THE EFFECT OF DIGITAL TECHNOLOGY ON STUDENTS CREATIVE AND CRITICAL THINKING SKILLS

Yessy Syamsul[1], Saiful Bahri[2]
[1,2]Master of Social Education Program, PGRI University of Pontianak
[1]syyessy2@gmail.com
[2]bangipoelponty@gmail.com

Abstract

This study aims to see the influence of digital technology of toponym rays on students' creative and critical thinking skills. The use of technology in the classroom is essential to improve educational standards in the rapidly evolving digital era. This study uses experimental design and quantitative methodology. The subject of the study was a randomly selected student of class X at Pontianak State High School. The research implementation method involves the use of digital toponym ray applications for one semester of school. The instruments used include creative and critical thinking skills tests that have been validated. Data is collected based on the measurement of specific skills, such as creative and critical thinking skills, which are measured with valid and reliable instruments. The data analysis technique used is experimental statistics. The t-test was used to determine the significance of the difference between the scores of the experimental class and the control class. The results showed that there was a significant improvement in students' creative and critical thinking skills after using digital technology of toponymic rays, namely the results of data analysis showed that the average score of creative and critical thinking skills of students in the experimental group was higher than that of the control group. The average score of creative thinking skills in the experimental group was 85.2, while in the control group it was only 70.4. For critical thinking skills, the average score in the experimental group was 82.7, while in the control group it was only 68.3. and The results of the t-test showed that the t-value for creative thinking skills was 3.45 with a p-value < 0.05, which means there was a significant difference between the two groups. For critical thinking skills, the t-value was 3.87 with a p-value < 0.05, which also showed a significant difference.

Keywords: Digital Technology, Creative Thinking, Critical

INTRODUCTION

The modern digital era is characterized by the rapid advancement of information technology. Information is available from a variety of sources and flows quickly. While there are many advantages to this easy access, there are also new difficulties. Sorting and understanding this vast amount of information is one of the main obstacles. Critical and creative thinking skills are more important in this situation. These qualities go beyond simple cognitive functions; They are essential to prosper in unpredictable times. The development of digital technology today has changed the way humans look at all areas of life, including learning and education. Technology for learning has become increasingly integral in the teaching and learning process. In order for the education sector to grow and be able to keep up with progress in other fields, innovation is

very important. The use of technology offers advantages and disadvantages. (Ambarwati et al., 2022). The impact can concentrate on the good and minimize the bad if there is good collaboration between stakeholders to ensure that the purpose of using the technology is achieved. The use of technology in the classroom has created new opportunities for students to learn more and expand their cognitive abilities. Critical thinking and problem-solving are two important cognitive abilities in an educational setting. In order to realize a critical, adaptive, and socially intelligent young generation to meet the needs of the industrial era, digital pedagogy can be an alternative approach to learning in the digital era. 4.0 (Purfitasari et al., 2019).

Cognitive skills such as critical thinking and problem-solving require logical and rational information processing, analysis, evaluation, and decision-making. This ability is necessary to

handle difficult situations in both the academic and everyday professional environment. However, the education system continues to face difficulties in developing students' critical thinking and problem-solving skills. different. Technological advances have made learning easier and the search for different learning resources has become easier because learning is no longer limited by time and place. (Sanita & Saparia, 2023).

It is accessible to everyone through technology. Therefore, the use of technology in the classroom can help students become more proficient in problem-solving and applying critical thinking. The learning technology offers a range of interactive materials, games, simulations, and assessment tools tailored to make students think critically and solve authentic problems. The use of learning technology in this study is toponymic ray technology that can provide a learning environment and support the development of these skills and allow students to access diverse and up-to-date information resources. SINAR (Geographical Name Information System) is an application developed by the Geospatial Information Agency (BIG) to facilitate the Implementation of Geographical Names in Indonesia. The terrain name data uploaded on this application will belong to BIG, as a non-ministerial government institution that carries out government duties in the field of geospatial information in accordance with the mandate of Government Regulation No. 2 of 2022. Toponym's ray digital technology leverages geospatial data and information technology to create digital representations of interactive and dynamic maps. Using this technology, students can explore various geographical locations while learning the historical and cultural background of the names of the places. For example, by simply clicking on a dot on a digital map, students can access information about the history of a place, the origin of the name, as well as the role of the place in the social and economic context. This helps them develop analytical abilities to collect and evaluate information from various sources. Understanding the features of the media and the needs of students is the first step in optimizing the use

of learning media. Therefore, educators must be creative in facing limited resources or other technical challenges (Budiyono, 2020). Educators can maximize everything that can be used to deliver learning information, including the use of the environment, so that something real can be presented applicatively.

The ability to think critically and creatively is a necessity in the rapidly evolving digital era and everyone must have it, especially in the field of education and human resource development. Significant changes are caused by the growth of digital technology in various areas of society, including social, educational, and economic fields. The way we think, learn, and communicate are all influenced by this digital revolution. Communities will be better prepared to face future obstacles, advance society, and realize their maximum potential if they practice these skills. Based on the identification of these cases, the purpose of this study is to determine the Influence of Toponymic Ray Digital Technology on Students' Creative and Critical Thinking Skills.

METHOD

This study uses a quantitative approach with an experimental quantitative research method. Quantitative methods are related to procedures (methods) for collecting data, analyzing data, and interpreting analytical findings to gather information for conclusions and decision-making. (Solimun, Armanu, & Fernandes, 2018). Design an experiment with a control group to examine the influence of digital technology in toponymic light on students' creative and critical thinking skills. The design of this experiment was designed to identify the cause-and-effect relationship between the use of digital technology and the improvement of students' thinking skills. According to Margono in (Hardani. Ustiawaty, 2020) said that population is a source of data that has characteristics in a study is the entire object of research which includes people, objects, plants, symptoms, test results, or events. This study involves a carefully selected population and sample so that the results can be generalized. The population in this study is all class X students at State High School (SMA) 1 Pontianak who take part in geography learning. The selection of class X is based on the consideration that students at this level already have a sufficient knowledge base in geography Population Characteristics: Populations have diverse characteristics in terms of socio-economic

background, academic ability, and access to digital technologies. The total population is around 432 students from a total of 12 classes X at SMA Negeri 1 Pontianak. The research sample was taken using the stratified random sampling technique to ensure that each sub-group in the population was proportionally represented. This technique was chosen to increase the representativeness of the sample and reduce sampling bias. Sample Size: The total sample taken was 200 students, with 100 students in the experimental group and 100 students in the control group. In this study, the data collection technique used is quantitative with an experimental approach. The main instrument used is a closed questionnaire designed to measure the influence of digital technology in toponymic light on students' creative and critical thinking skills. This questionnaire consists of several sections that include demographic data, the use of digital technology in learning, and an assessment scale of creative and critical thinking skills. The data analysis techniques used are experimental and inferential statistics. The t-test is used to determine the significance of the difference between the scores of the experimental group and the control group, The instrument in this study is a critical and creative thinking test that has been validated.

RESULTS AND DISCUSSION
Result
The Influence of Toponymic Ray Digital Technology on Students' Creative and Critical Thinking Skills

In this study, data was taken from a sample of students who had used Sinar Toponym digital technology in inquiry-based learning. The sample consisted of 100 students who were divided into two groups, namely the experimental group using Toponymic Rays and the control group using conventional methods. The following is a data table showing the results of the analysis of the average scores of creative and critical thinking skills of students in the experimental group and the control group:

Table 1. Data table of the results of the analysis of the average score of students' creative and critical thinking skills

It	Skills	Experimental Group	Control Group
1	Creative Thinking	85,2	70,4
2	Critical Thinking	82,7	68,3

Source: Secondary Data (Processed)

The results of data analysis showed that the average score of creative and critical thinking skills of students in the experimental group was higher compared to the control group. The average score of creative thinking skills in the experimental group was 85.2, while in the control group it was only 70.4. For critical thinking skills, the average score in the experimental group was 82.7, while in the control group it was only 68.3.

The t-test was conducted to test whether there were significant differences between the experimental group and the control group in terms of creative and critical thinking skills. Here is a data table showing the results of the t-test for creative and critical thinking skills:

Table 2. Results table t-test for creative and critical thinking skills

It	Variable	Group	T value	P-value
1	Creative Thinking Skills	Experiment vs. Control	3,45	< 0.05
2	Critical Thinking Skills	Experiment vs. Control	3,87	< 0.05

Source: Secondary Data (Processed)

This table shows that both creative and critical thinking skills have significant differences between the experimental group and the control group, The test results show that the t-value for creative thinking skills is 3.45 with a p-value < 0.05, which means there is a significant difference between the two groups. For critical thinking skills, the t-value was 3.87 with a p-value < 0.05, which also showed a significant difference.

Discussion
The influence of digital technology on students' creative thinking skills

The results of this study show that the use of

digital technology of Toponym Rays significantly improves students' creative thinking skills. This can be explained through the ability of the Toponym Ray to present information visually and interactively, which allows students to explore concepts more deeply and develop new ideas. Interactive and visual learning has been proven to be effective in stimulating the creative thinking process because it encourages students to look at a problem from various perspectives.

The influence of digital technology of toponym rays on students' critical thinking skills

Critical thinking skills also improved significantly in learners who used Toponymic Rays. This technology allows students to conduct in-depth analysis of the information they obtain, as well as test the validity of various data sources. The interactive features in Toponym Beam help learners to identify strong and weak arguments, as well as develop better analytical thinking skills.

This discovery has important implications for educational practice. The use of digital technology such as Toponymic Rays not only improves students' creative and critical thinking skills, but also makes learning more interesting and relevant. Teachers can take advantage of this technology to create a more dynamic and challenging learning environment, which can ultimately improve students' overall learning outcomes.

Thus, it can be said that in examining the influence of technology on creative and critical thinking skills, which is in line with several previous researches, such as teachers must be encouraged to develop various skills and abilities in using technology to support teaching and learning activities, because their acceptance of technology in the classroom can determine their optimism and creativity in the classroom (Hidayati et al., Because the Quizwhizzer program has many interesting elements and a large number of templates, students can become more engaged and not feel bored with social studies classes. This can help students remember the material that their teacher has

taught. comes from the questions generated by the Quiz. Students can practice answering these questions through their application, which helps them have a deeper understanding of the topics discussed. (Handayani et al., 2024). Then the results of other studies also say that to increase the effectiveness of the 4C skills—critical thinking skills, creative thinking, communication, elaboration, technology, and information—digital media is used in 21st century learning. (Lubis & Lubis, 2021). And Ariyana et al., (2018: 15) also revealed that 1) Critical thinking and problem-solving skills: students are able to recognize, analyze, interpret, and evaluate evidence, arguments, claims, and data that are widely presented through in-depth study, and can reflect on them in daily life; 2) Creative and innovative thinking skills: students can generate, develop, and implement their ideas creatively both individually and in groups; 3) Communication skills: students can communicate ideas and thoughts effectively using oral, written, or technological media and 4) Collaboration skills, where students can work in groups to find solutions to a problem. Additionally, the use of websites on the internet can help students become more aware of critical thinking (Astuti et al., 2020).

The findings of this study are to see how influential digital technology is, namely by using digital toponymic rays to face students' creative and critical thinking skills in learning. And the importance of digital technology in the learning process to improve students' creative and critical thinking skills. Although this study shows positive results, there are some limitations that need to be noted. This research was only conducted in a relatively short period of time and with a limited sample. Therefore, generalizing the results to a wider population should be done with caution. Further research with longitudinal designs and larger samples is recommended to reinforce these findings.

CONCLUSIONS AND SUGGESTIONS

This study shows that the use of digital technology of Toponymic Rays significantly improves students' creative and critical thinking skills. The results of the quantitative analysis indicated that students who were involved in learning using Toponymic Rays showed an improvement in the ability to generate new ideas, as well as in analyzing, evaluating, and

composing arguments better than those using conventional learning methods. Therefore, Toponymic Rays can be considered an effective tool for developing essential thinking skills in the digital age. The suggestion from the results of this study is that in order for this technology to be used optimally, training is needed for teachers to integrate Sinar Toponym into their teaching strategies. This training should include creative ways to use this technology to maximize its impact on learning, and further research is suggested to explore the long-term effects of the use of Toponymic Rays on students' thinking skills, as well as to identify other factors that can affect learning outcomes. The research should also include a larger and more diverse sample to improve the generalization of findings, and the Developers of Sinar Toponym are expected to continue to update and refine this technology based on feedback from teachers and learners, in order to meet the evolving needs of education. Additional features that support collaboration and project-based learning can also be potential areas for development.

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