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The Identification Misconception in Geography Learning During Covid-19 Pandemic Using Three-Tier Diagnostic Test

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Online learning during covid-19 pandemic is the first experience for most teachers and students in Aceh. This study aims to find out how the level of geographical concepts understanding during online learning in Aceh, Indonesia through three-tier diagnostic test. After knowing the concepts students find difficult as well as their difficulties in understanding those concepts, as long-term goal online learning method which is effective and innovative will be developed to enhance the level of geographical concepts understanding and to avoid misconception in students. This study uses quantitative approach. The object of study were students of class XI and XII with the total of 131 students come from 19 school in Banda Aceh and Aceh Besar. Data collection instrument used was test in the form of three-tier diagnostic test given online through google forms. Data analysis was carried out by analyzing the combination of answers using three-level multiple choice. The results showed indicated that the percentage of students who understand concept was 6.2%, do not understand concept were 78.50%, misconception was 3.18% and error was 2.12%. Based on the result of study it can be concluded that most respondents were in the category of do not understand the concept.

Keywords: geography learning, misconception, three-tier diagnostic test, learning, covid-19 pandemic

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INTRODUCTION

During Covid-19 pandemic, elearning has been implemented in almost all over the world (Goldschmidt, 2020). Elearning is considered as the best approach to learning process during Covid-19 pandemic, and it is an alternative of modern learning method (Mailizar et al., 2020). In its implementation in Indonesia, The Ministry of Education and Culture provide online learning platform dan it can be accessed in webdite https://spada.kemdikbud.go.id and https://kuliahdaring.kemdikbud.go.id. It is expected that this platform can support student and teacher so student can learn from home.

Implementation of online learning is not as smooth and effective as expected due to various factors that involve various component (Zaharah et al., 2020). Online learning process run in unmeasured and unexamined scale because it never happens before that learning with online system is done concurrently (Sun et al. 2020). Schools with lack of experience in online learning or no experience at all and have not prepared online learning resources will find difficulty particularly when teachers do not understand how to use online application (Scull et al., 2020). In countryside area, it become its own problem, because information technology infrastructure is very limited.

Several researches had been conducted to measure obstacle and challenge in e-learning during covid-19 pandemic in Indonesia. Mailizar et al. (2020) had conducted the research on teacher perspective about the obstacle in implementing e-learning during covid-19 pandemic in four levels of obstacle, namely teacher, school, curriculum, and student. His research result indicated that the obstacle of student level has highest effect in using e-learning. Based on that research finding, it can be known that based on teachers' perspective, obstacle in student has highest effect in using e-learning.

Daryanto (2008) emphasis in the learning process will form the ability to understand a concept put forward by the teacher, and be able to utilize the content and communicate it well. Understand is to know about something and can see it in various sides (Gadeng et al., 2018). Student is said understand something if he or she can explain and exemplify by using his own word. Lack of conceptual understanding and application in student because the subject matter in concept is very difficult due to its wide coverage (Iriyanti et al., 2012). These which cause lack of conceptual understanding in students.

Each concept has a relation with other concepts or is interrelated. Those concepts that shape student's understanding. Student often only memorize concept definition without noticing the relation between one concept with another concept. Another factor which cause lack of conceptual understanding is student readiness in receiving lesson which can affects learning concentration. Marsita et al. (2010:62) student readiness in receiving a subject matter will strongly affect student's understanding level. If student psychology and though has ready before receiving a subject matter, then student will easy to receive new concept given by teacher. In contrast, if student had not ready or not ready at all to receive the subject matter given by teacher then student's response in receiving new concepts is not optimal so it is possible that student experience lack of understanding and misconception to the concept they receive.

Misconception is having different assumption about a concept. Suparno in Kurniadi (2008:31) mention that "misconception or one of concepts point to a concept doesn't accord with a definitions accepted by experts in the field." Misconception can be initial concept, incorrect relationships beetween concepts, intuitive ideas or naïve views. The causes of misconceptions in learning is students tend to base their thoughts on things that are visible in a situation (Dahar, 2011). Based on the citation above, it can be concluded that if students interpret a concept without deep understanding then it will cause misconception. Finally, that wrong interpretation can become wrong idea that admitted by student as correct. If misconception has occurred then student will keep thinking that the concept is correct. It shows that it is important to ensure student readiness both psychic and mental in receiving learning. It strongly affects student concentration in absorbing the lesson received from the teacher and can prevent students' wrong interpretation including misconception.

Lack of student's understanding is caused by two factors namely, students misinterpret phenomena or event they encounter in their life. Less directed learning conducted by teacher so students misinterpret a concept (Mentari et al., 2014). As a result, it can cause misconception in understanding geographical concept. Diagnostic test is test used to find out students' weakness so the right treatment can be given based on these weakness (Arikunto, 2006). If teacher has found where student weakness located then it is more easily to give solution to student who experience difficulty.

Diagnostic test aims to ensure whether student had mastered knowledge which become base to be able to receive further knowledge. One of diagnostic tests that can be used to identify conceptual understanding and misconception is three tier test. This instrument can identify student's conceptual understanding easily and doesn't need more time. In addition, it can distinguish students who answered incorrectly because of misconceptions or lack of understanding of the subject matter (Suhendi, 2014).

Three-level multiple choice is a diagnostic test in the form of multiple choice consisting of 3 levels of questions. The first level contains items (subject matter), the second level asks the reasons for the answers from the first level and the third level of the belief index (Tresnasih, 2013). Every level of exam in one item of three-tier multiple choice will measure 3 levels at a time. The first level measures knowledge ability, the second level measures reason (reason tier) namely ability to explain knowledge which become base in chosing one of answers, and level of confidence (confidence tier) to measures degree of confidence in determining answer and reason choosen (Bunawan, 2014). The three-level multiple choice instruments are useful to see conceptual understanding and also identify misconceptions in students.

Based on background and literature review above, it is important to conduct research on level of conceptual understanding in students, particularly the concepts in geography subject and moreover during online learning. From this research it can be known which concepts in geography subject students find it hard to understand during online learning and the difficulties they experience in understanding those concepts.

METHOD

This study focuses on identifying the level of conceptual understanding in students by using three-tier multiple choice instrument. Type of research used in this study is descriptive research. Descriptive research aims to (a) Describe data or phenomena obtained from the field in numeric form; (b) summarize data in pictorial form; (c) display data in tabular form so elevator can more easily understand the phenomena occurs in students (Sukardi, 2008:145). The description given in this study is about the result of identification of conceptual understanding level in geography subject. The study was conducted in 19 Senior High School/Islamic Senior High School in Banda Aceh and Aceh Besar by involving 131 students of class XI and XII Majoring Social Studies.

Table 1
The number of schools and students involved in research

No	School	Location	Number of Students
1	SMA 7	Banda Aceh	10
2	SMA 12	Banda Aceh	1
3	SMA 4	Banda Aceh	6
4	SMA 5	Banda Aceh	5
5	SMA 1 Montasik	Aceh Besar	6
6	SMA 1 Darul Imarah	Aceh Besar	16
7	SMA 8	Banda Aceh	30
8	SMA 1 Lhoknga	Aceh Besar	15
9	SMA 1 Peukan Bada	Aceh Besar	1
10	SMA 2 Selimeum	Aceh Besar	4
11	SMA 1 Masjid Raya	Aceh Besar	1
12	MAN 6	Aceh Besar	1
13	SMA 1 Lampeuneurut	Aceh Besar	1
14	SMA 1	Banda Aceh	15
15	SMA 1 Kuta Cot Glie	Aceh Besar	3
16	SMA 1 Jeumpa Puteh	Banda Aceh	3
17	SMA 1 Indrapuri	Aceh Besar	7
18	SMA 2	Banda Aceh	4
19	SMA 1 Baitussalam	Aceh Besar	2
Total			131

This study was divided into three stages, namely preparation, implementation and final. Preparation stage is initial stage before the study conducted with the stages comprising:

a) Making syllabus of diagnostic test item and three-tier multiple choice item.
b) Doing validity test quantitativey based on validity and reliability.
c) Making final recapitulation of test analysis to determine test items used in the study.

Implementation stage is a stage that will be done during research process. Implementation stage comprises:
a) Giving diagnostic test item to research sample.
b) Analyzing student's answer of diagnostic test based on scoring guidance.

c) Grouping the understanding level of students who are categorized as understand, do not understand, misconception and error.
d) Calculating the percentage of students conception categorized as understand, do not understand, misconception and error.

The final stage is stage after preparation and implementation stage which comprises:
a) Identifying students' conceptual understanding in the subject matter of geography subject of class XI and XII
b) Categorizing the result of identifying conceptual understanding

Data collection was done by using test. The test was in the form of three-tier multiple choices. This test was used to identify students' conceptual understanding in geography subject. This test aims to obtain data about the result of identifying students' conceptual understanding in geography subject. Test in this study in the form of written test namely diagnostic test of three-tier multiple choices that consists of 36 items. The questions are prepared based on the learning material contained in the geography subject syllabus for senior high school/islamic senior high school according to the 2013 revised edition of the 2016 curriculum that applies in the Republic of Indonesia.

Table 2
The syllabus of research instrument

No	Basic Competence	Items Number	Item Number
1.	Geography Basic Knowledge	2	1,2
2.	Map	1	3
3.	Remote Sensing and GIS	2	4,5
4.	Geographical Research	1	6
5.	Earth as Life Space	6	7,8,9,10,11,12
6.	Litosphere Dynamic	8	13,14,15,16,17,18,19,20
7.	Pedosphere Dynamic	2	21,22
8.	Atmosphere Dynamic	4	23,24,25,26
9.	Hidrosphere Dynamic	3	27,28,29
10.	Condition of Indonesia as The World Maritime Pivot	1	30
11.	Flora and Fauna of Indonesia and The World	1	31
12.	Food Security, Industry and Energy	1	32
13.	Indonesia Demography Dynamic	1	33
14.	Indonesian Cultural Diversity	1	34
15.	Disaster Management	2	35,36

Data analysis was done by answer combination technique using three-tier multiple choices. To identify answer combination of students' conceptual understanding, this study adapted the answer combination technique used by Kaltakci and Nifuler (2007). The answer combination to analyze students' conceptual understanding is summarized in Table 5. Based on table 5 there are only two options of confidence level used in three-tier multiple choice namely convinced and not convinced. But this study uses Confidence Rating Index (CRI) with 5 answer choices or scale 1-5 as said by Tresnasih et al. (2013). Analysis of answer combination in three-tier was categorized into four categories namely: understand concept, do not understand concept, misconception, and error with type of answer that had been determined in each category.

Table 3
Analysis of answer combination in three-tier multiple choice instrument

No	Category	Type of Answer
1	Understand Concept	Correct answer+correct reason+convinced
2	Do Not Understand Concept	Correct answer+correct reason+not convinced
		Incorrect answer+correct reason+not convinced
		Correct answer +incorrect reason+not convinced
		Incorrect answer+incorrect reason+not convinced
3	Error	Incorrect answer+incorrect answer+ convinced
4	Misconception	Incorrect answer+incorrect answer+ convinced
		Incorrect answer+incorrect reason+convinced

Source: Kaltakci dan Nifuler, 2007:500

Confidence Rating Index (CRI) has 5 scale namely scale 1-5 with criteria: guess, not convinced, doubt, and certain (Table 4).

Table 4
Confidence rating index and its criteria

CRI	Criteria
1	Guess
2	Not Convinced
3	Doubt
4	Convinced
5	Certain

Source: Tresnasih et al., 2013:169

The technique of combination answer analysis technique to identify students' conceptual understanding in this study is combination of analysis technique in table 3 and 4 summarized in table 5.

Table 5
Analysis of answer combination in three-tier multiple choice

Category	Type of Answer		
	Level One	Level Two	Level Three
Understand Concept	Correct	Correct	CRI > 2,5
Do Not Understand Concept	Correct	Correct	CRI ≤ 2,5
	Correct	Incorrect	CRI ≤ 2,5
	Incorrect	Correct	CRI ≤ 2,5
	Incorrect	Incorrect	CRI ≤ 2,5
Error	Incorrect	Correct	CRI > 2,5
Misconception	Correct	Incorrect	CRI > 2,5
	Incorrect	Incorrect	CRI > 2,5

Source: Kaltacki and Nifuler, 2007:500; Tresnasih et al., 2013:169

Next, each possibility of student answer is calculated in the form of percentage, to find out the percentage of student in each category: understand, do not understand, error and misconception in each concept by using percentage formula. Further, description of data on students' conceptual understanding level according to Sudijono (2009:35):

Table 6
Description of data on conceptual understanding level

Percentage (%)	Criteria of Understanding Level
80-100	Very Good
66-79	Good
56-65	Enough
46-55	Lack
≤ 45	Fail

(Source: Sudijono, 2009:35)

FINDINGS

Recapitulation of percentage of students' conceptual understanding level in Geography learning during Covid-19 pandemic in students in Banda Aceh and Aceh Besar, it can be known that percentage of students who understand concept was 6.2%, do not understand concept were 78.50%, misconception was 3.18% and error was 2.12%. It can be described that from 15 basic competences in geography subject, 12 or 80% basic competence showed the result that level of students who do not understand concept was very high with percentage level above 80% because in all basic competences tested at the time of test, the lowest percentage of students who do not understand concept were 42,32%, and the highest percentage of students who do not understand concept were 93%.

Table 7
Recapitulation of percentage of students' conceptual understanding level in online geography learning during covid-19 pandemic in students in Banda Aceh and Aceh Besar Regency

No	Basic Competence	Total Number of Items	Item Number	Category of Understanding Level			
				Misconception	Understand Concept	Do Not Understand Concept	Error
1	Geography Basic Knowledge	2	1,2	46,36%	9,44%	42,32%	1,87%
2	Map	1	3	33%	14%	45%	8%
3	Remote Sensing and Geographical Information System	2	4,5	29,5%	19,5%	45,5%	5,5%
4	Geographical Research	1	6	7%	5%	86%	2%
5	Earth as Life Space	6	7,8,9,10,11,12	7%	4%	87%	2%
6	Litosphere Dynamic	8	13,14,15,16,17,18,19,20	8%	4%	87%	1%
7	Pedosphere Dynamic	2	21,22	9%	6%	85%	0%
8	Atmosphere Dynamic	4	23,24,25,26	7%	5%	86%	2%
9	Hidrosphere Dynamic	3	27,28,29	9%	3%	87%	1%
10	Condition of Indonesia as The World Maritime Pivot	1	30	11%	4%	83%	2%
11	Flora and Fauna of Indonesia and The World	1	31	6%	8%	86%	0%
12	Food Security, Industry and Energy	1	32	6%	8%	85%	1%
13	Indonesia Demography Dynamic	1	33	3%	2%	93%	2%
14	Indonesian Culture Diversity	1	34	6,82%	0%	91,67%	1,51%
15	Disaster Management	2	35,36	9%	1%	88%	2%
Mean				3,18%	6,2%	78,50%	2,12%

Source: Data Processing 2021

In accordance with the rule in table 6, the description of data on conceptual understanding level, conceptual understanding level can be categorized as fail, because in all basic competences tested it obtained percentage ≤ 45%, the lowest level was at 0% and the highest level was at 19.5%. Whereas the lowest percentage level of error was in 0%, and the highest percentage level of error was at 8%. The last, the lowest percentage level of misconception was at 3%, and the highest percentage level of misconception was at 46,36%. Therefore, based on research result in the field it can be concluded that online learning in geography learning during pandemic is not as expected or in the other word it is fail. The point is online learning bring very big negative effect to students in Aceh Province, particularly in geography subject.

DISCUSSION

It is very important for a teacher to know the level of student's understanding of a concept (Aydeniz et al., 2017), Three-tier diagnostic test can reveal students' difficulty in understanding a concept (Saat et al., 2016) and reveal students' misunderstanding in understanding a concept (Milenkovic et al., 2016). Level of students' conceptual understanding in online geography learning during Covid-19 pandemic in Banda Aceh and Aceh Besar Regency particularly in the subject matter of basic geography shows that those who understand concept was 9.44%, do not understand concept were 42.32%, misconception was 46.36% and error was 1.87%. The lack of students' conceptual understanding in the first basic competence is caused by several factors such as the abstract subject matter and unaccomplishment because the subject matters are overload.

Subject matter in the subject matter of basic geography is indeed very broad, starts from definition of geography, history of geography development, object of study, classification, principle until geographical approach, so make difficult students to understand all concepts in this subject matter. It is in accordance with Iriyanti et al. (2012:9) that lack of conceptual understanding in students can be the result of various things, one of them is the subject matter which is very difficult because has broad the coverage. Based on experience also, the subject matter of basic geography is very difficult for teacher to be taught to students, because among geography teachers themselves often occurs different opinions when giving answer about basic geography subject matter, particularly when discussing sub topic of geographical approach. So, it is very normal if level of misconception among students also very high at 46.36% in that subject matter.

In the subject matter of map, level of students' conceptual understanding in geography learning during covid-19 pandemic in students in Banda Aceh City and Aceh Besar Regency showed that students who understand concept were 14%, do not understand concept were 45%, misconception were 33% and error was 8%. The percentage of misconception in the subject matter of map is quite high because in this subject matter, students not only required to understand theory or concept such as the basics of mapping and types of maps, but also can apply it in map making. As revealed by Mentari et al. (2014:85) that several factors that the causes of misconceptions include students being unable to apply the concepts they have learned in solving a problem and connecting

them to one another. So, in learning the subject matter about map, students not only should understand the definition and types of maps, but also should understand about map scale and map projection and can apply it.

In the subject matter of remote sensing and geographical information system, the level of students' conceptual understanding in online geography learning during covid-19 pandemic in Banda Aceh City and Aceh Besar Regency indicated that students who understand concept were 19.5%, do not understand concept were 45.5%, misconception were 29.5% and error was 5.5%.

Percentage of misconception in the subject matter of remote sensing and geographical information system is quite high, because in this subject matter, students not only required to be able to understand theory or concept such as the basics of remote sensing and geographical information system, type of image of remote sensing and image interpretation, theory of data processing in geographical information system, but also should be able to use some applications that support and suitable for remote sensing and geographical information system.

Based on the author's experience, the subject matter about the basics of mapping particularly in sub subject matter of remote sensing and geographical information system is the subject matter which is very difficult for teacher to be taught to students because geography teachers only able to teach theory about remote sensing and geographical information system, and many geography teachers who are unable to use supporting technology of remote sensing and geographical information system. Finally, lack of facilities available such as software and hardware in each school to support the subject matter of remote sensing and geographical information system learning. Those are various problems occur in Indonesia during geography learning particularly the subject matter of remote sensing and geographical information system (Gadeng et al., 2021). So it is very normal if the level of students who do not understand concept achieve 45.5% in the subject matter of remote sensing and geographical information system.

In the subject matter about litosphere, pedosphere, atmosphere and hydrosphere dynamics, the level of students' conceptual understanding is also low in general. In this subject matter, many students not understand concept. According to Desfandi, et al (2020) lack of understanding to subject matter that student experience caused by several factors, one of them which frequently happens is students misconceive a concept taugh by teacher during learning in class. It can be said that students understand well a subject matter if they can constructs meaning of learning messages then convey these messages by using their own words and sentences (Gadeng et al., 2018:2; Anderson and Krathwol, 2015:105).

In the subject matter of Indonesian culture diversity, it indicated that students who understand concept was 0%, do not understand concept were 91.67%, misconception was 6.82% and erros was 1.51%. The low level of students' conceptual understanding can be caused by various factors, among other is level of student readiness to learn as expressed by Marsita et al. (2010:62) that student readiness in receiving a subject matter

will strongly affects level of students' understanding. The subject matter of Indonesian culture diversity is new subject matter included in geography subject as in accord with curriculum 2013 Revision Edition 2016, so makes difficult teacher to deliver that subject matter to students, moreover during covid-19 pandemic learning is done online so it makes the delivery of subject matter does not run perfectly. The change into online learning which has psychological effect makes students cannot adjust fully their learning pattern to the demand of online learning (Abdurrahman, 2021). The effect is also influence of learning outcome (Fitriasari, et al. 2020).

In the subject matter of disaster management, level of conceptual understanding in students who understand concept was 1%, do not understand concept were 88%, misconception was 9% and error was 2%. This subject matter of disaster management is very important to be taught well to students because the learning outcome in this subject matter become students' mainstay to self-evacuate when disaster occurs in community. Moreover, Indonesia becomes the country which is very vulnerable to disaster due to its geological and geographical condition. Geography subject becomes formal socialization media to enhance disaster knowledge and understanding in students.

Even though the student's outcome is not as expected, from 15 basic competences in geography subject, 12 or 80% basic competence shows the result that percentage of students who do not understand concept is very high that was above 80%. Therefore, it is expected that geography teacher can teach well the subject matter to students by using various learning approaches, learning strategy, learning model, learning method, learning media and utilize environment as learning source. As revealed by Daryanto (2008:25) that the emphasis in the teaching and learning process will form the ability to understand the concepts given by teacher, and be able to utilize the content and communicate it well. It aims to create innovative, creative and fun learning, so it affects enhancement of students' learning outcome. Saguni et al. (2021:315) states that most likely teacher can encourage students to enhance their academic achievement. Student readiness in receiving a subject matter will be strongly affect level of student's understanding (Marsita et al., 2010:62).

In essence, students' learning outcome which is bad in knowledge and conceptual understanding obtained in this study is the negative effect of online learning in geography subject in school in Banda Aceh and Aceh Besar. That problem not only occurs in Aceh Province, but also occurs in many other regions. Students find it very hard to understand the subject matter delivered by teacher during online learning, moreover the tasks given continuously by all teachers from the beginning until the end of learning. Some students have obstacle in technology tools which are used for online learning, the cost of internet quota which is very expensive with different price in each region. Usually, the cost of internet quota in city is far cheaper than in village. The last problem which is very fatal is unstable internet network in each region. The quality of internet network in city is very adequate, whereas in village is very bad, keeping in mind that some students live in city and some students live in village. (Asmuni, 2020; Muhajir, 2020; Abdurrahman, et al., 2021; Nasution, 2021).

CONCLUSION

Covid-19 pandemic has caused learning in various regions in all educational levels should be done online. It also affects data collection of this research. Research data collection should be done online through google forms. In spite of various obstacles, Alhamdulillah online data collection can be done well because of the support from Principal and geography teachers in Banda Aceh City and Aceh Besar Regency. Similarly with data analysis data that had been done in a set time. The finding of this research indicated that students who understand concept was 6.2%, do not understand concept were 78.50%, misconception was 3.18% dan error was 2.12%. This result is still far from expectation and far from perfect. But because learning is done online with all limitations, that result is understandable.

Based on research finding, there are several suggestions given from this research the researchers recommend Government to open opportunity to allow face- to- face learning with strict health protocol so the spread of covid-19 virus can be minimized well. And Teachers also are expected to be serious in enhancing students' conceptual understanding maximally through the learning process of geography subject as expected. Hopefully the results of this research can be useful for teachers of geography subjects in Aceh Besar District and Banda Aceh City Aceh Province, Indonesia. So that geography subject teachers can optimize the learning process in various learning materials by using various learning media that can arouse students' enthusiasm for learning. Then, teachers are also expected to be able to use various online learning models that can activate students and can improve students' critical thinking skills. The spirit of learning and the activeness of students will have a major influence on the learning outcomes possessed by students, such as learning outcomes in the cognitive aspect (knowledge), learning outcomes in affective aspects (attitudes) and learning outcomes in psychomotor aspects (skills), so that in the end the goal learning can be achieved as expected by teachers of geography subjects at the high school level. Future researchers are expected to be able to conduct research on misconceptions in geography learning for a wider research location, so that research results can be more diverse and can provide very useful input for teachers of geography subjects in various districts/cities in Aceh Province and even all provinces in Indonesia. Indonesia.

Further researchers are expected to be able to conduct research on misconceptions in learning geography offline (outside the network) so that the research results obtained are more valid and accurate, unlike this research which was conducted online (on the network) through the distribution of google forms to students, because in when this research was taking place during the Covid 19 pandemic, so there were restrictions in learning and it was carried out online (on a network), the impact on students was not serious and not enthusiastic to answer the various questions posed in the study of misconceptions of geography learning. Hopefully the suggestions above can be applied and can be improved by further researchers in the future.

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