plays a vital role in developing students' understanding, as described in social constructivism theory. Social constructivism states that knowledge develops through discussion and negotiation to deepen their understanding (Jaworski, 2024). Like Carter's case study on social constructivism theory, research illustrates that mathematical objects develop through collaborative practice, supporting the view that mathematical concepts result from shared thinking within a mathematical community, not just from individual thinking (Rytilä, 2021).

Although the benefits of feedback have been widely studied, research on students' perceptions of peer feedback in mathematics learning is still limited. The low implementation of peer feedback in mathematics learning indicates that this practice is not optimal in supporting students' learning experiences (Vattøy & Gamlem, 2024). Many are unaware that students' perceptions affect their motivation and engagement in learning (Chow, 2024). According to Li et al. (2024), Positive perceptions can encourage participation and learning outcomes, and negative perceptions can be a barrier, so further research is needed to understand students' perceptions more deeply.

Based on the description above, this study aims to determine students' perceptions of peer feedback in learning mathematics. By knowing how these perceptions are, this study is normal to provide a clearer understanding of their impact on students' understanding of mathematics learning.

METHOD

This study uses a quantitative descriptive method. This method was chosen because it can describe students' perceptions of peer feedback in mathematics learning based on numerical data that can be analyzed statistically. The research participants consisted of 20 students from several universities in Banten. Participants were selected using the

Simple Random Sampling technique to obtain a random sample from the entire population so that the research results could reflect a more accurate and objective view of the population as a whole. All participating students followed the feedback strategy in mathematics learning for one semester, so they answered the statements based on their experiences.

The data collection technique used a closed questionnaire with a four-point Likert scale distributed via Google Forms and conducted over one month. The questionnaire consists of 35 statements grouped into seven indicators. After that, data analysis was done by looking at the overall data, organizing it, calculating percentages, and drawing conclusions. The analysis results will be used to obtain a general picture of students' perceptions of peer feedback in mathematics learning quantitatively.

RESULT AND DISCUSSION

The data analysis from a questionnaire consisting of 35 questions on students' perceptions of peer feedback in mathematics learning is divided into seven indicators. The results of the study can be seen in Table 1 below.

Table 1. Percentage of Student Questionnaire Results

No	INDICATOR	PERCENTAGE	
		AGREE	DISAGREE
1	Peer Feedback	82%	18%
2	Quality and Effectiveness of Peer Feedback	82%	18%
3	The Effect of Feedback on Understanding Mathematical Concepts	81,25%	18,75%
4	The Role of Lecturers in Encouraging Peer Feedback	77,5%	22,5%
5	Challenges in Giving and Receiving Feedback	60%	40%
6	The Effect of Feedback on Material Mastery	82,5%	17,5%
7	Implementation of Feedback in Mathematics Learning	79,5%	20,5%

The results presented in the table above indicate that most students perceive peer feedback in mathematics learning positively. As many as 82% of students agreed that peer feedback was active and helpful, with 18% disagreeing. The quality and effectiveness of feedback also received 82% approval, while 18% doubted it. The influence of feedback on

understanding mathematical concepts is even more substantial, where 81,25% of students agree that peer feedback helps them understand the material better, while 18,75% disagree. In addition, the role of lecturers in supporting the peer feedback process is considered very important by 77,5% of students, although 22,5% disagree. This shows that lecturers' presence and active support are needed to facilitate and strengthen the process of providing feedback between peers to make it more effective. The influence of feedback on mastery of the material received the highest approval, with 82,5%, with only 17,5% disagreeing, confirming the effectiveness of peer feedback in improving mastery of the material. Implementing feedback in mathematics learning also received a positive response from most students, with 79,5% agreeing that feedback had been implemented well. However, around 20,5% of students felt dissatisfied, indicating that even though a lot had been done, there was room for improvement so that the learning process could run more effectively and provide maximum benefits for all students. These data confirm that peer feedback has a very positive role in mathematics learning, improving conceptual understanding and mastery of the material, with significant support from lecturers.

The high level of positive responses of students to peer feedback in mathematics learning suggests that this process does have a tangible impact on their learning experience. Because the input provided by peers is perceived as clear, relevant, and valuable, many students find it easier to understand previously considered difficult material. This directly contributes to an increase in overall mastery of mathematical concepts. Feedback is essential for students to analyze their courage and weaknesses, facilitating targeted improvements in their learning process (Navaridas-Nalda et al., 2020). A meta-analysis revealed a significant effect size of 0.651, indicating that peer feedback positively impacts cognitive dimensions of learning more than non-cognitive dimensions (Li et al., 2024). This finding is also consistent with another meta-analysis that reported a moderate effect size (d = 0.48) of feedback on student learning, particularly in cognitive and motor skills (Wisniewski et al., 2020). This type of feedback encourages students to attribute their performance to their efforts, leading to increased motivation and engagement in subsequent learning activities (Maier, 2021). Providing direct feedback in the context of mastery learning can positively impact student perception and engagement, although it does not always lead to significant improvements in grades (Trevino & Cavazos, 2018).

In addition, the active involvement of lecturers in the feedback process makes students feel more confident and directed so that this activity does not run alone without direction. According to Nurkhamidah et al., (2024) and Gehringer (2017), instructors guide students in providing constructive feedback, which improves their writing and critical thinking skills. Lecturer support also helps create a collaborative and supportive learning atmosphere. Although there are still a small number of students who feel doubtful or dissatisfied, this can be related to individual experiences or suboptimal group dynamics. However, in general, because peer feedback is carried out with a structured approach and supported by lecturers, most students feel the results are positive. Peer feedback can also improve the teaching effectiveness of lecturers, as shown in a study where lecturers received constructive feedback, which significantly improved their presentation skills (Ruesseler et al., 2014). Riyadi et al. (2025) further clarify that lecturers create a safe environment where students feel comfortable exchanging feedback, which can ease their anxiety and help boost their assurance. This atmosphere

can be approved by accelerating respect, empathy, and constructive criticism (Goold, 2016).

Although most students responded positively to implementing peer feedback, other results showed that some students still felt challenged. As many as 60% of students admitted having difficulty giving and receiving feedback, indicating that this process did not go smoothly for all parties. These difficulties can be caused by awkwardness, uncertainty in delivering constructive criticism, or fear of offending friends. Feedback is often perceived as judgmental, leading to defensiveness and rejection by the recipient (Shinners, 2014) and decreasing motivation if not delivered in a constructive and specific way (Mardhiyah et al., 2024). On the other hand, 40% of students felt that they did not experience these obstacles, indicating that most had started to get used to it and could go through this process more openly. Many students felt unsure about their ability to provide constructive feedback, which can lead to hesitation in conveying their thoughts (Cendani & Purnamaningwulan, 2023). Receiving feedback, especially criticism, can trigger a defensive response, making it difficult for individuals to accept and act on their feedback (Kuang et al., 2019).

These findings align with research conducted by Husband & Nikfarjam (2022) and Hošpesová et al. (2022), who stated that peer feedback can improve conceptual understanding and encourage active involvement in the learning process. The second study highlighted that peer feedback acts as an evaluation tool and a means of consideration that allows students to think critically about their and others' work. In addition, effective feedback from instructors also contributes to improved learning outcomes, highlighting the importance of clear communication and guidance (Singh, 2019). Implementing diverse feedback strategies, including multimedia and self-feedback, can create an easy learning experience and promote academic success (Ruiz-Primo & Brookhart, 2017). This finding aids the results of this study, which shows that most students feel the benefits of peer feedback, both in improving mastery of the material and developing analytical thinking skills. When done correctly, peer feedback helps students learn from each other and boosts a more collaborative, reflective, and meaningful learning process.

CONCLUSION

Peer feedback in mathematics learning was received very positively by most students. This process has proven effective in improving conceptual understanding and mastery of mathematics materials, with active support from lecturers being essential to facilitate and direct feedback activities. Peer feedback has created a more collaborative and reflective learning pressure while hopeful students to be more actively involved in the learning process. Thus, implementing structured peer feedback fully supported by lecturers can improve the quality of mathematics learning more significantly. Future research is recommended to investigate the implementation of structured peer feedback that is actively supported by instructors and integrated with the effective use of technology to examine its impact on learning effectiveness and students' skill development.

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