The Effect of Learning model on Integrated Virtual Reality to Reduce Misconceptions of Geography Concept in Geography Students

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Abstract. The preliminary study found that students of the Department of Geography, FMIPA, UNM experienced many misconceptions about material concept of geography. Therefore, a research was carried out that aims to describe the reduction of misconceptions in the material after the implementation of E-Learning model to integrated Virtual Reality. This type of research is a quantitative descriptive study with the design ‘One Group Pretest-Postest Design’. The research subject were students of the Geography education ICP (International Class Program) in even Semester of the 2019/2020 academic year, each class totaling 32 students. Data were collected through observation, giving pretest questions before treatment and giving postest questions after treatment. From the data that has been obtained then analyzed using tabulation CRI values to describe the profile of misconceptions that occur in students and analyze the n-gain value to determine the decrease in student misconceptions on the material. From the research results, it can be concluded that the reduction of misconceptions in the material after the implementation of the E-Learning model to integrated Virtual Reality can consistently: reduce student misconceptions.

1. Introduction

The along with the challenges of global life, education is very necessary because education is a determinant of the quality of human resources. Education is a fundamental factor that supports the progress of a nation. Before attending the formal learning process on campus, students have brought the initial concept of geography from school. The initial concept they carry is sometimes not in accordance with or contradicting the accepted concept of the experts. These different concepts are often called misconceptions. They get the initial concept while in school, from their experiences and observations in society or from their daily life.

The formation of teaching materials in the process of learning and teaching is important, because it can affect student’s understanding of a lesson material. Overall in the learning process, concept is the basis for thinking to solving problems in learning process. If the concepts possessed by students keep even contradicting with scientific concepts, then this causes obstacles to the acceptance of new concepts that will be studied, understanding different concepts from scientifically accepted concepts is known as misconception (Gulkom, 2011).

Misconceptions can occur when students are trying to form new knowledge in the form of initial concepts. The formation of this initial conception can be started when students get learning experiences at school and in their environment. Misconceptions can also occur when students get it from the results
of the learning process at the previous educational level. This is in accordance with research, Murni (2013) which explains that the misconceptions that a person will get from the previous education level will remain in him until he is in higher education. Another factor that causes misconceptions in students is their lecturer. This is in a study conducted by Taufik (2012) that if a lecturer teaches students the wrong concept, then this will give the student wrong thoughts in an effort to reconstruct knowledge so that interference occurs between the concepts that have been studied (wrong) and those who are learning (right). Misconceptions can also be persistent when not proven wrong or challenged by other concepts.

Identification is carried out to see the errors received by students, so that they can see what actually happened and then be able to prepare themselves to follow up on these problems. Therefore, to test students regarding conceptual understanding, it is necessary to ask questions about one of the material concepts of geography by measuring a misconception that is happening with the CRI method, respondents are asked to provide confidence at that level with knowledge, concepts, or laws. Students who make mistakes in answering the questions do not fully experience misconceptions. Students who are wrong in answering the questions may not know the concept. One of the way to identify misconceptions, as well as distinguish them from not knowing the concept, is to use Certainty of Response Index (CRI) method. CRI is the level of confidence / certainty of the respondent in answering each question (question) given. CRI is usually based on a scale and is given together with each answer of a question. A respondent experiences misconceptions or does not know the concept can be distinguished simply by comparing whether the answer to a question is correct or not with the index of certainty of the answer given to that question.

The learning model is also expected to change the passive condition to become active and creative. Changing teacher-oriented learning, students who are able to become active learning subjects with a pleasant learning atmosphere by using the right method will have an effect on good student learning outcomes as well. One of the appropriate models in reducing student misconceptions is the Virtual Reality Integrated E-Learning model.

Virtual Reality is a technology that allows a person to simulate a real object using a computer that is capable of generating a three-dimensional (3D) atmosphere so as to make the user physically involved. Virtual Reality technology has been widely used in many fields such as the medical, aviation industry, manufacturing, education, and games. Learning applications that use Virtual Reality technology have their own charm when using them and can make users interested in things or materials in the application that will have an impact on the ease of understanding of the material.

The concept of Virtual Reality refers to the principles, methods and techniques of a system used in the design and manufacture of software products that will be used to assist multimedia computing systems with special device requirements. A Virtual Reality offers the possibility to change the way in which humans perceive the reality around them by simulating and modeling an artificial room. All media that imitate reality are included in the Virtual Reality category (Lacrama, 2007).

The research took the object in the Department of Geography, FMIPA UNM. Based on the results of initial observations, the researcher found a misconception of the concept of geography in the introductory course of the philosophy of geography, the researcher found that 30% mastered the concept and the rest of the students do not know the concepts and misconceptions. Therefore, the researcher chose this class as a place of research.

To identify misconceptions, one way that can be used is by using the Certainty of Response Index (CRI) method. CRI is a diagnostic test in the form of multiple choice questions or completely false and reasoned questions with a combination of the confidence level of the selected answers (Kaur, 2013). If a person's CRI value is low, then this indicates that the person is only guessing when answering, whereas if someone's CRI is in the high category it indicates that the person has a high level of confidence in choosing the answer (Murni, 2013).

2. Research Method
The type of this research is descriptive quantitative approach with the design “One Group Pretest-Postest Design”. The data analysis technique uses descriptive analysis by explaining the learning model carried out in the ICP class, Geography, the geographical concept of a quantitative approach to processing data that has been obtained from the results of cognitive assessments in postest activities, detecting the level of understanding of students. The research subjects gave a CRI value, between 0-5 for each selected answer. The value of CRI 0 is asked if the answer chosen is the result of a pure guess, while CRI 5 is asked if the answer is chosen on the basis of knowledge and is strongly believed to be true. The CRI confidence index can be seen from the following table:

### Table 1 Response Scale for Certainty of Response Index (CRI)

| Scale | Category            | Guess Percentage |
|-------|---------------------|------------------|
| 0     | Totally Guess Answer| 100              |
| 1     | Almost Guess        | 75-99            |
| 2     | Not Sure            | 50-74            |
| 3     | Sure                | 25-49            |
| 4     | Almost Certain      | 1-24             |
| 5     | Certain             | 0                |

The results of the answers presented from the research subjects were then analyzed by the researcher by looking at the truth of the answers of the research subjects with the CRI chosen by the research subjects. Then to distinguish between knowing the concept, not knowing the concept and individual misconceptions can be seen in the table below:

### Table 2 CRI Terms for Differentiating Conceptual Understanding, Misconceptions, and Unconceptions

| Answer Choices | Reason | CRI | Category                  |
|----------------|--------|-----|---------------------------|
| Right          | Right  | >2,5| Understand The Concept well|
| Right          | Right  | <2,5| Don't Know The Concept    |
| False          | False  | >2,5| Misconceptions             |
| False          | False  | <2,5| Don’t Know The Concept    |

After that, the percentage of each criterion is calculated using the formula below:

a. Percentage Who Know the Concept (KC):

\[ KC = \frac{KC}{N} \times 100\% \]

b. Percentage who didn't know the concept (DKC):

\[ DKC = \frac{DKC}{N} \times 100\% \]

c. Percentage of misconceptions (MC):

\[ MC = \frac{MC}{N} \times 100\% \]

Information:
KC = Number of students who know the concept
DKC = Number of students who do not know the concept
MC = Number of students who experience misconceptions
N = Total of Students

3. Result and Discussion

3.1. Classroom Performance Description
The implementation of learning in the experimental class, namely in the ICP Geography Class, the learning process in this study consisted of six meetings, 4 face-to-face meetings and 2 evaluation meetings (pretest and posttest), and each meeting consisted of 3 lesson hours. One hour of lessons for 45 minutes. The experimental class consisted of 32 students who were given treatment using the Virtual Reality Integrated E-Learning model. Activities in this form of stimulation, statement / problem identification, data collection, data processing, verification, and drawing conclusions.

3.1.1. Pretest

Table 3. The percentage of students' pretest scores in the experimental class based on the answer to the CRI method in the Know Concepts, Don't Know Concepts and Misconceptions categories on geography concepts

| No | Sub Concept         | Question Number | KC | DKC | MC | KC   | DKC | MC   |
|----|---------------------|-----------------|----|-----|----|------|-----|------|
| 1  | Pattern Concept     | 1               | 13 | 7   | 12 | 40.62| 21.87| 37.5 |
|    |                     | 2               | 13 | 5   | 14 | 40.62| 15.62| 43.75|
|    |                     | 3               | 13 | 5   | 14 | 40.62| 15.62| 43.75|
|    |                     | 4               | 13 | 8   | 11 | 40.62| 25.00| 34.37|
|    |                     | 5               | 13 | 6   | 13 | 40.62| 18.75| 40.62|
|    |                     | 6               | 13 | 4   | 15 | 40.62| 12.50| 46.87|
|    | Average             |                |    |     |    | 40.7 | 18.2 | 41.1 |
| 2  | Morphological       | 7               | 13 | 4   | 15 | 40.62| 12.50| 46.87|
|    | Concept             | 8               | 13 | 5   | 14 | 40.62| 15.62| 43.75|
|    |                     | 10              | 14 | 3   | 16 | 43.75| 9.37 | 50.00|
|    |                     | 11              | 13 | 5   | 14 | 40.62| 15.62| 43.75|
|    |                     | 12              | 13 | 6   | 13 | 40.62| 18.75| 40.62|
|    |                     | 13              | 13 | 6   | 13 | 40.62| 18.75| 40.62|
|    |                     | 15              | 14 | 5   | 14 | 43.75| 15.62| 43.75|
|    |                     | 16              | 14 | 4   | 15 | 43.75| 12.50| 46.87|
|    | Average             |                |    |     |    | 41.1 | 17.7 | 41.2 |
| 3  | Agglomeration       | 9               | 13 | 7   | 12 | 40.62| 21.87| 37.5 |
|    | Concept             | 14              | 14 | 5   | 14 | 43.75| 15.62| 43.75|
|    |                     | 17              | 14 | 6   | 13 | 43.75| 18.75| 40.62|
|    |                     | 18              | 13 | 4   | 15 | 40.62| 12.50| 46.87|
|    |                     | 19              | 13 | 4   | 15 | 40.62| 12.50| 46.87|
|    |                     | 20              | 13 | 3   | 14 | 40.62| 9.37 | 43.75|
|    | Average             |                |    |     |    | 40.9 | 14.9 | 44.2 |

Source: Field Data Processing
The Pre-test percentage value of students who know the concept, do not know the concept and misconceptions in the experiment

![Figure 1. Geographical Concept Improvement Diagram in Experiment Class](image)

Based on Figure 4.1 the diagram of improving the concept of geography in the Experiment class above, it can be seen that students who know the material concept of Pattern Concept are 41%, don't know the concept of 18% and misconceptions are 41%. In the concept of agglomeration, students who know the concept are 41%, don't know the concept of 15% and misconception is 44%, while in the morphological concept the percentage of know the concept is 42%, don't know the concept 15% and misconception is 42%. A high percentage value is in the concept of agglomeration, which is 44% of students who experience misconceptions.

### 3.1.2. Posttest

The results showed that the effect of the Virtual Reality Integrated E-Learning model can overcome student misconceptions on the concept of geography in the Department of Geography. The percentage of students based on the answers and the CRI (Certainty of Response Index) category of Know the Concept (KC), Don't Know the Concept (DKC), Misconception (MC) can be seen in the following table:

#### Table 4. The Percentage of Student Postest Scores in The Experimental Class Based On The CRI method answer

| No | Sub Concept | Question Number | The number of students who answered | Percentage |
|----|-------------|-----------------|-------------------------------------|------------|
|    |             |                 | KC | DKC | MC | KC | DKC | MC |
| 1  | Pattern Concept | 1               | 32 | 0   | 0  | 100.00 | 00.00 | 00.00 |
|    |              | 2               | 25 | 3   | 4  | 78.12  | 9.37  | 12.50 |
|    |              | 3               | 30 | 2   | 0  | 93.75  | 6.25  | 00.00 |
|    |              | 4               | 26 | 3   | 3  | 81.25  | 9.37  | 9.37  |
|    |              | 5               | 26 | 1   | 5  | 81.25  | 3.12  | 15.62 |
|    |              | 6               | 26 | 5   | 1  | 81.25  | 15.62 | 3.12  |
|    |             | Average         |    |     |    | 85.8   | 7.3   | 6.9   |
| 2  | Morphological | 7               | 30 | 0   | 2  | 93.75  | 00.00 | 6.25  |
|    |              | 8               | 26 | 2   | 4  | 81.25  | 6.25  | 12.50 |
The percentage of posttest students who know the concept, do not know the concept and misconceptions in Figure 4.2 Geographical Concept Improvement Diagram in the Postest Experiment class.

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline
Concept & 10 & 29 & 0 & 3 & 90.62 & 00.00 & 9.37 \\
11 & 30 & 1 & 1 & 93.75 & 3.12 & 3.12 \\
12 & 28 & 1 & 3 & 87.50 & 3.12 & 9.37 \\
13 & 24 & 2 & 6 & 75.00 & 6.25 & 18.75 \\
15 & 25 & 2 & 5 & 78.12 & 6.25 & 15.62 \\
16 & 24 & 4 & 4 & 75.00 & 12.50 & 12.50 \\
\hline
Average & 83.8 & 5.1 & 11.1 \\
\hline
3 Agglomeration Concept & 9 & 30 & 1 & 1 & 93.75 & 3.12 & 3.12 \\
14 & 27 & 1 & 4 & 84.37 & 3.12 & 12.50 \\
17 & 24 & 1 & 4 & 75.00 & 3.12 & 21.87 \\
18 & 29 & 0 & 3 & 90.62 & 00.00 & 9.37 \\
19 & 26 & 1 & 5 & 81.25 & 3.12 & 15.62 \\
20 & 29 & 2 & 1 & 90.62 & 6.25 & 3.12 \\
\hline
Average & 85.6 & 3.3 & 11.1 \\
\hline
\end{tabular}
\caption{Geographical Concept Improvement Diagram in the Postest Experiment class}
\end{table}

Source: Processed Field Data

Postest class can be seen that the pattern concept material in the experimental class is 45% in the percentage value of the pretest and posttest, for not understanding the concept there is a decrease of 17%, and for the misconception category there is 34% decrease. In the concept of agglomeration, there was an increase in the understanding of students who knew the concept by 43%, the category did not know the concept, it decreased by 10%, and the misconception category decreased by 33%. In the morphological concept there was an increase in students who knew the concept by 44%, in the category of students who did not know the concept there was a decrease by 12% and for the category of students who had misconceptions there was a decrease by 32%.

In the results of the above research, after learning there was an increase in concept understanding, and there was a decrease in students who did not know the concept as well as students whose
misconceptions decreased due to different student learning models. An ineffective learning process can result in students experiencing not understanding the concepts and misconceptions about the material presented. According to research by Sipatuhar & Adriana (2015) the misconceptions that are inherent in students obtained in previous learning materials will greatly affect students' ability to accept and understand the new knowledge they face. Based on the data obtained, the learning model greatly affects the level of understanding of students and student misconceptions from misunderstanding of the concept to know the concept.

Table 5. Pretest, Posttest, and N-Gain misconceptions

|                | Pretest | Posttest | N-Gain | Kategori N-Gain |
|----------------|---------|----------|--------|-----------------|
| N-1            | 43.16667| 9.7      | 0.78   | Tinggi          |

Source: Processed Field Data

Based on table 5, it is known that N-Gain is in the high category, so it can be concluded that the learning model can reduce misconceptions.

4. Closing

4.1. Conclusion
The Virtual Reality Integrated E-Learning model can reduce misconceptions that occur in students of the FMIPA UNM Geography ICP Class, clarifying geography material that is considered abstract.

4.2. Suggestion
There are suggestions that we can convey for geography lecturers, in particular, using the Virtual Reality Integrated E-Learning model into teaching and learning process to be able to reduce misconceptions that occur in student learning outcomes and it is hoped that further research can develop and develop research results by conducting research. continued on different material or even on other learning materials in order to increase understanding of students.

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