ISSN: 2775-8508
E-ISSN: 2797 - 1058

Journal Universitas Muhammadiyah Gresik Engineering, Social Science, and Health International Conference (UMGESHIC)
UMGCINMATIC : 1st Rethinking Education during Covid-19 Era: Challange and Innovation

IDENTIFICATION OF SCIENCE SUBJECT MISCONCEPTION IN ELEMENTARY SCHOOLS

Author
Lathifatul Mahdiyah[1], Nataria Wahyuning S[2], Ismail Marzuki[3]

[1,2,3]Universitas Muhammadiyah Gresik

lathifatulmahdiyah@gmail.com , nataria.nata@umg.ac.id , ismailmarzukisag@gmail.com

ABSTRACT

This study aims to analyze the misconceptions in the fifth grade students of MIM 1 Pantenan on the photosynthetic material of green plants. This type of research is a research with a qualitative descriptive approach. The method used to identify misconceptions is the CRI method using an open-ended multiple choice test instrument. The results of the analysis show that the percentage in the category of misconceptions experienced by all 5th grade students of MIM 1 Pantenan in the concept of photosynthesis in green plants tends to have a greater percentage of 45.15% than the percentage of understanding other concepts. The misconceptions experienced by many of the fifth grade students of MIM 1 Pantenan are found in the indicator questions number 1 & 6. In the indicator question number 1, namely the concept of the process of photosynthesis in green plants, in this case most of the fifth grade students of MIM 1 Pantenan answered that the process of photosynthesis can only occur during the day only with the help of sunlight. Meanwhile, in the indicator question number 6, namely the concept of photosynthesis taking place if there is no sufficient intensity of sunlight, in this case most of the class V MIM 1 Pantenan students answered that if there is no sufficient intensity of sunlight, photosynthesis cannot take place.

Keywords: Misconception, Photosynthesis, CRI.

1. INTRODUCTION

Science is a science that is obtained through the accumulation of data with observations and conclusions in order to get a description of a phenomenon that is believed (Tinambunan, 2017). Science learning also gives time for students to be able to interpret their own concepts, which can directly provide scientific experience (Fitriyati, dkk, 2017). Science learning essentially refers to the product process and scientific attitude, biology learning can usually provide a variety of learning experiences to master the concepts and processes of science. One of the concepts reviewed in biology is the concept of photosynthesis in green plants. This concept is a very important concept because it examines how green plants make food, so they can understand the process of photosynthesis well (Mustaqim, 2015).

According to Cokadar (2012: 84) most elementary school children still often experience errors in the concepts of photosynthesis and plant respiration. Some children most often experience misconceptions about the concepts of photosynthesis and plant respiration, especially in the basic

understanding related to these concepts. In this case, it has been strengthened in research that has been carried out by (Dwi, I dkk, 2014) which revealed that plant respiration can only occur at night and only green leaves are capable of photosynthesis.

Factors causing conceptual errors in learning can also be caused by teachers who are less than optimal in controlling a lesson. Especially in improving mastery and skills in understanding a concept, because most elementary school children have not developed an understanding of scientific concepts and processes. Therefore, it is important for teachers to really pay attention to conceptual errors or also known as (misconceptions) that occur in elementary school children from an early age.

One technique that can be used to identify misconceptions in elementary school children is to use the Certainty of Response Index (CRI) technique, a method that has been developed by Saleem Hasan (1999). This technique can be used to identify misconceptions that occur. Certainty of Response Index (CRI) is one way that can be used to distinguish which children have misconceptions from those who lack knowledge (Haris, 2016). The Certainty of Response Index (CRI) technique is a technique that is easy to express misconceptions that occur because there is a level of confidence from the source in responding to the questions given. Therefore, if the CRI technique is included with the answer to a question, it can be seen which concepts contained in the material make elementary school children experience misconceptions (Saputri dkk, 2016). So this technique can be used to identify the occurrence of misconceptions and can sort between understanding the concept or not knowing the concept.

The disadvantages of the multiple choice test with the CRI technique are in the classification of each elementary school child who has low quality in terms of self-confidence and the many factors that elementary school children often guess in answering questions. By looking at the weaknesses or shortcomings of the CRI technique, the classification in understanding the concepts that have been arranged by Saleem Hasan (1999) was updated by Aliefman Hakim (2012) by using the word open reasoning on multiple choice tests. So for elementary school children who understand the concept well but determine a low CRI can be classified in the group understand the concept but are not sure (Hakim dkk, 2012).

The advantage of this CRI technique is that the teacher can identify the misconceptions of elementary school children rationally because in addition to answering multiple choice questions and the level of confidence in the questions that have been answered. Elementary school children's reasons for the answers contained in the questions can also be seen and can be known, so that they can identify misconceptions easily and correctly (Mustaqim, 2015).

Many of the research results show that there are many mistakes in understanding each concept that can be experienced by elementary school children and teachers. But not all of these errors can be referred to as misconceptions. Because in some mistakes it can be caused by incomplete mastery of elementary school children's concepts. The misunderstanding of the concept can be caused by one of the factors that often occurs, namely that most elementary school children develop their understanding and knowledge based on what they see and hear. Regardless that a concept they believe in is actually a right or wrong concept.

Based on interviews with science teachers at MIM 1 Pantenan, misconceptions often occur in SD/MI children, but compared to misconceptions, concept ignorance is more common. So based on the background that has been stated above, the researchers are interested in conducting a qualitative research entitled "Identification of Science Subject Misconceptions in Elementary School". This study uses the

Certainty of Response Index (CRI) technique in identifying misconceptions in elementary school. So with this research, it is hoped that it will be able to increase understanding and knowledge for elementary school children and it is hoped that there will be no more misconceptions taught by the teacher.

2. METHODS

This type of qualitative research uses the CRI technique, namely in data collection. Researchers want to collect information about the misconceptions of elementary school children in the concept of photosynthesis in green plants which is described by analyzing the suitability of data regarding elementary school children's answers with the actual concept.

This qualitative research was conducted in the odd semester VA and VB classes, namely in the 2020/2021 school year. The location of the research carried out was at the MIM 1 Pantenan elementary school, Panceng district, Gresik district.

The data collection instruments used in this study were teacher interviews, open-ended multiple choice tests and interviews with elementary school children. This study uses an instrument in the form of open-ended multiple choice questions accompanied by a CRI (Certainty of Response Index) form which is used to determine the occurrence of misconceptions in elementary school children. Each item used in this research instrument has 4 answer choices. The instrument preparation technique carried out refers to the steps of forming a diagnostic test in which each item is measured by asking specific questions so that it is easy to identify the level of difficulty that occurs (Widdiharto R, 2008).

Analysis and validity of the data from the research results, namely quantitative data in the form of test results data accompanied by a CRI form on a scale designed by Saleem Hasan (1999) which was later updated by Aliefman Hakim (2012). The second level of understanding is based on the level of understanding according to Aliefman Hakim (2012).

Table 1. Modification of Understanding Level Category

Answer	Reason	CRI Value	Description
Correct	Correct	> 2,5	Understand the concept well
Correct	Correct	< 2,5	Understand the concept but not sure
Correct	Wrong	> 2,5	Misconception
Correct	Wrong	< 2,5	Don't know the concept
Wrong	Correct	> 2,5	Misconception
Wrong	Correct	< 2,5	Don't know the concept
Wrong	Wrong	> 2,5	Misconception
Wrong	Wrong	< 2,5	Don't know the concept

Third, determine the level of understanding by analyzing the answers of each individual by distinguishing between children who understand the concept well, understand the concept but are not sure, misconceptions and those who do not know the concept. Fourth, the calculation of the percentage at each level with the calculation formula:

P = f / N x 100%

Information :
P = Group percentage score
f = Number of individuals in each group
N = Number of individuals (the total number of elementary school children who are the research subjects).

Fifth, summarize the average level of understanding of elementary school children. The sixth examines the location of elementary school children's misconceptions on each item with the highest percentage of misconceptions experienced by elementary school children. Then the results of this data processing will then refer to the conclusions.

3. RESULTS AND DISCUSSION

Based on the results of research in classes VA and VB MIM 1 Pantenan taken from the results of the answers of children in class VA and VB on open-ended multiple choice questions accompanied by a confidence level column (CRI) in tabular form. Then the results of the answers along with the level of confidence of the fifth graders can be categorized/classified into 4 categories, namely the category of Understanding the Concept well, the category of Understanding Concepts but Not Convincing, the category of Misconceptions and the category of Don't Know the Concept at all. The following is the percentage result data from each class VA and VB MIM 1 Pantenan.

VA Class Presentation

Table 2. Percentage of Understanding Level of VA grade students based on 4 Categories in Photosynthetic Material in Green Plants

No	Question Indicator	Category %			
		PK	PKKY	M	TTK
1	Knowing the process of photosynthesis	6,25	25	62,5	6,25
2	Knowing plants that are able to carry out the process of photosynthesis	25	31,25	37,5	6,25
3	Knowing the location of chlorophyll	6,25	56,25	37,5	0,00
4	Knowing the process of respiration	18,75	31,25	37,5	12,5
5	Knowing the consequences of the photosynthesis process on mango trees during the day	12,5	31,25	43,75	12,5
6	Knowing the effect of the absence of sunlight in the photosynthesis process	0,00	25	68,75	6,25
7	Knowing the light reactions in the photosynthesis process	31,25	25	18,75	25
8	Knowing the dark reactions in the photosynthesis process	18,75	37,5	31,25	12,5
9	Knowing the needs of cactus plants in photosynthesis	0,00	37,5	43,75	18,75
10	Knowing most of the locations of chlorophyll in legumes	18,75	56,25	6,25	18,75
AVERAGE		**13,75**	**35,63**	**38,75**	**11,88**

The percentage of understanding level category in VA class is dominated by misconception category, which is 38.75% and the lowest level of understanding percentage is in the Do not Know Concept category, which is 11.88%. Meanwhile, the average percentage in the Understanding Concept category is 13.75% and Understanding Concepts but less sure is 35.63%. The category of misconceptions in each item consists of 6 items that have the highest percentage of misconceptions from the four categories of understanding levels for class VA MIM 1 Pantenan students, namely items number 1, 2, 4, 5, 6, 9.

VB Class Presentation

Table 3. Percentage of Understanding Level of VB grade students based on 4 Categories in Photosynthetic Material in Green Plants

No	Question Indicator	Category %			
		PK	PKKY	M	TTK
1	Knowing the process of photosynthesis	17,65	17,65	64,71	0,00
2	Knowing plants that are able to carry out the process of photosynthesis	29,41	17,65	52,94	0,00
3	Knowing the location of chlorophyll	0,00	35,29	58,82	5,88
4	Knowing the process of respiration	11,76	17,65	58,82	11,76
5	Knowing the consequences of the photosynthesis process on mango trees during the day	17,65	17,65	58,82	5,88
6	Knowing the effect of the absence of sunlight in the photosynthesis process	0,00	29,41	64,71	5,88
7	Knowing the light reactions in the photosynthesis process	41,17	35,29	23,53	0,00
8	Knowing the dark reactions in the photosynthesis process	5,88	29,41	58,82	5,88
9	Knowing the needs of cactus plants in photosynthesis	0,00	52,94	35,29	11,76
10	Knowing most of the locations of chlorophyll in legumes	11,76	41,17	35,29	11,76
AVERAGE		**13,53**	**29,41**	**51,18**	**5,88**

The percentage of understanding level category in class VB is dominated by the misconception category, which is 51.18% and the lowest percentage level of understanding is in the Do not Know Concept category, which is 5.88%. While the average percentage in the Understanding Concept category is 13.53% and Understanding Concepts but Not Convincing is 29.41%. The category of misconceptions in each item is 7 items that have the highest percentage of misconceptions out of the four categories of understanding levels of children in class VB MIM 1 Pantenan, namely items number 1, 2, 3, 4, 5, 6, 8.

Recapitulation / Calculation of Average Data from the Percentage of All Class V MIM 1 Children on the Concept of Photosynthesis in Green Plants

The results of the recapitulation of the average percentage of all 5th grade students of MIM 1 Pantenan on the concept of photosynthesis in green plants are presented in the form of a bar chart.

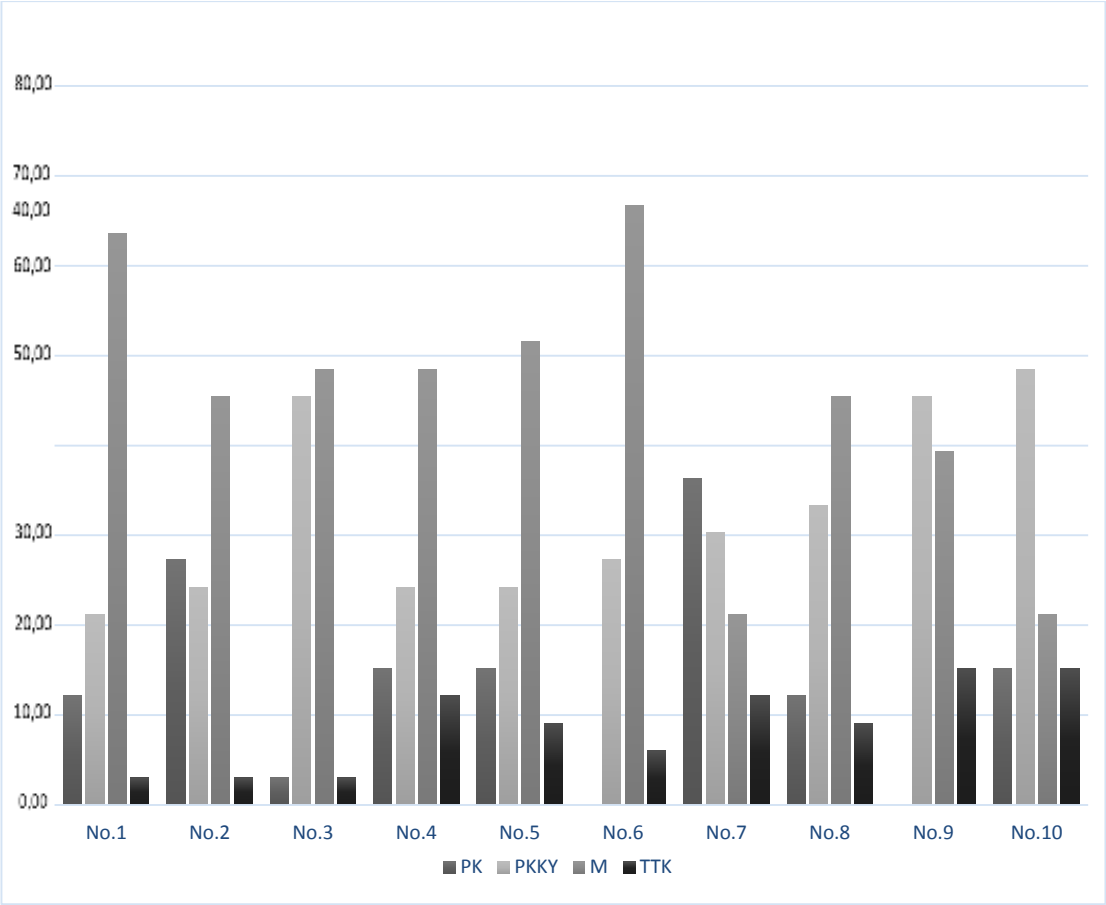

Figure 1. Recapitulation of the average percentage of all 5th grade students of MIM 1 Pantenan on the concept of photosynthesis in green plants.

The recapitulation / calculation of the average percentage of the concept understanding category is 13.64%, the category understands the concept but is not sure about 32.42%, the misconception category is 45.15% and the category does not know the concept of 8.79%. If seen from the picture above, the percentage of misconceptions in all fifth graders is the most superior of the four percentage categories of other levels / degrees of understanding, namely in item numbers 1,2,3,4,5,6,8. So in this case it can be said that the level of understanding of fifth graders on the concept of photosynthesis in green plants in the misconception category tends to be higher than in other categories.

Discussion

Based on the results of interviews with the 5th grade science teacher at MIM 1 Pantenan about an understanding of the concepts that occurred, many of the fifth graders often experience ignorance of concepts rather than previous misconceptions. However, when viewed from the percentage of all fifth graders in the concept of photosynthesis in green plants, many of the fifth graders have misconceptions. When viewed from the review of the answers to all 5th grade students of MIM 1 Pantenan, the average calculation of misconceptions in class V children is superior / greater.

If it is seen from the bar chart above, it can be said that the misconception category is superior to other categories such as the category of understanding the concept, understanding the concept but not being sure and the category of not knowing the concept.

So in this case, based on the results of the answer review and the calculation of the average percentage of children in class V MIM 1 Pantenan, the discussion of this study focuses on the items that have the highest percentage category, namely the category of misconceptions in item numbers 1 & 6. 1 & 6 are the most superior items from the results of the calculation of photosynthesis in green plants which have a percentage of 60%.

From the results of the information and also the results of interviews with teachers and fifth graders regarding the reasons for the misconceptions, it can be concluded that, most of them stated that the reason for the misconceptions came from the teacher. This is possible due to the provision of less than optimal learning methods, namely the teacher only focuses on one side of the concept being taught. Most of the fifth graders also only rely on information and explanations from the teacher, in the sense that they are lazy to look for other information related to the material being studied.

1. Misconception Review on Problem Number 1

Question	Review
1. The process of photosynthesis can occur in …. a. Night only b. Daytime only c. Day and Night d. Midnight	Based on these questions, most of them answered that the process of photosynthesis can only occur during the day with the help of sunlight. The average percentage of misconceptions of fifth graders who answered this question was 63.64%. So judging from the reasons given, they tend to still be confused whether the photosynthesis process can only occur during the day, then the reason is because the photosynthesis process can only take place in the presence of sunlight.

2. Misconception Review on Problem Number 6

Question	Review
6. If there is no sufficient sunlight intensity, the photosynthesis process will occur …. a. Keep going b. Going well c. Cannot take place d. Disturbed	Based on these questions, most of them answered that if there is no sufficient intensity of sunlight, photosynthesis cannot take place. The average percentage of misconceptions of fifth graders who answered this question was 66.67%. From the reasons given, they tend to still be confused whether if there is no sufficient intensity of sunlight, the photosynthesis process can still take place or not, then the reason is because photosynthesis can only occur in the presence of sunlight.

4. CONCLUSION AND SUGGESTION

A. Conclusion

The misconceptions experienced by all 5th grade students of MIM 1 Pantenan in the concept of photosynthesis in green plants is that it has a percentage of 45.15% and is greater than the percentage of understanding other concepts. So the percentage of misconceptions experienced tends to be in a higher category than the percentage of understanding other concepts. Misconceptions in class V MIM 1 Pantenan often occur in the indicators of questions number 1 & 6, namely determining the concept of photosynthesis in green plants and knowing the consequences of the absence of sufficient sunlight intensity in the photosynthesis process.

B. Suggestion

1. For teachers, before carrying out a lesson, it is better to ask students about the material to be given. This is to be able to find out to what extent the knowledge they get and the teacher can also find out where the misconceptions that may be experienced by their students are.
2. For teachers and future researchers, this research method, namely the method of using open-ended multiple choice questions, can be used to detect misconceptions in students.

REFERENCES

Arikunto Suharsimi. (2012). *Educational Evaluation Basics.*

Çokadar, H. (2012). *Photosynthesis and respiration processes: Prospective teachers' conception levels*. Egitim ve Bilim, *37*(164), 81–93.

Dwi, I. dkk. (2014). *Application of the approach. Journal of Science Education E-Pensa, 01*(02), 170–181.

Faizah, K. (2016). *Misconceptions in Science Learning. 1*, 115–128. https://doi.org/10.31219/osf.io/spm84

Fitriyati, I., Hidayat, A., & Munzil. (2017). *Learning Tool Development Science to Improve Higher Order Thinking and Reasoning Skills Scientific Junior High School Students*. Journal of Science Learning, 1(1), 27–34.

Hakim, A., Liliasari, & Kadarohman, A. (2012). *Student Concept Understanding of Natural Products Chemistry in Primary and Secondary Metabolites Using the Data Collecting Technique of Modified CRI.* International Online Journal of Educational Sciences, 4(3), 544–553.

Haris, V. (2016). *Identifying Mechanics Misconceptions Using Cri (Certainty of Response Index). Ta'dib*, 16(1). https://doi.org/10.31958/jt.v16i1.240

Hasan, S., Bagayoko, D., & Kelley, E. L. (1999). *Misconceptions and the certainty of response index (CRI)*. Physics Education, *34*(5), 294–299. https://doi.org/10.1088/0031-9120/34/5/304

Muna, I. A. (2012). *Misconceptions of Photosynthetic Materials in Science Learning Natural Knowledge (Science) In Sd/Mi.* Cendekia: Journal Education And Society, 10(2), 201. https://doi.org/10.21154/cendekia.v10i2.411

Mustaqim, T. A. (2015). *Identify Students' Misconceptions Using Certainty of Response Index (CRI) Method on the Concept of Photosynthesis and Plant Respiration*. *Edusains*, *6*(2), 145–152. https://doi.org/10.15408/es.v6i2.1117

Rolahnoviza, G. (2017). *Analysis of Misconceptions in Science Subjects at SMP N Penukal, Penukal Abab Regency, Lematang Ilir Pendopo. Bioilmi : Journal Education,* 3(1), 38-46. https://doi.org/https://doi.org/10.19109/bioilmi.v3i1.5167.

Rachmadi Widdiharto. (2008). *Diagnosis of Middle School Mathematics Learning Difficulties and Alternative Remedial Process.* 17–21. http://library1.nida.ac.th/termpaper6/sd/2554/19755.pdf

Raco, J. (2018). *Qualitative research methods: types, characteristics and advantages.*

https://doi.org/10.31219/osf.io/mfzuj

Rusdiyana, E. (2016). *Item Analysis of the Two-Level Multiple Choice Test For Identifying Students' Misconceptions on the Concepts of Photosynthesis and Respiration Plant*. BioEdu, 5(2), 247897.

S. Rositawaty, A. M. (2008). *Happy to Learn Natural Science Class V SD/MI.* In Journal of Chemical Information and Modeling (Vol. 53, Issue 9).

Saputri, L. A., Dewi, N. M., & Setiadi, A. eka. (2016). *Journal of Biology Education*, Vol. 3, No.2, Agustus 2016 53. Journal Biology Education, *3*(2), 53–62.

Tayubi, Y. R. (2005). *Identifying Misconceptions in Physics Concepts Using Certainty of Response Index (CRI).* Jurnal UPI, 24(3), 4–9.

Thoha Chabib. (1990). *Education Evaluation Techniques.*

Tinambunan, R. (2017). *Using The Tps Model To Improve*. By : Risda Tinambunan.

Yuliati, Y. (2017). *Literature review Literature review*. Literature Review, 6(November), 33–37.

Eka, Karma I. (2014). *Misconceptions in Science Lessons in Elementary Schools.* Yogyakarta: deepublish.