

# Biology teachers' misconception of MGMP Malang are moderate in biodiversity and low in protist

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**Abstract.** Misconceptions on biology teachers can occur if the concepts possessed are not in accordance with scientific concepts. Teachers who misconceptions cause low quality of learning, so the learning objectives are not achieved. Misconceptions on teachers also trigger misconceptions on students. This study aims to identify misconceptions about Biodiversity and Protist material in MGMP (teachers community) Biology Malang teachers. This type of research is descriptive qualitative. The object of the study was the teacher who joined the Malang Biology MGMP team. The instrument used for data retrieval is a three tier diagnostic instrument developed with steps in Treagust. Three-tier diagnostic test in the form of questions on the material Biodiversity and Protist which amounted to 30 questions. The results showed an average of false positive misconceptions of 17.02% and an average of false negative misconceptions of 37.31% in Biodiversity material while the average of false positive misconceptions of 21.15% and an average of false negative misconceptions of 20.30% in Protista material. These misconceptions are in the category moderate in biodiversity and low in protist. Misconceptions on teachers caused by misinterpreting concepts.

**Keywords:** *biodiversity, misconception, protist, teacher*

## 1. Introduction

Teachers have an important role in the world of education, so according to Minister of Education Regulation Number 16 Year 2007 regarding Teacher Competency Standards that a teacher is required to have 4 Basic Competencies namely pedagogical, personality, social and professional competence. In professional competence, the teacher masters the material, structure, concepts, and scientific mindset that supports the subjects being taught. Teachers who lack knowledge of subject matter science are capable of causing learning done by poor quality teachers [1], [2]. As a result of the lack of teacher knowledge that students do not achieve the learning objectives to be achieved so that the low scores, the learning process is hampered and lead to poor understanding of students who are misconceptions [3].

The teacher's lack of understanding of a concept is caused by the teacher having learning problems related to the concept of the material. Teachers in Ngada Regency, Nusa Tenggara Timur Province experienced a misconception in science by 75%, this cause by this is because the teacher does not understand the concept of the material being studied [4]. The problems that occur are the teacher presents problems that are not in accordance with the topic or not contextual, the teacher provides an explanation of the concept of material that is not necessary, the teacher explains the concept is unclear, uses confusing terms, emphasizes the importance of not learning the concept of the material being taught, ignores the students' initial knowledge, and only briefly discusses the implementation of



concepts in everyday life [5]. Besides originating from a lack of understanding of teachers, misconceptions are also caused by the use of textbooks that are the teacher's handle [6], [7].

In learning science, there are many concepts that have been agreed by experts with certainty, but understanding of a different concept causes misconceptions [8], [9]. Research conducted on Biology education students at Ganesha University of Education shows that there are variations in the level of misunderstanding in various scientific concepts (especially biology) with a percentage of misconceptions above 50% [10]. Based on the results of the identification of misconceptions in class X students at SMAN 1 Trenggalek, MAN 2 Lamongan, SMA Islam Malang and SMAN 1 Pare conducted in July 2019 with a total of 127 students showing average misconceptions of 22.08% experienced by students on Biodiversity material and misconceptions of 13.25% experienced students in Protist material. The study showed that many students experienced misconceptions. The teacher is one of the factors that can cause misconceptions in students so research is needed on identifying teacher misconceptions.

Misconceptions are difficult to correct, but if they can be detected early, prevention can be carried out [11], [12]. Identification of misconceptions needs to be done in order to find the right steps to find out the wrong concepts and efforts to overcome them. Some ways that can be used to identify misconceptions are concept maps, multiple choice tests with open reasoning, making scientific papers, concept assessments, and diagnostic test instruments three-tier [13].

The diagnostic test instrument three-tier conducted by experts provides information about student understanding along with responses, so this instrument provides an estimate of the percentage of false negatives and false positives without conducting further interviews. The existence of the tier third provides information about misunderstanding and lack of knowledge in students as well as the level of student confidence [14]. Based on the explanation above, a study was conducted to identify teacher misconceptions using a diagnostic instrument three-tier on Biodiversity and Protist material.

## 2. Research method

The research conducted was a descriptive research type qualitative quantitative. The study was conducted in August 2019 until September 2019. Object of research was teachers who joined the MGMP Biology in Malang. The number of teachers who took the test was 23 out of 38 people who at SMAN 8 Malang on September 14<sup>th</sup>, 2019. The diagnostic instrument three-tier used in the study was developed with steps in Treagust [15]. Activities undertaken to create a diagnostic instrument three-tier are (1) defining content in the form of making concept maps to determine the proportion of concepts and making a grid, (2) obtaining information that is developing multiple-choice open-source questions then validating them, and (3) developing diagnostic tests that make the second tier and third tier. The questions made were 15 items on Biodiversity and 15 items on Protist material. The instrument was validated by material experts and assessment experts before being implemented to identify misconceptions. The data analysis technique was carried out in a quantitative and qualitative descriptive manner. This is done after the teacher answers the test, then identify misconceptions with the criteria for determining misconceptions which can be seen in table 1. Then clarifying student misconceptions, misconceptions are grouped based on percentage results. Reference to determining misconception categories is shown in table 2.

**Table 1.** Criteria for determining conception response type

No.	Criteria	Response Type		
		Tier 1	Tier 2	Tier 3
1	Understand the Concept	True	True	Sure
2	Guess	True	True	Not Sure
3	Misconceptions ( <i>False positive</i> )	True	False	Sure
4	Don't understand concept ( <i>lack knowledge</i> )	True	False	Not Sure
5	Misconceptions ( <i>false negative</i> )	False	True	Sure

6	Don't understand concept ( <i>lack knowledge</i> )	False	True	Not Sure
7	Misconceptions ( <i>false negative</i> )	False	False	Sure
8	Don't understand concept( <i>lack knowledge</i> )	False	False	Not Sure

Source: [14]

**Table 2.** Category of misconception

Percentage	Category
0% < misconception < 30%	Low
30% < misconception < 70%	Moderate
70% < misconception < 100%	High

Source: [25]

### 3. Results and Discussion

#### 3.1. Results

The results of the study identifying the MGMP Biology teacher misconceptions can be seen in table 2 for Biodiversity material and in table 3 for Protist material. The results shows that the mean of misconceptions false positive on Biodiversity material is 1.02% while misconceptions are false negative 37.31%. The mean of misconceptions false positive on Protist material was 21.15% while the mean of misconceptions false negative was 20.30%.

**Table 3.** Results of identification of MGMP biology teacher concepts on biodiversity.

Indicator	Number test	Understand the Concept	Misconception		Don't Understand the Concept	Guess
			False Positive	False Negative		
Analysis of Biodiversity Levels	1, 2, 3, 4, dan 5	29.73%	17.12%	47.75%	4.50%	0.90%
Threat of Biodiversity Damage	6, 7, 9, 10, dan 11	37.17%	16.81%	38.05%	7.08%	0.88%
Diversity Conservation Efforts	8, 12, 13, 14 dan 15	48.65%	17.12%	26.13%	5.41%	2.70%
Average		38.52%	17.02%	37.31%	5.66%	1.50%

**Table 4.** Results of identification of MGMP biology teacher concepts on protist.

Indicator	Number test	Understand the Concept	Misconception		Don't Understand the Concept	Guess
			False Positive	False Negative		
Identification of General Characteristics of Protists like Animal	16 dan 17	73.33%	20.00%	0.00%	4.44%	2.22%
Identification of General Characteristics of Protists like Plant	18 dan 19	35.71%	40.48%	9.52%	4.76%	9.52%
Identification of	20 dan 21	17.07%	2.44%	43.90%	36.59%	0.00%

Indicator	Number test	Understand the Concept	Misconception		Don't Understand the Concept	Guess
			False Positive	False Negative		
General Characteristics of Protists like Fungi	22 dan 23	23.08%	20.51%	23.08%	25.64%	7.69%
Classification of Protists like Animal, Protists like Plant and Protists like Fungi	24, 25, 26, 27, 28, 29 dan 30	35.81%	22.30%	25.00%	13.51%	3.38%
Average		37.00%	21.15%	20.30%	16.99%	4.56%

### 3.2. Discussion

Misconceptions experienced by MGMP Biology teachers in Malang are divided into two categories namely false positive misconceptions and false negative misconceptions. Misconceptions are false positive caused by a lack of understanding of a concept. While misconceptions are false negative caused by receiving information about an incomplete concept (deficiency information) [16].

Based on the results of the study, the material on Biodiversity is a negative false misconception which has an average percentage higher than positive false misconceptions that is equal to 37.31% including the medium category. Based on the data, the teacher who compared the most misconceptions on the substance of the biological level analysis obtained with the highest percentage is 47.75%. In this sub-material, a complete analysis of biological levels of genes, species and ecosystems is presented. This shows the teacher's lack of understanding about the level of biodiversity. Most teachers only provide simple examples for defining high levels of life. Lack of understanding of teachers causes teachers to not be able to give examples of the level of participation that is around [17]. This is corroborated by research conducted by Aisyah in 2011 on the concept of Biodiversity in teachers by 50% and in the material on Indonesian Biodiversity and in the Conservation of concept errors in teachers by 75% [18].

The teacher often gives explanations and examples in books. Textbooks that are used as the sole source of guidance for teachers increase the occurrence of misconceptions among teachers [19]. Textbooks in schools often use examples of biodiversity from abroad, such as ostriches, polar bears, and kangaroos so, that only a few use examples of living things from the surrounding environment. The teacher does not provide contextual examples because of a lack of understanding of the level of biodiversity and it is difficult to determine contextual examples around the student's environment [20]. The teacher needs to develop abilities and creativity in interpreting the concepts of the material being learned with students' daily lives.

The results showed that the mean of false positive misconceptions was higher than false negative misconceptions, which was 21.15% which was in the low category. Based on the data that teachers experience misconceptions in the sub-material identification of the general characteristics of Protists like Mushroom which is shown with the highest percentage is 43.90%. Teacher misconceptions due to lack of understanding of Protista material due to improper interpretation of understanding and the teacher only reads from textbooks and does not upgrade knowledge. There are misconceptions in the textbook that the teacher handles so that the teacher conveys the concept of the material to the students which contains the misconception. According to Raharjo's research that two biology textbooks for grade X high school students in Klaten District were found to be misconceptions of 14.28% and 10.71% in Protista material [21]. The concept of Protist material that is not understood by the teacher

raises misconceptions and causes the selection of sources used by the teacher does not support the concept of the material being taught by the teacher [22]. Teachers are less able to determine the media and teaching methods that are in accordance with the concept of material so as to cause misconceptions on students due to the material being taught is not understood by students [23].

Teachers need to upgrade information and knowledge that is good, current, contextual and follows the progress of science and technology. However, most teachers only teach concepts in textbooks that some information is outdated. Inability to follow changes in science and technology, causes misunderstanding of information that can cause misconceptions in students. This causes misconceptions and misinformation of disagreement with respect to information. Conflicting views on information add to the confusion and can lead to the merging of information in the form of new concepts that are more complex due to misconceptions between teachers and students [24].

Efforts that can be applied to overcome misconceptions on teachers and prospective teachers are (1) identification of prior knowledge prior knowledge before giving lecture material and make misconceptions brought by teachers as teaching references, (2) using various cognitive conflict learning models and strategies that make teachers are more critical and require them to process teaching materials in more depth, and (3) include the results of misconception searches in teaching materials for courses to reduce misconceptions that can occur to teachers [4].

#### 4. Conclusion

The results of the study concluded that misconceptions experienced by MGMP Biology Malang City teachers on Biodiversity included moderate and low categories on Protist.

#### References

- [1] Hewindati Y T and Suryanto A 2004 *J. Pendidikan* **1** 61-72
- [2] Wahyudi I and Maharta N 2013 *J. Pendidikan MIPA (Old)* **1**
- [3] Salirawati D 2011 *J. Penelitian dan Evaluasi Pendidikan* **2** 232-249.  
<http://dx.doi.org/10.21831/pep.v1i2.1095>
- [4] Laksana D N L 2014 *J. Ilmiah Pendidikan Citra Bakti* **1** 15-26
- [5] Simamora M and Redhana I W 2007 *J. Penelitian dan Pengembangan Pendidikan* **2** 148-160
- [6] Chandrasegaran A L, David F T and Mauro M 2007 *Chemistry Education Research and Practice* 293-307 <https://doi.org/10.1039/B7RP90006F>
- [7] Nusantara E 201 *Bioedukasi* **4** 2
- [8] Tekkaya C 2002 *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi* **23**
- [9] Tayubi Y R 2005 *Mimbar Pendidikan* **3** 4-9
- [10] Mukaromah Siti H B and Ibnul M 2012 *J. of Biology Education* **2** 182-189
- [11] Bahar M 2003 strategies *Educational Sciences: Theory & Practice* **1** 55-64
- [12] Özmen H 2004 *J. of Science Education and Technology* **2** 147-159
- [13] Mustika A A, Hala Y and Aarsal A F 2015 *J. Ilmiah Ilmu Pengetahuan Alam* **2**  
<https://doi.org/10.35580/sainsmat3211192014>
- [14] Peşman H and Eryılmaz A 2010 *The J. of Educational Research* **3** 208-222  
<https://doi.org/10.1080/00220670903383002>
- [15] Treagust D F 1988 *Int. J. of science education* **2** 159-169  
<https://doi.org/10.1080/0950069880100204>
- [16] Khairaty N I, Taiyeb A M and Hartati H 2018 *J. Nalar Pendidikan* **1** 7-13
- [17] Septian I, Ariyati E and Marlina R *J. Pendidikan dan Pembelajaran* **10**
- [18] Imaningtyas C D, Karyanto P, Nurmiyati N and Asriani L 2016 *J. Pendidikan Biologi* **1** 4-10
- [19] Nurulwati N, Veloo A and Ali R M 2014 *J. Pendidikan Sains Indonesia* **1** 87-95
- [20] Leksono S M, Rustaman N and Redjeki S 2013 *J. Cakrawala Pendidikan* **3**  
<http://dx.doi.org/10.21831/cp.v3i3.1628>
- [21] Raharjo D Ramli M and Rinanto Y 2018 *Porc. Int. Conf. on Mathematics and Science Education of Universitas Pendidikan Indonesia (Bandung)* vol 3 (Bandung: UPI) p 85-90.

- [22] Sari L Y 2013 *Proc. SEMIRATA (Lampung)* vol 1 (Lampung: FMIPA Universitas lampung)
- [23] Murni D 2013 *Proc. Semirata FMIPA Universitas Lampung (Lampung)* vol 1 (Lampung: Universitas Lampung) p 205-211
- [24] Marshall H A 2003 *Countering Astronomy Misconceptions in High School Students* (Dallas: University of Texas) pp 1-14