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Improving the Cognitive Learning Outcomes of Class XI Students through The Use of Quizizz on Biodiversity at SMAN 93 Jakarta

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Abstract

This study aims to find out whether there is a difference in the average learning outcomes of class XI students on the subject of Biodiversity at SMAN 93 Jakarta. The method used is a quasi-experimental design with a pretest post-test control group. Sampling in this study uses a purposive sampling technique. The samples in this study were class XI-5 as the control class and XI-6 as the experimental class with a total of 33 students in each class. The data analysis technique in this study is divided into three, namely the instrument test which consists of a validity test and a reliability test. Then the analysis prerequisite test consists of the normality test and homogeneity test as well as the data analysis test, the t-test of two independent samples. The results of the validity test showed that 20 multiple-choice questions compiled based on Anderson & Krathwohl's taxonomy were valid and had a high level of reliability. Then the results of the normality test show that all data is normally distributed and homogeneous. The results of the t-test of two independent samples show the value of Sig. (2-tailed) of 0.000 <0.05 which means H0 is rejected and Ha is accepted. So it can be concluded that there is a difference in the average value between the experimental class and the control class.

Keywords: Quizizz, Cognitive Learning Outcomes, Biodiversity Material

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1. Introduction

Learning is the process of facilitating individuals to learn. According to Abuddin Nata, learning can be defined as an effort to influence someone emotionally, intellectually and spiritually in order to learn according to their wishes (Syahputra, 2018). In general, geography learning aims to provide students with knowledge, skills and perspectives related to geography. Geography learning does not only teach students to be able to master concepts and theories textually, but also apply their knowledge conceptually in everyday life. Geography learning needs to be directed to form students with the ability, attitudes and skills to think critically, understand geospheric phenomena, foster a sense of love for

the country, understand the existence of other countries and be able to overcome problems arising from human relations with the environment (Nandi, 2016).

According to Rusli, the media becomes an intermediary for teachers to convey learning material to students in teaching and learning process (Hakimah et al., 2023). The use of appropriate learning media can increase interest, learning outcomes and active learner interaction. Quizizz can be used as an alternative to game and technology-based media (Solikah, 2020). Quizizz focuses on learner-centered learning. The implementation of the "learning while playing" system provides many benefits in realizing fun learning activities by supporting diverse learning styles whether visual, auditory or kinesthetic (Aini, 2019).

The use of Quizizz, especially in learning Biodiversity, has several advantages. This is inseparable from its features which are always updated to suit the needs of teachers and students. The “create a lesson” feature is a new way for teachers to create learning content in the form of attractive presentation slides. Students can observe and study learning content through their smartphone devices by joining live lessons using links or codes shared by the teacher, making it more practical because it does not require the installation of a projector screen. In one of the topics of Biodiversity, namely the Distribution of Flora and Fauna in Indonesia and the World, teachers are given the convenience of being able to add image, video and audio media as complementary media. In addition, teachers can insert ice breaking in the middle of delivering material. Quizizz makes it easy for teachers to analyze the validity of questions with an automatic and detailed scoring system (Amany, 2020). Moreover, the use of Quizizz can minimize errors in data input and paperless. The “Live Quiz” feature provides various forms of formative questions such as multiple choice, short form, essay etc. (Pusparani, 2020). Through the teleportation feature, Quizizz provides thousands of quizzes from various subjects. The completeness of these features is very helpful in facilitating learning activities at various levels and subjects without losing the essence of learning itself (Sattar et al., 2021).

However, besides its advantages, some of the disadvantages of Quizizz are hard to access if there is no internet network, players cannot stop before all questions are answered and students will have problems if they join late. Research conducted by Lathifa Utami Dewi (2020), utilizing Quizizz as a web 2.0-based formative assessment media in learning Periodic System of Elements. The results showed a difference in the average scores of the experimental and control classes as evidenced by the independent sample t-test hypothesis test (Dewi, 2020). Meanwhile, research conducted by Sayyidah Ayu Maziyyah (2021), using Kahoot application as a game-based learning media for learning Islamic Religious Education in the new normal era. The results of her research show that Kahoot learning media is effective for improving student learning outcomes. This is supported by an increase in the average post-test score (after implementing Kahoot) with the average pre-test score (before implementing Kahoot) (Maziyyah, 2021). Research conducted by Nur Safitri Wihastin (2020) also implements the use of Kahoot in evaluating economic learning during the COVID-19 pandemic. The results showed that there was a significant influence between the implementation of economic learning evaluation based on Kahoot in the midst of COVID-19 pandemic on student learning motivation at MAN 2 Bekasi City with a high level of influence of 0.744 or 74.4% (Wihastin, 2020). The difference in this study are the classroom and subject that is used as the research subject. While the similarity is the use of game-based interactive media, which are Quizizz and Kahoot.

Broadly speaking, this study aims to determine whether there is a difference in the average learning outcomes of class XI students on Biodiversity at SMAN 93 Jakarta. This article also discusses the use of Quizizz in creating a fun learning situation. This is due to the assumption that learning geography at school is quite uninteresting to learn (Maryani, 2006). Therefore, it is necessary to have learning innovations, such as the use of concrete media or the latest technology to improve students' cognitive learning outcomes in geography learning, especially on Biodiversity.

2. Method

The research location was at SMAN 93 Jakarta which is located on Jalan Raya Jakarta-Bogor, Komplek Paspampres Kelurahan Kampung Tengah Kecamatan Kramat Jati, East Jakarta. This research was conducted from July to August 2022. The pretest was given on July 25, 2022. Then proceed with learning Biodiversity for five meetings. While the post-test was held on August 22, 2022.

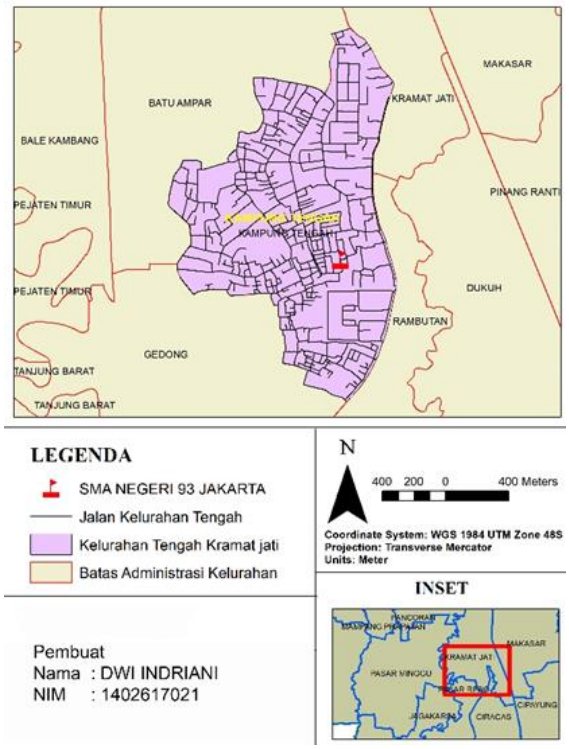

Figure 1. Location of SMAN 93 Jakarta

This research is quasi-experimental research with pretest post-test control group design. The subjects in this study were students at XI-5 as the control class and XI-6 as the experimental class with a total of 33 students in each class. Both control and experimental classes received the same learning method, material arrangement and assignments. The difference is the control class which does not use Quizizz while the experimental class uses Quizizz as a medium that supports learning activities.

The instrument used in this study was a test. The pretest question consists of 20 multiple choice questions prepared based on Anderson and Krathwohl's Taxonomy with cognitive levels C1 (Remembering), C2 (Understanding) and C3 (Applying). The formula for calculating the percentage of cognitive level questions is as follows (Amelia et al., 2016):

$$Ki = \frac{ki}{N} \times 100 \quad (1)$$

Description:
Ki = Percentage of 1st cognitive level
ki = Number of questions that correspond to the 1st cognitive level
N = Total number of questions

Table 1. Distribution of Multiple-Choice Questions on Biodiversity Based on Anderson & Krathwohl Taxonomy

Cognitive Level	Question Number	Number of Questions	Percentage
remembering (C1)	1,2,6,7,8,9,10,12,15,16,17,18	12	60%
understanding (C2)	3,4,5,14	4	20%
applying (C3)	11,13,19,20	4	20%
Total		20	100%

Based on table 1, it can be seen that the cognitive level in the distribution of multiple-choice questions on Biodiversity at class XI is explained as follows:
1) There are twelve questions (60%) at the cognitive level of remembering (C1). These questions measure the ability of students to recall a concept, fact, term or definition.
2) There were four questions (20%) at the cognitive level of understanding (C2). These questions measure students' ability to understand the relationship between a fact or concept.
3) There are four questions (20%) at the cognitive level of applying (C3). These questions measure the students' ability to select or use concepts, laws, postulates, rules or ideas appropriately and correctly to be applied to a situation.
In order for an instrument to be trusted, it must be tested for validity and reliability first (Sugiyono, 2013). The validity of the question can be known by calculating the r product moment correlation based on the original score of the students. The results of the validity test of the 20 questions were declared valid. While the results of the instrument reliability test are presented in the form of the following table:

Table 2. Reliability Test Results

Cronbach's Alpha Value	Cronbach's Alpha Interval Value	Criteria	Conclusion
0,799	< 0,20	Very Low	high
	0,20 – 0,399	Low	
	0,40 – 0,599	Fair	
	0,60 – 0,799	High	
	0,80 – 1,00	Very High	

Based on table 2, the reliability test of this research instrument has a calculated Cronbach's Alpha value of 0.799. Referring to the Cronbach's Alpha value criteria according to Sugiyono, it can be concluded that this research instrument is declared reliable with a high level of consistency.

Tabel 2. Hasil Uji Reliabilitas

Nilai Hitung Cronbach's Alpha	Interval Nilai Cronbach's Alpha	Kriteria	Kesimpulan
0,799	< 0,20	Sangat Rendah	Tinggi
	0,20 – 0,399	Rendah	
	0,40 – 0,599	Cukup	
	0,60 – 0,799	Tinggi	
	0,80 – 1,00	Sangat Tinggi	

Berdasarkan tabel 2, uji reliabilitas terhadap instrumen penelitian ini memiliki nilai hitung *Cronbach's Alpha* sebesar 0,799. Mengacu pada kriteria nilai *Cronbach's Alpha* menurut Sugiyono, maka dapat disimpulkan bahwa instrumen penelitian ini dinyatakan reliabel dengan tingkat kekonsistenan yang tinggi.

3. Hasil dan Pembahasan

A. Quizizz

Quizizz is a digital application that consists of quiz game features, surveys or discussions. Quizizz is described as an application for creating interactive quiz games based on a response system that is played in real time. Citra and Rosy explained that Quizizz is a game-based educational application with many players (multiplayer) (Pusparani, 2020). Quizizz can be operated on various devices such as iOS / Mac, Android, Windows or Linux.

1) Quizizz Account Creation

- Log in to the web www.quizizz.com
- If you don't have an account, click sign up
- Complete each account registration requirement
- Log in again by filling in the email and password used when registering an account.

2) Quiz or Test Creation

- Log in to the Quizizz account using the registered email and password
- Three options will appear, namely School, Office / Business and Family. Select "School" then select the role as an instructor (teacher)
- Choose create a quiz
- Choose the appropriate subject then click "save"
- The next display appears, click "create new question". Choose several types of interactive questions such as multiple choice, short form, and essay.
- Input the question on "write question here" column, then enter the answer option on "answer option 1" column and so on (for multiple choice question types)
- Put a check mark in the correct answer column
- Set the duration of the question then click "save"
- When you have completed the quiz, click "finish quiz". Complete the quiz details (level/grade) then click "save details"
- Set the quiz as "homework" if you want to give it as homework or choose "play live" if you want to play it right away.
- The next display is the code or link used to join the quiz. Furthermore, students can join the game using the code or link.

3) Lesson Content (Slide) Creation

- Open the start menu then click the create button and select the lesson option

- Name it and select relevant subjects
- Choose a theme that will be applied to all slides in the lesson
- Like all other powerpoint applications, select the toolbar options to edit the created lesson content
- Add images, text, audio, video or symbols as supplementary media.

According to Zhao, one of the characteristics of Quizizz is the leaderboard that shows the ranking of students based on their performance (Dewi, 2020). The faster they answer the question correctly, the greater the points earned.

Figure 2. Leaderboard Quizizz

Compared to Kahoot, Quizizz has differences based on the presentation of assessments, questions, feedback and more. In Kahoot, questions are presented using a projector, where only answer choices are displayed on the participant's screen. The participant then has to answer each question before the time runs out. Each question can include a maximum of 95 characters and each answer option can include a maximum of 60 characters with four multiple choice options. While in Quizizz, questions and answers are presented one by one on the participant's screen in a randomized order. Each participant can immediately answer the next question without having to wait for another participant or until time's out. There is feedback provided in the form of pictures. There is no character limit and the number of answer options is flexible. Question and answer options can include pictures, video or audio (Orhan Göksün & Gürsoy, 2019).

B. Students Learning Outcomes

Based on statistical calculations, there is a difference in the average post-test of the control class and the experimental class of 4.55. The average value of the control class post-test is 80.15 with a standard deviation of 18.264. While the average value of the experimental class post-test is 84.70 with a standard deviation of 12.307.

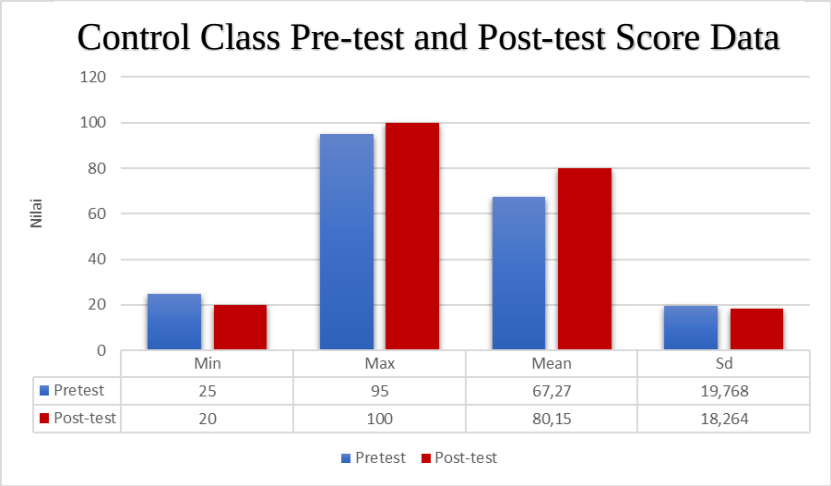

Figure 3. Difference in Pretest and Post-test Score of Control Class

Based on the diagram in Figure 3, it can be interpreted that the comparison of the average pretest and post-test is 67.27 and 80.15, respectively. In this case, the control class had an increase of 12.88. While the comparison of the lowest scores on the pretest and post-test were 25 and 20. The highest score reached 95 for the pretest and 100 for the post-test.

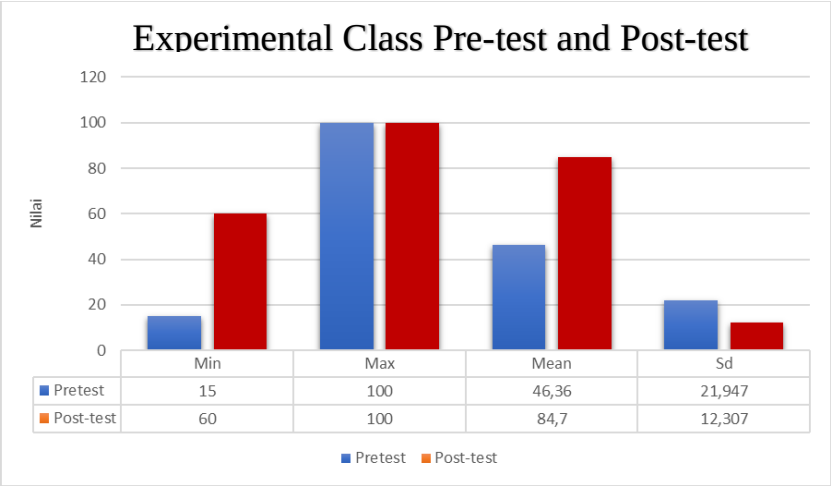

Figure 4. Difference between Pretest and Post-test scores of Experimental Classes

Based on the diagram in Figure 4, it can be interpreted that the comparison of the average pretest and post-test is 46.36 and 84.70, respectively. In this case, the experimental class had a significant increase in value of 38.34. While the comparison of the lowest scores on the pretest and post-test was 15 and 60. The highest score reached 100 for both the pretest and post-test. Meanwhile, to calculate the percentage of student learning outcomes based on the cognitive level of the question using the following formula (Amelia et al., 2016)

$$\text{Hi} = \frac{\text{bi}}{\text{ki}} \times 100 \qquad (2)$$

Description:
Hi = Percentage of correct answers for each cognitive level
bi = Number of correct answers for each cognitive level
ki = Number of questions that correspond to the 1st cognitive level

Table 3. Percentage of Students' Learning Outcomes at Each Cognitive Level

Cognitive level	*Pre-test* (%)		*Post-test* (%)	
	Control	Experiment	Control	Experiment
C1	70,20%	45,71%	82,58%	87,37%
C2	56,82%	41,67%	68,94%	81,82%
C3	68,94%	53,03%	84,09%	79,55%

Based on table 3, it can be interpreted that the learning outcomes (pretest and post-test) of students in the control and experimental classes for each cognitive level have increased. The control class had an increase in the cognitive level of remembering (C1) of 12.38%, at the cognitive level of understanding (C2) an increase of 12.12%, at the cognitive level of applying (C3) an increase of 15.15%. While the experimental class had an increase in the cognitive level of remembering (C1) of 41.66%, at the cognitive level of understanding (C2) an increase of 40.15%, at the cognitive level of applying (C3) an increase of 26.52%.

Referring to the post-test results, the control class had the largest percentage of 84.09% at the C3 cognitive level with the ability to apply. So that the control class is at the level of the MOTS (Middle Order Thinking Skills) question. While the experimental class has the largest percentage of 87.37% at cognitive level C1 with the ability to remember. So that the experimental class is at the LOTS (Lower Order Thinking Skills) question level.

C. Analysis Prerequisite Test Results

The results of the prerequisite test analysis consist of normality test and homogeneity test. The normality test is carried out to determine whether a data distribution is normal or not. The normality test used is the Kolmogorov-Smirnov test with the following criteria:

- If the Significance value (Sig.) > 0.05, then the data is normally distributed
- If the Significance value (Sig.) <0.05, then the data is not normally distributed

The results of the normality test are presented in the form of the following table:

Table 4. Normality Test Results

Data Type	Sig Value	reference value	Conclusion
Experimental Class Pretest	0,052	0,05	Normal
Experimental Class Post-test	0,130	0,05	Normal
Control Class Pretest	0,200	0,05	Normal
Control Class Post-test	0,200	0,05	Normal

Based on Table 4, the results of the normality test on the four data, namely the Experimental Class Pretest with a Sig value. 0.052 and the Experimental Class Post-test

with a value of Sig. 0,130. Then the Control Class Pretest with a Sig value. 0.200 and the Control Class Post-test with a Sig value. 0,200. So it can be concluded that all data is normally distributed because it has a Sig. value greater than 0.05.

Then the homogeneity test is carried out to test the similarity of the variance of each data group. The homogeneity test used is the f test with the following criteria:

- If the Sig value. Based on Mean> from 0.05, then the data variance is homogeneous
- If the Sig value. Based on Mean < than 0.05, then the data variance is not homogeneous

The results of the homogeneity test are presented in the following table:

Table 5. Homogeneity Test Results

Data Type	Sig Value (Based on Mean)	reference value	Conclusion
Learning Outcome	0,391	0,05	Homogeneous

Based on Table 5, the homogeneity test results were obtained with a Sig value (Based on Mean) of 0.391. Thus, the learning outcomes data in this study are homogeneous because the Sig. (Based on Mean) is greater than 0.05.

D. Data Analysis Test

The data analysis test used is the mean difference test. Aims to determine whether there is an average difference between two variables. The type of test used is the independent sample t-test. This method was chosen because the samples in this study were unpaired samples (independent samples) with the following test criteria:

- If the Sig value (2-tailed) <0.05 then H0 is rejected and Ha is accepted, which means that there is a difference in the average learning outcomes of students between the experimental class and the control class.
- If the Sig value (2-tailed) > 0.05 then H0 is accepted and Ha is rejected, which means that there is no difference in the average learning outcomes of students between the experimental class and the control class.

The results of the t test of two independent samples are presented in the form of the following table:

Table 6. Two Independent Samples t Test Results

Data Type	Sig Value (2-tailed)	reference value	Conclusion
Learning Outcome	0,000	0,05	H0 is rejected and Ha is accepted

Based on Table 6, the Sig. (2-tailed) of 0.000 <0.05, which means H0 is rejected and Ha is accepted. When viewed from the test criteria, the Sig value (2-tailed) <0.05. So it can be concluded that there is a difference in the average learning outcomes of students between the experimental class and the control class.

In this case, there are several factors that at least influence the difference in student learning outcomes in the experimental and control classes. First, internal factors that come from the learners themselves such as the physical and psychological condition of healthy

learners. The second factor is the level of students' understanding of learning materials. To improve students' understanding, teachers usually provide assessments in the form of evaluation questions. Through the use of Quizizz media, students are given the convenience to do quizzes or evaluation questions anywhere and anytime. The more often they practice, the more students' understanding will increase. Apart from these two factors, keep in mind that teachers also have an important role in the entire learning process. Starting from delivering material, assignments to clear and detailed assessments.

E. Characteristics of Learning in Control and Experimental Classes

1) Learning in Control Class

Learning activities that take place in the control class mostly utilize powerpoint media, printed books and google forms (used during pretest and post-test). However, to add insight and understanding, students in the control class were given the opportunity to look for references from various sources. So that the information they get is more diverse. In addition, students in the control class tended to be more active in conducting discussions and questions and answers. The teacher becomes easier in supervising the learning activities. Some of the challenges in the control class are that the teacher must be able to innovate in making or choosing media that attracts the attention of students. Teachers also have to prepare evaluation questions for each meeting.

2) Learning in Experimental Class

The use of Quizizz at learning in experimental class has many variations. Quizizz used during the pretest at the first meeting aims to determine students' initial understanding of Biodiversity. At the second meeting, Quizizz was used to provide an ice breaking quiz in the middle of the delivery of the subject matter of Biome Characteristics and Fauna Distribution in the World by the teacher. Then at the third meeting, Quizizz was also used as a medium to convey the subject matter of the Distribution of Flora and Fauna in Indonesia which was complemented by video viewing through the “live class” feature. At the fourth meeting, Quizizz was used to provide assessment or evaluation questions through the teleportation feature. From the results of the evaluation, the teacher can find out the extent to which level of students’ understanding in accordance with the predetermined competency achievements. Finally, Quizizz is used to provide a post-test at the fifth meeting after completing all learning on Biodiversity.

The use of Quizizz can stimulate memory, attract and give a good impression to students without reducing the essence of learning (Noor, 2020). However, in its implementation, teachers and students are faced with several challenges such as teachers not always being able to monitor the use of smartphone devices during learning. Besides, the duration of time that makes students rush and less careful when working on questions given, so teachers need to rearrange the time duration of each question adjusted to each cognitive level.

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4. Conclusion

Based on the t test of two independent samples, the Sig. (2-tailed) of 0.000 <0.05 which means H0 is rejected and Ha is accepted. So, it can be concluded that there is a difference in the average learning outcomes of students between the experimental class and the control class. Then referring to the post-test results, the control class is at the MOTS (Middle Order Thinking Skills) question level because it has the largest percentage of 84.09% at the C3 cognitive level with the ability to apply. While the

experimental class is at the LOTS (Lower Order Thinking Skills) question level because it has the largest percentage of 87.37% at the C1 cognitive level with the ability to remember.

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