

DECISION SUPPORT SYSTEM ON STUDENTS CRITICAL THINKING SKILLS IN ICT BASED EDUCATIVE LEARNING

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Abstract: *This research aims to develop and test a decision-making system designed to evaluate and improve students' critical thinking skills in Information and Communication Technology (ICT)-based learning. Along with the development of technology in education, critical thinking skills become one of the essential competencies that must be possessed by students. This decision-making system uses a decision support system (DSS) method that integrates several indicators of critical thinking skills, such as analysis, interpretation, evaluation, and inference. Data were obtained through test instruments and observations on secondary school students involved in ICT-based learning. This study used a quantitative method with a pseudo-experimental approach. The research sample consisted of 120 students who were divided into experimental and control groups. The experimental group used an ICT-based decision-making system in the learning process, while the control group used conventional methods. The results showed that the use of ICT-based decision-making system significantly improved students' critical thinking skills compared to the conventional method. The system assists teachers in monitoring students' progress and providing timely feedback to improve learning effectiveness. These findings suggest that the application of technology in learning not only improves academic outcomes but also hones students' cognitive skills, particularly critical thinking ability. Thus, further development of this system is expected to support the implementation of a competency-based curriculum that emphasizes the use of technology in education.*

Keywords: *Decision Support System, Critical Thinking, ICT, Educational Learning, Technology in Education*

Abstrak: Penelitian ini bertujuan untuk mengembangkan dan menguji sistem pengambilan keputusan yang dirancang untuk mengevaluasi dan meningkatkan kemampuan berpikir kritis siswa dalam pembelajaran berbasis Teknologi Informasi dan Komunikasi (TIK). Seiring dengan berkembangnya teknologi di bidang pendidikan, kemampuan berpikir kritis menjadi salah satu kompetensi penting yang harus dimiliki oleh siswa. Sistem pengambilan keputusan ini menggunakan metode sistem pendukung keputusan (DSS) yang mengintegrasikan beberapa indikator kemampuan berpikir kritis, seperti analisis, interpretasi, evaluasi, dan inferensi. Data diperoleh melalui instrumen tes dan observasi pada siswa sekolah menengah yang terlibat dalam pembelajaran berbasis ICT. Penelitian ini menggunakan metode kuantitatif dengan pendekatan pseudo-eksperimental. Sampel penelitian berjumlah 120 siswa yang dibagi menjadi kelompok eksperimen dan kontrol. Kelompok eksperimen menggunakan sistem pengambilan keputusan berbasis ICT dalam proses pembelajaran, sedangkan kelompok kontrol menggunakan metode konvensional. Hasil penelitian menunjukkan bahwa penggunaan sistem pengambilan keputusan berbasis ICT secara signifikan meningkatkan kemampuan berpikir kritis siswa dibandingkan dengan metode konvensional. Sistem ini membantu guru dalam memantau kemajuan siswa dan memberikan umpan balik tepat waktu untuk meningkatkan efektivitas pembelajaran. Temuan ini menunjukkan bahwa penerapan teknologi dalam pembelajaran tidak hanya meningkatkan hasil akademik tetapi juga mengasah keterampilan kognitif siswa, khususnya kemampuan berpikir kritis. Dengan

demikian, pengembangan lebih lanjut sistem ini diharapkan dapat mendukung penerapan kurikulum berbasis kompetensi yang menekankan pada pemanfaatan teknologi dalam pendidikan.

Kata Kunci: Sistem Pendukung Keputusan, Berpikir Kritis, TIK, Pembelajaran Edukatif, Teknologi dalam Pendidikan

INTRODUCTION

Rapid advances in Information and Communication Technology (ICT) have changed various aspects of life, including education. The use of ICT in learning has opened up new opportunities to develop teaching methods that are more interactive, dynamic and integrated with the needs of the modern world. One of the skills that are important in this digital era is critical thinking, which is considered as the main foundation in effective decision-making and complex problem solving. Critical thinking involves the ability to analyze information, evaluate arguments, identify assumptions, and draw logical conclusions. In the context of education, this ability is crucial to develop so that students can face increasingly complex global challenges. However, in reality, there are still many students who show limitations in critical thinking skills. This can be caused by various factors, such as teaching methods that do not emphasize the development of critical thinking skills, as well as limited tools or systems that can help teachers to identify and improve students' thinking skills in a timely and accurate manner. Therefore, a new approach is needed that not only integrates technology in the learning process, but also provides effective support in decision-making related to students' cognitive development, especially in critical thinking. ICT-based decision-making systems offer a solution to this problem. It allows teachers to collect, analyze and evaluate data on students' critical thinking skills in real-time, as well as provide feedback that can help students improve their skills. Decision support systems (DSS) are also capable of assisting in devising more adaptive learning strategies, where

learning materials can be tailored to the abilities of individual students. Thus, teachers can take more appropriate steps in facilitating students' critical thinking development. Kong, S. C. (2014)

This research focuses on the development and application of an ICT-based decision-making system in educational learning, particularly in improving students' critical thinking skills. In this research, the decision-making system is designed using various indicators of critical thinking skills, such as analysis, evaluation, and synthesis of information. In addition, this study also aims to evaluate the effectiveness of the system in improving the critical thinking skills of secondary school students. Along with the implementation of Merdeka Belajar Curriculum in Indonesia, which emphasizes the development of student competencies through project-based learning and the use of technology, this research is expected to make a real contribution in helping teachers utilize technology to achieve these goals. With the right system development, it is hoped that students can be better prepared to face future challenges that demand higher critical thinking skills. Therefore, this study aims to answer several important questions: (1) How can an ICT-based decision-making system improve students' critical thinking skills? (2) What are the most relevant indicators of critical thinking skills in the context of ICT-based learning? (3) How does the effectiveness of this system compare with conventional teaching methods in improving students' critical thinking skills? Through this research, it is hoped that effective solutions can be found to improve the quality of education in Indonesia, especially in the development of critical

thinking skills which is one of the main competencies of the 21st century. Changwong, K., Sukkamart, A., & Sisan, B. (2018)

METHODS

This research uses a quantitative approach with a quasi-experiment method, which aims to test the effectiveness of an Information and Communication Technology (ICT)-based decision-making system in improving students' critical thinking skills. The method is designed to compare two groups of students, namely the experimental group that uses ICT-based decision-making system in learning and the control group that uses conventional learning methods.

1. Research Design
This study used a pretest-posttest control group design, which involved two groups of students, namely: Isnaeni (2021)

a. Experimental group: Students who received intervention through the use of ICT-based decision-making system in the learning process. Chang, C. Y., Kao, C. H., & Hwang, G. J. (2020).

b. Control group: Students who follow the learning process with conventional methods without the support of ICT systems.

Before and after the treatment, both groups will be given critical thinking ability tests (pretest and posttest) to measure the changes that occur.

2. Population and Sample

The population of this study were secondary school students involved in ICT-based learning in one of the schools in Medan city. The sample selection was conducted using purposive sampling technique, in which the sample was selected based on certain criteria, namely students who were already familiar with learning using ICT devices and were expected to be able to follow the research process well. Yuan, Y. H., Liu, C. H., & Kuang, S. S. (2021)

The sample of this study consisted of 120

students who were divided into two groups, each group consisting of 60 students: Tasrif, E. (2021)

1. Experimental group: 60 students who will follow the learning with the help of ICT-based decision-making system.
2. Control group: 60 students who followed the learning without using the system.

3. Research Instruments
The instruments used in this study include: Iqbal, H. M. (2020)

1. Critical thinking ability test: This test was prepared based on indicators of critical thinking skills adapted from the Critical Thinking Disposition model which includes components of analysis, evaluation, interpretation, and inference. This test was used to measure students' critical thinking skills before and after treatment. Miftakhurrohmah, N. L (2023)
2. Student perception questionnaire: This questionnaire was used to measure students' perceptions of the use of ICT-based decision-making system and its influence on their learning.
3. Observation sheet: This sheet was used to record students' engagement in learning, interaction with the system, and critical thinking processes displayed during learning.

Research Procedure
This research was conducted in several stages as follows: Mahmudah, S.(2022)

Preparation Stage:

1. Developing an ICT-based decision-making system designed to evaluate students' critical thinking skills based on certain indicators.
2. Preparing research instruments (critical thinking test, questionnaire, and observation sheet). Puig, B.(2020)
3. Conducting validity and reliability tests of the instruments to ensure

measurement accuracy and consistency.

4. Provide brief training to teachers and students in the experimental group regarding the use of ICT-based decision-making systems. Hamdani, S. A.(2022)

Implementation Phase:

1. Experimental group: Students in this group will use the ICT-based decision-making system during the learning process. This system allows teachers and students to identify weaknesses in critical thinking in real-time and provide immediate feedback.
2. Control group: Students in this group will follow conventional learning without using the ICT system.
3. Both groups will be given a pretest to measure initial critical thinking skills before the intervention.

Treatment Phase:

1. The treatment lasts for 8 weeks, in which the experimental group uses the ICT-based decision-making system in each learning session. Meanwhile, the control group will carry out learning with conventional methods without using supporting technology.
2. During the learning process, observations are made of students' interactions and their engagement in the learning process, as well as how they apply critical thinking skills.

Data Collection Phase:

1. After the treatment is completed, both groups will be given a posttest to measure changes in their critical thinking skills.
2. Additional data will be collected from a questionnaire on students' perceptions of using the system and an observation sheet that records the learning process.

RESULTS AND DISCUSSION

This study aims to evaluate the effectiveness of an ICT-based decision-making system on improving students' critical thinking skills. After conducting treatment for eight weeks, the results of critical thinking ability tests before and after treatment (pretest and posttest) were analyzed using statistical tests to determine significant differences between the experimental and control groups. The following are the results of the t-test and N-gain test for both groups: 1. Statistical Description of Pretest and Posttest Results: Table 1 displays the statistical description of the pretest and posttest results in both groups.

Group	N	Pret est (Mean)	Postt est (Mean)	N-gain	N-gain category
Experimental Group	6	50,3	82,4	0,64	Medium
Control Group	6	51,1	71,8	0,42	Medium

Based on Table 1, it can be seen that the experimental group using the ICT-based decision-making system experienced a higher increase (Mean N-gain = 0.64) compared to the control group (Mean N-gain = 0.42). This indicates that the ICT-based system has a more significant impact on improving students' critical thinking skills.

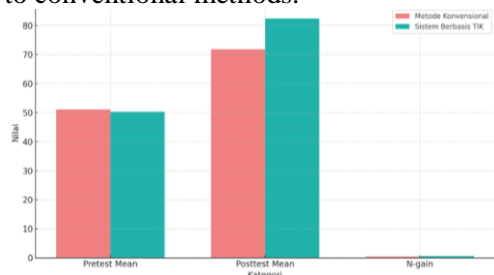
2. Statistical Test

To determine whether there is a significant difference between the two groups, a t-test was conducted on the posttest results of the two groups. The following are the results of the t test:

Variable	T-value	df	Sig. (2-tailed)	Interpretasi
Posttest Experience vs	4.210	11	0.0008	Significant

Control

The t-test results showed that there was a significant difference between the posttest results of the experimental group and the control group ($t(118) = 4.210, p < 0.05$). This shows that the use of ICT-based decision-making systems is significantly more effective in improving students' critical thinking skills compared to conventional methods.



The following chart shows the comparison of the effectiveness of ICT-based decision-making systems with conventional teaching methods in improving students' critical thinking skills. In the chart, you can see:

1. Pretest Mean: The average score before the treatment.
2. Posttest Mean: The average score after the treatment.
3. N-gain: The increase in scores after learning (in the medium category for both methods, but higher for the ICT-based system).

Discussion

The results of this study indicate that the implementation of an ICT-based decision-making system is able to have a positive impact on students' critical thinking skills. The significant increase in the experimental group compared to the control group indicates that the technology used in this system can help students in the process of evaluating, analyzing, and synthesizing information more effectively. Some of the factors that support the success of ICT-based decision-making systems in improving students' critical thinking skills include:

1. Real-time Feedback: The system provides feedback as soon as

students complete a task or exercise. This allows students to immediately know their weaknesses and correct them before moving on to the next stage of learning.

2. Personalized Learning: The system is able to customize learning based on students' individual abilities, so they can learn according to their own pace and needs.
3. Engaging Use of ICT: Technology-based learning attracts students to engage more actively in the learning process. This increases students' motivation and engagement, which in turn affects their critical thinking skills.

CONCLUSION

This research concludes that ICT-based decision-making systems can significantly improve students' critical thinking skills in educational learning. This technology offers an effective solution in supporting teachers to monitor students' progress and provide more adaptive and interactive learning. With wider implementation, this system can be a useful tool to improve the quality of learning at various levels of education.

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