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Identification of Student Misconception Level Through The *Four-Tier Diagnostic Test as* A Result of The Implementation of E-Module Development

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Abstract

Learning in Kurikulum Merdeka guides students not only to wait for information from the teacher but also to independently obtain good learning resources. Each student's literacy skills will influence their ability to understand the material. Students having a misconception still become a big threat, therefore the students need specially designed learning media based on materials needed which is listed in the teacher's lesson plan. The learning media was developed in e-modules that can be used both offline and online to help reduce misconceptions about the material being studied. This study aims to identify the level of students' misconceptions between classes that use e-modules and those that do not. The research design used a posttest-only control group design with questions of the type of four-tier diagnostic test. Students answered by Google Forms and analyzed based on the Certainty of Response Index (CRI) criteria. The results of the implementation of e-modules, which have been developed based on the needs of the teacher's lesson plan, show differences in the level of misconceptions between classes that use it and those that don't. In the experimental class, 33.4% of students stated misconceptions, while in the control class, it was 51.7.

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INTRODUCTION

Learning in Kurikulum Merdeka guides students not only to wait for information from the teacher but also to independently obtain good learning resources. Each student's literacy skills will influence their ability to understand the material. However, in reality, the literacy abilities of junior high school students, especially in Jember Regency, do not have a significant difference. This was mentioned by (Prafitasari A. , 2023) that scientific literacy ability for nominal, functional, and procedural indicators of middle and high school students aged 15 years old do not show any significant difference. Therefore, apart from students' literacy skills, the quality of reading sources is a very important thing to get attention, so the students' misconceptions can be minimized. Misconception is a condition where the understanding of students or someone about a concept or material is not by scientific theory (Puspitasari et al, 2019). Based on previous research (Wicaksono, Priantari, & Prafitasari, 2021) using multilevel diagnostic tests, it was found that the level of students' misconceptions in learning science in 5 junior high schools in Jember Regency was studied. This is certainly a finding that the results should not only be known without any action or steps to be able to overcome or suppress the

occurrence of misconceptions among junior high school students who have the potential to carry over to high school. From the research (Wicaksono, Priantari, & Prafitasari, 2021), it is also explained that several factors that have the potential to cause misconceptions are learning resources, methods, methods or forms of learning, as well as learning media chosen by the teacher.

According to (Muslih, 2022) An increase in learning outcomes, students, student activities during the learning process, and student reactions to learning activities all contribute to increased learning efficacy. Today in "Kurikulum Merdeka" learning with a blended system has combined face-to-face learning with technology-based learning both online and offline (Puspitarini, 2022). Although it is considered quite effective because students can have the flexibility to access various learning resources the information that the teacher wants to convey is not always well absorbed and misconceptions occur due to unstructured student learning resources. When students carry out activities in online form, some students only fill in attendance or look for sources that may not necessarily be relevant because they have not received learning resources that are by the material and have included theoretical texts, images, and videos that support the explanation of the material and references for do the tasks of online learning given by the teacher. Therefore, students need learning media that can help students' independent learning process when online, as well as clarify teacher information when offline learning to suppress misconceptions in students. Learning media that are specifically structured to reduce these misconceptions must contain every information that the teacher wants to convey, complete with theoretical texts, supporting pictures, and videos that explain science materials that are nano-molecule, abstract, or invisible and that are difficult to understand by students. Based on the problems described, it is necessary to research and develop e-module learning media to suppress the emergence of misconceptions in students due to online learning. E-module was chosen based on the research. (Mahrawi, 2021) That e-book-based interactive learning media could attract students' attention and interest in learning to increase, the use of language was simpler and easier to understand. This article is structured to find out how the level of students' misconceptions differs through the *four-tier diagnostic test question type* after one class uses the e-module learning media that has been developed and the other class uses learning media in the form of sources from the internet that are commonly used.

METHODS

This research which aims to determine the difference in the level of students' misconceptions between those who use e-module learning media and those who do not, is a *true experimental study* and was carried out using a *posttest-only control group design research design* with the following scheme.

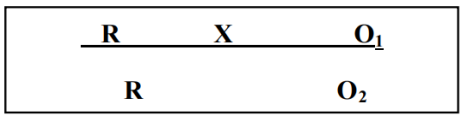

Figure 1. Schematic of *Posttest Only Control Group Design*

The selection of respondents (R) for the control and experimental classes used a *random sampling technique* based on the scores of the previous semester. The study was conducted without using a *pretest*. The control class in this case is the class that is given treatment (X), which is using learning media that has been declared valid based on expert judgment. The learning media previously developed by researchers in the form of e-modules by the material needs in the lesson plans that have been prepared by teachers in the field of science studies at SMP Negeri 10 Jember. The level of students' misconceptions from both classes was tested by giving a *posttest* (O) using a *four-tier diagnostic test type question* which has four levels of questions. The answers to the *posttest questions* using the *four-tier diagnostic test type* from the control and experimental classes were then compared based on the *Certainty of Response Index* (CRI) rubric criteria with the help of *Google Form*.

RESULTS AND DISCUSSION

Misconception is a condition where the understanding of students or someone about a concept or material is not by scientific theory (Puspitasari et al, 2019). Misconceptions are erroneous ideas or views about a concept that are understood by someone that is not by the concept agreed upon and considered correct by experts, usually different (wrong) views are resistant (difficult to change) and persistent (tend to persist) (Suhermiati, 2015). Errors in understanding concepts or misconceptions in learning occur a lot in elementary, junior high, high school to university. Misconceptions can hinder the process of receiving new knowledge from students so it will have an impact on the success of students in the next learning process.

This research on identifying the different levels of students' misconceptions was carried out at SMP Negeri 10 Jember on the respiratory system material for class VIII even semesters. The school was chosen because SMP Negeri 10 Jember is one of 5 schools with students who have a high level of misconception after online learning. The study was initiated by conducting interviews with teachers in the field of science study for class VIII as well as confirming the findings of misconceptions which were quite high in previous studies. The teacher also explains the teaching materials used and the learning outcomes contained in the lesson plans that have been prepared. This information is used as the basis for developing e-module learning media that are specifically tailored to the needs of students in meeting indicators of competency achievement or GPA. According to Satriawati, the module can facilitate students in learning, both independently and in mentoring because it is equipped with learning instructions (Satriawati, 2015). The selection of e-modules is also strengthened by the results of Puspitasari et al .'s development which states that students respond well to the e-module learning media and assess it as effective as a learning resource.(Puspitasari, Suyono, & Astutiningtyas, 2021)

The modules developed must be attractive to increase learning motivation to increase students' understanding (Mahnun, 2012). first, go through the validation stage. After being declared valid by experts and practitioners (teachers), the learning media in the form of e-modules was applied in learning in the experimental class to find out the difference in the level of misconceptions with classes using unstructured learning resources search results on the internet. The learning media that have been developed are compiled by containing all the information students need related to the material being taught. The material in the e-module

includes various elements such as reading texts, pictures, animations, and explanatory videos as well as practice questions that can be easily learned by students without having to look for too many sources on the internet and their suitability is unknown. This was also emphasized by Syahrul (2019) who stated that the presentation of the e-module must have a design of the size and color of the test, background, images, and sample questions along with exercises and answer keys, as well as a summary of the material (Syahrul, 2019). This is to make it easier for students to learn and practice solving problems of a material concept.

The e-module used previously was a development based on the learning process design for the subject teacher. The validation test is determined based on the average percentage of three validators, 1 teacher, and the results of student responses. The average percentage is then expressed using the criteria for determining the Likert scale range and is declared valid at 70%. This determination is also by Riduwan's validity criteria which divides the realm of validity criteria as follows.

Table 1. Criteria for the Percentage of Validity of the Likert Skala Scale

Category	**Scale (%)**
Invalid	0 — 20
Less Valid	21 — 40
Quite Valid	41 — 60
Valid	61 — 80
Very Valid	81 — 100

Source (Asri & Dwiningsing, 2022)

Based on the table above, the results of the validation of the e-module learning media with a percentage of 70% have been declared valid and can be applied after revisions are made based on input from teachers, material, media, and language experts, as well as assessments of student responses.

The evaluation of learning from the experimental class and the control class was carried out using a four-tier diagnostic test. The existence of 4-level questions is the result of the development of two- and three-level questions which are considered to still have weaknesses. The weakness is that it has not been able to detect the level of confidence of students in answering questions and giving reasons (Gurel & Kaltakci, 2015). Therefore, the four-tier diagnostic test was chosen to determine the level of student confidence in answering, so that the level of student understanding of a concept can be identified. The items used in this posttest are the result of the development of Dewi, NP's four-tier diagnostic test (2021) which is adapted to the learning achievement needs of class VIII students at SMP Negeri 10 Jember on respiratory system material. The items have been declared valid with the $_{\text{calculated}}$ r value at a significance of 0.05 is 0.493 which means it is greater than the r $_{\text{table}}$ 0.361 (Dewi, 2021). The answers to the four-tier diagnostic test types are analyzed per point by using the Certainty of Response Index (CRI) rubric as follows.

Table 2. CRI Score and Criteria

CRI	Criteria
0	Just guessing
1	More Guessing
2	Not sure
3	Certain
4	Almost Sure without Doubt
5	Very sure

Source (A'yun, Harjito, & Nuswowati, 2018)

Students are declared to have misconceptions and cannot be classified by looking at the level of belief they choose. According to Nadziroh, the criteria for a student's level of understanding can be determined through the following CRI index.

Table 3. Certainly of Response Index Criteria

CRI Indeks Index	Scale	Answer	Criteria
Low	1-2	Wrong Right	Don't Understand the Concept
Tall	3-4	Right Wrong	Understand Concept Misconception

Source Development Results (Nadziroh, 2021)

The table above can be interpreted that a high score indicates a high level of self-confidence from students regarding the reasons for the answers given, but if it turns out that the answers given are wrong, it can be stated that the students have misconceptions.

The results of the recapitulation of the identification of students' understanding in the experimental class and control class on each item can be detailed in the following table.

Table 4. Identification of misconceptions per Item Questions for each Class

Experiment Class				Control Class			
Question Items	**M**	**TP**	**P**	**Question Items**	**M**	**TP**	**P**
1.	6	1	22	**1.**	10	1	17
2.	4	0	25	**2.**	13	1	14
3.	12	3	14	**3.**	16	3	9
4.	13	7	9	**4.**	16	7	5
5.	5	2	22	**5.**	16	2	10

Experiment Class				Control Class			
6.	9	0	20	**6.**	18	2	8
7.	6	3	20	**7.**	12	3	13
8.	23	3	3	**8.**	21	2	5
9.	6	1	22	**9.**	11	4	13
10.	13	2	14	**10.**	12	0	16

Based on the results of the evaluation using a *four-tier diagnostic test* to compare the level of students' misconceptions from two classes with different treatments, can be presented in the following table.

Table 5. Comparison of Experimental and Control Class Understanding

Class	**Mastery learning**	**Misconception**	**Do not understand**	**Understand**
Experiment	75.86%	33.4%	7.6%	58.9 %
Control	50%	51.7%	8.9%	39.2%

The table above shows the differences in students' understanding between the experimental class using e-module learning media on respiratory system material and the control class using search results from the internet. Overall, the level of understanding of students in the experimental class was 58.9 % and students who experienced misconceptions were 33.4%. This value is still better than the control class which shows the percentage of students' misconceptions is 51.7 % and the level of understanding is only 39.2%. The results of the two test classes are certainly not a satisfactory value in achieving learning objectives. The teaching and learning process is also very influential in determining students' cognitive learning outcomes. However, from this data, it can be shown that the use of e-modules specifically developed based on the needs of the teacher's lesson plans can give positive results and suppress the existence of a higher level of misconception. The experimental class data above when compared with the misconception level research at SMP Negeri 10 Jember in 2021 also shows positive changes. The results of previous research at the school showed that the percentage of misconceptions was 60.6 % and only 16.3% of students stated that they understood. (Wicaksono, Priantari, & Prafitasari, 2021).

The results of the identification of understanding that have been described previously are directly proportional to the learning outcomes of the experimental class and the control class. The greater the percentage of student understanding, the better the learning outcomes. However, the data on students' learning mastery results were greater than their level of understanding. So even though the data shows that only 58.9 % of students are stated to understand, it turns out that there are 75.86% of students are declared to have completed their

learning outcomes. This is because students can answer correctly the questions given even though they don't understand the concept for sure, so the process of answering can be doubtful or there is an element of luck. This is by the theory presented by Saleem Hasan, Diola Bagayoko, and Ella Kelley in the form of the following matrix table.

Table 6. Student Answer Matrix based on Answers and High Low Criteria CRI

Answer	**Low CRI Criteria (<2.5)**	**High CRI Criteria (>2.5)**
Right	Fortune Guess	Understand Concept
Wrong	Lack of Knowledge	Misconception

Source of development results
(Hasan, Bagayoko, & Kelly, 1999)

The table above explains that if the student's answer is correct but the selected CRI score shown by the student is low, then the student's answer is only a lucky guess because it is correct. If the answer is wrong but the CRI score shown by the student is low, then the student has a poor understanding. Conversely, if students have high confidence in the answers that turn out to be wrong, then the students experience misconceptions. Students who are declared to understand the concept.

CONCLUSION

Misconception is a condition where students have a high belief in a concept that is misunderstood. This condition cannot be allowed to continue because it will have an impact on students' understanding of the material and the next level of education. One of the factors that cause misconceptions is the use of learning resources that are not directed, are free, have not guaranteed credibility, and are not necessarily by the needs of the material to be conveyed by the teacher. Therefore, the best learning materials are those that are prepared by themselves or adapted to the teacher's lesson plans.

The development of learning media that is specifically prepared by the teacher's material in the learning process plan (RPP) can help students understand the concept. The e-module learning media can be used both in face-to-face learning and online. This will certainly reduce the number of students who experience misconceptions. This is evident from the results of the research data that has been described previously that there is a difference in the percentage of students who experience misconceptions in classes that use e-module learning media and those who do not. In the experimental class, students who stated misconceptions were 33.4 %, while in the control class, it was 51.7%.

SUGGESTION

About developing a misconception instrument using CRI, each question must have an answer at a level that is easily differentiated by students. A Credible reading resource to suppress students' misconceptions is very important. Therefore, this research can be developed or continued using different biological materials.

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