JHSS (Journal of Humanities and Social Studies)
https://journal.unpak.ac.id/index.php/jhss
Volume 06, Number 02, July 2022, Page 262-267
e-ISSN: 2598-120X; p-ISSN: 2598-117X

THE USE OF MULTIMEDIA AS AN EFFORT TO IMPROVE ELEMENTARY TEACHER COMPREHENSION ABILITY AND CREATIVE THINKING SKILLS IN FOLLOWING SCIENCE STUDY COURSES

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Article history: *received 02 June 2022; revised 06 June 2022; accepted 12 June 2022* *DOI: https://doi.org/10.33751/jhss.v6i2.5392*

Abstract. The research objective was to improve the understanding and creative thinking skills of elementary teacher as prospective teachers in following science courses. The research design used is to make elementary teacher groups into small groups. During the learning process, observations about elementary teacher cooperation during learning with multimedia media were carried out to assess their understanding and creative thinking skills. The results of the observations of each cycle were evaluated as material for reflection in the next cycle to improve college student understanding and creative thinking skills in accordance with predetermined targets. Data analysis was carried out by descriptive quantitative. From the results of the T-test, the results, it was found that there were significant differences. This means that understanding of science process concepts and skills increases after prospective student teachers experience the learning process using multimedia. From the results of the average value of understanding the concept, increasing from 39.86% to 88.22%. and science process skills increased the average value from 49.89% to 86.44%. 92% of college student gave a positive response, namely agreeing and strongly agreeing that the science lecture process using multimedia learning media can improve science process skills and understanding of material in science subjects for elementary teacher education college student. Keywords: multimedia; comprehension ability; creative thinking skills.

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I. INTRODUCTION

Creativity has an important role for the success of a teacher to become a good teacher. Creativity is an effort to produce ideas or something that is unique or new (Greenstein **[1]**). Creativity in education is needed to open up new ways that contribute to improving the quality of learning (Beetlestone **[3]**). The importance of teachers having creative thinking skills because creative thinking is one of the abilities that must be possessed to face the demands of the 21st century, which consists of critical thinking and problem solving, creative, communicative, and collaboration (Gunawan **[3]**). The problem that often arises in the learning process at school is the lack of use of learning media so that students are less active and less interested in the material being taught. Many schools actually have adequate facilities and infrastructure to support learning, such as computer laboratories, science laboratories, and LCDs, but their use is not optimal (Yustiqvar **[4]**). Teachers who have creative thinking skills are needed to deal with these problems (Turkmen **[5]**). Another problem is the limited skills of teachers in developing science experimental designs. Yudhie's **[6]** research on Pakuan University Elementary School Teacher Education (PGSD) students showed that their skill scores in designing science experiments were only around 50% or in the not good category. Weak skills in designing science experiments are also experienced by many teachers, so teachers tend to rarely invite their students to do experiments at school (Sudargo, **[7]**; Sukarno **[8]**; Yudhie **[9]**). This indicates the importance of improving teachers' creative thinking skills, both in designing, developing, and utilizing science experimental media **[10]**.

The teacher's not yet optimal creative thinking skills can be attributed to the science learning model that has been applied so far, namely learning which is dominated by the lecture method **[11]**. According to Skamp **[12]**, an effective science learning model is to encourage students to actively express ideas and evidence of investigation, learning topics are related to students' daily lives, and challenging students to develop meaningful understanding of what they are learning. The science learning model that fits the learning characteristics proposed by Skamp **[12]** is classified as an inquiry model. Inquiry learning is a model that gives teachers the opportunity to investigate natural science problems they are interested in (Ketpichainarong **[13]**). The inquiry learning model is in accordance with constructivist principles, namely giving students the opportunity to construct new understandings based on their experiences exploring various phenomena in their environment (Akinbobola & Afalobi, **[14]**; Andrini **[15]**; Rahayu **[16]**).

Natural Science or also known as Science is a science with the topic of discussion of natural phenomena which are arranged systematically based on the results of experiments and observations made by humans (Samatoa **[17]**). Having an understanding of natural science can provide benefits for human life considering that humans always live side by side with nature. Therefore, science education has been given from an early age, namely at the elementary school level. Teaching

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e-ISSN: 2598-120X; p-ISSN: 2598-117X

science in elementary schools in the 2013 curriculum has different forms of presentation of material between high and low grades. In high class learning there are basic science competencies while in the low class there is no basic science competence **[18]**. Even so, the existence of science (*Ilmu Pengetahuan Alam – IPA*) material still exists and is integrated with other basic competencies, such as Indonesian. The purpose of teaching science in schools is so that students have mastery of knowledge, scientific attitudes, and process skills (Kumala **[19]**).

Science teaching in elementary schools needs to keep up with the times because good education is education that always develops with the changing times. Education in the 21st century or known as the era of the industrial revolution 4.0 coexists with the use of digital technology and 21st century learning skills. 21st century or 4C skills include creative thinking skills, critical thinking and problem solving (critical thinking and problem solving), communication (communication), and collaboration (collaboration) (Sri Setyaningsih **[20]**). The achievement of 21st century skills is supported by the ability of educators to develop lesson plans that contain 4C activities (Septikasari & Frasandy **[21]**). 4C skills can be combined with science learning, so that students are expected to be able to solve various problems encountered in their daily environment (Monica, Rizky, & Estuhono, **[22]**). Therefore, to bring out the 4C skills in students in science learning, teachers need to be educators who are sensitive and responsive to the needs of students. The teacher plays a role in animating a passionate, inspiring, and creative learning atmosphere (Pramono **[23]**). Teachers are also required to have good competence in the learning process of students (Yulyani **[24]**).

The lack of mastery of scientific concepts and critical thinking skills is one of the reasons that students are not much involved in the process of constructing a concept in their minds. To be able to develop mastery of concepts and critical thinking skills in learning abstract science concepts, information technology assistance is needed. Information technology in education is applied in the form of interactive multimedia in the form of software, which provides facilities for students to learn a material. The use of interactive multimedia applications in learning will increase efficiency, motivation, and facilitate active learning, experimental learning, consistent, with student-centered learning (Ratih **[25]**). The use of interactive multimedia in learning is also very possible to improve the expected thinking skills. In general, the benefits that can be obtained through the use of interactive multimedia are that the learning process can be more interesting, more interactive, the amount of teaching time can be reduced, the quality of student learning can be improved and the teaching and learning process can be carried out anywhere and anytime, and can improve students' reasoning abilities, (Henny **[26]**). Henny Suharyati with Yudhie **[26]**, with research on interactive multimedia found that the increase in mastery of the concept of students who took part in learning using cooperative learning characteristics assisted by interactive multimedia was significantly higher than students who took part in conventional learning. Sutarno **[27]**, found that the increase in concept mastery and critical thinking skills of students who took part in magnetic field learning using online interactive multimedia was significantly higher than students who took conventional learning. Furthermore, Gunawan **[3]** shows that the use of interactive multimedia is also proven to increase students' abilities in drawing conclusions and solving problems.

According to Yudhie **[28]**, there are several advantages and disadvantages of interactive multimedia as learning media including: (1) The advantages of interactive multimedia are: (a) Interactive means that this multimedia program is programmed or designed to be used by students individually (self-study), (b) Providing an affective climate individually meaning that is more affective in a more individual way, never forgetting, never bored, very patient in carrying out instructions, as desired, (c) Increasing learning motivation (d) Providing feedback (response) and (e) Because interactive multimedia is programmed for independent learning, the control over its use rests entirely with the users. The use of multimedia technology as an interactive learning method, which is a learning tool for students, has several basic strengths, as stated by Hasrul **[29]**, namely: (1) Mixed. Media by using multimedia technology, various existing conventional media can be integrated into one type of interactive media, such as text media (blackboard), audio, video, which if separated will require more media. (2) User controls. Interactive multimedia implementation technology (IMMI), allows users to browse teaching materials, according to their abilities and background knowledge, besides that it makes users more comfortable in studying media content, repeatedly. (3) Simulation and visualization. Simulation and visualization are special functions that are owned by interactive multimedia, so that with computer animation, simulation and visualization technology, users will get more real information from abstract information. Some curricula require understanding of complex, abstract, dynamic and microscopic processes, so that with simulation and visualization students will be able to develop mental models in their cognitive aspects. (4) Different learning styles. Interactive multimedia has the potential to accommodate users with different learning styles.

II. RESEARCH METHODS

This research is an exploratory research with research subjects elementary school teachers in the city of Bogor. The research object that is expected to be mastered by teachers in terms of cognitive, affective, and psychomotor aspects. The research was carried out in elementary school teachers in the city of Bogor. The independent variable of the study is a form of lecture implementation, namely learning science Studies using interactive multimedia learning media. The dependent variable in this study is teachers' competence which includes concept understanding and creative thinking skills. The research instruments consist of the Lecture Unit, interactive

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multimedia learning media, teachers' worksheets, concept mastery test sheets, questionnaires and interviews **[6]**.

Research data collection is done by determining the data source, then the type of data, data collection techniques, and instruments. To see the increase in mastery of concepts and science process skills, an analysis of the results of the test of mastery of concepts and science process skills was carried out before and after learning using interactive multimedia learning media. Comparative analysis before and after the application of the learning model was carried out by the t test. To see the responses of lecturers and students to the learning model, an analysis of questionnaires and interviews was carried out **[30]**. Analysis of creative thinking skills to see cognitive, affective, and psychomotor aspects seen from the assessment format.

III. RESULTS AND DISCUSSION

Based on the research results, it can be seen that the process of learning science (IPA) using multimedia learning media has been able to develop a number of mastery of higher-order thinking skills for elementary school teachers. The findings regarding the overall mastery of science concepts tested show that the N-gain (%) is at a moderate level for the control class; while for the experimental class on high achievement. This finding is possible because science subjects are more for developing higher-order thinking skills. King **[31]** stated that higher order thinking requires unusual thinking skills which involve metacognition, reflective thinking, critical and creative thinking. This thinking ability can be activated with inquiry learning strategies (Hussain, **[32]**).

This study obtained data from assessments of material mastery tests and observations on student worksheets before treatment (pretest) and after treatment (posttest) in learning science. To see an increase in mastery of material concepts and Science Process Skills (KPS) before and after treatment, a T-test was carried out on student responses to learning using multimedia which was developed by evaluating the results of questionnaires filled out by students. Students' understanding of science subject matter was developed from questionnaires on student worksheets.

The results of the concept understanding test were carried out beforehand. 40.20% of the control class and 39.86% of the experimental class managed to get a score above 70. In these two classes, no class managed to get a score above 80. This initial test was used to measure students' initial abilities, both in class control. as well as in the experimental class. Furthermore, to see how far the effect of treatment on student learning outcomes, a post-test was carried out on the effect of using multimedia media for science learning, between the control class and the experimental class. In general, there was an increase in the percentage of student test scores in both classes, namely in the control class 71.2% of students had scores above 70, no scores below 50, while in the experimental class there were 88.22% of student test scores. students who have grades above. 70, there is no value below 50. If the two classes are compared with the percentage of the number of each class, then the level of improvement in learning outcomes for the two classes shows a significant increase in results.

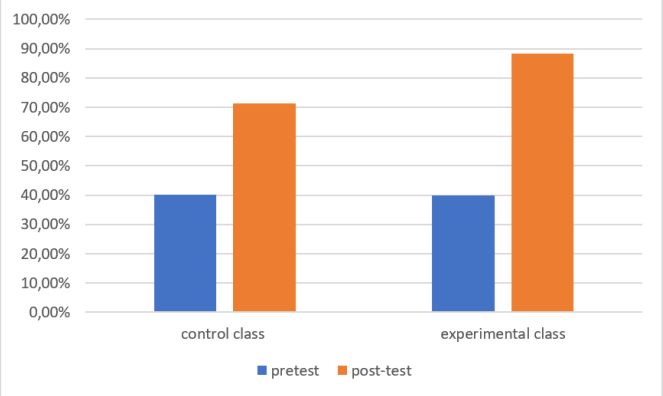

Figure 1. Student Concept Understanding Achievement Diagram

However, from the two classes, the percentage of students who scored above 80 was greater in the experimental class than the control class. Thus it can be seen that the provision of treatment using multimedia media in science subjects in experimental class students has a significant effect on their learning outcomes. The average level of learning outcomes for the two classes shows that all students in both the experimental class and the control class scored above 70, it's just that the percentage of students who scored above 80 was still higher in the experimental class. The high average learning outcomes of the experimental class compared to the control class can be caused by the use of multimedia media in learning which motivates students to be more focused. Based on observations made during learning, students are generally more active in reading, observing and studying the material. The results of this study are in accordance with the findings of Mohler **[33]** which states that the use of interactive multimedia can improve learning outcomes, especially those related to spatial concepts which are widely found in scientific concepts.

The KPS observed before and after the use of multimedia in learning was observed in more depth than the KPS pretest and KPS posttest questionnaires. The developed KPS test consists of questions related to observation, application of material concepts, interpretation or conclusion of results, and the planning process. The KPS pretest and KPS posttest data collection was carried out simultaneously with the pretest and posttest of understanding the concept, both pretest, midtest, and final test conducted in the field. two science learning classes. conducted on all teachers who took part in science lessons, the results obtained were only 51.8% of the control class and 49.89% of the experimental class managed to get a score above 70. In both classes no one managed to get a score above 80. Post test used to see the differentiating factors and the influence of the use of multimedia media in science learning between the control

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class and the experimental class. In general, there was an increase in the percentage of student test scores in both classes, namely in the control class 69.3% of students had scores above 70, no scores below 50, while in the experimental class there were 86.44% of students who had test scores. score above. 70, no score below 50.

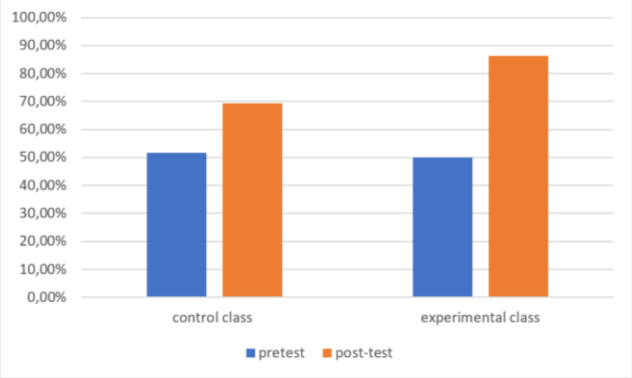

Figure 2. Diagram of Achievement of Students' Science Process Skills

If the two classes are compared with the total percentage of each class, then the level of improvement in the KPS in the two classes shows a significant increase in results. However, from the two classes, the percentage of students who scored above 80 was greater in the experimental class than the control class. Thus it can be seen that giving treatment using multimedia media for science learning to experimental class students has a significant effect on students' KPS. Learning media by utilizing multimedia media can help students' abstraction power. Material that is relatively abstract or difficult to observe is concretized through pictures, animations and videos contained in this media so that students become more interested and happy to learn the material.

The teacher's response to the learning process using multimedia in science subjects can be seen from filling out the questionnaire. The results of the questionnaire get answers Strongly Agree as much as 46%, Agree 46% and Disagree answers 8%. So 92% of the answers agreed, while the other 8% answered disagree. This means that it can be concluded that the teacher's desire to use multimedia in science learning to improve KPS is a positive response. This shows that teachers really like learning science using multimedia because with this media students feel clearer about the material being taught. Students can find many new things contained in the media that can be discussed with friends, students can focus well on following the lesson and can make it easier for students to remember the material that has been taught. Thus it can be said that the level of validity of the use of multimedia in science learning has been tested for use as a learning medium independently by the teacher.

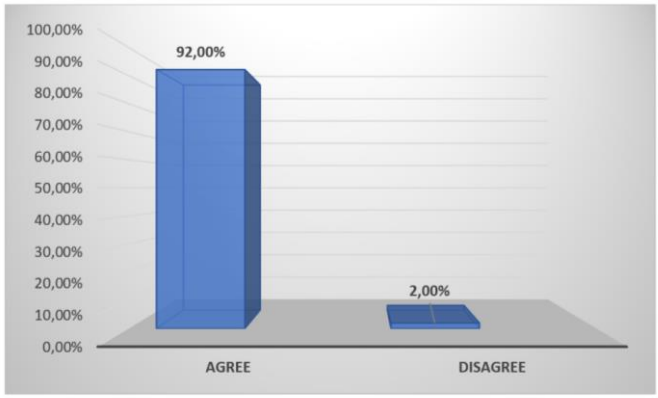

Figure 3. Diagram of Student Responses to Multimedia Learning Media

The results of data processing on the pretest and posttest mastery of science subject matter concepts by paying attention to the answers to the integrated concept mastery test and higher order thinking skills for each question. The N-gain scores for mastery of basic science subjects integrated with higher order thinking skills are all in the high category. Zoller and Pushkin **[34]** stated that there is a relationship between the learning model applied and the improvement of higher order thinking skills in the laboratory-based inquiry learning model. The use of computer-based media can improve learning outcomes in science learning.

In the application of science learning multimedia media, several advantages were found, namely (a) it can be used to improve mastery of basic science concepts and higher order thinking skills for teachers; (b) allows students to learn independently from the prepared multimedia which is equipped with guiding questions and arranged in a systematic and sequential manner according to the concepts to be taught and various levels of difficulty so that students feel assisted in understanding science concepts and the level of thinking ability. height developed by the teacher; (c) provide direct examples of teacher-oriented models of teaching science and higher-order thinking skills.

In this study, with the continuous active involvement of teachers in learning science and higher-order thinking skills, it is hoped that they will have organized thinking skills which are reliable tools for solving problems and can be applied in everyday life. If it is associated with teacher assignments it can be said to be very relevant because they not only hear lectures, or only see, but even experience student-centered learning. This is a useful provision for science teachers because in the field they will later play a major role in determining the quality of science learning in schools. Carind and Sund **[35]** stated that the advantage of student-centered learning is that students will be trained to think continuously through identifying problems, identifying problem variables, and finally finding steps to solve the problem.

Learning science subjects in this study is intended to develop high-order thinking skills for teachers. Even though it has been well designed according to the situation and class, from observations during learning there are still some

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limitations. Some limitations in its application that have been developed are that this learning requires a computer/laptop device, and depends on the presence or absence of an electrical network. Judging from the results of the pretest and posttest T test mastery of the concept and improvement of KPS showed a significant difference. This means that there is a development of KPS and the development of conceptual understanding after students carry out learning using multimedia in science subjects. The response of students and teachers to this learning model was very positive, if we observe each statement it can be revealed that the use of multimedia developed is more economical and interactive, guides learning creativity, develops thinking skills, arouses interest in designing other similar experiments. . It can be seen that the use of multimedia in science learning can develop a teacher's science process skills.

IV. CONCLUSION

From the results, it was found that there were significant differences. This means that understanding of science process concepts and skills increases after prospective student teachers experience the learning process using multimedia. From the results of the average value of understanding the concept, increasing from 39.86% to 88.22%. and science process skills increased the average value from 49.89% to 86.44%. 92% of college student gave a positive response, namely agreeing and strongly agreeing that the science lecture process using multimedia learning media can improve science process skills and understanding of material in science subjects for elementary teacher education college student.

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