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The Effect of the Online Learning Using Examples Non-Examples Learning Model Combined with Cooperative Learning Approach on Students' Cognitive on Protists Concepts

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Sherly Suci Ramadhanti[1], Dian Rachmawati[2*], Evi Amelia[3]

[1,2.3]Department of Biology Education, Faculty of Teacher Training and Education,
Universitas Sultan Ageng Tirtayasa, Indonesia

Corresponding Email: *dian.rachmawati@untirta.ac.id

Abstract

This study aimed to investigate the effect of the online learning using examples non-examples learning model combined with cooperative learning approach on students' cognitive abilities on students' cognitive on protists concepts. This study implements a quasi experimental research methodology that used a pretest-posttest control group design. The research subject divided to the experimental group and control group. The samples were collected using a random sampling approach, which involved randomly selecting participants without considering their education level. The data collecting methodology used multiple-choice pretest and posttest assessments to quantify cognitive capabilities. The research results Indicate that the mean pretest score in the experimental group was 33, while it was 25 in the control group. Furthermore, the posttest score in the experimental group was 37, whereas it was 31 in the control group. The findings of the independent simple t-test hypothesis on cognitive capacities in the posttest were obtained. The significance value of 0.187 is more than the P of 0.05, indicating that the null hypothesis (H_0) is accepted. Therefore, it can be concluded that the examples non-examples learning model combined with cooperative learning approach does not significantly impact the cognitive abilities of students on protists concepts for class X high school science students.

Keywords: Online Learning, Examples Non-Examples Learning Model, Cooperative Learning Approach, Protists, Cognitive

INTRODUCTION

School is an educational institution where students receive intellectual stimulation and teacher guidance. The Covid-19 epidemic from 2019 to 2023 had a widespread impact on human activities worldwide. It affected social contact, economics, commerce, entertainment, transportation, politics, and education (Onyema et al., 2020). Amidst the pandemic, all operations within schools were halted, causing a significant disruption to the education sector as a whole. Due to the need for online platforms, educational activities require changes in learning techniques, students, teachers, and parents (Tarkar, 2020). In-person delivery of educational content by teachers was substituted by online learning video presentations, leading to a shift in classroom communication to the Google Meet platform (Sawitri, 2020), WhatsApp, and Zoom (Selvaraj et al., 2021).

UNESCO recommends online distance learning programs in response to the epidemic (Setyorini, 2020). During the implementation process, challenges frequently faced include insufficient infrastructure, inadequate digital literacy among teachers and students, and the need for suitable learning methodologies (Tedesse & Muluye, 2020). In order to enhance efficiency in online learning, it is imperative to implement a pedagogical approach that catalyzes increasing motivation for and participation in learning activities. Cooperative learning enhances student motivation and engagement in the learning process.

Cooperative learning encourages active participation by students in collaborative problem-solving activities within small groups. Sastramayani (2018) observed that forming small groups in cooperative learning generates a collaborative environment where students work together to accomplish learning objectives. The cooperative approach entails individual and group interactions among students, facilitating their mastery of the learning material during class (Hasanah & Himami, 2021). Cooperative learning at the secondary school level can significantly increase students' problem-solving skills by 76% (Trujillo-Leon, 2022). Cooperative learning enhanced mathematics learning results, as students could fix their errors and limitations through collaborative efforts (Kaymak et al., 2021).

Protists material in biology requires student involvement and active participation in its study. Protists refers to eukaryotic organisms that inhabited the Earth around one billion years prior to the emergence of plants, fungi, and mammals (Campbell, 2003). Learning about Protists involves overcoming various challenges, including understanding its fundamental classification, morphological traits, reproductive mechanisms, and identification techniques (Sihombing & Pranoto, 2021). According to Bachrum et al. (2019), image media facilitates the communication of Protists material. By selecting an appropriate learning model, students' cognitive capacities in understanding Protists information are expected to be increased.

The examples non-examples learning model combined with cooperative learning approach can be applied to improve the efficiency of online learning. The online learning using examples non-examples learning model combined with cooperative learning approach involves student engagement through collaborative learning and the exchange of opinions based on observations of photographs. It also requires active participation in presentations and discussions regarding their learning outcomes (Alexander, 2019). Teacher Nariana (2020) can enhance the use of the examples-non-examples model by providing relevant photos that align with the learning objectives. Alexander (2019) discovered that implementing the example-non-example cooperative learning

approach may improve students' cognitive capacities. In addition, as stated by Susanti (2020), the example-non-example model has been found to enhance students' comprehension and engagement in the learning process. According to Nurjannah and Khatimah (2022), using the example-non-example model in high school history learning can significantly improve students' evaluation test scores, with an increase of up to 28.48%. Additionally, it can enhance classical completeness by up to 47.82%. Implementing the non-example model with animation media significantly increased students' cognitive capacities and conceptual knowledge of chemical bonding material, resulting in a score of 81.96 (Husni, 2022).

Based on the provided description, further investigation is required to examine the effect of the online learning using examples non-examples learning model combined with cooperative learning approach on students' cognitive ability. This study aims to investigate the effect of the online learning using examples non-examples learning model combined with cooperative learning approach on students' cognitive on protists concepts.

METHOD

The research was conducted during the odd semester of the 2021/2022 academic year in class X at senior high school. The technique used in this research was the quasi experimental method. The study used a pretest-posttest control group design consisting of two sampling groups: the experimental group and the control group (Chotimah, 2019). The sample consists of high school students in class X during the first semester of the 2021-2022 academic year. The samples were collected by a random sampling methodology, where no consideration was given to the students' level within the population. The study consisted of two classes: class X 1 (B) as the experimental group and class X 1 (A) as the control group.

The research involved pretest and posttest instruments and utilized a pretest to assess students' comprehension levels before beginning the learning process. A posttest is carried out to assess the final abilities of students after they have completed their study. The test provided an instrument for evaluating students' cognitive learning outcomes. The assessment takes the form of a multiple-choice. This test was used to evaluate the effect of the treatment on the experimental group.

An investigation of the effect of the online learning using examples non-examples learning model combined with cooperative learning approach. This study used cognitive ability exams to analyze pupils' cognitive ability. The cognitive ability test aimed to ascertain the cognitive ability score achieved by each student. The pretest and posttest determine the scores assigned in the

multiple-choice test. Specifically, a correct answer is given a score of 1, while an incorrect response receives a 0. The collected scores will then be processed to determine the value of the student's cognitive ability by applying the provided formula:

$$Final\ score = \frac{B}{N} \times 100$$

Where,

B: the correct answer divided by the total score

N: the number of the given test divided by the maximum score

The results of cognitive ability are classified based on the obtained scores into the following categories: excellent category for scores ranging from 80-100%, good category for scores ranging from 70-79%, fair category for scores ranging from 60-69%, poor category for scores ranging from 50-59%, and extremely poor category for scores below 50%. The average student score can be calculated by dividing the sum of all student scores by the total number of students (Hanim, 2017).

The data collected was checked for normality to determine if the samples from the two analyzed classes had a normal distribution (Nasution, 2020). The homogeneity test is conducted by analyzing the variance of the data in order to confirm its homogeneity (Nasution, 2020). The Kolmogorov-Smirnov test was used to conduct normality and homogeneity tests, utilizing IBM SPSS Statistics 20 software. The t-test was employed to conduct statistical testing by comparing the pretest and posttest data.

RESULTS AND DISCUSSION

Student's cognitive

The student's cognitive abilities are assessed by ten multiple-choice questions that have undergone thorough evaluation to verify their validity, reliability, difficulty level, and item discrimination. Pretest questions are given at the outset of instruction to assess students' comprehension prior to learning. Following the learning process, a posttest is carried out to evaluate students' cognitive capabilities subsequent to their engagement in the learning activity. Figure 1 displays the mean scores before and after the test.

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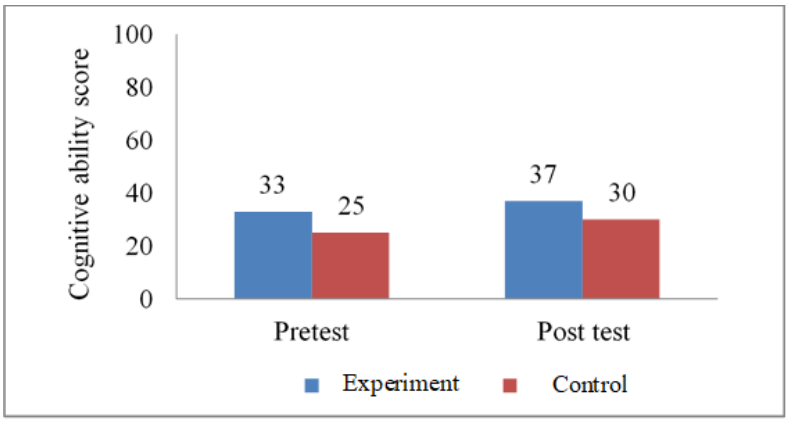

Figure 1. Student's cognitive ability through *pretest* and *posttest* in experiment and control group

Differences were found in the pretest scores between the experimental and control classes. The preliminary analysis revealed that the mean score for students' cognitive ability in the experimental group was 33, whereas in the control group, it was 25. Following instruction using the online learning using examples non-examples learning model combined with cooperative learning approach, the experimental class achieved a posttest score of 37, whereas the control class achieved a score of 30. Poor results in the pretest have been suggested to be related to unfamiliar Protists topics that students have not previously examined. Makmum (2006) suggested that low pretest scores may be attributed to students' insufficient understanding of the concepts presented in the new material they have studied. Furthermore, the low pretest results can be attributed to the student's lack of motivation to acquire knowledge before beginning new learning experiences. Conducting a pretest indirectly prompts students to review the subject matter.

The mean posttest score indicates a slight increase in the overall of student's cognitive ability in both the experimental and control groups. The mean posttest score in the experimental group surpassed the mean posttest score in the control group. The posttest scores indicate the students' proficiency in the Protists topics and cognitive capabilities. After implementing the online learning using examples non-examples learning model combined with cooperative learning approach, the student's cognitive ability is categorized according to various factors (Figure 2).

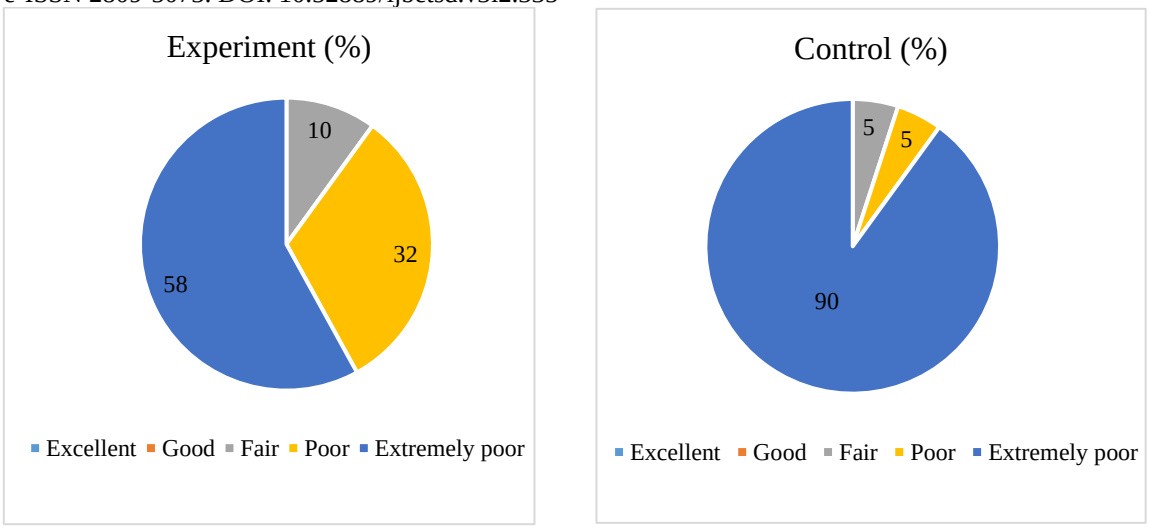

Figure 2. Students' Cognitive Criteria in Experimental and Control Classes

The result found differences in the percentage of students' cognitive abilities observed in the experimental and control classes. Most students in the experimental and control classes showed cognitive abilities classified as extremely poor, while the remaining students fall into the fair and poor categories. Within the experimental class, 10% of the students met the fair criteria, 32% came into the poor criteria, and 58% were categorized as the extremely poor criteria. Within the control class, 5% of individuals achieved a score that achieved the fair criteria, 5% achieved a score that was poor criteria, and 90% achieved a score that was considered extremely poor criteria.

The outcome may be attributed to students' lack of attention to the subject matter supplied by the online teacher during the learning process. While the teacher is responsible for executing each stage of the online learning using examples non-examples learning model combined with cooperative learning approach, delivering it online can potentially induce student concern. One of the issues is the disabled camera feature throughout the learning process, which negatively impacts students' ability to respond to questions. Dinata (2021) stated that online learning involves additional time for preparation and might lead to irritated behavior, anxiety, lack of confidence, and uncertainty among students.

The cognitive parameters identified in research might be modified by several circumstances in attaining competency. This research examines five *Cognitive Achievement Indicators*. These indicators include: 1) identifying protists based on shared characteristics with fungi; 2) identifying protists based on shared characteristics with plants; 3) identifying protists based on shared characteristics with animals; 4) analyzing protists based on their morphological characteristics; 5) analyzing protists based on their functional role in life. The cognitive ability of students is assessed

using these five markers. The Cognitive Achievement Indicators represent pupils' cognitive capacities, as shown in Figure 3.

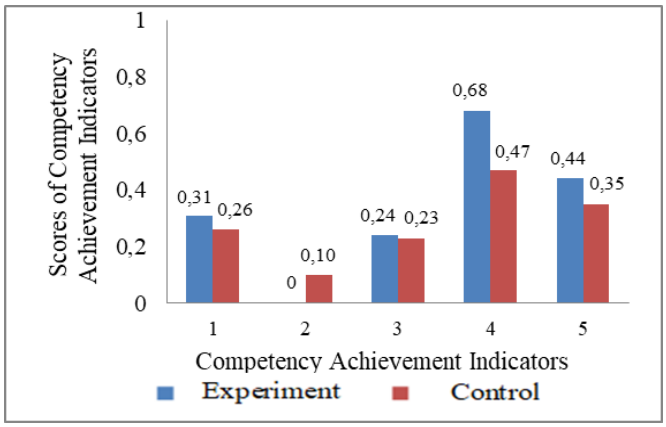

Figure 3. *Cognitive Achievement Indicators* in experimental and control groups, namely: 1) identifying Protists based on shared characteristics with fungi; 2) identifying Protists based on shared characteristics with plants; 3) identifying Protists based on shared characteristics with animals; 4) analyzing Protists based on their morphological characteristics; 5) analyzing Protists based on their functional role in life.

Students' cognitive ability exhibits varying values as measured by their cognitive achievement indicators. The highest score was achieved at indicator 4 in the experimental and control classes, namely in the analysis of Protists using morphological characteristics. The experimental class achieved indicator 4 with a score of 0.68; however, the control class scored 0.47. The variation in scores between the experimental and control classes may be attributed to the implementation of learning models in these classes. According to the results from the posttest questions, students did not experience any challenges comprehending the information. Although the material is classified under cognitive level C4, specifically for analysis, it also contains factual information. This result relates to Wiwi (2016), that most factual information exhibits low abstraction. The categorization of Protists is more conveniently represented through visual media due to their distinct morphological variations, which differentiate them from fungi, plants, and mammals. Utilizing the the online learning using examples non-examples learning model combined with cooperative learning approach facilitates students to analyze protists classifications' distinctions morphologically through visual media.

Based on the intellectual dimension, indicator two is considered cognitive level C3. Wiwi (2016) defines conceptual knowledge as abstract knowledge that involves classification, which

often poses challenges for students regarding comprehension. An additional contributing element to the low value of indicator 2 is the failure of the provided image to meet the specified requirements. The conceptual dimension involves abstract information and employs visual representations in the online learning using examples non-examples learning model combined with cooperative learning approach. These visual representations must include a well-defined structure that effectively conveys the key points, facilitating students' comprehension of the content. Inadequate visual presentation can impede students' comprehension of the topic. The content presented in indicator two challenges students in comprehending the differentiating characteristics of each phylum of Protists. The challenge lies in identifying plant-like Protists from true plants based on their anatomical structure. Similarly, Ningsih (2018) claimed that the sub-material concerning plant-like protists' characteristics is challenging due to students' limited comprehension of the fundamental principles of identifying plant-like protists.

Other indicators exhibit various values; for example, indicator 1 involves Protists identification by examining their general characteristics similar to fungi. This is assessed through cognitive level questions at level C3, which require applying knowledge. Application refers to the capacity to utilize previously acquired knowledge in novel contexts (Dian, 2018). In indicator 1, students demonstrate their comprehension of the topic by accurately answering pretest and posttest questions. The experimental class achieved a score of 0.31, whereas the control class achieved a score of 0.26. The results indicate that the experimental class scored higher than the control class. Visual media in experimental classrooms can enhance proficiency in applying (C3) in a concrete context. This factual dimension encompasses fundamental elements. Students will seek knowledge regarding the offered images, as the brain finds them intriguing and highlights student analysis (Poko, 2017).

Indicator 3 involves the identification of protists using animal-like traits and is assessed with questions at the C3 cognitive level. The experimental class had an indicator value of three of 0.24, while the control class had a value of 0.23. Indicator 3 possesses a factual aspect, resulting in a higher score than Indicator 2. As Wiwi's (2016) reported, the factual dimension implies that students do not require much critical thinking. When studying Protists, students must distinguish the various methods of movement exhibited by Protozoa in each phylum, which are identified by their Latin names. In a study conducted by researcher Ningsih (2018), it was shown that the extensive use of technical terminology in sub-material protists, such as animals, as well as the usage of Latin names, can diminish students' enthusiasm for learning. Presenting the online

learning using examples non-examples learning model combined with cooperative learning approach using graphics facilitates students in identifying the problem's content, enhancing comprehension of the learning material.

Indicator 5 involves the analysis of Protists according to their specific function in living organisms. This indication is categorized as a cognitive level C4, encompassing factual and conceptual aspects. The experimental class achieved a score of 0.44, however, the control class obtained a score of 0.35. Students demonstrated proficiency in responding to indicator five questions and encountered no challenges in providing accurate responses. The supplementary material on the role of protists provides additional information on their everyday functions, facilitating students' memorization and application of the benefits and drawbacks associated with protists. According to Ningsih (2018), students find it more convenient to remember the protist species and their respective functions relevant to daily existence. Using authentic images in the experimental class, through the implementation of the online learning using examples non-examples learning model combined with cooperative learning approach facilitates students' comprehension of the subject in alignment with factual information. Utilizing visual media facilitates the comprehension of abstract concepts for students.

The experimental class typically exhibits a higher indicator score compared to the control class. However, the obtained value drops short of the standard level. This is believed to be attributed to the challenges found in online learning. Within the atmosphere of remote education, it was observed that a significant number of students exhibited difficulty in openly communicating their opinions. Students prefer engaging in discussions using the chat feature, resulting in reduced attention towards the teacher delivering the material. Online learning imposes constraints on students. Dinata (2021) asserts that online learning diminishes students' confidence to engage actively in the learning process, impeding their excitement for acquiring knowledge.

Ineffective interactions between teachers and students lead to various problems. Masithoh's (2023) study showed that several challenges were identified in the implementation of online learning for students, including 1) limited access to smartphones among students, 2) difficulties in acquiring internet data quotas, 3) insufficient digital literacy skills, 4) lagging internet connectivity; and 5) unfavorable learning environments. The primary challenges students encounter in online education are unreliable internet connections and unsuitable home environments, leading to many students opting to turn off their cameras during learning sessions. An inadequate internet connection might impede the learning process, rendering it difficult for students to concentrate and

comprehend the subject being provided. In addition, unfavorable home settings, particularly when parents are required to assist with their work at home, pose challenges for students in maintaining focus (Widodo, 2020). This results in failing to attain the desired learning outcomes unless the standard value is achieved.

An additional obstacle to online learning is the lack of direct access to the learning process, which poses challenges in monitoring learning progress and student achievements (Nuraiman, 2023). Insufficient competence in digital skills can be improved by a process called habituation. The habituation process includes the regular execution of events. The habituation process attempts to facilitate students' effortless access to learning applications and prevent any potential confusion that may arise prior to or during the learning process (Abidin, 2018). Numerous obstacles affect students' ability to respond, leading to less interaction between teachers and students. Consequently, this limits the effectiveness of the learning process and makes it challenging to comprehend the teaching material.

One approach is to offer educational materials in the form of PowerPoint presentations to class groups for self-study outside of regular class hours (Dewi, 2023). In this study, the online learning using examples non-examples learning model combined with cooperative learning approach is implemented using PowerPoint presentations as the learning medium. These presentations consist of images that show difficulties together with concise explanations. Following the conclusion of the learning activity and the presentation session, the PowerPoint is sent over the WhatsApp group. The teacher facilitates students' ability to reach a conclusion and get clarity by utilizing a powerpoint presentation. Supplying supplementary resources upon completion of an exercise can enhance students' comprehension and offer easily accessible educational materials for both teachers and students (Nuraiman, 2023).

Teachers can further support students by offering online learning opportunities through media platforms (websites) accessible via the Internet, virtual courses, digital classes, or modules. The modules must adhere to the specified standards. 1) The learning objectives are formulated with clarity, specificity, and observability; 2) The module content is relevant to the learning needs; 3) The module is aligned with the curriculum and syllabus (Isman, 2016). According to the provided description, the steps in the online learning using examples non-examples learning model combined with cooperative learning approach need to be enhanced. Nevertheless, the use of pretest and posttest in this study facilitates the monitoring of students' knowledge before and after implementing the learning process based on assessment.

The study revealed that implementing the the online learning using examples non-examples learning model combined with cooperative learning approach did not significantly impact students' cognitive abilities in online learning (P 0.187 > 0.05). The findings of this study may be attributed to the fact that the cooperative learning approach of the online learning using examples non-examples learning model combined with cooperative learning approach focuses on visually appealing visuals that are easily comprehensible for students. However, it should be noted that not all content can be effectively conveyed by visual representation alone. The online learning using examples non-examples learning model combined with cooperative learning approach requires a more extended duration of the learning process in order to demonstrate its effectiveness. Procrastination, lack of motivation, and disinterest in the Protists subject among students can be attributed to the ineffectiveness of the online learning using examples non-examples learning model combined with cooperative learning approach and inadequate teaching of the protists concepts. Using the online learning using examples non-examples learning model combined with cooperative learning approach is particularly effective for developing conceptual understanding, fostering creativity, and conducting a superficial analysis (Mukaramah, 2020).

CONCLUSION

The research findings indicate that the mean scores of students' cognitive abilities following the posttest in the experimental group were 37; however, in the control group, it was 31. The posttest indicated that 10% of students in the experimental class included the fair criteria, 32% included the poor criteria, and 90% demonstrated an extremely poor cognitive ability. Hypothesis testing uses the t-test, where a p-value greater than 0.05 indicates a significance level of 0.187 or the acceptance of the null hypothesis (H_0). Implementing the the online learning using examples non-examples learning model combined with cooperative learning approach has been found to have no substantial effect on students' cognitive abilities in class X high school protists content.

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