

# Remediation of Science Misconceptions Through Modification of Concept Attainment Model

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**Abstract:-** This Paper describe the science conception profile of 5th grade students before, after remediation of science misconceptions through a modified concept attainment model. This is a pre-experimental one group pretest posttest design. This Paper was developed following the 4-D model development research design (Define, Design, Develop, and Disseminate). The developed learning instructional of science misconceptions remediation through modification of the concept attainment learning model has been validated by experts. The validation results state that the learning instructional can be applied. Validated learning instructional were tested on 5th grade students of SDN Gunungsari I / 484 Surabaya. With a total of 30 students. The results of limited trials show that remediation of students' misconceptions, which was originally 88.33% of students experiencing misconceptions, has dropped to 12.67%. Based on that result, remediation of science misconception in the 5th grade can be done through a modification of the concept attainment learning model.

**Keywords:-** Misconception, Science, Concept Attainment Model, Remediation, Primary School, Concept Profile.

## I. INTRODUCTION

This paper describes the conception profile of students who understand concepts, do not understand concepts, lack understanding of concepts, or who experience misconceptions in learning science in 5th grade elementary school. Remediation is also done to reduce the number of students who experience misconceptions. Remediation of misconceptions is done through modification of the concept attainment model. The concept attainment learning model was developed to teach key concepts that serve as a foundation for students to think at a higher level. This model is not designed to convey most of the information to students, but instead conveys certain key concepts to students.

### ➤ Concepts, Conception, Preconceptions and Misconceptions

Sciences is an attempt to understand the universe through targeted observations to get a conclusion that is classified into three parts, products (facts, concepts, principles), processes, and attitudes (Susanto, 2013). Science as a product faces many obstacles in its implementation, in this case the application of concepts, especially at the elementary school level. Problems with the

application of these concepts include the occurrence of misconceptions on several concepts in learning science in elementary schools.

According to Ibrahim (2012) Students form an understanding of events or natural phenomena that occur in the surrounding environment before they learn it in school. This initial understanding or initial concept that students have is called preconception. The initial understanding of students or the initial concepts possessed by students is generally less than perfect or incomplete and does not always correspond to the concepts agreed upon by the experts, this causes misconceptions or misconceptions.

Generally, science learning activities in elementary schools do not consider the initial concepts that students have, so what happens is that students are given the concept directly without considering the initial concept or preconception they already have. The initial concept of students with the actual concept that they get from learning activities in school is not necessarily the same or appropriate, if the initial concept possessed by students is not in accordance with the actual concept obtained from learning activities in school then this does not cause significant problems, with words Other preconceptions among students will change when they are taught the actual concepts. According to Ibrahim (2012), if the initial concept (preconceptions) of students is not easy to change, and these students always return to their initial concept even though it has been introduced to the correct concept, it is called a misconception (misconception).

Ibrahim (2012) states, good science learning should be able to actively construct the formation of initial concepts that students have had with new concepts learners learn. Understanding this concept is very important for students and even for everyone including the teacher. This is evidenced by the inclusion of an understanding of the concepts in the curriculum of each level of education. In the learning process, according to Taber (in Canada, 2017) students build their own knowledge as an iterative process, where new concepts or ideas need to understand the conceptual framework they already have. When students learn, the students actually have done the activities to compile their initial concepts with the new concepts they have obtained, so that there is a web of concepts.

Students' misconceptions appear due to misunderstanding of a concept. Students who have misconceptions are very difficult to change their views of

certain concepts. Based on previous research, for example: (1) modification of the concept attainment model to change the Science conception of elementary school teachers (Ibrahim, 2018), (2) the implementation of the concept attainment model to teach concepts to Indonesian students (Ilyas, 2010), (3) development of instruments to diagnose misconceptions in students (Mujizatul, 2017), (4) strategies for treating misconceptions in students (Patemah, 2016). Shows that most students experience misconceptions.

In some studies that have been done before, it is known that some students experience misconceptions. Some of the scientific concepts that leading to misconceptions are: (1) photosynthesis, (2) Bugenville flowers, (3) frog amphibian animals, (4) bird characteristics, (5) mammal’s characteristics, (6) animal’s bodies are covered by feathers, (7) gravity, and (8) liquidity. Not all misconceptions are categorized as misconceptions, some may be preconceptions. Because there are still some students who do not understand the concept of science, some other students understand the concept but are not quite right so they experience a misunderstanding of the concept or misconception.

➤ *Modification of Concept Attainment Model*

The concept attainment model is the process of finding the most essential attributes of a concept learned through identifying and defining activities (Ibrahim, 2012). How to distinguish these attributes by given examples of concepts and examples of concepts that are not. Thus, the concept attainment model (CAM) is an inductive learning model designed to help students practice analytical thinking skills to learn concepts (Klausmeier, et al in Ibrahim, 2012).

Arends (2013) states that the concept attainment model can assist students in finding or getting concepts through inductive reasoning processes. Meanwhile, according to Kauchak and Eggen (2012) that the concept attainment models help students achieve learning objectives, namely to build and develop understanding of concepts and critical thinking skills.

Modification of the concept Attainment model that was developed by Ibrahim (2018) has 5 steps consisting of: (1) Probing, (2) Propose previous conception, (3) Observation, (4) Confirmation and Clarification, (5) Elaborate.

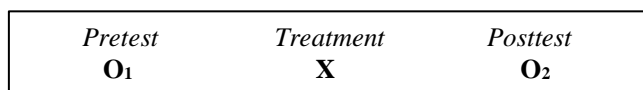
Stages	Stage Name	Purpose
1	<i>Probing</i>	Explores the initial conception of students by asking probing questioning
2	<i>Propose previous conception</i>	Get the conception formulation that is owned by students. This conception can be right or wrong
3	<i>Observation</i>	Test the truth of students' conceptions with facts from the field, for example, presenting examples
4	<i>Confirmation and Clarification</i>	Discuss, negotiate, and provide scaffolding of students' conceptions with facts shown to facilitate conceptual change in students
5	<i>Elaborate</i>	Showing additional evidence or facts to increase students' confidence in the truth or misconception they have

Table 1

**II. METHOD**

This Paper is a pre-experimental one grup pretest posttest design. The main purpose is to examine the effect of the modified concept attainment model on changes in students' Science conception using the 4D model without the disseminations` step. The study was conducted at SDN Gunungsari I / 484 Surabaya in 5th grade students of the 2019/2020 school year, totaling 30 students, consisting of 15 male students and 15 female students.

Trial of learning tools developed by one grup pretest posttest design (Sugiyono, 2012) is described in the following pattern.



The test instrument used in this study is the Three Tier Test instrument used to record students' conceptions. The Three Tier Test instrument consists of 10 items as described in Table 2 below:

No.	The Sciences Misconceptions	Concept Code
1.	Plants cook food on the leaves with the help of sunlight	Concept 1
2.	Photosynthesis only occurs during the day	Concept 2
3.	Plants take food from the soil through the roots	Concept 3
4.	In the Bougenville Flower the flower petal is shown by the wide, red, yellow, orange, or white part of the flower	Concept 4
5.	Frogs belong to the Amphibian group because they live in water and on land one after the other	Concept 5
6.	Characteristics of birds include being able to fly, have wings, beak and lay eggs	Concept 6
7.	Characteristics of mammals is having ears	Concept 7
8.	The body of cats, dogs, cows, is covered by fur	Concept 8
9.	Heavier objects, such as stones will fall faster than lighter objects such as cotton if dropped together from a height	Concept 9
10.	Liquid that are put into a bottle, Will changes its shape with the same shape of the bottle	Concept 10

Table 2:- The Sciences Misconceptions of 5th Grade Students

After testing using the Three Tier Test instrument, students' responses were recorded and categorized into five categories based on the adoption and adaptation of the Kutluay study (in Jauhariyah, et al., 2018) shown in Table 3 below.

<i>Phenomena (P)</i>	<i>Reasoning (R)</i>	<i>Confidence</i>	<b>Category</b>
<i>First Tier</i>	<i>Second Tier</i>	<i>Third Tier</i>	
True	True	Sure	Understand The Concept (UC)
True	True	Unsure	Less Understand The Concept (LUC)
False	False	Unsure	Do Not Understand The Concept (NUC)
False	True	Unsure	
True	False	Unsure	Guessing (G)
True	False	Sure	Misconceptions (M)
False	True	Sure	
False	False	Sure	

Table 3:- Combination of Three Tier Test Answers

**III. RESULT AND DISCUSSION**

Table 4 below is the result of the pretest and conception profile of students before treatment.

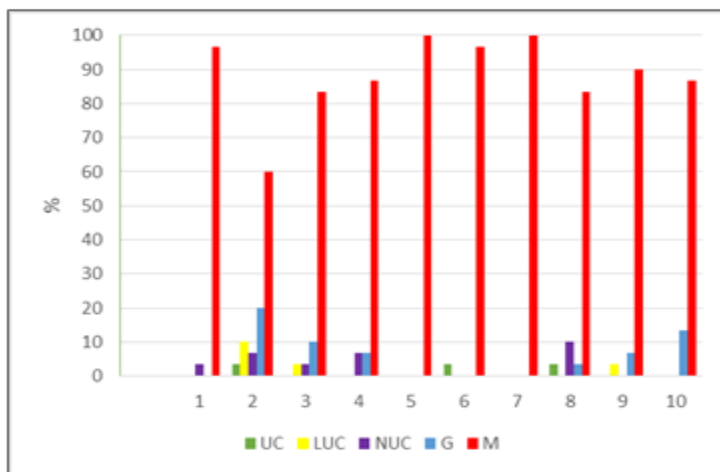
Students Code	Concept Number									
	1	2	3	4	5	6	7	8	9	10
1	M	M	M	M	M	M	M	M	M	M
2	M	M	M	M	M	M	M	M	M	M
3	M	G	M	NUC	M	M	M	NUC	M	M
4	M	M	M	M	M	M	M	M	LUC	G
5	M	M	M	M	M	M	M	NUC	M	M
6	M	M	M	M	M	M	M	M	M	M
7	M	M	M	M	M	UC	M	M	M	M
8	M	M	M	M	M	M	M	M	M	M
9	M	UC	M	M	M	M	M	M	M	M
10	M	M	M	M	M	M	M	M	G	M
11	M	M	M	M	M	M	M	M	M	M
12	M	M	M	M	M	M	M	M	M	M
13	M	M	M	M	M	M	M	UC	M	M
14	NUC	M	G	M	M	M	M	M	M	M
15	M	LUC	NUC	M	M	M	M	M	M	M
16	M	NUC	LUC	M	M	M	M	M	G	M
17	M	M	M	G	M	M	M	M	M	G
18	M	NUC	M	M	M	M	M	M	M	G
19	M	G	M	M	M	M	M	M	M	M
20	M	M	M	M	M	M	M	M	M	M
21	M	M	M	M	M	M	M	M	M	M
22	M	G	G	M	M	M	M	M	M	M
23	M	G	M	M	M	M	M	M	M	M
24	M	G	G	M	M	M	M	G	M	M
25	M	LUC	M	M	M	M	M	M	M	M
26	M	LUC	M	M	M	M	M	M	M	M
27	M	G	M	M	M	M	M	M	M	G
28	M	M	M	G	M	M	M	M	M	M
29	M	M	M	NUC	M	M	M	M	M	M
30	M	M	M	M	M	M	M	NUC	M	M
	UC	:	Understand The Concepts							
	LUC	:	Less Understand The Concepts							
	NUC	:	Do Not Understand The Concepts							
	G	:	Guessing							
	M	:	Misconceptions							

Table 4:- Students Conception Profile (Pretest)

Based on Table 4 above, you can describe the percentage of students' answer combinations in each concept number as in Table 5 and Graph 1 below

Concept Number	Combination of Three Tier Answer Categories				
	Understand the Concepts (%)	Less Understand the Concepts (%)	Do Not Understand the Concepts (%)	Guessing (%)	Misconceptions (%)
1	0 (0.00)	0 (0.00)	1 (3.33)	0 (0.00)	29 (96.67)
2	1 (3.33)	3 (10.00)	2 (6.67)	6 (20.00)	18 (60.00)
3	0 (0.00)	1 (3.33)	1 (3.33)	3 (10.00)	25 (83.33)
4	0 (0.00)	0 (0.00)	2 (6.67)	2 (6.67)	26 (86.67)
5	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	30 (100.00)
6	1 (3.33)	0 (0.00)	0 (0.00)	0 (0.00)	29 (96.67)
7	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	30 (100.00)
8	1 (3.33)	0 (0.00)	3 (10.00)	1 (3.33)	25 (83.33)
9	0 (0.00)	1 (3.33)	0 (0.00)	2 (6.67)	27 (90.00)
10	0 (0.00)	0 (0.00)	0 (0.00)	4 (13.33)	26 (86.67)
Average percentage	1.00	1.67	3.00	6.00	88.33

Table 5:- Combination of Students Answer Categories



Graph 1:- Combination of Student Answer Categories (Pretest)

Based on Table 4 and Graph 1 above, there are no students who understand the concept (UC) in concepts number 1, 3, 4, 5, 7, 9, and 10. Students' understanding of the concept of photosynthesis, bougenville flowers, frogs as amphibian animals, characteristics of mammals, falling object velocity and changes in the shape of liquid are still very weak. As for the category of Not Understanding the Concept (NUC), there are at most concepts 8, 4 and 2 namely the concept of a cat's body covered by hair, bougenville flowers and photosynthesis. Students do not understand the concept can be caused by students quickly forget what they have learned. Not understanding the concept can also occur because students do not pay attention to the learning process when the methods used by the teacher seem boring so there are some concepts that are not understood by students. Concept numbers 1, 4, 5, 6, 7, 8, and 10 are not included in the Less Understanding Concept

(LUC) category. This shows that there are no students who do not understand the concept. It also means that students unconfidently choose answers in the first and second tiers. Guessing Category (G) can be caused by students who do not understand the concept so that in addition to the students' answers being wrong in the first or second tier, the student is also unsure of the answer he chose. In the category of Misconception (M) shows that students experience misconceptions (misconceptions) almost in all the concepts proposed at the pretest. The highest misconception lies in concepts 5 and 7 which are about frogs as amphibian animals and the characteristics of mammals.

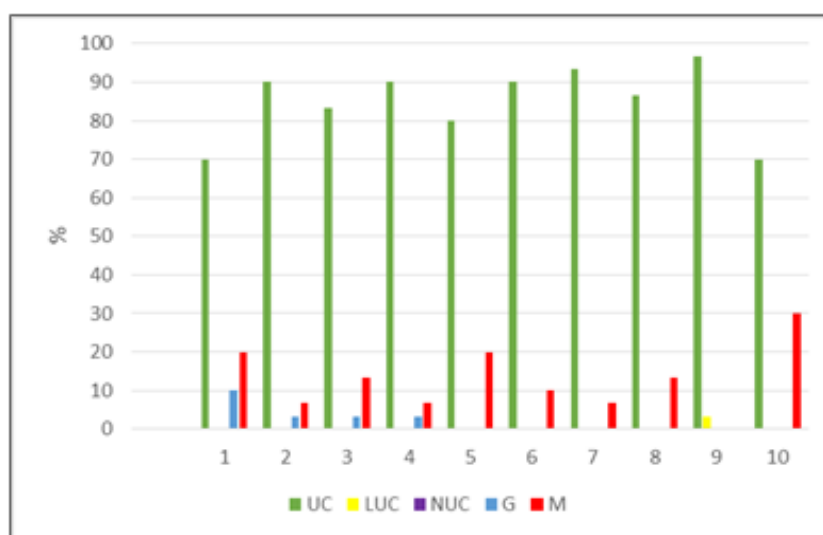
As for the results of the posttest and the conception profile of the students after treatment is presented in Table 6 below.

STUDENTS CODE	CONCEPTS NUMBER									
	1	2	3	4	5	6	7	8	9	10
1	UC	UC	M	UC	UC	UC	UC	UC	UC	UC
2	UC	UC	UC	UC	UC	UC	UC	UC	UC	M
3	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC
4	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC
5	UC	UC	UC	UC	M	UC	UC	UC	UC	M
6	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC
7	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC
8	M	UC	UC	UC	UC	UC	UC	UC	UC	UC
9	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC
10	M	UC	UC	M	UC	M	UC	M	UC	M
11	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC
12	M	UC	UC	UC	M	UC	M	UC	UC	M
13	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC
14	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC
15	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC
16	G	UC	UC	UC	UC	UC	UC	UC	LUC	UC
17	G	G	M	UC	M	UC	UC	M	UC	UC
18	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC
19	UC	UC	UC	UC	UC	UC	UC	UC	UC	M
20	UC	UC	UC	UC	UC	M	UC	UC	UC	UC
21	UC	UC	UC	UC	UC	UC	UC	UC	UC	M
22	M	M	M	M	M	UC	UC	M	UC	M
23	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC
24	G	UC	G	G	UC	UC	UC	UC	UC	UC
25	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC
26	UC	UC	UC	UC	UC	UC	UC	UC	UC	M
27	M	UC	M	UC	M	M	M	M	UC	UC
28	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC
29	UC	UC	UC	UC	M	UC	UC	UC	UC	M
30	M	M	UC	UC	UC	UC	UC	UC	UC	UC
	UC	:	Understand The Concepts							
	LUC	:	Less Understand The Concepts							
	NUC	:	Do Not Understand The Concepts							
	G	:	Guessing							
	M	:	Misconceptions							

Table 6:- Student Conception Profile (Posttest)

Concept Number	Combination of Three Tier Answer Categories				
	Understand the Concept (%)	Less Understand the Concepts (%)	Do Not Understand the Concepts (%)	Guessing (%)	Misconceptions (%)
1	21 (70.00)	0 (0.00)	0 (0.00)	3 (10.00)	6 (20.00)
2	27 (90.00)	0 (0.00)	0 (0.00)	1 (3.33)	2 (6.67)
3	25 (83.33)	0 (0.00)	0 (0.00)	1 (3.33)	4 (13.33)
4	27 (90.00)	0 (0.00)	0 (0.00)	1 (3.33)	2 (6.67)
5	24 (80.00)	0 (0.00)	0 (0.00)	0 (0.00)	6 (20.00)
6	27 (90.00)	0 (0.00)	0 (0.00)	0 (0.00)	3(10.00)
7	28 (93.33)	0 (0.00)	0 (0.00)	0 (0.00)	2 (6.67)
8	26 (86.67)	0 (0.00)	0 (0.00)	0 (0.00)	4 (13.33)
9	29 (96.67)	1 (3.33)	0 (0.00)	0 (0.00)	0 (0.00)
10	21 (70.00)	0 (0.00)	0 (0.00)	0 (0.00)	9 (30.00)
Average Percentage	85.00	0.33	0.00	2.00	12.67

Table 7:- Combination of Students Answer Categories (Posttest)



Graph 2:- Combination of Student Answer Categories (Posttest)

Based on Table 7 and Graph 2 above, there are no students who do not understand the concept (NUC). As for the category of Less Understanding of the Concept (LUC), there are still students who do not understand concept number 9, namely the concept of falling object velocity. Students do not understand the concept can be caused by students quickly forgetting what they have learned or not paying attention when learning in class. Guessing Category (G) in the posttest can be caused by students who do not understand the concept so that in addition to students' answers being wrong in the first or second tier, the student is also unsure of the answer he chose. In the Concept Understanding (UC) category, almost all students have understood the correct concept. The highest understanding category (UC) concept lies in concept number 9, which is the concept of falling object velocity. Whereas for the category of Misconception (M) shows that students experience the highest misconception (misunderstanding) lies in concept 10 which is about the nature of liquid substances.

#### IV. CONCLUSIONS

Based on the results of profile conceptions on the pretest and posttest of 5th grade students, through modification of the concept attainment model that has been described previously, it can be concluded that students who understand Concept (UC) jumped up as much as 84% from initially only 1% to 85%, the category did not understand the concept (NUC) was reduced by 1.34% to 0.33%, students included in the Less Understanding Concept (LUC) category fell by 1.67% to 0% in other words there were no students who did not understand the concept. While for the Guessing category (G) decreased by 4%, which was originally 6% to 2% and students who experienced Misconception (M) decreased as much as 70.66%, which from 83.33% to 12.67%. So, Based on that result, remediation of science misconception in the 5th grade can be done through a modification of the concept attainment learning model.

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