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THE EFFECT OF PREZI-ASSISTED PRESENTATION MEDIA ON STUDENTS' CRITICAL THINKING SKILLS IN THE COORDINATION SYSTEM TOPIC FOR GRADE XI AT SMA NEGERI 8 PEKANBARU

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ABSTRACT

The low critical thinking skills of students in biology learning motivated this study. This issue occurs due to several factors, one of which is the use of presentation media that does not adequately support the learning process. The purpose of this study was to determine the effect of Prezi presentation media on students' critical thinking skills in the coordination system topic for Grade XI at SMA Negeri 8 Pekanbaru. This study employed a quasi-experimental method with a pretest–posttest control group design. The samples were classes XI.10 and XI.8, selected using purposive sampling. Prezi presentation media was used in the experimental class during the learning process, while the control class used PowerPoint media commonly used by the teacher. The research instruments included a critical thinking skills test and an observation sheet. The results showed that the critical thinking skills of students in the experimental class were higher than those in the control class. The average pretest score of the experimental class was 43.5 compared to 39.3 in the control class, while the average posttest score was 81.8 in the experimental class and 68.8 in the control class. The data obtained were analyzed using an independent sample t-test, resulting in a significance value (2-tailed) of 0.000 < 0.05. Therefore, it can be concluded that the use of Prezi-assisted presentation media has a significant effect on students' critical thinking skills in the coordination system topic for Grade XI at SMA Negeri 8 Pekanbaru.

Keywords: Critical Thinking Skills; Learning Media; Prezi.

INTRODUCTION

Twenty-first century education requires students to master the 4C skills: creative thinking, critical thinking, communication, and collaboration (Prayogi & Estetika, 2019). Among these skills, critical thinking is particularly important because it relates to the ability to analyze information, make decisions, and solve complex problems. The national curriculum also emphasizes student-centered learning, requiring students to learn independently and construct concepts from the material they study.

Students' critical thinking skills in Indonesia are still relatively low. The 2023 Programme for International Student Assessment (PISA) results show that Indonesia ranks 68th with a science score of 398. This achievement indicates students' limited ability to analyze and reason using scientific information. Azrai et al. (2020) also emphasized that critical thinking skills contribute 19.9% to students' scientific literacy. These low PISA results reinforce the urgency of improving critical thinking skills, especially in science and biology learning.

Similar issues are found at SMA Negeri 8 Pekanbaru. Based on interviews with biology teachers and an initial critical thinking test, students still struggle with several critical thinking indicators. Initial scores showed that the indicators of analyzing and drawing conclusions were in the "moderately critical" category, while synthesizing, identifying and solving problems, and evaluating fell into the "less critical" category. Overall, students' critical thinking skills were categorized as low, indicating a need for improvement in biology learning.

One of the Grade XI biology topics that requires strong critical thinking skills is the coordination system. This topic involves the interconnectedness of the nervous system, endocrine system, and sensory system, which contain complex and abstract mechanisms. Biology teachers stated that the coordination system is difficult for students to understand due to the large number of subtopics and the interrelation among concepts. This is consistent with Pratiwi et al. (2022), who stated that the coordination system is a challenging biology topic because many of its concepts cannot be directly observed. Therefore, effective learning models and media are needed to help students understand abstract concepts and enhance analytical skills.

The presentation media commonly used by teachers is PowerPoint; however, its use is considered monotonous and less engaging, especially during afternoon lessons. Small text and images also make it difficult for students to understand the material, causing them to lose focus quickly. This condition indicates the need for more innovative presentation media that can support critical thinking.

One alternative media option is Prezi presentation media. Prezi offers advantages such as non-linear displays, zoom in–zoom out features, and multimedia integration that make presentations more interactive and dynamic. Muhsan (2022) stated that the use of Prezi helps students remember material more easily due to its visually appealing and interactive presentation format. Research by Kasim et al. (2020) and Puspitasari and Supriyanto (2022) also demonstrated that Prezi has a positive effect on critical thinking skills and helps students understand abstract biological concepts through interactive visualization and concept interconnections.

Based on this description, Prezi is considered suitable for teaching the coordination system, which is complex and abstract. Therefore, the researcher conducted a study entitled "The Effect of Prezi-Assisted Presentation Media on Students' Critical Thinking Skills in the Coordination System Topic for Grade XI at SMA Negeri 8 Pekanbaru."

RESEARCH METHODS

This study is a quantitative study employing a quasi-experimental method with a pretest–posttest control group design. The population in this study consisted of Grade XI students at SMA Negeri 8 Pekanbaru. The sample was selected using purposive sampling based on considerations of academic ability uniformity, stable learning conditions, and class schedule suitability. The sample consisted of two classes: XI.10 as the experimental class and XI.8 as the control class. The experimental class used Prezi-assisted media during the learning process, while the control class used PowerPoint media provided by the teacher. The independent variable in this study was the Prezi presentation media, whereas the dependent variable was students' critical thinking skills. The data collection instruments consisted of a critical thinking skills test and an observation sheet using a rating scale. The critical thinking test instrument had undergone validity and reliability testing. The validity test results indicated that all items were valid at the 5% significance level. The reliability test

showed a reliability coefficient of 0.736, indicating that the instrument was reliable and suitable for data collection. Additionally, the item difficulty analysis showed that all questions were in the medium category, and the discrimination index was in the high category, indicating that the instrument effectively measured critical thinking skills.

The study was conducted in three main stages: the preparation stage, the implementation stage, and the reporting stage. In the preparation stage, Problem-Based Learning lesson plans were developed, Prezi presentation media was designed, and research instruments were validated. The implementation stage included administering the pretest, conducting learning using PowerPoint media in the control class and Prezi media in the experimental class, observing critical thinking skills during the learning process, and administering the posttest. The reporting stage included data processing, analysis of research findings, and drawing conclusions.

The data were analyzed using quantitative analysis techniques with SPSS version 26. Critical thinking skills were analyzed by calculating the percentage of achievement for each critical thinking indicator and determining the normalized gain (N-gain) to measure improvement in students' critical thinking skills. Before hypothesis testing, prerequisite tests were conducted using the Shapiro–Wilk normality test and the homogeneity of variance test. Subsequently, hypothesis testing was performed using the Independent Samples T-Test with a 5% significance level to determine the differences in critical thinking skills between the experimental and control classes.

RESULTS AND DISCUSSION

RESULTS

Instrument Feasibility Test Results

The research instrument used consisted of a critical thinking skills test with 35 items. An instrument feasibility test was conducted, including validity, reliability, item difficulty level, and item discrimination tests before the instrument was used. The results of the instrument feasibility test are presented in Table 1.

Table 1. Feasibility Test Results of the Critical Thinking Skills Test Instrument

Type of Test	Result
Validity	Valid
Reliability	Reliable
Difficulty Level	Medium
Discrimination Index	High

Based on Table 1, all 35 items were declared valid and reliable, with a reliability coefficient indicating good instrument consistency. The difficulty level of the 35 items fell into the medium category, and the discrimination index of all items was in the high category, indicating that the instrument was appropriate for measuring students' critical thinking skills.

Critical Thinking Skills Based on Pretest–Posttest Results

The pretest and posttest data obtained were analyzed and calculated for each class. The critical thinking skill data of students in the experimental and control classes are presented in Table 2.

Table 2. Average Pretest and Posttest Scores of Students' Critical Thinking Skills

Class	Average pretest score	Category	Average posttest score	Category
Control	39,3	Very uncritical	81,8	Fairly critical
Experimental	43,5	Very uncritical	68,8	Critical

Based on the data analysis, the average pretest score in the experimental class was in the low category, namely 43.6 (very uncritical). However, after the implementation of Prezi media in the learning process, students' posttest scores showed a significant increase to 81.8 (critical). Meanwhile, the control class that used conventional PowerPoint media also showed an improvement, but not as large as that of the experimental class, increasing from 39.3 (very uncritical) in the pretest to 68.8 (fairly critical) in the posttest.

Critical Thinking Skills Based on Observation Results

The observations were conducted by two observers, namely a biology teacher and a university student. In summary, the observation results for the experimental class and the control class can be seen in the following table.

Table 3. Observation of Students' Critical Thinking Skills

Class	Average	Category
Control	66,86	Fairly critical
Experimental	78,04	Critical

From the presented observation results, it was found that the indicators of students' critical thinking skills were higher in the experimental class, with a score of 78.04 (critical), compared to the control class, which scored 66.86 (fairly critical).

Hypothesis Testing

Based on the prerequisite tests conducted on the pretest and posttest data for each class, the results showed that the data were normally distributed and had homogeneous variances. Therefore, the hypothesis testing was carried out using the Independent Samples t-test with a significance level of < 0.05. If the significance level is < 0.05, the hypothesis is accepted. The results of the hypothesis testing are presented in the following table.

Table 4. Results of Hypothesis Testing (Independent Samples t-test)

Independent Sample Test					
		t-test for Equality of Means			
		t	df	Sig. (2-tailed)	Mean Different
Posttest	Equal variances assumed	7,074	74	0.000	12.921
	Equal variansces not assumed	7,074	70.276	0.000	12.921

Hypothesis testing using the Independent Samples t-test on the posttest scores of the control class and the experimental class yielded a result of 0.000, indicating that the significance value (Sig. 2-tailed) is < 0.05. This means that there is a significant difference in students' critical thinking skills between those who learned using Prezi media and those who learned using conventional media. Therefore, H_0 is rejected and H_1 is accepted, indicating that Prezi presentation media has a significant effect on students' critical thinking skills.

DISCUSSION

Instrument Feasibility Test

The instrument used in this study consisted of critical thinking skills test items. The instrument feasibility test included validity testing, reliability testing, item difficulty level analysis, and item discrimination analysis. Validity testing is a measure that indicates the degree of validity of an instrument (Arikunto, 2013). In this study, the critical thinking test items were validated through a try-out conducted on a group outside the research sample who had already studied the related material. The results of the try-out were analyzed to determine which items were feasible to use or needed revision, with the assistance of SPSS version 26. The results of the instrument validity test showed that rxy > rtable, therefore 35 test items were declared valid at a 5% significance level.

After the items were declared valid, a reliability test was conducted to determine the level of consistency of the instrument so that it could be trusted as a data collection tool because the instrument was considered good (Winarni, 2018). An instrument is considered reliable if it has a reliability coefficient value greater than or equal to 0.70. The results of the reliability test conducted on the instrument tried out on Biology Education students of the 2022 cohort using SPSS version 26 showed a reliability coefficient value of 0.736. Thus, it can be concluded that the instrument used is reliable and suitable for use.

The next test was the item difficulty level test, which refers to the extent to which a test item can be answered correctly by test participants and simultaneously reflects the level of difficulty of the item in measuring the assessed competence. Items that are too easy will result in almost all participants being able to answer correctly, whereas items that are too difficult will cause most

participants to be unable to answer correctly. Consequently, such items cannot accurately describe the actual differences in students' abilities.

In general, the level of item difficulty is expressed by a difficulty index denoted by P, which is obtained by dividing the number of students who answered correctly by the total number of students who took the test. This index is then analyzed to classify items into easy, moderate, or difficult categories. Items classified as moderate are usually retained more often in the instrument because they are able to provide a better description of variations in students' abilities, with an index range of 0.3–0.7 (Solichin, 2017). The 35 test items analyzed had difficulty indices between 0.3 and 0.7 and fell into the moderate category; therefore, all items were considered feasible for use. Thus, difficulty level analysis is an important step in instrument development to ensure that the items used are truly valid, representative, and aligned with the measurement objectives.

The next test was the item discrimination test, which aims to determine the ability of a test item to distinguish between groups based on differences in the measured aspect according to the variations present within the group. Good item discrimination indicates that the item is effective in identifying differences in students' abilities. If an item has high discrimination power, it is capable of selecting students who truly understand the material well. Conversely, if the discrimination power is low or negative, the item is considered to be of low quality because it cannot distinguish between high- and low-ability students.

This analysis helps researchers determine whether an item should be retained, revised, or discarded from the evaluation instrument. Thus, the instrument used becomes more representative in describing students' actual abilities. In addition, good item discrimination ensures that test results truly reflect individual ability variations within the group. Therefore, item discrimination testing is an important step in developing a valid and reliable test instrument.

The results of the analysis conducted on the test items showed that all items had high discrimination power, meaning that each item was able to effectively distinguish between students with high and low abilities. Therefore, all items were suitable for use in this study as instruments for measuring critical thinking skills.

Indicators of Critical Thinking Skills

Students' critical thinking skills were measured using five indicators: analyzing, synthesizing, identifying and solving problems, drawing conclusions, and evaluating and judging. The results showed that the average posttest and observation scores in the experimental class (using Prezi media) were higher than those in the control class (using PowerPoint). This finding is in line with the study by Bilqis et al. (2023), which states that problem-assisted learning models or innovative media can improve students' critical thinking skills.

The first indicator of critical thinking skills is analyzing. According to Wibowo and Lestari (2022), analytical skills require students to break down complex information into meaningful parts and relate them through logical connections; therefore, learning needs to be supported by media that can clearly visualize these relationships. Students' analytical abilities in the experimental class increased compared to those in the control class. This finding is consistent with the study by Ardiansyah (2025), which showed that the use of interactive visual-based presentation media significantly improved achievement in the analysis indicator compared to conventional linear media. The images and cases presented in Prezi, along with its zooming feature, made it easier for students to identify in detail the parts of neurons, the brain, the spinal cord, the location of endocrine glands, and sensory structures. Prezi creates an engaging and innovative learning experience for students due to its dynamic and interactive presentation of information. Prezi not only functions as a presentation tool but also as a learning medium that increases students' active involvement in the learning process. Dynamic visualization in Prezi helps students relate real-life phenomena to biological concepts, making comparative thinking more effective (Siti, 2021).

The next indicator is synthesizing. The role of Prezi in training students' synthesis skills, such as searching for and connecting information, lies in its ability to present dynamic and interactive visualizations that are interconnected across concepts, thereby helping students understand the relationship between skin receptor structures and the function of the sense of touch more concretely. This is in line with the findings of Mah et al. (2023), who stated that Prezi offers a dynamic visual approach in presenting information, enabling students to be actively involved in the learning process and to more easily understand the relationships among concepts.

The ability to identify and solve problems is the next indicator of critical thinking skills. Prezi displays images showing the locations of endocrine glands and the hormones they produce. These images are enlarged using the zooming feature, allowing students to clearly understand the material. In addition, Prezi presents a case of increased thyroxine hormone secretion along with several of its symptoms, which is then discussed in the Student Task Worksheet (LTPD). Based on the cause-and-effect relationship between hormone secretion and bodily symptoms, supported by visual images, students are able to conclude that thyroid disorders are the main cause of the given case. According to Kristiantari et al. (2022), problem-solving-based learning supported by Prezi media can enhance critical thinking skills and conceptual understanding because students do not merely receive information linearly, but also construct meaning from the visual interconnections presented.

The next indicator is drawing conclusions. The ability to draw conclusions is an important indicator of critical thinking that requires students to understand information, apply inductive and deductive reasoning, and generate varied ideas or options based on the facts obtained. Prezi facilitates this understanding by presenting the flow of impulses through sensory pathways, the brain, motor pathways, and effectors, allowing students to see the integration of receptors, neurons, and muscles in a single comprehensive scheme. Prezi presents clear visuals of the central nervous system and peripheral nervous system. In addition, Prezi also presents cases of nervous system disorders that are discussed in groups through the LTPD, thereby fostering students' deeper understanding. Prezi allows information exploration in a non-linear format. It also presents various endocrine glands, the hormones they produce, and the functions of these hormones, enabling students to explore multiple concepts before arriving at a final conclusion. This is supported by the study of Hartati and Susilo (2020), which stated that Prezi media enhances students' divergent thinking skills due to its flexible presentation structure and concept-exploration-centered approach.

The final indicator of critical thinking is evaluating and judging. This indicator relates to students' ability to assess, consider, and express opinions logically based on certain criteria. Prezi had a clear effect on improving students' evaluative abilities. This finding is consistent with the study by Nurdin and Fitria (2021), which stated that interactive, visual, and non-linear learning media such as Prezi can help students critically evaluate concepts by encouraging cognitive engagement and visualization of complex interconceptual relationships. Prezi presents a case of a student who was initially active in sports activities but recently became easily fatigued, often sleepy in class, experienced weight loss despite an increased appetite, frequent urination, and excessive thirst. Prezi then displays zoomed-in slides enlarging diagrams of the insulin and glucagon pathways, as well as autoimmune diagrams attacking pancreatic β cells. At this stage, students demonstrated evaluative abilities by expressing diverse opinions regarding the biological causes of these symptoms.

The Effect of Prezi-Assisted Presentation Media on Students' Critical Thinking Skills

Critical thinking skills can be viewed through five indicators: analyzing, synthesizing, identifying and solving problems, drawing conclusions, and evaluating and judging. The researcher conducted a study at SMA Negeri 8 Pekanbaru to examine the effect of Prezi-assisted presentation media on students' critical thinking skills. Based on hypothesis testing processed using SPSS version 26, a result of 0.000 was obtained, indicating that the significance value (Sig. 2-tailed) was < 0.05; therefore, H_0 was rejected and H_1 was accepted. This means that Prezi presentation media has a significant effect on students' critical thinking skills in the coordination system topic for Grade XI students at SMA Negeri 8 Pekanbaru. This finding is consistent with the study by Jamil (2023), which showed that Prezi media has a significant effect on students' critical thinking skills.

Prezi presentation media plays an important role in improving students' critical thinking skills due to its interactive presentation characteristics, which include narration and problem scenarios, zooming features, non-linear displays, and the integration of explanatory text, anatomical images, and short videos of physiological processes. When students face critical thinking questions, such as comparing the central nervous system and the peripheral nervous system in terms of function and location, they have already seen Prezi displays that visually illustrate the differences between the central and peripheral nervous systems, thereby supporting students in answering questions more effectively. This is in line with Ripai (2023), who stated that Prezi allows information to be presented logically, visually, and spatially, thus helping to strengthen higher-order thinking processes.

The non-linear display of Prezi presentation media and its zooming user interface features support students in observing visual objects in detail, such as neuron structures, parts of the brain

and their functions, the locations of glands and hormone pathways, and sensory structures. This visual support helps transform abstract concepts into more concrete ones for students. Such visualization strengthens conceptual understanding because structures, functions, and relationships among organs can be observed in detail. This is consistent with Mayer's (2022) Multimedia Learning Theory, which emphasizes that presenting information simultaneously through visual and verbal channels can optimize understanding, enhance memory retention, and encourage higher-level information processing. In addition, Sari (2024) emphasized that Prezi is a presentation medium capable of enhancing analytical and critical thinking skills in 21st-century learning.

Prezi-assisted presentation media has a significant effect on students' critical thinking skills in the coordination system topic. This effect is demonstrated by improvements in posttest scores and observation results derived from students' activities during the learning process, including discussions in the Student Task Worksheet (LTPD). Prezi presentation media can serve as an effective innovation in biology learning to develop students' critical thinking skills, especially for abstract and complex topics such as the coordination system.

CONCLUSIONS

Based on the hypothesis testing, a result of 0.000 was obtained, indicating that the significance value (Sig. 2-tailed) was < 0.05. This means that there is a significant difference in the critical thinking skills of students who learned using Prezi media; therefore, H_0 is rejected and H_1 is accepted. Thus, it can be concluded that the use of Prezi-assisted presentation media has a significant effect on students' critical thinking skills at SMA Negeri 8 Pekanbaru. Based on the implementation of the research that has been conducted, the following recommendations are proposed: (1) Future researchers are encouraged to further develop Prezi presentation media or other learning media that are more adaptive and interactive to enhance critical thinking skills; (2) Each indicator of critical thinking skills should be evenly incorporated into the developed media so that students' critical thinking abilities can be more clearly observed. (3)Future researchers may apply Prezi presentation media that incorporate critical thinking skill aspects to other biology topics and combine them with the Case Method in learning to create more engaging, varied, and innovative learning experiences.

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