

tutors can be more flexible in conveying material according to the wishes of friends to participate in learning activities more effectively, because students or students will be more flexible in managing learning time, learning objectives and targets for mastery of the expected material (Hastari, 2019).

The same thing according to Ahdiyati (2014), the peer tutor method is a vehicle for discovery and concept development, in the learning process there is interaction between one student and another student in solving problems given by the teacher, resulting in an attitude of researching, creative, diligent, Collaboration, critical, tolerant, objective, responsible, honest, disciplined and original (Novidianti et al., 2021). Learning with the peer tutor method helps friends with low abilities (Jediut & Madu, 2021). In peer tutoring, students who are basically embarrassed to ask lecturers or teachers with these conditions can have the courage to ask questions about information submitted by lecturers that are not understood with the help of friends as tutors and motivational providers in asking questions.

The question posed by the student is a process of cognitive conflict that arises in the student where the initial abilities possessed by the student cannot accept the new information received resulting in a conflict process. With a group of peer tutors, some students feel embarrassed when asking the lecturer, but with a group of peer tutors, they will have the courage to ask questions and if these questions cannot be discussed between their groups, the team leader will represent the questions to the lecturers. So that conflicts that occur will be straightened out by lecturers and will avoid misconceptions (Hasanah, 2023). With such a process, the learning objectives or understanding and problem solving will soon be overcome.

Solving the problems given will soon be resolved by students with low, high, and moderate abilities with cognitive conflicts. Cognitive conflict is a condition where there is conflict with students' cognition. Conflicts occur because of differences in the initial conceptions that students have with their learning experiences. Cognitive conflict occurs when their mental balance is disrupted because their experience does not match the current conditions (Verawati, 2020).

The current condition presented by the lecturer is a problem related to solving integral functions of fractional powers. Based on observations in class during the learning process of class IF A Afternoon University Main Potential integral material with the topic of integral

functions of fractional powers students looked confused. The reason for their confusion is why do you give fractions exponents, how do you subtract fractions and the concept of numbers as denominators. At the time of presentation of the material there were some students with high levels of initial ability who felt there were no problems and no questions, but for medium ability levels there were lots of questions and complaints about the questions the lecturer gave, on the grounds that the lecturer gave questions that were not the same as the examples given. For students with low ability levels, they just stay silent and whisper among their friends, not understanding what to ask the lecturer. The examples of questions given to students are as follows:

$$\int \frac{1}{(3x+2)^{\frac{5}{3}}} dx \quad \text{dan} \quad \int \sqrt[3]{x^2} dx$$

Figure 1. Fractional Integrals and Root Forms

In fact, for students with high initial abilities and when learning about exponents of fractions and roots, mastering the concepts of fractions and roots, questions like the example above are not that difficult. However, in reality, students who choose the Informatics major, who think that there is no Informatics major for mathematics material, is a very wrong thought, where in general students do not really like learning mathematics. So that their initial abilities when studying Mathematics II were not fulfilled so that for this material students experienced many obstacles or even did not know at all (Indana Lazulfa1 et al., 2020). This means that when learning their attitude and motivation there are no comments and no questions. Therefore, so that there is cognitive conflict between students with low initial abilities during learning, there needs to be a place for these students to ask questions about how to solve the problem correctly, by providing space for discussion (Lukman et al., 2021) guided by a lecturer where friends act as tutors and explain to them things they don't understand and master about solving integral fractional powers and root forms. The solution that is applied during learning is the cognitive conflict strategy (Siagian et al., 2023)

Cognitive conflict strategies in this study include: 1) identifying the current state of student knowledge; 2) confronting students with conflicting information; 3) evaluate the degree of conceptual change between students' initial ideas or beliefs by conducting a posttest after the instructional intervention (according to Hewson).

(Verawati, 2020). Conceptually, the cognitive conflict strategy in the peer tutor model is presented in Figure 2 below,

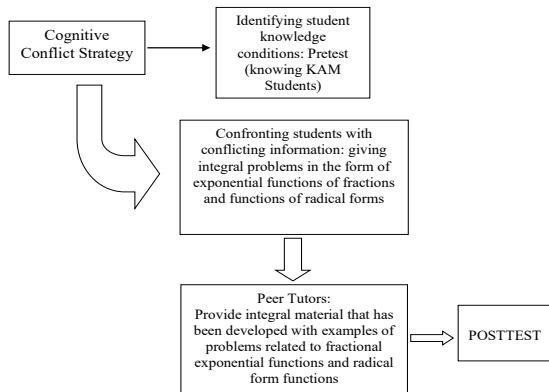


Figure 2. Cognitive Conflict Strategy Concept Map

The steps for the Peer Tutor model include:

- 1) Choose material that is easy for students to understand, namely integral material with functions of fractional powers and functions in the form of roots that have been developed by giving examples that have been described in detail in fractional power operations.
- 2) Divide students into small heterogeneous groups with 3-4 members. Students who are good at tutoring in each existing group.
- 3) Give material to each group with sub-sub-materials.
- 4) Give them sufficient time to prepare both inside and outside the classroom.
- 5) Each group delivers material according to the tasks that have been given and the lecturer acts as a resource person.
- 6) After each group conveys its tasks sequentially, the lecturer concludes and clarifies for student submissions that need to be straightened out if there is an inappropriate understanding (Purwantati, 2018).

Based on the problem analysis that has been formulated, the aim of this research is to see how much influence cognitive conflict strategies in peer tutor collaborative learning have on individual mathematical problem solving abilities. The benefit is that students who feel embarrassed when asking about misconceptions in the material discussed will be more open, because of the collaboration of peer tutors. so that the misconceptions that students face can be resolved and have an impact on each student's problem solving abilities.

2. Research Method

This study used qualitative and quantitative methods to examine and analyze in depth the effect of peer tutoring with cognitive conflict strategies on collaborative mathematics

completion and its effect on individual learning outcomes, using data triangulation techniques (observation sheets, interviews, and questionnaire results). This study also used test instruments, questionnaires, observation sheets, field notes, interview guides and learning tools. The tests developed included an initial mathematical ability test (KAM) and a final posttest learning test. The test instrument in the form of a description test has previously been tested for validity, discriminating power, level of difficulty, and test reliability index. The learning tools developed are lecture program units (SAP), student worksheets (LKM) and mathematics teaching materials II. The research design is The One -Group Pretest -Posttest Design (Lestari, K.E dan Yudhanegara, 2015) and is shown as Table 1 follows,

Table 1 Research Design

O ₁	X ₁	O ₂
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Source: Modification (Lestari, K.E dan Yudhanegara, 2015).

Information:

- O₁ = Pretest
- X = Peer Tutor Model Treatment with Cognitive Conflict Strategies
- O₂ = Posttest

The population in this study were all students of Informatics at the University of Main Potential in semester II who had a Mathematics II course. The sampling technique is purposive sampling (sample aims) meaning that this sampling has a specific purpose (Santina et al., 2021). The aim is to find out how big the differences in students' abilities are in solving integral problems of fractional powers and root forms by solving them in collaboration with previous abilities (Firmansyah & Dede, 2022). The posttest data obtained were tested for normality and homogeneity, and the N-Gain Test was also carried out. Subsequent data analysis used the one sample t test. This is in line with research (Rozana et al., 2020). The alternative hypothesis proposed is the average student learning outcomes after applying the peer tutor model with a cognitive conflict strategy of more than 75.

3. Finding and Discussion

After implementing the peer tutor model with cognitive conflict strategies in solving mathematical problems in collaboration, a posttest was carried out independently and data was obtained. The data were tested for normality

and homogeneity then the N-Gain test was carried out and presented in Table 2 below,

Hasil penelitian disajikan dalam bentuk grafik/tabel atau deskriptif. Analisis dan interpretasi hasil ini diperlukan sebelum dibahas.

Tabel dibuat hanya dengan menggunakan garis horisontal. Jika tabel lebih dari satu baris dituliskan dalam spasi tunggal. Sebagai contoh, dapat dilihat pada tabel 2 berikut.

Tabel 2. Table 2 Student N-Gain Results

N-Gain Index Range	Criteria	Result
$g > 0,7$	Tall	
$0,7 \geq g > 0,3$	Currently	0,50
$g \leq 0,3$	Low	

Based on the calculation of the N-Gain Index in Table 2 above, it can be seen that the result is 0.50, which means that based on the criteria, the increase in mathematical problem solving is classified as moderate, meaning that there is a significant influence of the peer tutor model with cognitive conflict strategies in learning mathematical problem solving collaboratively and effect on individual student learning outcomes. This is in line with research (Putra et al., 2019), (Ningrum, 2019), (Rusmini et al., 2020). Furthermore, after the data was tested with the N-Gain calculation, the data was also tested with a one sample t test and the results obtained presented in Table 3 below,

Tabel 3. One sample posttest t test

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
X	28	83.2143	5.73073	1.08301

Based on Table 3, it can be concluded that the results of the one sample t test show that the average of the student posttest is 83.2143 with a standard deviation of 5.73073 and a standard error of 1.08301, which means that based on the established hypothesis that $H_0 = 75$ so that the acceptance area is located at acceptance of H_1 and H_0 is rejected. Furthermore, for one sample t test values are also explained in Table 4 below,

Based on Table 4, it can be explained about the results of the one sample t test for test value = 75, then the tcount = 7.585 and the sig2-tailed value = 0.000. The test is carried out on the right side, so the P-value = $\frac{1}{2} \alpha$ the sig 2-tailed value or the P-value = 0.000. The criterion for testing the hypothesis is the P-value then H_0 is accepted and vice versa if the P-value then H_0 is rejected. Based on the results presented in Table 4, it can

be seen that the result P-value = 0.000 ($< 1/2\alpha$) means that the result area is at the rejection of H_0 and at acceptance of H_1 or there is not enough evidence to accept H_0 , in other words at the 95% confidence level the statement that the average yield individual learning and collaborative mathematical problem solving skills over 75 are acceptable.

Tabel 4. One sample posttest t test

One-Sample Test						
Test Value = 75						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
X	7.585	27	.000	8.21429	5.9921	10.4364

Furthermore, for the process of student answers when solving problems as well as conceptual errors that students have when solving integral functions of fractional powers are presented below,

$$\frac{5}{3} x^{\frac{5}{3}} + C$$

Figure 3 Student Answers Integral Rational Functions

The answer above shows that there is an error in the student's concept of the integral concept of functions in the form of roots or functions with fractional powers. The answer that needs to be clarified is the steps to solving the problem like the solution below,

The image shows a handwritten solution for the integral of a cube root function. The steps are as follows:

$$\int \sqrt[3]{x^2} dx = \int x^{\frac{2}{3}} dx$$

$$= \frac{1}{(\frac{2}{3} + 1)} x^{(\frac{2}{3} + 1)} + C$$

$$= \frac{3}{5} x^{\frac{5}{3}} + C$$

$$= \frac{3}{5} x \sqrt[3]{x} + C$$

Figure 4. Solving the correct integral form of the root problem

The correct solution can be seen in Figure 4 above, but students do not easily understand the process that occurs from these answers for students who have low initial abilities and do not have the courage to ask the real concept to the supervisor (lecturer). So the conflicts that occur with students about the information they have with the latest information provided need something that can bridge so that mistakes in solving simple problems for those who are able but difficult (not simple) for those with low and medium abilities. Peer tutors are a place so that students' feelings of embarrassment can be solved regarding solving the wrong problem (Fuadi et al., 2018). Lecturers can provide sub-material with details on how to get answers and steps for completion by exploring the concept of exponential fractions and combining it with the concept of exponential integrals. One way is to provide an overview of the solution as shown in Figure 2 below,

$\int 4x^{\frac{1}{2}} dx \Rightarrow$ fokus: $\frac{1}{2} + 1 = \frac{1}{2} + \frac{2}{2}$
 atau dgn jalan $= \frac{1+2}{2}$
 pintas:
 artinya pembilang ditanyai oleh penyebut.
 berarti $1+2 = \frac{3}{2}$
 dan menyisakan angka 2 sebagai penyebut: $\frac{3}{2}$
 Jadi integral $\int 4x^{\frac{1}{2}} dx =$
 Jawab:
 $= \frac{4x^{\frac{3}{2}} + \frac{3}{2}}{\frac{3}{2}} + C$
 $= \frac{4x^{\frac{3}{2}} + \frac{3}{2}}{\frac{3}{2}} + C$
 $= \frac{8}{3} x^{\frac{3}{2}} + C$

Figure 5. The steps for solving the correct problem

Based on Figure 5, it can be seen how the process of raising the rank of fractions is obtained so that the results are in accordance with what the supervisor wants. However, it can be seen that the numbers at the rank are different, but the concept is the same, so it is expected that there will be a little conflict among students. For those with high abilities there is no problem, but for those with low abilities they will definitely be confused even though there are already similar examples. This is where the function of peer tutors is to align and unify the concepts they have. Furthermore, the lecturer can also provide other examples in several ways so that they can be an option for students to complete according to their abilities, as shown in Figure 6 below,

Untuk bentuk:
 $\int 9\sqrt{x} + 5\sqrt{x^3} + 1 dx$
 I. fokus: $9\sqrt{x} = 9x^{\frac{1}{2}} = 9x^{\frac{1}{2}}$
 maka $V =$ penyebut $\frac{1}{2}$
 II. fokus:
 $\int 9\sqrt{x} = \int 9x^{\frac{1}{2}} dx$
 $= 9x^{\frac{1}{2} + \frac{1}{2}} + C$
 $= 9x^1 + C$
 $= \frac{9}{2} x^2 + C$
 } posisi dibalik pembilang jadi penyebut
 $= \frac{9}{2}$ menjadi $\frac{2}{9}$ sehingga
 $= \frac{2}{9} \cdot 9x^2 + C$
 $= \frac{18}{9} x^2 + C$
 $= 2x^2 + C$ } diubah kembali dalam bentuk akar
 $= 2x^1 \sqrt{x} + C$ } x^1 berasal dari $x^{\frac{1}{2}} : 2$

Figure 6 Correct problem solving

Based on Figure 6, it can be explained several ways to change and technically calculate the integral form of the exponential form and how to return the form of the exponential form to the original root form function after the function is integrated. This really needs peers to explain to their friends personally the understanding they have with new information. If the lecturer is expected to explain in detail, it means that the lecturer has to do back learning and it takes a long time and students who already understand will feel bored (Hanifah Hafni Hasibuan, 2016). So the best alternative is to study the peer tutor model with cognitive conflict strategies by providing sub-sub-material that has been developed by the lecturer with previous material so that it is hoped that students will understand more independently during discussions.

In addition to data based on posttest results, data from questionnaires and interviews with representative students were also obtained. These representatives were selected based on lecturer observations during the learning process where students who looked so stressed and busy asking questions to their friends but based on study habits with other methods these students never asked. Furthermore, the second choice is students who usually ask questions frequently and have moderate initial abilities. The third choice is students who have never asked questions but their initial ability is high or good. Furthermore, based on observation, it was also seen how the learning process was carried out and data triangulation was carried out from several sources, both based on the results of calculations and the hypotheses proposed so that it could be concluded from the whole that learning with the peer tutor model with a cognitive conflict strategy where the acceptance area is at H1 acceptance, namely that the average value of student learning outcomes or posttest >

75 compared to the pretest results there is an increase. This is an indication that there is a significant influence of the peer tutor model on collaborative mathematical problem solving and individual learning outcomes. This is in line with research (Ramlan, 2014).

4. Conclusion and Suggestion

Based on the background and discussion of the research results, it can be concluded that with the peer tutor model with cognitive conflict strategies, students can solve mathematical problems collaboratively and have a significant effect on student mathematics learning outcomes. Furthermore, with the peer tutor model, student learning motivation becomes better. This means that students who are embarrassed to ask about the wrong things about understanding the concept of material on integral functions of fractional powers can be straightened out. Based on these conclusions, the authors feel that the peer tutor model with cognitive conflict strategies can be used as a reference for learning with other materials. But something certainly has less value, so the author hopes that for readers who make this paper as a reference for their research, it will certainly be better if there are improvements to make it even better.

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