Prediction of Teachers And Prospective Physics Students Toward High School Students' Difficulties In Solving Physics Problem

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***Abstract* -The aims of this research were to elicit and to describe teachers' and prospective physics students' prediction toward difficulties of high school students in solving physics problems. Participants of the research were two physics teachers, two prospective physics students six high school students. Student participants consisted of three categories, i.e: high, moderate and low in the ability to solve physics problems from a respondents' selection test. Data from the teachers and physics students were collected by interviews to predict the students' difficulties. Data from the students were collected by testing. The overall data were analyzed by applying a descriptive-qualitative approach. Results of the research showed teachers and physics students had similarity in making predictions toward the students' difficulties. Although, the predictions were not similar to the real difficulties of the students.**

Keywords: Prediction, the difficulty about physics, physics teacher, physics student teachers, high school students.

I. INTRODUCTION

The quality of education depends on the quality of a teacher [1]. Therefore, teachers must have knowledge of the ability of theoretical and practical knowledge, learning, and teaching [2]. A teacher should familiarize themselves with the knowledge possessed by students to assist students in learning. Teachers need to understand the theory of conceptual change experienced by students in the learning process. Teachers also need to know the process of assimilation and adjustment to the concept in order to avoid conceptual changes between what students know and instructions given by the teacher or by Piaget called the model "optimal mismatch". An understanding of the knowledge of the concepts or ideas about the difficulties that are owned by the students, especially in the context of physics is also very important. Based on the conception and the difficulties that are owned by students, teachers get to plan the task to design the desired cognitive conflict [3].

Ref. [4] studied the physics assessment difficult issues between experts and beginners. The results showed that ratings matter expert difficulty is more accurate than the beginner in making judgments. The difference in accuracy between the expert and the beginner is influenced by experience. However, there is no explanation of the reasons used by beginners to make judgments about the difficulty of physics problems as the reasons used by the experts.

Ref. [5] asked students and instructors to scale the difficulties on kinematics and energy-effort questions on a scale of 1 to 10. Students were also asked to determine the level of violence against the problems and solve them. They found that students and instructors had many similar predictions, but differed in sub-questions. The predictive predictions made by the instructor are strongly correlated with the students' performance in question and measure the complexity of the problem compared to the students.

Previous research has investigated the ability of a physics student in conducting predictions and found that students overestimate their own performance on the test, with overestimation clearer for low-performing students [6]. This may be due to more students to consider their own abilities and underestimated the difficulty of the problem on a test [7].

There is also a study using a cued recall task has been found that students using the assessment of learning and problem difficult to choose items for additional studies, focusing on items that are judged to be more difficult even without the pressure of time [8]. This strategy is generally formed of individuals who spend more time studying the problem, they tend to be more difficult to assess relearn item whose sequence has been determined [9], [10]. However, this strategy only applies to students who vote the issue difficulty trouble in tune with the normative acts [11]. However, this strategy only applies to students who vote the issue difficulty trouble in tune with the normative acts

Other research [3] discussed the importance of the teachers know the difficulties experienced by students. The study explores one of the components of pedagogical content knowledge graduate students. Content knowledge includes an understanding of the kinematics graph before they apply it in teaching. He found generally the better graduate students in identifying the difficulty of the test chart kinematics. undergraduate students can not identify common pitfalls to graphics kinematics.

The success of the teaching and learning process is determined by the learning management factor that enables the good teaching and learning process. Thus it is necessary to study the prediction of teachers and physics teacher prospective students against student difficulties. Prediction is done so that teachers as educators can understand or know the level of ability of students. Similarly, a physics student teachers can understand the difficulties students if work on the problems of physics and can hone pedagogical content teacher y.

This study was similar to that of [4]. The difference lies in the respondents involved. The study involved three groups of respondents (teachers, students, and students). Teachers and student respondents were given an essay test and asked to predict the difficulties students could encounter. The student respondents worked on the problem.

II. METHODS

The type of research in this research is descriptive-qualitative research. The subject of this study using three groups of respondents, physics teacher, physics student teachers and students. The first respondent group is a physics teacher as much as 2 (Teacher A and Teacher B). Teacher A has about 15 years of service and Teacher B about 13 years old. Second, a physics student VIII half as much as two people who become Physics Laboratory assistant for 2 years (Student A and Student B). Third, Class XI student as much as 6 out of 21 people who follow the Test Selection of Respondents (TSR). Selected student respondents based on categorization can be seen in Table I.

TABLE 1. RESPONDENTS STUDENTS WERE SELECTED FROM THE TEST SELECTIONRESPONDENTS BY CATEGORY

No.	Respondents Code	Category	New Code
1	RM 007	High	ST-1
2	RM014	High	ST-2
3	RM 010	Medium	SS -1
4	RM 021	Medium	SS-2
5	RM 013	Low	SR-1
6	RM 017	Low	SR-2

Data The collection of data through the provision of an essay test as much as 5 numbers and semi-structured interviews. Tests given to teachers and physics teacher candidates are not to be done. They are asked to predict the difficulties students may experience during the skimming of the essay. The student respondents were given the same test to do. Furthermore, the data were analyzed using qualitative descriptive approach.

III. RESULTS AND DISCUSSION

A. Prediction student teachers

Predictions made by teacher A, in general, is a student will have difficulty understanding and applying the concept of equality in solving problems. The results of this prediction are consistent with the work of students in the high category based on the TSR. Students who fall into the category of high gain low yields did not even answer some of the questions provided. When viewed in terms of experience should the teacher better understand the level of student ability based on the experience long enough to be an educator. However, results obtained from predictions made by Teacher A do not occur in students who have moderate and low categories.

Predictions made by teacher B is common to all categories of students but is dominant to students who have a lower category. These predictions are not in an all-too-complete manner with the results obtained from the student's work. Prediction only occurs on the number one, three and four. It should enable teachers to determine the ability of students to meet the problem as it has been given.

The results of both teachers in predicting student difficulties in solving physics problems are still far from the results expected by researchers. Experience teaches that for a long time should be able to make teachers better understand the character and abilities of students. Teachers should also be able to predict what difficulties students will experience in working on the problem regardless of student work.

B. Student to student prediction

Prediction made by student A to student's difficulties in solving physics problem happened in all categories of students. The prediction only occurs in question number two about determining the normal style. Predictions made by student B occur in high-calibrated students (ST-1) from previous TSR results. Based on the findings, found that the predictions made by different students with the work of the students. In terms of experience, students do not have teaching experience compared to teachers. Students who were respondents in this study were students who had been a physics laboratory assistant basic one and two. They also are students who have good grades in an elementary physics course and microteaching. It is enough to help students in making predictions of how the students' difficulties when solving the problem despite not having experience of teaching directly in front of students.

Summary results of the prediction of teachers and student teachers of physics based on the theme as well as the difficulties experienced by the students and the suitability of the prediction in this study can be seen in Table II.

The results of this research different from the results of research conducted by [4]. Ref. [4] studied about the assessment of physics problem difficult between experts and beginners. Research results show that the assessment of severity of the problem by experts is more accurate than the starters. The difference in accuracy between expert and novice influenced by experience. Similarly, a study conducted by [5] asked undergraduate students and instructors to rate the difficulty of kinematics and work energy questions on a scale of 1 to 10. In addition, students were asked to rate the

familiarity of the problems and to solve the problems. They found that while students and instructors were similar in many of their predictions, they differed on a subset of questions. Overall they were unable to discern a pattern to explain the difference in difficulty ratings but did note that students rated context-rich problems as easier than instructors for work-energy problems, but not for kinematics problems. Further, the difficulty predictions made by instructors correlated more strongly with student performance on the questions and to measures of problem complexity than did the student predictions.

Results of this research show that the prediction of teachers and students have same to predicted the student's difficulties in solving physics. It is a contrast to the results of research conducted by [4], [5]. The result of the research shows that the expert and the instructor is more accurate compared to beginners and students. Supposedly that is happening in this research, teachers were more dominant in making predictions in terms of experience both in teaching and solving for students in this study is used as the respondents are students of the teacher respondents. This suggests that teachers do not understand and know the ability of students in solving problems. Based on the results obtained as well, it appears that the predictions trouble does not occur to some respondents, especially on respondents SS-2 and hardship always occur on the respondents ST-1.

TABLE II. SUMMARY OF PREDICTIONS TEACHERS AND STUDENT TEACHERS OF PHYSICS BASED ON THE THEME AS WELL AS THE DIFFICULTIES EXPERIENCED BY STUDENTS AND SUITABILITY PREDICTION

No.	Problem	Teacher Prediction (TP)	Students Prediction (SP)	Students Difficulty Generally	Suitability Prediction	
					TP	SP
1	Voltage Rope Force	Students will have difficulty to determining the acceleration due to connecting it with gravity and do not know the formula	Students will have difficulty determining the direction of tension straps and do not know how to determine the acceleration	students are confused how to operate the formula tension straps despite knowing the formula	0	0
2	acceleration of System	students have difficulty determining the acceleration and operate formula	student difficulty in drawing the system, analyze the problem and determine the formula	Erroneous When do problem despite knowing the formula used	0	0
3	determining the Normal force	students difficulty determining the force resultant and specify two normal style	students will be difficulties when not understand the picture and determine normal two styles	Confused determine two normal force	1	1
4	Braking force	students difficulty to link the GLB formula and uniformly accelerated motion as well as when students do not understand the formula	students had difficulties determining the force resultant, look for the kinetic and static friction coefficient and the determination of the GLB formula or uniformly accelerated motion	Most students do not know the formula uniformly accelerated motion	0,1	0,1
5	Specifying the Objects Accelerate	Students difficulty understanding the concept by reviewing the two objects and pull objects.	Students determine the tension rope and do not know the formula	of students confused the formula acceleration of the object because there are two things that are reviewed	1	1

Description:
0 = incorrect
1 = correct
0,1 = partly correct

The second difference respondents (ST-1 and SS-2) are very prominent, can be caused is not only of the student ability level but rather how teachers deliver the lessons. Whether or not students understand the material being taught by a teacher not only sticking to a particular student. Therefore, a teacher should familiarize themselves with the knowledge possessed by students to assist students in learning. Therefore, the importance of the teacher to know concepts or ideas about the difficulties that are owned by the students, especially in the context of physics. If students are motivated by the existing anomalies, will create a cognitive conflict in students that illustrate the concepts that are inadequate in explaining the new situation they encountered, resulting in students not satisfied with the concept that they have today. The teacher should be aware of the concept and the difficulties that have by students own so that teachers can plan the task to design a desired cognitive conflict [3]. In addition, teachers or student teachers in making predictions supported physics of pedagogical knowledge possessed to manage the learning from the plan until the assessment of learning. Thus, the ability to make predictions by teachers and student teachers of physics not only

in the review based on the experience but also assisted with pedagogical knowledge possessed.

IV. CONCLUSIONS

Results and discussion show that the prediction of teachers and students to the difficulties in solving physics students have same, though there are differences in some context prediction. Student work when adjusted on the predictions made by teachers and students found that overall predictions do not occur in students.

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