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PROFILE OF STUDENTS' CONCEPTUAL CHANGE ABILITIES IN MOTION MATERIAL

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Abstract

This research aims to describe students' conceptual change abilities. This research uses a descriptive method. The research subjects were 22 students at MA Alkhairaat Biromaru class X MIPA. The research instrument uses 5 concept questions about relative motion, distance and displacement, GLB, GLBB and GJB with 1 question each. The N-Gain test carried out on the concept change test showed that there were differences in resultspretest andPosttest based on test N-Gain is 65.23% in the medium category. Conceptual Change Capability of the pra concepts constructed by students from the experience gained, most of which are not in accordance with scientific concepts. From the 5 items regarding concepts about movement, it can be seen that the students' pretest results (pre-concept abilities) are still very low. To carry out the process of changing students' preconcepts, it is necessary to use an approach or learning model that involves the process of Assimilation and Accommodation in the learning process, because changing students' pra concepts requires a cognitive conflict that is able to convince students that their initial knowledge (pra concepts) has been constructed into knowledge. science can be replaced with correct and appropriate concepts.

Keywords: Capability Profile, Conceptual Change, Motion

INTRODUCTION

Natural Science Learning (IPA) is a systematic knowledge activity, which explains natural phenomena which contains a collection of facts,

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scientific methods and scientific attitudes whose main aim is to help students learn concepts and apply them to solve problems found in everyday life. -day.

In science learning activities, students are sometimes faced with differences in understanding between preconcepts that have been constructed as knowledge and actual concepts. Students often believe that inaccurate concepts or misconceptions are true knowledge. This misconception that occurs among students is one that can hinder the science learning process.

In dealing with the problem of misconceptions, a constructivist view is needed, namely the process of actively constructing knowledge, so that conceptual change will occur. In order for the conceptual changes process to be carried out, there must be 4 conditions, namely: (1) there is dissatisfaction with the concepts that students have; (2) the concept to be introduced must be understandable (intelligible); (3) the conception must be logically acceptable (plausible); and (4) the conception offered has an important role in solving problems (fruitful).

Conceptual changes present events or occurrences that make students feel dissatisfied with the concepts they have, because the concepts they have cannot be used to understand the material. The process of changing students' conceptions being replaced by correct concepts can take the form of two conceptual changes, namely weak changes where students accept new concepts/ideas/knowledge but have not thrown away their initial preconceptions. Cases like this allow students to experience misconceptions again in translating a case into everyday life outside of the concepts/ideas that have been conveyed. Furthermore, there is a radical change, namely that students have received new ideas/concepts through the process of assimilation and accommodation in the learning process so that the initial pre-concepts that were constructed can be replaced with correct concepts.

To find out concepts that still have misconceptions as material for students' conceptual changes, it is necessary to carry out a conceptual change test (diagnostic test) in order to provide an accurate picture of the misconceptions experienced by students based on the mistakes students make and show how students think in answering questions. given even if their answer is wrong.

Thus, this diagnostic test is expected to be able to classify the profile of students' conceptual abilities in movement material. Based on the description above, a conceptual change ability profile analysis was carried out to find out the causes of misconceptions and determine follow-up actions to correct

misconceptions so that conceptual changes occur in students in understanding movement material.

RESEARCH METHOD

The method used in this research is descriptive method. The research subjects were 22 students at MA Alkhairaat Biromaru Class X MIPA. The research instrument uses 5 concept questions about relative motion, distance and displacement, uniform straight motion (GLB), 1 question each. Students were given an initial test, then the teacher carried out traditional learning for 2 weeks, then the researcher conducted a posttest to see changes in the concept.

Students' conceptual change ability scores are calculated using scoring techniques with corrections to the conceptual answers given by students according to the assessment guidelines. Drawing conclusions based on the N-Gain Test.

The calculation results obtained are then grouped by category in Table 1

Category	Score
Very High	80 < P ≤ 100
Tall	60 < P ≤ 80
Currently	40 < P ≤ 60
Low	20 < P ≤ 40
Very low	0 < P ≤ 20

Then, in the concept test results, students are classified into three groups, namely high, medium and low groups. Each group was randomly selected to be interviewed. The purpose of interviews is to see the consistency of students' understanding and check students' conceptual changes.

RESULT AND DISCUSSION

N-Gain test concept change test

The N-Gain test carried out on the concept change test showed that there was a difference in the preetest and posttest results based on the N-Gain test which was 65.23% in the medium category. The average difference for each item on the pretest and posttest results can be seen in table 2 below:

Table 2. Average Score for Preetest-Posttest Items

Question No	**Draft**	**Score**		**Gains (%)**	**Criteria**
		Posttest	***Pretest***		
1	Relative Motion	3,13	0,5	75,1	Tall

2	Distance and Displacement	5,41	1,04	73,3	Tall
3	GLB	2,65	0,59	46,7	Currentl y
4	GLBB	2,00	0,06	49,2	Currentl y
5	GJB	3,85	0,09	76,6	Tall

Interview result

Interviews are the most important part of this research because by conducting interviews researchers can obtain descriptions of the answers put forward by respondents and to confirm the respondents' answers. Apart from that, the researcher obtained clear information while convincing the researcher of the researcher's initial suspicions regarding the students' concepts and thoughts

The students who were used as respondents in this research can be observed in Table 3

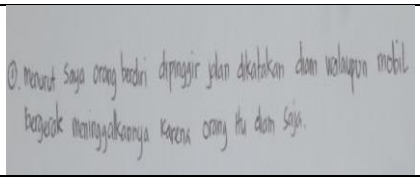
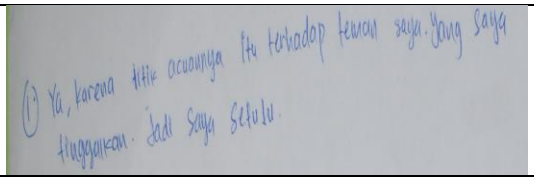
Table. 3 Respondent Codes and Categories

No	Code	Category
1	RESP-01	Low
2	RESP-21	Currently
3	RESP-11	Tall

Question Number 1

Question number 1 is about the concept of relative motion. The following is a transcript of the student interviews in table 4

Table 4. Interview Results for Question Number 1

Preetest	***Posttest***
	

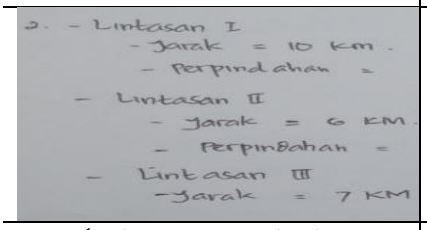
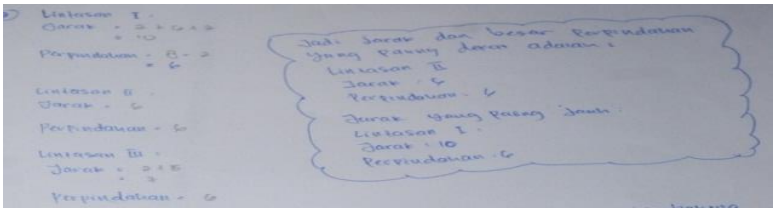
P : (Subjects are asked to read question No.1). Can you try to say in your own words the meaning of question No.1? R : <reading the question>In my opinion, a child standing on the side means the child is still, meaning he is not P : moving, even though the car is moving away. R : Question No.1 is related to P : what concept? < Pause > movement R : concept. What do you know about the concept of movement? Forgot sir.	P : (Subjects are asked to read question No.1). Can you try to say in your own words the meaning of question No.1? R : <reading the question> I think my friend is said to be moving even though he seems to be standing still on the side of the road but the car is moving away from my friend so there is a change in the distance between the car and my P : friend. For example, if I say that the friend standing on the side of the road is not moving, do you think R : you agree with that statement? In my opinion, Sis, the child can be said to be moving because the car is moving. P : What if the car is stationary? <Pause> means that the child is said to not move R : because there is no change in position or distance. For example, a car is heading in the same direction as a child standing on the side of the P : road, then the car moves closer to the child, when it passes (faces) the car with the child, is it R : said to be moving? P : <Pause <confused> means that the object R : moves depending on its reference point. P : Question No. 1 What concept is this related to? R : Motion Concept. What do you know about the concept of movement? In my opinion, what moves changes position or distance depending on the reference point of the object.

Respondents' understanding regarding question no. 1 shows that Respondents Resp-01 Resp-21 and Resp-11 initially did not understand the concept of relative motion. The tendency to understand the concept of respondents 01, Resp-21 and Resp-11 assumes that an object is said to be moving if there is a force that moves the object which causes a change in the position of the object. This pre concept is not completely correct. In the concept of motion, there is what is called passive motion, where the object is stationary but the reference point is moving or what is usually called apparent motion. The pattern of thinking shown by respondents shows an Aristotelian mindset.

Question Number 2

Question number 2 is about the concept of distance and displacement. The following is a transcript of the student interviews in table 5

Table 5. Interview Results for Question Number 2

Preetest	*Posttest*
	
P : (Subjects are asked to read question No.2). Try saying in your own R : words the meaning of question No. 2? <pause for a moment><read the question and look at the picture> based on this picture, I think the P : distance of the first R : track is 10 km, the second track has a P : distance of 6 km, a distance of 7 km. R : How is the transfer done? The displacement is the same as the distance. P : Do you think distance R : and displacement are P : the same? <Pause for a moment> It's the same, because if R : I walk 1 meter forward that means my displacement is also 1 meter. Question No. 2 is related to what concept? Distance and displacement Can you explain the	P : (Subjects are asked to read question No.2). Try saying in your own words the meaning of question No.2. R : <pause for a moment><read the question and look at the picture> I think the distance of the first track is 10 km and the displacement is 6 km. The second route has a distance of 6 km and a displacement of 6 km. The third track has a distance of 7 km and a displacement of 6 km. Do you think distance and displacement are vector or scalar quantities? P : <Silence for a moment> if distance is a scalar quantity, if displacement is a vector quantity. R : What are vector and scalar quantities? P : A vector quantity is a quantity that has a value and also R : has a direction, Sis, whereas a scalar quantity only has a P : value. What about the size of the movements of the three R : groups? Is it the same or different? <pause for a moment><pay attention to the results of your work> with Sis. The displacement is 6 km. Based on this picture, the starting position and final position of the three groups are the same, namely from the office P : to the field. So automatically the displacement is the R : same. P : Question No. 2 is related to what concept? Distance and displacement concept R : Can you explain the concept of distance and displacement? Distance is the length of the path traveled by an object without paying attention to the direction of motion, whereas displacement is a change in the position of an object. Which only depends on the initial and final position of the object.

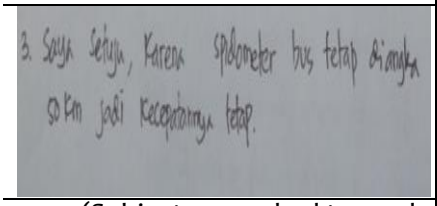
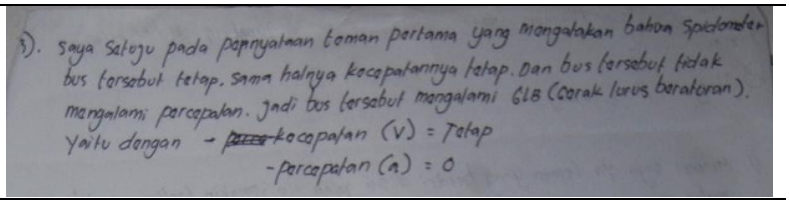
	concept of distance and displacement? Distance and displacement are the same because they both measure the distance a moving person or object moves.		

Respondents' understanding regarding question no. 2 shows that Respondents Resp-01, Resp-21 and Resp-11 initially did not understand the concepts of distance and displacement. According to Resp-01 and Resp-11, distance and displacement are the same, while Resp-21 says that distance and displacement are the same, but Resp-21 cannot show the difference between distance and displacement correctly, only distinguishing based on the definition of distance. and displacement. Apart from that, respondents were not able to indicate the quantities referred to in terms of switch and vector quantities. From the results of the interviews, it was found that respondents' preconceptions showed similarities in distance and displacement, if the point change only changed at one point and on a straight trajectory, if the trajectory was changed in the form of a geometric shape, most respondents had misconceptions in perceiving distance and displacement.

Question Number 3

Question number 3 is about the concept of uniform straight motion (GLB). The following is a transcript of the student interview in table 6

Table 6. Interview Results for Question Number 3

Preetest	***Prosttest***
	
P : (Subjects are asked to read question No.3). Can you try to say in your own words what question No. 3 means? R : <pause for a moment><reading the question> The vehicle's speedometer shows the speed at which the motorbike is moving, because for 10 minutes there has been no change in the speedometer indication so the speed is P : constant. So I agree Question No. 3 is related to R : what concept? <pause> Speed P : Can you explain the concept of speed? R : <pause> I don't know, sir.	P : (Subjects are asked to read question No.3). Can you try to say in your own words what question No. 3 means? R : <reading the question> the bus speedometer shows that the speed has not changed for 10 minutes by showing the number 50 km/hour, so the bus speed remains the bus speed remains because there is no acceleration that P : increases the bus speed. Why do you answer that you disagree with your friend's opinion when they say the bus is accelerating but the R : acceleration is constant? <pause> I agree because the speed of the bus remains 50 km, nothing increases or decreases the speed so the P : acceleration remains the same but has a value of zero. R : Question No. 1 is related to what concept? P : <pause> GLB R : Can you explain the concept of speed? <pause> GLB is uniform straight motion with constant speed and acceleration equal to zero

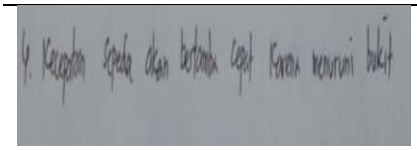
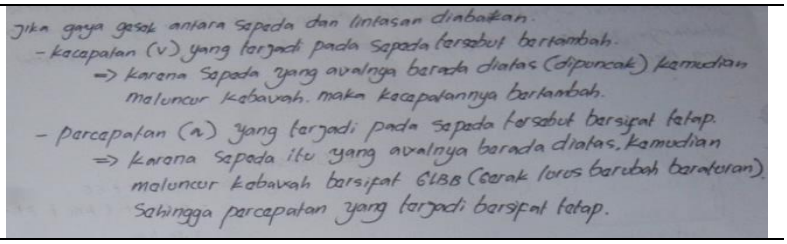
Respondents' understanding regarding question No.3 shows that Respondents Resp-01, Resp-21 and Resp-11 initially did not understand the concept of GLB. Respondents do not know what speed is, acceleration. Respondents tend to interpret speed and acceleration as the same.

Question Number 4

Question number 4 is about the concept of relative motion. The following is a transcript of the student interviews in table 7

Table 7. Interview Results for Question Number 4

Preetest	***Posttest***

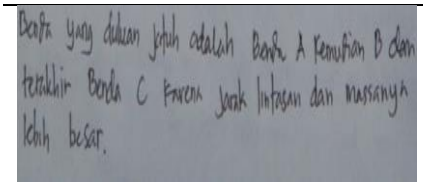
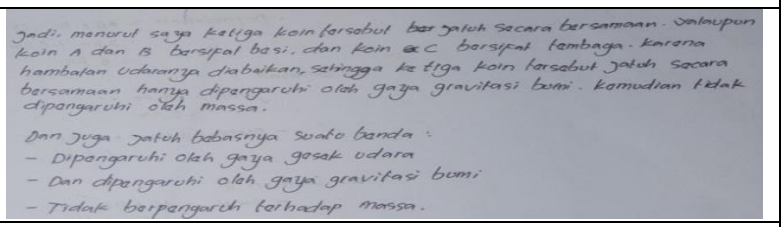
	
P : (Subjects are asked to read question No. 4). Can you try to say in your own words what R : question No. 4 means? <Pause for a moment> <reading the question> the bicycle's acceleration increases as it goes down the hill. Because the acceleration increases, P : the bicycle's speed increases, becoming R : faster. Question No. 4 is related P : to what concept? <Pause> <look at the question> I don't know R : Question No.4 includes uniform rectilinear motion or uniformly P : changing rectilinear motion? R : <Pauses a moment> <looks at the question> the straight motion turns into a uniform one, perhaps sir. Can you explain the GLBB concept? <pauses> <looks at the question> I don't know, sir	P : (Subjects are asked to read question No. 4), Can you try to say in your own words what question No. 4 means? R : <pause for a moment><reading the question> The child's bicycle speed increases and the acceleration P : remains constant. You mentioned that the Speed increases, the acceleration remains the same. What is the value of the R : change in speed and acceleration? <pause for a moment>the speed continues to increase and the acceleration is not equal to zero or greater than Zero, but the change is unchanged or constant, meaning the acceleration is constant but not equal to P : Zero and greater than Zero so that the object R : experiences acceleration, not deceleration. P : Question No. 4 is related to what concept? R : GLBB Sir. Can you explain the GLBB concept? <pause> GLBB is the motion of an object in a straight path that experiences an increase or decrease in speed and the acceleration remains constant.

Respondents' understanding regarding question no. 3 shows that Respondents Resp-01, Resp-21 and Resp-11 initially did not understand the GLBB concept. Respondents do not know what speed is, acceleration. Respondents tend to interpret speed and acceleration as the same.

Question Number 5

Question number 5 is about the concept of relative motion. The following is a transcript of the student interviews in table 8

Table 8. Interview Results for Question Number 5

Preetest	***Posttest***
	
P : (Subjects are asked to read question No. 5). Can you try to say in your own words what question No. R : 5 means? <Pause> <reading the question> In my opinion, the coin that will reach the floor first is the heavier P : coin, namely the iron coin. What about the R : acceleration of the two balls? The acceleration of iron coins is greater than P : aluminum coins, because R : iron coins are heavier than aluminum coins. P : What about the length of the track? R : The shortest path reaches P : the floor first. Question No. 5 is related R : to what concept? Falling object concept Can you explain what falling object you mean? Heavier objects will fall to the floor more quickly than light objects	P : (Subjects are asked to read question No. 5). Try saying in your own words the meaning of question No. 5 R : <pauses> <reads the question> the three coins fall at the same time, because they are only influenced by the force of gravity. The magnitude of the gravitational force acting on the three coins is the same, namely 10 P : m/s2, so they fall simultaneously. R : What about the mass and path length of the coin? Mass does not affect the speed of a falling object. If the path length of C is different from that of coins A and B, coin C will get an initial speed that is not equal to zero in the form of a push because coin C is thrown while coins A and B do not have avalanche speed of zero. So it all P : falls at the same time. R : Question No. What concept do these 5 relate to? P : The concept of free fall, sir. R : Can you explain what falling object you mean? If objects are placed at the same height and dropped at the same time, what influences their speed to the bottom is the air friction force and the earth's gravitational force.

Respondents' understanding regarding question no. 5 shows that Respondents Resp-01, Resp-21 and Resp-11 initially did not understand the concept of free fall motion, they thought that objects with greater mass

would reach the surface more quickly than lighter objects, this mindset who belongs to Aristotelian thinking.

CONCLUSION

The ability to conceptual changes (conceptual changes) of preconcepts constructed by students from the experience gained is largely not in accordance with scientific concepts. From the 5 concept questions about movement, it can be seen that the students' pretest results (pre-concept abilities) are still very low. To carry out the process of changing students' preconcepts, it is necessary to use an approach or learning model that involves the process of Assimilation and Accommodation in the learning process, because changing students' preconcepts requires a cognitive conflict that is able to convince students that their initial knowledge (preconcepts) has been constructed into knowledge. science can be replaced with correct and appropriate concepts.

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