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Changes in Science Conception Profile of Primary School Students Through Modification of Concept Acquisition Model

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Abstract:- This study aims to describe changes in the conceptual science profile of elementary school students after using a modification of the concept acquisition model. The population in this study were fifth grade students at SDN Rungkut Menanggal II/583 Surabaya. The sample in this study was fifth grade students, amounting to 35 students. The study design uses one group pretest-posttest. The instrument used was the Three Tiers Instrument. Data analysis was used descriptive qualitative with the results of the modification of the concept acquisition model well, increased student activity, and there was a change in the conceptual profile of students' science. The average of students' misconceptions at the pretest was 92%. At the posttest stage decreased misconception so that the percentage becomes 36%. After one week of retention, there was a decrease in misconception to 21%. Student response was also very good with a percentage of 87%. The conclusion from this study is that by using a modification of the concept acquisition model, the understanding of the science concepts of fifth grade students is getting better.

Keywords:- *Profile Changes, Science Conceptions, Modification Of Concept Acquisition Models.*

I. INTRODUCTION

Ibrahim (2012) states that the concept is the foundation of every science including science. The concept is an abstraction of a set of stimuli (events, data, objects, facts) that have the same characteristics. On that basis the concept is abstract. For example, insects are the name of the concept, because insects are the name of a group of animals that have the same characteristic, hexapods. So insects are abstract, concrete examples are grasshoppers, mosquitoes, flies, dragonflies. A concept has 5 elements, namely (1) label or name, (2) definition or understanding, (3) essential traits or attributes, and (4) examples, and (5) value or benefit / usefulness of the concept

Mayer, K. (2010) explains that understanding concepts is very important in science learning, as in a report titled "Science for All Americans" published by The American Association for the Advancement of Science (AAAS) which states that students must have an understanding of scientific concepts , both in general about science and parts of science. The concept of science found in elementary schools is the concept of plants and animals: (1) parts of plants; (2) function of plant parts; and (3) animal body parts and their functions.

Each student has initial knowledge in himself that is very influential on information processing and problem solving to the problems they face. Pine, et al. (2001) states that students do not come to school as tabularasa, because students already have experiences and ideas that influence how to respond to their environment. Mayer, K. (2010) states that students' initial knowledge (preconceptions) has a major influence on the learning process and this must be considered in preparing plans and implementing learning. The teacher must align the students' initial knowledge (preconceptions) of the concept of the material being learned.

Arends (2013) states that the teacher's important task in learning concepts is to make decisions about which learning model to use. The teacher must analyze the concepts being taught and decide on examples and not which examples will be used and how best to present them to students. One learning model that can be used so that students understand the concept of science well is the concept acquisition model (concept attainment model).

According to Tennyson & Cocchiarella (1986) that the concept acquisition model (concept attainment model) is the process of identifying and defining concepts by obtaining attributes that are in accordance with the understanding of the concepts that have been learned. The concept acquisition model is an inductive learning model that can help students to understand concepts and apply analytical thinking skills.

The concept acquisition learning model is designed to teach students concepts using examples and non-examples so that students are expected to be able to think analytically so students can discover the characteristics and definitions of a concept. Understanding the concept is very important. Therefore understanding the concept is included in the curriculum at every level of education. Gagne, Briggs, and Wagner (1988) state that understanding concepts is a skill that enables a person to be able to act. Someone who has a good understanding of the concept allows him to apply it in various activities. Progress and technology that occur at this time depends on the understanding and mastery of the concepts possessed.

According to Van den Berg (1991), students in learning already have experience and knowledge related to the lesson. Educators should teach the correct concepts so students can understand well. Students who construct a concept do not rule out having the wrong understanding so that misconceptions occur. Vitharana (2015) states that teachers should identify students' wrong understanding. This can provide students with an accurate understanding of conceptual concepts and phenomena.

Some misconceptions in elementary schools include the concept of photosynthesis of green plants, the concept of monocot plants, and buds on plants. Students still understand that photosynthesis occurs only with the help of sunlight alone. Therefore it is necessary to design an innovation in the form of a modification of the concept acquisition model so that it helps students in understanding the science concepts.

Ibrahim (2018), states that there are five stages in modifying the concept acquisition model in improving students' conceptions. Stages of modification of the concept acquisition model, namely (1) exploring the students' initial conceptions (probing questions), (2) propose previous conception, (3) observation, (4) confirmation and clarification, and (5) consolidation of concepts.

Based on the explanation, the writer is motivated to conduct research on the change of science concept profile of elementary school students through modification of the concept acquisition model. Modification of the concept acquisition model is expected to change students' IPA conceptions for the better so that no misconceptions are found in science learning in elementary schools.

II. METHOD

This research is an experimental research by applying a pre-experimental design. This research was conducted at Rungkut Menanggal II Elementary School in Gununganyar District, Surabaya City in the odd semester of the 2019/2020 academic year. School selection is based on the discovery of many students who have the potential to experience misconceptions. This is evident from the results of discussions with students, in addition to also observing books used in schools still contain misconceptions. The selection of this school was also due to the support of the principal and teachers who would support the implementation of this research.

A. Research Procedure

- *Preparation*

At this preparation stage the activities carried out are (1) The preparation of the equipment is designed by developing learning tools that are adapted to the modification of the concept mastery model. The tools in question include (a) Treatment Scenarios or Learning Plan (RPP), (b) PPt developed oriented to CAM modification strategies, (c) Misconception Detection Instruments, and (d) RPP Observation Implementation Sheet.

The device development model used in this study is the 4D model (design, define, develop, disseminate) and adapted to the 4P model that is defining, designing, developing, and distributing (Ibrahim, 2008). This model was chosen because the detailed stages are systematic, and appropriate for this study. The purpose of defining aims to determine and define learning requirements. In this stage, the boundaries of learning are determined, initially by inventorying potential concepts that will experience misconceptions based on the level of difficulty, analyzing concepts that have been found to experience misconceptions based on the results of other people's research, analyzing the books and research results of others against books that experience misconceptions. There are five main steps in this stage, namely: 1) curriculum / front and back analysis, 2) analyzing students, 3) analyzing assignments, 4) analyzing concepts, and 5) formulating learning objectives. At this stage the planning of the basic form of learning tools was carried out which included the preparation of the Instrument consisting of Treatment Scenarios or Learning Implementation Plans (PPP), PPt developed through CAM modification, Misconception Detection Instruments, and RPP Implementation Observation Sheet.

B. Data Collection Technique

- *Test*

Provision of tests is used to determine the profile of students' conceptions of the concept of science. The test was carried out three times, namely before the treatment (pretest), after the treatment (posttest), and a week after the posttest. Prestest is held at the beginning of learning, that is before the presentation of the lesson plan. This is useful to know the level of readiness of students in mastering the concept of science. Posttest is given after treatment (treatment) which aims to determine the level of achievement of the indicator. The third test is done a week after the posttest. This is done to determine student retention towards the mastery of science conceptions. The test used in this study used the Three Tiers Instrument which was done individually.

- *Observation*

Observations were carried out at the beginning of the study and at the time the research activities took place. At the beginning of the study conducted to determine the initial conditions of students as subjects in the study. Observations were also made to determine the condition of the study site. Observation when learning activities are carried out to record the implementation of the process during the treatment. Observation is carried out by a team of observers or observers who can perform objectively and have been trained in advance. Observation using the RPP Observation Sheet.

C. Research Instrument

➢ *Three Tiers Instrumen*

Three Tiers Instrument was developed related to concepts found in the field experiencing misconceptions from previous research.

➢ *Learning Tools Validation Sheet*

The learning device validation sheet was adapted from BSNP and developed by researchers. The learning device validation is carried out by experts who are competent in the learning device (validator). Validation is carried out on the Learning Implementation Plan, Misconception Detection Instrument, Student Response Instrument, and Observation Sheet of the RPP. Instrument in the form of instructions for use; table consisting of column number, column aspect assessed, and column rating scale; general conclusions; comments and suggestions for improvement; place and date of validation; name and signature of the validator.

➢ *Learning Observation Sheet*

Observation Sheet of the RPP Implementation contains the place and date of implementation; name and signature; hint: observed activities, implementation, assessment. The observed activities included: learning activities (introduction, core, closing), six learning steps that modified the learning model of concept acquisition, time management, and classroom atmosphere. This sheet is given to two observers who observe the implementation of learning in class directly.

➢ *Questionnaire Student Response To Learning*

Student response questionnaire is used to determine the responses and opinions of students towards teaching and learning activities that include: subject matter, display PPt, learning atmosphere, the way the teacher teaches, and students' opinions about the concept acquisition model. Students fill out this questionnaire after all meetings have ended.

D. Data Aalysis Technique

➢ *Analysis of Test Results*

Data derived from test results were analyzed descriptively. The respondents' conception profile is based on the results of the analysis using the developed rubric. The profile of students' misconceptions that contained respondents about the concept was described in the form of a matrix.

The steps in determining the student's conception position are as follows for each student (a) determining whether the student's answer is true or false. (b) determine whether the students' reasons are true or false, (c) determine the level of student confidence in the truth of the answer with guidance if the level of confidence ≥ 2.5 is categorized as confident while if below 2.5 is categorized as not sure.

➢ *Learning Implementation Analysis*

The results of observations of learning literacy were analyzed in a qualitative descriptive manner by counting the number of steps in the lesson plan implemented by the teacher and getting a minimum score of Good. Learning is said to be carried out if all steps are carried out.

➢ *Analysis of Validation Results*

Data validation analysis consists of device validation and the assessment is done by calculating the average score of each component that has been validated by the validator. The average score results are described as follows.

The validity of the learning kit is determined by the validator, which is determining whether each aspect validated is categorized as very valid, valid or invalid based on the assessment score on each item.

Interval	Category	Information
1,0 ≤ SV≤ 1,5	Invalid	Can not be used, requires consultation
1,6 < SV < 2,5	Invalid	Can be used with many revisions
2,6 < SV < 3,5	Valid	Can be used with a slight revision
3,6 < SV < 4,0	Very Valid	Can be used, without revision

Table 1:- Criteria for Categorizing the Results of Validation Learning tools (Ratumanan and Laurens, 2006)

➢ *Analysis of Student Responses*

Analysis of student responses is calculated by presenting the frequency of the number of responses of students divided by all responses multiplied by 100% Borich (1994).

The students' *pretest* and *posttest* results were used to determine changes in the conception profile of students before and after treatment. Changes in the form of improvement are known through the analysis of N-Gain, namely by using the equation as follows.

$$g = \frac{Spost - Spre}{Skor\ max - Spre}$$

Information:
g (*gain*) = increased level of mastery of concepts
S_{post} = final test score
S_{pre} = initial test score

N-gain also aims to determine the effectiveness of using the concept acquisition modification model. The higher the N-gain category the more effective the use of the learning model in improving the understanding of science conceptions of fifth grade students of SDN Rungkut Menanggal II/583 Surabaya.

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High and low normalized gain (n-gain) can be classified in Table 2 as follows.

Interval	Category
$0,7 \leq g$	High
$0,3 \leq g < 0,7$	Medium
$g < 0,3$	Low

Table 2:- Categorization Criteria for N-Gain **(**Melzer in Syahfitri, 2008:33)

The division of N-gain acquisition categories in the form of percent (%) can be presented in Table 3 as follows.

Percentage (%)	Interpretation
< 40	Ineffective
40 - 55	Less Effective
56 - 75	Effective Enough
>76	Effective

Table 3:- Categories of N-Gain Effectiveness Interpretation (Hake,R.R, 1999)

III. RESULT AND DISCUSSION

This research was conducted in four stages, namely the planning, implementation, development and dissemination stages. The development phase is an activity to improve learning tools and research instruments. The implementation phase was carried out at SDN Rungkut Menanggal II/583 Surabaya. Dissemination stage is carried out using the results of the development on a wide scale. The research sample was 35 students in class V consisting of 19 male students and 16 female students.

A. Student Conception Profile Results Before Research

The results of the identification of concept mastery (pretest) using the Three Tiers Instrument are presented in Table 4 below.

Concept Number	Percentage of Mastery of Concepts Before Research		
	TK (%)	TTK (%)	MK (%)
1	0	0	100
2	3	6	91
3	0	6	94
4	0	14	86
5	0	3	97
6	0	6	94
7	12	14	74
8	3	0	97
9	3	6	91
10	0	3	97
Information TK : Understand the Concept TTK : Do Not Understand the Concept MK : Misconception			

Table 4:- Mastery of Student Concepts before Research (Pretest)

The graph of the *pretest* results of the fifth grade students is presented in Figure 1 below.

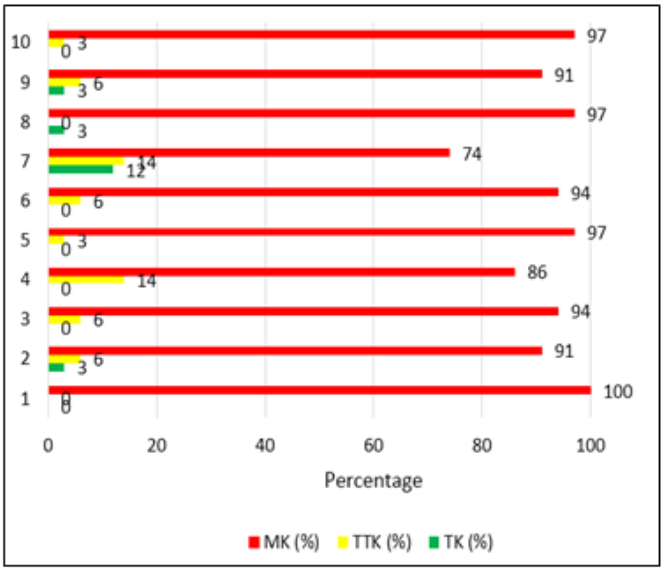

Fig 1:- Graph of Pretest Results for Class V Students

Based on Graph 1, it can be seen that many students experience misconceptions.

B. Treatment Implementation Results

Observation of the implementation of the CSP is carried out at each meeting. In every meeting, it is always preceded by conditioning the learning atmosphere first, providing motivation, and delivering the learning objectives. At the first meeting students are very enthusiastic about learning. Some examples of concepts that are displayed make students interested. Students are given the opportunity to give their opinions about the concepts presented. In the concept of photosynthesis, almost all grade V students think that plants can only carry out photosynthesis if exposed to sunlight. After giving several examples that contradict the previous examples, students then understand that green plants can also photosynthesize using light bulbs.

At the second meeting, students looked enthusiastic in learning. When showing examples of the concept of photosynthesis in plants that have red leaves, most students believe that red leaves cannot photosynthesize because they do not have green leaves. Students assume that leaf green substances are only found in leaves that are only green in color. After giving other examples, and discussing, students believe that plants with red leaves such as red spinach also photosynthesize. Likewise with the other concepts given at the third meeting to the tenth meeting, at first students experience misconceptions, after being given treatment with a pleasant learning atmosphere students can understand the true science concepts.

The recapitulation of observations of the implementation of learning devices shows, the percentage of 59%. This shows that the steps of learning by using a modification of the concept acquisition model have been implemented very well.

C. Student Conception Profile Results (Posttest)

Concept Number	Percentage of Concept Mastery (Posttest)		
	TK (%)	TTK (%)	MK (%)
1	83	6	11
2	86	3	11
3	34	3	63
4	51	3	46
5	26	3	71
6	51	6	43
7	68	6	26
8	68	3	29
9	60	6	34
10	66	6	28
Information TK : Understand the Concept TTK : Do Not Understand the Concept MK : Misconception			

Table 5:- Mastery of Student Concepts (posttest)

The students' posttest results graph is presented in Figure 2 below.

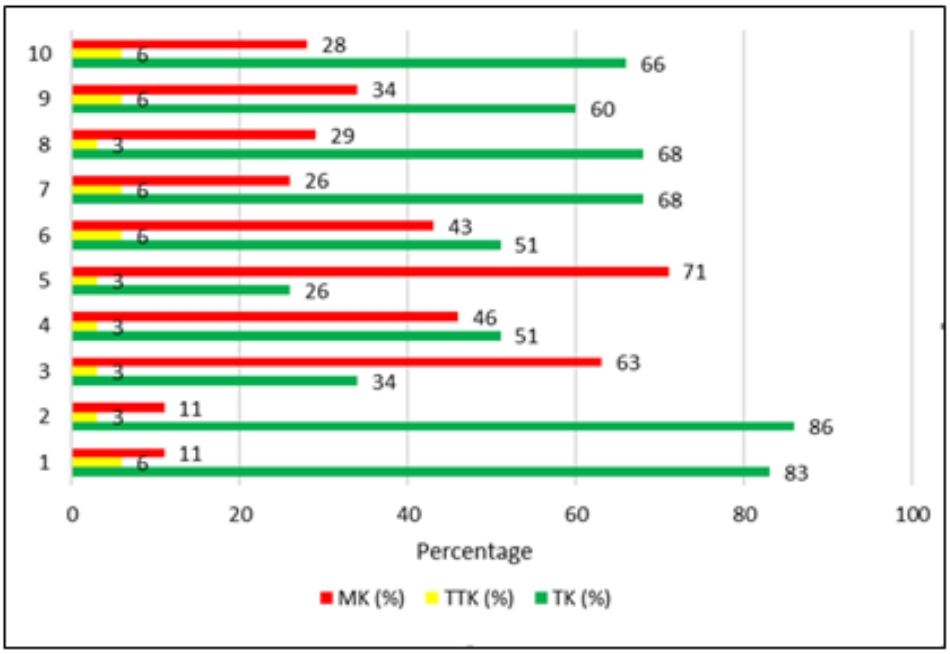

Fig 2:- Graph of Posttest Results for Class V Students

Based on Figure 2 shows that students who already know the concept more than students who experience misconceptions.

D. Profile of Student Conception after Retention

The results of identifying student retention in class V are presented in Table 6 below.

Concept Number	Percentage of Mastery of Concepts at Retention		
	TK (%)	TTK (%)	MK (%)
1	77	6	17
2	91	6	3
3	60	0	40
4	66	8	26
5	54	6	40
6	74	14	12
7	88	6	6
8	83	9	8
9	77	3	20
10	51	9	40
Information TK : Understand the Concept TTK : Do Not Understand the Concept MK : Misconception			

Table 6:- Mastery of Concept Students in Class V (retention)

Based on the results of the retention, the retention of fifth grade students in understanding science concepts is very good.

E. Results of Analysis of Student Responses

Measurement of student responses to learning by using a modification of the concept acquisition model was carried out after the experiment was carried out. Measurements were made using a questionnaire instrument containing closed questions. A summary of the results of the analysis of the responses of the fifth grade students is presented in Table 7 below.

No	Description	Assessment			
A.	**Theory**	**TS (%)**	**KS (%)**	**S (%)**	**SS (%)**
1.	Submission of material related to daily life	0	0	54,29	45,71
2.	The material presented is easy for students to understand	0	0	25,71	74,29
3.	Presentation of material motivates students to discuss with friends	0	0	28,57	71,43
4.	There is an influence on student attitudes and learning	0	0	14,29	85,71
5.	Presentation of material is fun and interesting	0	0	11,43	88,57
6.	Presentation of material motivates students to learn more about the material	0	0	8,57	91,43
B.	**PPt Display**				
1.	Interesting	0	0	14,29	85,71
2.	Easy to Understand	0	0	11,43	88,57
3.	Challenging to be creative	0	0	25,71	74,29
C.	**Learning Atmosphere**				
1.	Fun	0	0	8,57	91,43
2.	Motivate to better understand the concept of science	0	0	11,43	88,57
D.	**Ways Teachers Teach**				
1.	Interesting	0	0	5,71	94,29
2.	The language used is easy to understand	0	0	8,57	91,43
E.	**Learning Model**				
1.	Fun	0	0	11,43	88,57
2.	Foster curiosity (curiosity)	0	0	8,57	91,43
3.	Practicing responsibility	0	0	5,71	94,29

Table 7:- Recapitulation of Class V Students' Responses to Learning

Based on data from Table 7 learning by using a modification of the concept acquisition model gives a good response to students with a percentage of 80-100%.

F. Mastery of Student Concepts

The results of the identification of the mastery of science concepts of fifth grade students based on the results of the pretest, posttest, and retention are presented in Table 8 below.

Concept No	Percentage of Concept Mastery		
	***Pretest* (%)**	***Posttest* (%)**	**Retention (%)**
1	0	83	77
2	3	86	91
3	0	34	60
4	0	51	66
5	0	26	54
6	0	51	74
7	12	68	88
8	3	68	83
9	3	60	77
10	0	66	51

Table 8:- Mastery of Concept Students in grade V based on the results of the pretest, posttest, and retention

Based on Table 8 it can be seen that the mastery of student concepts changes. Changes in the form of an increase from *pretest* to *posttest*.

IV. CONCLUSION

Based on the results of the study concluded that learning by using a modification of the concept acquisition model can improve the understanding of science concepts of fifth grade students of SDN Rungkut Menanggal II/583. The implementation of learning has a percentage of 59% Good category. The average V class students who experience misconceptions at pretest is 92%. At the posttest stage decreased misconception to 36%. After being given retention there was a decrease in misconception to 21%. Student responses to learning science by using a modification of the concept acquisition model with a percentage of 80-100%.

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