RESEARCH ARTICLE

Differences in students critical thinking skills and interest with guided inquiry and learning videos

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Abstract: This study aimed to determine the differences: (1) critical thinking skills, (2) interest in learning, and (3) critical thinking skills and learning interests of class XI students using the guided inquiry learning model accompanied by learning videos. The method used is a quasi experiment with a posttest only control group design. The population in this study was class XI MIPA with 289 students and the sample used was class XI 4 and class XI 5 with 84 students. The sampling technique used is cluster random sampling. Collecting data on critical thinking skills uses a test, while collecting data on interest in learning uses a questionnaire. The data analysis technique used the t test and the manova test. The results showed that H_1 (t test) obtained the value of Sig. = 0.041 (<0.050), H_2 (t test) obtained Sig. = 0.041 (<0.050), and H_3 (manova test) obtained Sig. = 0.007 (<0.050). It was concluded that there were significant differences: (1) critical thinking skills, (2) interest in learning, and (3) critical thinking skills and learning interests of class XI students using the guided inquiry learning model accompanied by learning videos.

Keywords: critical thinking skills; guided inquiry; human respiratory system; interest in learning

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Introduction

Students' low critical thinking skills in biology learning are one of the problems often encountered in schools (Agnafia, 2019; Susilowati & Anam, 2017; Yustyan et al., 2016). In fact, as a field of science, the biology learning process is closely related to students' active role in developing critical thinking skills to gain an understanding of concepts (Sugandi, 2016). This essential process needs to be carried out so that students can learn more meaningfully, connected to the context of everyday problems, and not just memorize concepts. Furthermore, with good critical thinking skills, students have reflective and reasonable considerations in deciding what to believe or do (Ennis, 2013).

Critical thinking skills can develop if students are faced with problems designed in everyday contexts (Ningsih et al., 2018; Rachmadtullah, 2015). Some researchers state that contextual problems are used to bridge the biological concepts that students have learned with the real experiences they have had. In this way, students can more easily think critically, such as making clarifications, and assumptions, drawing conclusions, and making important decisions (Ennis, 2013).

The low critical thinking skills of students, according to several researchers, are caused by various factors such as the selection and implementation of learning models that are not optimal (Sa'diyah & Dwikurnianingsih, 2019; Sularso et al., 2015), inappropriate learning methods (Rachmawati, 2018), learning media which does not stimulate thinking skills (Astra et al., 2020; Daud, 2020), resulting in impacts that occur in students such as low motivation and interest in learning Nurlaela (2017) as a result of non-optimal learning being carried out. Therefore, teachers need to apply learning models that can stimulate students' critical thinking skills (Satwika et al., 2018), such as inquiry learning (Sa'diyah & Dwikurnianingsih, 2019; Sutama et al., 2014).

(Pratiwi & Mawardi, 2020) research states that inquiry has a better influence on improving students' critical thinking skills compared to other learning models. In this case, there are both free inquiry and guided inquiry (Sari et al., 2022). However, Sofiani et al (2018) stated that guided inquiry had a better influence on improving students' critical thinking skills compared to free inquiry. Furthermore, guided

inquiry gives students the opportunity to build their own knowledge by developing ideas based on problem formulation, formulating hypotheses, designing and processing data, and making conclusions by providing direction and motivation from the teacher which can help students to focus. Guided inquiry positions students to solve problems posed through scientific activities, namely asking questions, formulating hypotheses, collecting data, analyzing data, and making conclusions (Azizah et al., 2016).
On the other hand, learning that does not stimulate critical thinking skills often results in low student motivation and interest in learning. Erwiza et al (2019) research results state that there is a positive correlation between interest in learning and students' critical thinking. This is in line with Manshaee et al (2014) who states that students who have an interest in learning have a higher level of critical thinking than students who do not have an interest in learning in a particular field. Several researchers believe that interest has an important role in the learning process (Aryani et al., 2019). Thus, teachers need to make strategic efforts to increase students' interest in learning. Several researchers believe that selecting and developing appropriate learning models and methods is not enough without being accompanied by the use of relevant learning media.
The use of media in learning can build connections between students and the concepts they will learn in the learning model scenarios developed by the teacher. One media that can improve students' critical thinking skills and interest in learning is learning videos. Putra and Sudarti (2015); Rahman et al (2021); and Siswanto and Mustofa (2012) stated that the use of learning videos can improve students' critical thinking skills. Furthermore, Rahmi and Alfurqan (2021); Rizkina (2019) concluded that there is a significant influence of the use of learning videos on students' interest in learning. Learning using videos makes it easier to deliver material and makes the learning atmosphere more interesting and enjoyable, so that students can understand the material clearly (Rizkina, 2019). However, the use of previous learning videos has not optimally stimulated students' critical thinking skills, especially in achieving five indicators including basic clarification, decision making, making inferences, making further clarifications, and making supposition and integration. This research aims to improve students' critical thinking skills and interest in learning through the application of learning videos and the guided inquiry model.

Method

This research used a mixed-method approach with a posttest-only control group design. The experimental class was given learning treatment by applying the guided inquiry model accompanied by learning videos. Meanwhile, the control class was given treatment by implementing a guided inquiry model without accompanying learning videos.
This research was conducted at Senior High School (SHS) Batik 1 of Surakarta in the 2022/2023 academic year. The population in this study were all students in six classes XI Science and Mathematics SHS Batik 1 of Surakarta, totaling 289 students. The sample used consisted of two classes, namely class XI-4 as the control class and class The technique used in this research is cluster random sampling.
The independent variable (X) in this research is the guided inquiry learning model accompanied by learning videos. The dependent variable (Y) in this research is students' critical thinking skills and students' interest in learning. The method used for data collection is test and questionnaire. The test is used to measure students' critical thinking skills (Putri et al., 2020), while the questionnaire used to measure students' interest in learning (Yahya et al., 2017). The total score for measuring critical thinking skills refers to Ronnis (2011) as in Table 1, while the average score of students' learning interest is calculated using the index formula (P = (Total scores/Y) x 100%). The results obtained from the index formula are then converted referring to the criteria according to Darmadi (2011) as in Table 2.

Table 1. Range of scores, values, and criteria for critical thinking skills

No	Criteria for critical thinking skills	Score	Range (4 scale)	Range (1-100)
1	Poor	1	1.0 – 1.7	25 – 43
2	Moderate	2	1.8 – 2.5	44 – 62
3	Good	3	2.5 – 3.3	63 – 81
4	Very good	4	3.4 – 4.0	82 – 100

Table 2. Learning interest index criteria

Learning Interest Index (%)	Criteria
81 – 100	Very high
61 – 80	High
41 – 60	Low
0 – 40	Very low

The critical thinking ability indicators measured include basic clarification which includes the ability to

focus attention on questions, analyze arguments, and ask and answer questions and/or classification challenges. Furthermore, other indicator is decision-making, including the ability to assess the credibility of sources and observe and assess reports of observation results. Inference skills include the skills of concluding and evaluating deductions, making main conclusions, and making value judgments. Students' critical thinking skills are also assessed from their ability to make initial clarifications which consist of the ability to determine definitions and use appropriate criteria and (2) basic clarifications. The final indicator measured is the ability to integrate, including making from premises, reasons, assumptions, positions, and other propositions that are not agreed upon or doubted and integrating other dispositions and skills in making and defending decisions (Ennis, 2013).

On the other hand, indicators for measuring student interest in learning include interest consisting of enthusiasm for the learning process and interest in studying further material. Second is interest which includes three aspects, namely liking asking questions, liking answering questions, and not getting bored with the learning material. The final indicator is attentive attention which consists of five aspects, including asking the teacher, paying attention to the teacher's explanation, looking for varied learning resources, focusing on learning, and not daydreaming when the teacher explains lessons in class (Rizkina, 2019).

Data analysis in this study used the Independent t-test and Manova test with the help of SPSS version 26 software, after previously carrying out a normality test and homogeneity test (Wulanningsih et al., 2012). The normality test uses Shapiro-Wilk while homogeneity uses the Levene test using a confidence level of 95% ($\alpha = 0.05$). Multivariate testing is used to test whether there are differences in students' critical thinking skills (H_{a1}), students' learning interest (H_{a2}) partially and simultaneously (critical thinking skills and learning interest) when students are taught using guided inquiry and learning videos (H_{a3}). If the significance is below 0.050 then the three hypotheses are accepted (H_0 was rejected).

The normality test shows the Sig value. > 0.05, both in the control group and the experimental group, so that Ho is accepted and it can be stated that the critical thinking ability data in the control group and the experimental group are normally distributed. Furthermore, the homogeneity test results also show a Sig value > 0.050 (H_0 accepted). This shows that the data on students' critical thinking skills and students' interest in learning can be said to be homogeneous. Thus, the analysis can be continued with hypothesis testing, t-test and Manova test.

Results and Discussion

The results of the Independent Sample t-test showed that there was a significant difference in the critical thinking skills of students who studied with the guided inquiry model and learning videos compared to those who did not (control class). The average critical thinking ability of the control class was 59.03 compared to 65.92 in the experimental class. Based on the critical thinking ability category proposed by (Ronnis, 2011), the experimental class is classified as good and the control class is classified as moderate. The post-test scores for critical thinking skills in the experimental class showed that they were in the very good category (19%), good (26.2%), moderate (45.2%), and poor (9.5%).

On the other hand, the post-test scores for critical thinking skills in the control class showed the categories very good (9.5%), good (30.9%), moderate (42.9%), and poor (17.5%). The absence of learning videos affects students' critical thinking skills in the control class because there is no stimulus for students to think critically about the problems presented (Maniotes & Kuhlthau, 2014). The critical thinking skills of experimental and control class students per indicator and per aspect are presented in Table 3.

Table 3. Critical thinking ability of experiment class students and control class per indicator

Indicator	Aspect	Critical Thinking Ability of Experimental Class Students			Critical Thinking Ability of Control Class Students		
		%	$\bar{x}$	Category	%	$\bar{x}$	Category
1. Basic clarification	1. Focus on question	82.1	72.02	Good	85.0	72.62	Good
	2. Analyze the arguments	50.6			51.0		
	3. Ask and answer clarification question/challenges	83.3			83.0		
2. Decision	1. Access the credible sources	50.0	52.38	Moderate	43.0	46.63	Moderate
	2. Observe and access the observation report	54.8			50.0		
3. Inference	1. Summing up and assesing deduction	48.2	56.55	Moderate	35.0	38.89	Poor
	2. Make main conclusion	65.5			41.0		
	3. Create and assess value judgements	56			40.0		
4. Advance clarification	1. Define terms and using appropriate criteria	91.1	74.70	Good	88	69.94	Good

Indicator	Aspect		Critical Thinking Ability of Experimental Class Students			Critical Thinking Ability of Control Class Students		
			%	$\bar{x}$	Category	%	$\bar{x}$	Category
	2.	Basic clarification and inference	58.3			52		
5. Supposition and integration	1.	Considering and reasoning from premises, reasons, assumptions, positions, and other propostions	75.0	75.59	Good	74.0	70.54	Good
	2.	Integrate disposition and other skills in making and mantaining decision	76.2			67.0		
Average (%)								

The students' critical thinking ability scores (Table 3) show that the experimental class students' critical thinking skills were highest in the supposition and integration indicators (75.59%) while the lowest were in the decision indicators (52.38%), while the highest scores in the control class were highest in the clarification indicators. basic (72.62%) while the lowest was in the inference indicator (38.89%). A comparison of the critical thinking skills of experimental and control class students per indicator is presented in Figure 1.

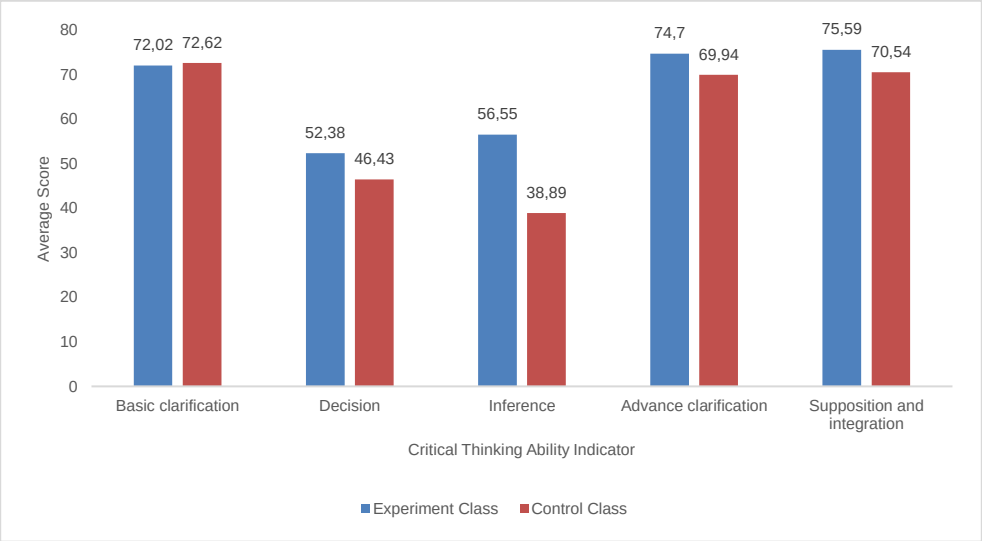

Figure 1. Comparison of critical thinking ability score of experimental and control class

Indicators of critical thinking skills between the experimental and control classes show almost the same pattern in each of its constituent aspects. For example, in measuring basic clarification, students in the experimental and control classes showed high scores (>80) in the focus on question-and-answer classification aspects. However, the average score of experimental class students was lower than that of the control class in the first aspect (focus on questions) and the second aspect (argument analysis). In this case, the learning videos used in the experimental class did not have a better influence on basic clarification indicators. This is proven by the average score of experimental class students being lower than that of the control class. Experimental class students were able to answer clarification questions regarding smoking as a cause of emphysema, better than control class students. This is because the learning video displays an explanation of the causes of emphysema (one of which is smoking). Meanwhile, control class students were able to formulate problems (focus on questions) about bronchitis and were able to analyze arguments (make conclusions based on the data presented in the questions) about chronic bronchitis better than the experimental class.

The lower score of experimental class students in this aspect is different from the statement Kurniati et al (2017) which states that the use of audiovisual learning media is a way out in dealing with problems, thereby challenging students to think critically. Yasin et al (2021) also stated that the use of videos provides students with the opportunity to formulate questions about what they see and discuss the presentation of material through video displays, so that students play an active role in discussions, complete LKS assignments, express opinions/ideas which will improve their ability to analyze an argument. Some of the obstacles faced during the implementation of learning videos in this research

were that students had not been conditioned to focus on questions and aspects of analyzing arguments. Furthermore, the teacher was not optimal in exploring the conclusions that students could draw from the learning videos shown, so the experimental class students were not able to criticize and analyze the truth of the arguments in the learning videos.

The same pattern also occurs in the assessment of two other indicators, such as advance clarification, and supposition and integration. The score conversion for all aspects is at a good level, either experimental class or control class. However, experimental class students were able to determine definitions of terms and clarify information from assumptions that were not asked in the problem description better than control class students. This is because the learning video displays and explains the process of oxygen diffusion in the alveoli and explains population density which is a factor in the transmission of respiratory diseases. In the learning process, the teacher also asks students to express their opinions based on the learning video. Kurniati et al (2017) stated that learning videos can motivate students to understand the concepts being studied. Apart from that, the use of videos can help teachers understand concepts, provide reinforcement for students, and contextualize concepts with students' daily experiences.

On the other hand, the learning videos used in the experimental class had a better influence on the assumption and integration indicators as evidenced by the average score of the experimental class students being higher than the control class. Experimental class students were able to consider the correctness of information from premises regarding the transmission of respiratory diseases and were able to defend decisions regarding the structure and function of the respiratory epithelium better than control class students. Some things that indicate this are the learning videos used to provide visualizations and explanations about the transmission of respiratory diseases as well as the structure and function of the respiratory epithelium. Siswanto and Mustofa (2012) stated that showing learning videos can help students visualize abstract concepts so that their learning is more meaningful. Learning that takes place with learning videos can provide motivation to students, so that students become more active and enthusiastic in participating in learning activities. Suriawati and Mundilarto (2019) also stated that learning videos can facilitate students' understanding and improve students' memory, so that in the end students can optimize their potential and capacity. The reason is, learning videos refer to the representation of reality, especially through sight and audio, which aims to present real experiences to students (Abdulhak & Darmawan, 2015).

The results presented above show a significant difference between the critical thinking skills of students who learn with guided inquiry accompanied by learning videos. The implementation of guided inquiry accompanied by learning videos encourages students to think more, such as practical activities which are preceded by viewing learning videos that stimulate students to think (Maniotes & Kuhlthau, 2014). Learning videos are used as teacher stimulus to stimulate students to think (Maniotes & Kuhlthau, 2014). This is different from the control class where learning uses a guided inquiry learning model without accompanying learning videos, so there is no stimulus or stimulus for students to think critically. The results of this study are in accordance with the statement of Purbarani et al (2018) that audiovisual learning media can improve students' critical thinking skills because learning videos can improve the quality of students' learning processes in learning. Kartikasari (2016) and Wahyuni et al (2018) in their research stated that learning media can build students' critical thinking skills.

Table 4. Learning interests of experiment class students and control class per indicator

Indicator	Aspect	Critical Thinking Ability of Experimental Class Students			Critical Thinking Ability of Control Class Students		
		%	$\bar{x}$	Category	%	$\bar{x}$	Category
1. Interest	1. Following learning process	74.7	72.80	High	69.9	71.23	High
	2. Excited in learning the next material	75.0			73.8		
2. Liking	1. Like asking the teachers	65.7	68.93	High	58.0	63.33	High
	2. Answering question	68.2			65.2		
	3. Interesting learning material						
3. Attention	1. Asking the teachers	68.8	70.90	High	67.0	67.59	High
	2. Pay attention to the teachers	76.2			70.8		
	3. Look for varied learning resources	73.2			73.5		
	4. Concentrate on learning	72.0			64.3		
	5. Not daydreaming in class	65.5			60.7		
Average (%)		71.01		High	66.95		High

The implementation of guided inquiry with learning videos showed results that were not much different between the experimental class and the control class. Table 4 shows that the three aspects measured, including interest, liking, and attention, all received scores between 60 – 80 (high). However, the

experimental class students' scores were higher than the control class (Figure 2). The same pattern is also shown in other indicators of learning interest. The scores obtained by students in the experimental class tend to be higher even though they are still in the same category.

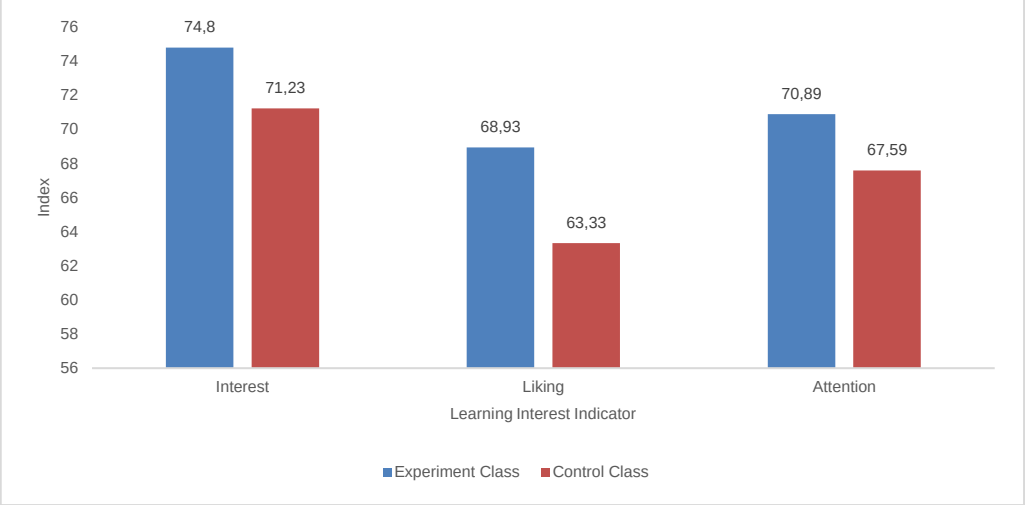

Figure 2. Learning interest of experiment class and control class students per indicator

The score of the learning interest indicator for students who learn using videos shows higher results. The experimental class students' score for the interest indicator was 72.80 (high), while the control class students' index was 71.23 (high). Based on all aspects of interest indicators, the index of experimental class students was also higher than that of the control class. The learning videos used in the experimental class have a better influence on students' interest in learning. Experimental class students seemed more interested in participating in the entire learning process and looked more enthusiastic. Students can be visually facilitated when studying bronchitis and emphysema. Media that utilizes audiovisuals is indicated to be able to increase and direct students' interest, so that it can generate interest in learning and more interaction between students and their environment (Rahmi & Alfurqan, 2021). Students in the experimental class were also seen asking questions more often, answering questions more enthusiastically, and not easily bored in learning. Pahmi et al (2022) stated that students' interest in learning tends to be better when using interactive media such as learning videos.

However, the Manova test results show that there is a significant difference in students' critical thinking skills and students' interest in learning simultaneously when students learn with guided inquiry accompanied by learning videos. The results of this research are in accordance with the statements of (Kartikasari, 2016) and (Wahyuni et al., 2018) that learning media can build students' interest in learning and build students' critical thinking skills. The use of learning videos is one solution to problems that challenge students to think critically (Kurniati et al., 2017), namely, students formulate questions about what they see from the learning video shows.

Experimental class students also discuss by showing learning videos, so that students practice actively expressing opinions/ideas which will improve their ability to analyze an argument and identify assumptions, which will train students' critical thinking skills on basic clarification and advanced clarification indicators (Yasin et al., 2021). Kurniati et al (2017) stated that students are stimulated to think critically, so they do not feel bored which increases students' interest in learning indicators of liking. The use of learning videos can also foster curiosity about the material presented so that it can increase students' interest in studying attention indicators (Pahmi et al., 2022). Learning activities that use learning videos make students focus on listening to learning videos enthusiastically, thus increasing their ability to observe or observe objects displayed in learning videos, so that they will improve students' critical thinking skills on decision-making indicators (Yasin et al., 2021). Students who focus on listening to learning videos can increase students' interest in learning through attention indicators (Rizkina, 2019). Learning videos can motivate students to understand the concepts being studied, help teachers repeat parts that are not clear to students, connect lesson material concepts with students' daily experiences, and increase students' interest in learning so that they can improve students' critical thinking and clarifying skills (Kurniati et a., 2017) and increase students' attention and interest (Rizkina, 2019).

Showing learning videos allows students to see abstract learning material so that learning is more meaningful so that it can improve students' critical thinking skills on assumption and integration indicators (Siswanto & Mustofa, 2012). Learning that takes place with learning videos makes students more active and enthusiastic in participating in teaching and learning activities. The material delivered through learning videos is easy for students to remember because the lesson material is designed in a varied

way and is not boring, so it can increase students' interest in learning on interest and liking indicators (Ariastuti et al., 2014).

Conclusion

Based on the research results, it can be concluded as follows: (1) there is a significant difference in the critical thinking skills of class XI students using the guided inquiry learning model accompanied by learning videos; (2) there is a significant difference in the learning interest of class XI students using the guided inquiry learning model accompanied by learning videos; and (3) there is a significant difference in the ability to think critically and the learning interest of class XI students using the guided inquiry learning model accompanied by learning videos.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Author Contributions

F. Shalihah: methodology, analysis, methodology, wrote the original draft and reviewing and editing. **H. Harlita:** analysis, methodology, wrote the original draft and Reviewing and editing. **A. Saputra:** methodology.

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