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Understanding students' concepts through guided inquiry learning and free modified inquiry on static fluid material

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Abstract. This study provides information on understanding students' concepts in guided inquiry learning groups and in free modified inquiry learning groups. Understanding of student concept is reviewed on the concept of static fluid case. The number of samples tested were 67 students. The sample is divided into 2 groups of students: the group is given guided inquiry learning and the group given the modified free inquiry learning. Understanding the concept of students is measured through 23 tests of items about the concept of static fluid. The result of the students 'understanding of the guide inquiry learning is better than the students' understanding of the concept of free modified inquiry learning.

Keyword : guided inquiry, free modified inquiry,static fluid

1. Introduction

Static fluid is a substance or object that has a position in a state of silence or not moving. Components related to the static fluid relationship: Type mass is a measure of the density of an object, so it can be said, if an object undergoes a large density, it can be said to have a large density as well. Type mass is a measure of the density of an object, so it can be said, if an object undergoes a large density, it can be said to have a large density. Pressure (P) is the unit of physics to express the result of force (F) with Area (A), the unit of pressure used in measuring the strength of a gas object and a liquid. To be more succinct, pressure is the result of the force (F) and the cross-section (A) according to the equation $p = \frac{F}{A}$. Assuming, that the greater the force given the greater the pressure, but vice versa, if the cross-sectional area is large, the applied pressure will be small. If pressure varies in an area, we can evaluate very small dF forces on very small surface elements in area dA [1]. $dF = P\,dA$,where P is the pressure at the location of area dA. The pressure given by the fluid varies with depth. A liquid of density ρ at rest, when ρ is assumed uniform throughout the liquid; this means that the liquid is incompressible. A sample of the liquid contained within an imaginary cylinder of cross-sectional area A extending from depth d to depth d + h. The liquid external to sample

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exerts forces at all points on the surface of the sample, perpendicular to the surface. The pressure exerted by the liquid on the bottom face of the sample is P, and the pressure on the top face is P_0. Therefore, the upward force exerted by the outside fluid on the bottom of the cylinder has a magnitude PA, and the downward force exerted on the top has a magnitude P_0A. The mass of liquid in the cylinder is $Mg=\rho V=\rho Ah$; therefore, the weight of the liquid in the cylinder is $Mg=\rho Ahg$. The total Presure, $P = P_0 + \rho.g.h$. the pressure P at a depth h below a point in the liquid at which the pressure is P_0 is greater by an amount ρgh .

Hydrostatic pressure $(P_h) = \rho.g.h$,where is the pressure generated by an object or object undergoing gravity when in the fluid. Therefore, the amount of pressure produced depends on the mass of the fluid type (ρ), the acceleration of the earth's gravity (g), and the height of the fluid or the liquid (h). The larger the density of a liquid, the greater the hydrostatic pressure it produces, and if it gets deeper into the body of the liquid, the hydrostatic pressure generated increases.

Understanding students' concepts on static fluid materials still needs improvement. Students need to be directly involved in the investigation to find their understanding. According to the purpose of science education is to teach students about the nature of science where students must be directly involved in the investigation and produce products in the form of facts, concepts, principles, theories, and laws [2]. The essence of science consists of four elements: science as a process, science as a product, science as attitude and science as application. The nature of science can be obtained and developed, one of them is through the physics lessons at school. Guided inquiry learning based on the context of the problem, determining the problem and the stages of the solution, the teacher guides the students to do the activity by asking the initial question and directing to a discussion [3]. Physical Learning must be taught according to physical characteristics through direct measurement, the use of experimental methods, demonstrations and the elaboration of formulas. [4] Guided inquiry and modified free inquiry are the types of inquiry learning. Guided inquiry is a learning process that is overall activity carried out by students such as investigation planning, observation, analyzing, interpreting data, proposing answers, formulating conclusions and communicating, while educators play a role as motivators who direct and provide good guidance through procedures Complete or directive questions during the inquiry process [5]. Inquiry as a way of studying scientific problems in a real-life context [6]. Inquiry-based learning is effective for improving learning outcomes, student enthusiasm in following practice activities, and student attitudes in learning [7].

Based on the theoretical and factual studies, an investigation of the use of guided inquiry method and free modified inquiry method. The inquiry was to find out the level of understanding of the physics concepts between the groups of students in guided inquiry learning and free modified inquiry learning group.

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2. Method

The research method used in this research is experimental research. Research to determine differences in students' understanding of concepts through guided inquiry learning model and free modified inquiry about static fluid. A sample of 67 students divided into 2 groups. The sample was taken by cluster random sampling consisting of 2 classes of XI IPA SMA Negeri 1 Polokarto Lesson Year 2016/2017. The measurement technique of students' concept comprehension is obtained through a series of standardized static fluid concepts test. Problem test static fluid concepts as much as 23 items. The test results are used to analyze learning outcomes and understanding of student concepts.

3. Result and Discussion

The study was conducted in 2 groups of students, namely groups with guided inquiry learning and groups of students with free modified inquiry learning on static fluid materials. After learning in each class, then measurement of student understanding through concept comprehension test. Data on student learning outcomes obtained from student test results are presented in Table 1.

Table 1. Description of Student Achievement Learning Data Cognitive

Studets groups	Sample	Max Value	Min Value	Mean	Standard deviation
guided inquiry	34	91	57	74,3	9,31
free modified inquiry	33	96	52	71,7	12,7

Based on Table 1. Understanding the concept of students in groups of guided inquiry students gained an average of higher values than in modified free inquiry groups. This is indicated by the average score of the group of students in guided inquiry learning equal to 74.3 greater than the student group in free modified inquiry learning. So it can be concluded there is a difference understanding of student concepts through guided inquiry learning model with free modified inquiry. The analysis of results suggests that learning with guided inquiry learning because during it proces the students get guidance and direction from the teacher rather than the free modified inquiry. Students get guidance and teacher direction so it is easier to understand a physical concept of static fluid [8].

The result of understanding the concept of students in guided inquiry learning group obtained a better understanding. It is shown by the result of correct answer by the student (taken example of result of question number 4) shown in Figure 1.

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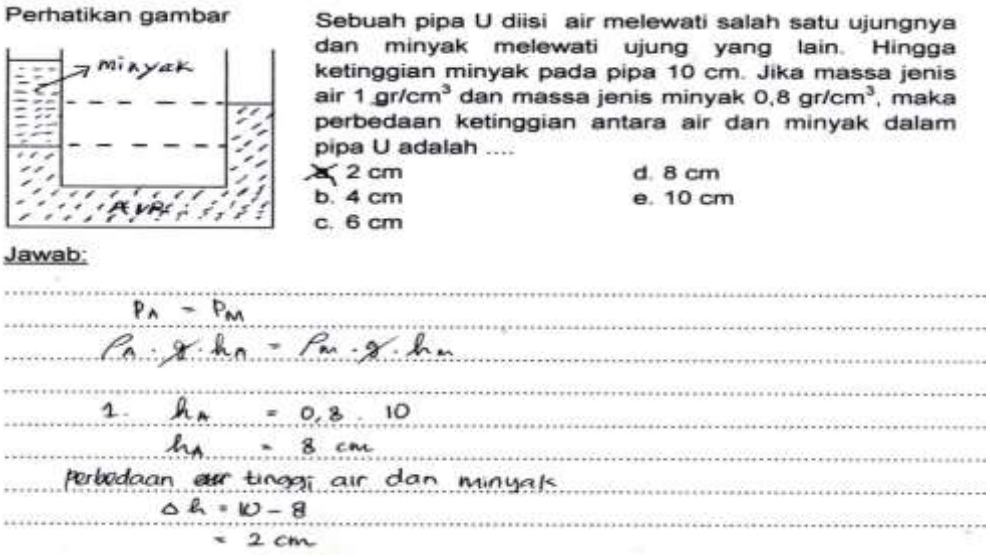

Figure 1. Results of correct answers of students

Based on Figure 1 the student's answer is known that the guided inquiry study group responded coherently in accordance with the theory's understanding. Different results are shown in the group of students in free modified inquiry learning. Most in the group answered the problem with the wrong understanding. The student's wrong answer is shown in Figure 2.

Based on Figure 2, some students directly apply the hydrostatic pressure equation to get the answer. Though it should be necessary to further examine the differences in water and oil levels. Students are also fooled at the choice of answers that there are results according to student count. The readiness of students' inadequate understanding leads the students without further thinking to analyze the problem [9].

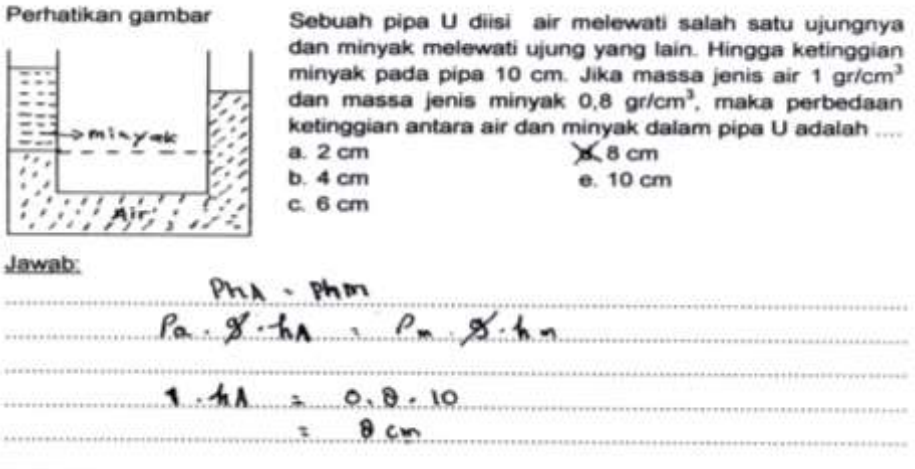

Figure 2. Results of incorrect answers of students

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4. Conclusions

Based on the result of the discussion, it can be concluded that there is a different understanding of student concept through guided inquiry learning model with free modified inquiry. The results of students' concept understanding on the concept of static fluid group learning with guided inquiry led to better outcomes than the group of students on learning with free modified inquiry. In the application of learning inquiry requires good preparation related to the willingness of learning materials and learning infrastructure facilities. Detailed directions for students are needed so that students can analyze the concept resolution more closely.

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