Inquiry learning in practice: it’s impact on understanding the concept and motivation of visual impairment students

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Abstract. Visual impairment students have limitations on the use of visual abilities, so they are difficult to learn physics that requires the role of active sense of sight. Therefore, students with visual impairment need a model and learning media that can maximize their sense of touch and hearing. Thereby strengthening understanding concepts, and the motivation of learning physics. The purpose of this study to determine the impact use from inquiry learning model to understand the concept and motivation of visual impairment students. The advantage of Inquiry learning are can trains students to discover their own concept obtained from the experience that they gained. This research design is action research to improve the conceptual understanding and motivation of the students. Data collection techniques used observation, interviews, and questionnaire given. The data analysis used qualitative descriptive method. This study was conducted for three meetings. The results of this study made the students became active, the concept understanding and motivation became increase. Its indicates that the model of inquiry learning that given in this research had a positive impact to impairment students.

1. Introduction

Children with special needs, have the right to attain education, both informal and formal including students with visual impairment [1,2]. The visually impaired students have limitation on the sense of sight, so they are difficult to learn and to understand the materials of science, especially physics that requires visual ability. The visual ability of students with visual impairment is disrupted, hence method and media adapted to their circumstances are needed [3]. One of the learning model that is suitable for their circumstances and activate the students is inquiry learning. The advantage of Inquiry learning are can trains students to discover their own concept obtained from the experience that they gained. The real experience that students acquire during the learning process can improve students’ conceptual understanding, so the concept obtained can last long in the students’ brain memory [4,5].

Inquiry steps can be used to build concepts that are adapted to the students’ ability. Inquiry learning trains the students to learn actively so as to foster students’ self-confidence and conceptual understanding. In practice, observation activity in the inquiry method is replaced with both groping and listening activities. The existence of group discussion activities while learning takes place, helps students become active, and curiosity becomes increased so as to understand a given concept [6,7]. Therefore, inquiry learning method is needed to generate visually impaired students’ activeness, conceptual understanding, and motivation based on the consideration of their limitations. The steps of inquiry learning can be observed there are presenting questions or problems, making hypotheses,
planning experiments, carrying out experiments, collecting and analyzing data, and making conclusions [8]. The focus of this study is to determine the impact of inquiry learning on understanding the concept and motivation of physics learning towards students with visual impairment.

2. Method
This study used action research design to improve students’ conceptual understanding [9]. The study was conducted in SLB A Dria Adi Semarang, consisted of two students as the subject study. The inquiry learning assisted with props of this study was conducted for three meetings with the materials of solar system, especially solar eclipse and lunar eclipse. Data collection techniques used observation, interviews and questionnaire. Pretest and posttest questions were given to the students at each meeting to measure the improvement of student’s conceptual understanding [10]. Data analysis technique is qualitative descriptive.

3. Results And Discussion
The learning system for the students with visual impairment is similar to that of normal students in general, but the difference is the time of each subject is five minutes earlier than that of public school. Basically, the IQ (Intelligence Quotient) of the students with visual impairment can be said normal and can be equated with normal students, even some students with visual impairment have above average IQ [11,12].

S-01, one of students of SLB A Dria Adi Semarang, suffers total blindness at birth, while the classmate, S-02 suffers low vision. At the time of initial observation, these two students had quite striking differences in class. S-01 was more often drowsy when she was given an assignment, she often forgot to accomplish it. Unlike her classmate, S-02, he was more active when he was given a lesson and more diligent to do the assignment. The way of their learning is different, S-01 with all of her limitations can only use slate and stylus, while S-02 can use pen and paper, but the font size is much larger that is 40 points. Based on interviews with both of them, the similarity of these two students is they prefer to type on laptops that uses JAWS applications than write on paper using stationery as well as slate [13].

At the initial meeting, students could only imagine the learning objects such as earth, moon, and sun according to their own imagination. Students were given a hypothesis using balls to select which objects are the sun, the earth and the moon by the size. The balls used as the real representation of the three objects. Initially, the students did not know the shape of the sun, the earth and the moon. However, with that representation, students finally got the actual imagination on their minds. At the time of group discussion activity, students gathered information. Students tried to find out the answers of the questions on the group discussion sheet by using the props and by listening and groping. After the group discussion activity and props using, their concepts about the sun, the earth and the moon became more in line with the actual situation, including the heat they felt that came from the sun. Students knew that the biggest from the solar system is the sun, the earth rotates on its axis called rotation, and it is the cause of the occurrence of day and night, as shown in the activity in Figure 1.

At the second meeting, that explain from the figure above, the student learning activity start doing research using the props and has been going in accordance with the existing time, the result its also allocation on the Table 1 [14]. Students were taught about the phenomenon of lunar eclipse. S-02 had already known the lunar eclipse because he had been taught about it at elementary school, but S-01 had never been taught about lunar eclipse. The given lesson emphasizes the ability of other senses in students with visual impairment, students can identify the characteristics of the earth, the moon and the sun by the sense of touch and hearing to gain information based on Figure 1. The students were very solemn as they heard the material narrated by the props in the form of sound. The lessons are done longer and must be repeated when using the props, in order to construct students’ conceptual understanding based on what they touch and hear so as to achieve a balance level at the equilibrium point in their understanding [15]. When students touched the heat emitted from the sun property
hitting the earth property so that it did not get to the moon because it was covered by the shadow of the earth, students knew the position of the three props in a straight line, that is the illustration when the total lunar eclipse occurs.

Figure 1. Learning process using the props

At the third meeting, students had already understood the concept of total lunar eclipse. The lesson continued on the concept of solar eclipse and tidal phenomenon of sea water caused by impact of the eclipse. Initially, students knew that the concept of solar eclipse based on the position of the sun, the earth and the moon. Students were asked to communicate hypothesis related to the process of solar eclipse and to use modeling with the props to match the concept that they had understood. The modeling is using the balls and sorting them as in the concept of lunar eclipse. At the time of using the props, students could feel and touch the flow of heat radiated from the sun to the moon, so that it did not reach the earth surface because it was covered by the shadow of the moon. Students’ hands did not feel the heat in the core shadow. However, their hands felt heat in the diffused shadow slightly. Next, the lesson was followed by the concept of a total solar eclipse and the impact of tidal water generated from the eclipse. When the feedback was given to the students, they altogether concluded and described the position of eclipse occurrence.

Commonly, it was observed at each stage of the first meeting that students were still embarrassed to ask questions and express their opinions during the discussion. The embarrassment that occurred when students were expressing their opinions due to they never had been taught by inquiry learning assisted with solar and lunar eclipse props. At the next meeting, students had started to adapt to the learning model used, they had started to dare to express their opinions and ask questions to teacher [16,17,18].

3.1 Impact of Inquiry Learning towards Student' Conceptual Understanding

Scores on the results of the assessment of students’ conceptual understanding can be observed in Table 1. It shows the improvement of conceptual understanding related to solar eclipse and lunar eclipse, at the first meeting up to the last meeting. S-02’s pretest and posttest assessment improved after the third lesson. The results of S-01’s work is changing from one meeting to another meeting. Initially, S-01 did not show her understanding towards the concept given by the teacher. After inquiry learning assisted with props was given, her scores improved bit by bit at each pretest and posttest. In conclusion, there is a conceptual understanding improvement between S-02 and S-01 after being taught by inquiry learning assisted by eclipse props, observed from the acquisition of assessment scores achieved at each meeting. The data analysis result shows that inquiry learning can improve students’ understanding [19-20-21-22].
### Table 1. Students’ Conceptual Understanding Scores

|                | Understanding Scores | Achievement of Improvement |
|----------------|----------------------|---------------------------|
|                | Before CAR<sup>a</sup> | After CAR<sup>b</sup>     |
| S-01<sup>c</sup> |                       |                           |
| 1<sup>st</sup> Meeting | 4                    | 6                         | Improved |
| 2<sup>nd</sup> Meeting | 6                    | 7                         | Improved |
| 3<sup>rd</sup> Meeting | 7                    | 9                         | Improved |
| S-02<sup>c</sup> |                       |                           |
| 1<sup>st</sup> Meeting | 7                    | 7                         | Constant |
| 2<sup>nd</sup> Meeting | 7                    | 7                         | Constant |
| 3<sup>rd</sup> Meeting | 8                    | 10                        | Improved |

<sup>a</sup> Classroom Action Research
<sup>b</sup> Student 2
<sup>c</sup> Student 1

### 3.2 Impact of Inquiry Learning towards Students’ Motivation

The results of motivation questionnaire assessment of students with visual impairment can be observed in the summary Table 2.

### Table 2. Students Learning Motivation Scores

| No | Dimension                                | Indicator                                      | S-01 Before | S-01 After | S-02 Before | S-02 Latter |
|----|-----------------------------------------|-----------------------------------------------|-------------|------------|-------------|-------------|
| 1  | Desire and urge to be success           | Needs to learn                                | Y           | Y          | Y           | Y           |
|    |                                         | Like the challenge                            | Y           | Y          | Y           | Y           |
| 2  | Encouragement and needs in learning    | Desire to succeed                             | Y           | Y          | Y           | Y           |
|    |                                         | Discipline                                    | N           | Y          | N           | Y           |
| 3  | Aspirations and future hopes           | Good achievement on learning outcomes         | Y           | Y          | Y           | Y           |
|    |                                         | Achieve goals                                 | Y           | Y          | Y           | Y           |
| 4  | Award in learning                      | Obtain the maximum score                      | Y           | Y          | Y           | Y           |
|    |                                         | Be excellent                                  | Y           | Y          | Y           | Y           |
| 5  | Interesting learning activity          | Study diligently, because the learning activity is interesting | Y           | Y          | N           | Y           |
|    |                                         | Feel happy when taught using props           | N           | Y          | Y           | Y           |
| 6  | Conducive learning environment         | Conducive environment to study               | Y           | Y          | Y           | Y           |
|    |                                         | Socialize with friends at school              | N           | Y          | Y           | Y           |

Based on the analysis of student’s motivation questionnaire results, it can be found that there is a significant motivation change. S-02 which initially did not show the motivation to learn in doing the task, but after given the instruction inquiry he became more diligent, as well as S-02 attitude that S-02 is not active in learning to be more active in learning. It is the same with S-01, after getting learning with props, S-01 became more enthusiastic to learn. As well as in the process of group discussion, among students who were previously reluctant to ask a friend in the group, became more frequent to ask and discuss with each other, so they felt comfortable. From the above statement, it can be seen that students are more interested in joint discussions than individual assignments, and that their motivation improves [23-25].
4. Conclusion

Inquiry learning can improve students’ conceptual learning and motivation, those are proven by the process that initially did not know to know, and the students who were at first inactive changed active. This learning requires relatively longer time compared to the learning with lecture method. That because teacher and students have not used to do teaching and learning activities using inquiry learning.

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