Students’ attitude towards the implementation of six-questions cognitive model on fraction

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Abstract. This study aims to analyze students’ attitudes towards the implementation of the six-questions cognitive model in teaching fractions. Samples in this study were taken in elementary school, Cianjur, Indonesia. The method of this study is a quantitative method by giving questionnaires to 44 elementary school students. The questionnaire amounts to 15 items about the six-questions cognitive model in teaching fractions. Data questionnaire was analyzed using Microsoft excel and SPSS 19.0. The study showed that percentage Students’ attitude towards implementing the six-questions cognitive model in teaching fractions was 78.03%. This proved that most of the students have a positive attitude towards implementing the six-questions cognitive model on fractions. The results of attitude data analysis also showed that the average student attitude was 3.12 larger than 2.5. This proves that students prefer the teacher to use the six-questions cognitive model on fractions than the traditional method. In further research, the six-questions cognitive model can be used on other mathematical topics.

1. Introduction
The aim of mathematics lessons in school is for students to get deep learning [1], [2]. Deep learning is students' ability to think and reflect and solve students' problems [3]. Deep learning indicators can also be seen from high-order thinking [4], [5], recall, knowledge transfer and attitude. From this point of perspective, Prof. Zhou Ying from Guangxi Normal University developed six-questions cognitive model. The six-questions cognitive model aims to focus on teaching students to get deep learning. The six-questions cognitive model consists of 6 parts which can be seen in Figure 1.

The six-questions cognitive model has been implemented in several studies to help students understand mathematics theories [6], [7]. These researches are lesson study and experiments on the six-questions cognitive model, improving students' mathematical understanding ability. The six-questions cognitive model can help teachers explain difficult math concepts to students [8]. Systematic thinking on the six-questions cognitive model makes it easy for students to understand mathematics material and get deep learning and increase students' mathematics high-orderer thinking skills [9]. Previous research has shown the effect of the six-questions cognitive model on students’ mathematical ability but has not shown students’ attitude towards the six-questions cognitive model. This research will take this opportunity to develop further research on the six-questions cognitive model.
The six-questions cognitive model is adopted from the 4-MAT, and it was developed by Prof. Zhou Ying. This model is a new learning model that is very flexible and can be used to explain various mathematical materials. The six-questions cognitive model can not only be used for mathematics lessons but can be used in other subjects. As a new learning model, the six-questions cognitive model received many responses from students. The investigation result shows that students' responses can be a measuring tool, whether this 6-question cognitive model is feasible or not. If students gave a positive response towards the model, we could say that six-questions cognitive model can be used and can be developed further. Students' response can be in the form of student learning outcomes. For example, how they feel towards the teacher's learning model, student attitudes during teaching and learning activities.

In this study, the researcher used an adapted questionnaire to see students’ attitude towards the six-questions cognitive model. This research can be used to evaluate the six-questions cognitive model to be developed better and an example of a model that teachers can use in schools to encourage students to get deep learning.

2. Method
The population in this study is from a school in Cianjur, Indonesia. The samples are 44 3rd grade students that are randomly chosen to participate in this research. This type of research uses a survey method [10]. Survey method is a method used to collect data or information from respondents. Researchers distributed questionnaires to students containing 15 questions about six questions on the cognitive model in teaching fraction. In this study, there were 15 questionnaire items about students’ attitudes towards six-questions cognitive model on fractions using a Likert scale.

Indicators for assessing student attitudes towards six-questions cognitive model consist of:
- students’ interest in learning fraction
- students' responses towards learning fraction with six questions cognitive
- students’ motivation towards learning fraction
- students’ preference for learn fraction using the six-questions cognitive model
- students’ responses to teaching and learning activities using the six-questions cognitive model
- students’ responses to the role of teachers in explaining fraction using the six-questions cognitive model

Furthermore, these items can be seen in table 1.
Table 1. Questioners about the six-questions cognitive model on fractions.

| No  | Statement                                                                 |
|-----|---------------------------------------------------------------------------|
| 1   | I don’t want to learn fraction                                            |
| 2   | I like fraction material so much                                          |
| 3   | Fraction material is not useful for my daily life                         |
| 4   | When the teacher is teaching fraction, I usually feel anxious             |
| 5   | fraction material is quietly boring                                       |
| 6   | fraction is important for me and useful in our daily life                 |
| 7   | I’m very curious about fraction                                           |
| 8   | The six-questions cognitive model has motivated to learn fraction         |
| 9   | Learning fraction with the six-questions cognitive model was very interesting |
| 10  | Learning fraction with the six-questions cognitive model has motivated me to learn much more about mathematics |
| 11  | The topic of fraction with the six questions cognitive model made me tired as mathematics are hard |
| 12  | I am very lazy to ask the teacher if there is material on fraction that I don’t understand |
| 13  | I want the six-questions cognitive model to be applied to other mathematical topics besides fraction material |
| 14  | I do not like learning fraction material with the six-questions cognitive model |
| 15  | I usually ask my teacher if there is fraction material that I don’t understand |

The questionnaire in this study was modified from the research of Rosyid A [11]. In Rosyid’s research, this questionnaire was used to examine students’ attitudes towards Missouri mathematics project. The results of the questionnaire were analyzed using quantitative descriptive methods. The data are interpreted based on the criteria which can be seen in table 2.

Table 2. Interpretation Criteria Percentage of Questionnaire about six-questions cognitive model.

| Criteria | Interpretation           |
|----------|--------------------------|
| 0%       | Nobody                   |
| 0% < X < 25% | A small part low      |
| 26% < X < 50% | Almost half adequate |
| 51% < X < 74% | Most of them good    |
| 75% < X < 100% | Almost all very good |

The questionnaire in this study uses a Likert scale. Correspondents answered the questionnaire Strongly Disagree, Disagree, Agree, Strongly Agree. The researcher directed students to fill out the questionnaire carefully and with honesty. After the students filled out 15 questionnaire items, the research data were processed using SPSS 19.00. If the questionnaire results show a percentage above 51%, the student's attitude towards the learning model using the six-questions cognitive model is good and can be implemented in other subjects.

3. Result and Discussion
The analysis result of students’ attitude towards six-questions cognitive model on fraction is 78.03%. This shows that most students have positive attitudes towards the implementation of six-questions cognitive model on fractions. Researchers see students like the six-questions cognitive model because the six-questions cognitive model has good learning steps. It leads students to deep learning and helps students understand the basic concepts of fraction material. The average students' attitude is 62.4%, and when it is compared to the neutral attitude, which is 50%, it shows that students gave a positive response towards learning fraction using the six-questions cognitive model.
This study's results are in accordance with the research conducted by Cunhua [6] that the class that uses the new learning model is very attractive to students. Students feel that using new learning models makes it easy for them to master the basic concepts of fraction material. This can be seen in the student's statement "I want the six-questions cognitive model to be applied to other mathematical topics besides fraction material". Most students strongly agreed with this statement. The detailed data for each indicator is described below.

Table 3. Students’ interest in learning fraction.

| Questionnaire item | Type of questioner | Strongly Agree | Agree | Disagree | Strongly Disagree | Average |
|--------------------|--------------------|----------------|-------|----------|-------------------|---------|
| 2                  | Positive           | 20             | 17    | 7        | 0                 | 82.39%  |
|                    | 4 points           | 0              | 3 points | 2 points | 1 point | 3.30    |
| 5                  | Negative           | 0.00%          | 9.09% | 68.18%   | 22.73%            | 78.41%  |
|                    | 1 point            | 2 points       | 3 points | 4 points | 3.14    |

As shown in table 3, in the statement "I like fraction material so much” most students agree, and a small proportion of students disagree. This proves that using the six-questions cognitive model on fraction material makes students like fraction. Also, on the statement "fraction material is quietly boring” most students disagreed, and only four students agreed. This proves that six-questions cognitive model on fraction material increases students’ interest in learning about fraction material.

Table 4. Students’ responses towards six-questions cognitive model on fraction material.

| Questionnaire item | Type of questioner | Strongly Agree | Agree | Disagree | Strongly Disagree | Average |
|--------------------|--------------------|----------------|-------|----------|-------------------|---------|
| 4                  | Negative           | 0.00%          | 1     | 29       | 14                | 82.39%  |
|                    | 1 point            | 2 points       | 3 points | 4 points | 3.30    |
| 7                  | Positive           | 47.73%         | 31.82% | 20.45%   | 0.00%            | 81.82%  |
|                    | 4 points           | 3 points       | 2 points | 1 point | 3.27    |

Table 5. Students’ motivation towards learning fraction.

| Questionnaire item | Type of questioner | Strongly Agree | Agree | Disagree | Strongly Disagree | Average |
|--------------------|--------------------|----------------|-------|----------|-------------------|---------|
| 1                  | Negative           | 0.00%          | 8     | 24       | 12                | 77.27%  |
|                    | 1 point            | 2 points       | 3 points | 4 points | 3.09    |
| 3                  | Negative           | 2.27%          | 15.91% | 68.18%   | 13.64%           | 73.30%  |
|                    | 1 point            | 2 points       | 3 points | 4 points | 2.93    |
| 6                  | Positive           | 50.00%         | 22.73% | 15.91%   | 11.36%           | 77.84%  |
|                    | 4 points           | 3 points       | 2 points | 1 point | 3.11    |
| 8                  | positive           | 50.00%         | 25.00% | 20.45%   | 4.55%            | 80.11%  |
|                    | 4 points           | 3 points       | 2 points | 1 point | 3.20    |
Based on table 4, in the statement “When the teacher is teaching fractions, I usually feel anxious” most students answered disagree. They said that when the teacher explained the fraction material using six-questions cognitive model, learning became easier to understand and less difficult. In the statement “I'm inquisitive about the fraction”, most students answered strongly agree. The six-questions cognitive model can explain the fundamental concepts as well and in more detail. Can increasing students' curiosity.

Based on table 5 in the statement ”I don't want to learn fraction”, most students answered disagree because at the “from where” stage the six-questions cognitive model increased students' curiosity. Encourage students to learn more about fraction. In the statement ”Fraction material is not useful for my daily life”, most students answered disagree because the "what" stage in the six-questions cognitive model explained the relationship between fraction and students' daily lives. So that students feel that fraction is important science.

It can be seen in table 6, in the statement ”fraction is important for me and useful in our daily life” 77.84% (3.11) students answered strongly agree because after they heard the basic concept of fraction, students understood and wanted to study the fraction material seriously. The teacher also reminds students that fractions can be seen directly in daily life. In the statement ”six-questions cognitive model has motivated to learn fraction”, although the students' answers varied, most students still agreed because the "why" stage in the six-questions cognitive model directed students to master the fraction material.

### Table 6. Students' preference for learning fraction using the six-questions cognitive model.

| Questionnaire item | Type of questioner | Strongly Agree | Agree | Disagree | Strongly Disagree | Average |
|--------------------|--------------------|----------------|-------|----------|-------------------|---------|
| 9                  | Positive           | 16             | 23    | 5        | 0                 | 81.25%  |
|                    |                    | 36.36%         | 52.27%| 11.36%   | 0.00%             |         |
|                    |                    | 4 points       | 3 points | 2 points | 1 point | 3.25   |
| 10                 | Positive           | 12             | 24    | 8        | 0                 | 77.27%  |
|                    |                    | 27.27%         | 54.55%| 18.18%   | 0.00%             |         |
|                    |                    | 4 points       | 3 points | 2 points | 1 point | 3.09   |
| 14                 | Negative           | 0              | 9     | 23       | 12                | 76.70%  |
|                    |                    | 0.00%          | 20.45%| 52.27%   | 27.27%            |         |
|                    |                    | 1 point        | 2 points | 3 points | 4 points | 3.07   |

Based on table 6, the statement ”Learning fraction with the six-questions cognitive model was very interesting”, 23 students said they agreed and 16 students said they strongly agreed. This proves that the six-questions cognitive model does not bore students. In the statement ”Learning fraction with the six-questions cognitive model has motivated me to learn much more about mathematics” most students answered agree. ”What if it changes” in the six-question cognitive model explains the relationship between mathematics and other subjects. This makes students motivated to learn math better. In the statement ”I do not like learning fraction material with the six-questions cognitive model” 76.70% (3.07) students answered disagree. They say math is easier to understand.

Based on Table 7, in the statement ”Topic of fraction with the six-questions cognitive model made me tired as mathematics are hard” most students said they disagreed. They said six-questions cognitive model helped them to understand more about fraction. Students' answers to the statement ”I want the six-questions cognitive model to be applied to other mathematical topics besides fraction material” agree and strongly agree. They said The six-questions cognitive model can help them understand other math material.
### Table 7. Students' responses to teaching and learning activities using the six-questions cognitive model.

| Questionnaire item | Type of questioner | Strongly Agree | Agree | Disagree | Strongly Disagree | Average |
|--------------------|-------------------|----------------|-------|----------|-------------------|---------|
| 11                 | Negative          | 1              | 5     | 26       | 12                | 4.55%   |
|                    |                   | 4.55%          | 25.00%| 59.09%   | 11.36%            | 69.32%  |
| 13                 | Positive          | 10             | 29    | 5        | 0                 | 2.27%   |
|                    |                   | 25.00%         | 56.82%| 18.18%   | 0.00%             | 76.70%  |

### Table 8. Students' responses to the role of teachers in the six-questions cognitive model on fraction.

| Questionnaire item | Type of questioner | Strongly Agree | Agree | Disagree | Strongly Disagree | Average |
|--------------------|-------------------|----------------|-------|----------|-------------------|---------|
| 12                 | Negative          | 1              | 5     | 26       | 12                | 2.27%   |
|                    |                   | 2.27%          | 11.36%| 59.09%   | 27.27%            | 77.84%  |
| 15                 | Positive          | 10             | 29    | 5        | 0                 | 22.73%  |
|                    |                   | 65.91%         | 11.36%| 0.00%    | 77.84%            | 3.11    |

In Table 8, it can be seen that the students' answers in the statement "I am very lazy to ask the teacher if there is material in the fraction that I don't understand" is disagreeing. The six-questions cognitive model can make complex material easier for students to master. In the statement "I usually ask my teacher if there is fraction material that I don't understand", 65.91% of students agreed. This shows that students dare to ask questions about fraction material if students do not understand it.

Based on the research result, the six-questions cognitive model is feasible as it receives positive responses from students. Furthermore, the six-questions cognitive model can help teachers explain complex mathematical material\[6\]–\[8\], \[12\], help students to get deep learning and increase high-order thinking ability. This is in line with Lin’s research which stated that six-questions cognitive model could help to improve students' learning outcomes \[9\]. The result of this study indicates that the six-question cognitive model can be used in the teaching-learning activity.

### 4. Conclusion

Teaching and learning activities should focus on basic mathematical concepts. The six-questions cognitive model can help students get deep learning, help students understand the basic concepts on fraction material, and improve students' high-order thinking skills. Based on the research result, it can be seen that students like the six-questions cognitive model and have a positive attitude towards the six-questions cognitive model. In further research, research on the effects of the six-questions cognitive model on students' mathematical abilities can be carried out. Suggestion for future research is using the six-questions cognitive model to see students’ high order thinking skill.

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