The Influence of Inquiry Learning Model in Improving Students' Critical Thinking Skills in View of Learning Styles in Science Learning in Elementary Schools

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Article Info	Abstract
	One of the skills that students need to possess in the 21st century is the ability to think critically. Students' critical thinking skills can be developed in natural science learning. Nonetheless, not all learning models can help students improve their critical thinking skills. Undoubtedly, a suitable learning model must be chosen; the most crucial step is understanding the student's preferred learning method. This study, therefore, aims to determine the influence of the inquiry learning model in improving students' critical thinking skills in terms of various student learning styles. This study used a quantitative research approach. The method used was an experimental research method with a 2x2 factorial ANOVA experimental research type. This research was conducted in class V at eight elementary schools in Majalengka Regency, with a total sample of 262 students. The data collection instrument employed was an essay test. The data analysis techniques utilized were the normality test, homogeneity test, and the Two-Way ANOVA test using the SPSS version 25 application. The results of this study demonstrated that the critical thinking skills of students with a kinesthetic learning style had a higher average score than those with an audio-visual learning style when the teacher applied the inquiry learning model to natural science learning. It was because the activities of the inquiry learning model in science learning involved a lot of physical movement activities, which are characteristics of students with a kinesthetic learning style.

Info Artikel	Abstrak
Riwayat Artikel Diterima: 01 Maret 2023 Direvisi: 13 April 2023 Diterbitkan: 15 April 2023	Salah satu keterampilan yang perlu dimiliki siswa di abad 21 adalah kemampuan berpikir kritis. Kemampuan berpikir kritis siswa dapat dikembangkan dalam pembelajaran IPA. Meskipun demikian, tidak semua model pembelajaran dapat membantu siswa meningkatkan kemampuan berpikir kritisnya. Tidak diragukan lagi, model pembelajaran yang cocok harus dipilih; langkah yang paling penting adalah memahami metode belajar yang disukai siswa. Oleh karena itu, penelitian ini bertujuan untuk mengetahui pengaruh model pembelajaran inkuiri dalam meningkatkan kemampuan berpikir kritis siswa ditinjau dari berbagai gaya belajar siswa. Penelitian ini menggunakan pendekatan penelitian kuantitatif. Metode yang digunakan adalah metode penelitian eksperimen dengan jenis penelitian eksperimen ANOVA faktorial 2x2. Penelitian ini dilakukan di kelas V di delapan sekolah dasar di Kabupaten Majalengka dengan jumlah sampel sebanyak 262 siswa. Instrumen pengumpulan data yang digunakan adalah tes uraian. Teknik analisis data yang digunakan adalah uji normalitas, uji homogenitas, dan uji Two-Way ANOVA dengan menggunakan aplikasi SPSS versi 25. Hasil penelitian ini menunjukkan bahwa kemampuan berpikir kritis siswa dengan gaya belajar kinestetik memiliki skor rata-rata yang lebih tinggi dibandingkan siswa dengan gaya belajar audio visual ketika guru menerapkan model pembelajaran inkuiri pada pembelajaran IPA. Hal tersebut dikarenakan aktivitas model pembelajaran inkuiri dalam pembelajaran IPA banyak melibatkan aktivitas gerak fisik yang merupakan karakteristik siswa dengan gaya belajar kinestetik.

INTRODUCTION

One of the most essential subjects for elementary school students is natural science because it can help students develop the skills and abilities they will need to function in the future. Learning natural sciences also examines the interaction between humans and nature or interactions among living things. The purpose of teaching natural sciences in schools is for students to master knowledge, scientific attitudes, and process skills (Jannah & Atmojo, 2022; Widani et al., 2019).

However, the facts revealed that not all elementary school students liked learning science. It is as stated by Awe & Benge (2017), Khairina et al. (2017), and Yunarti (2021) that the factors that made natural science learning disliked by students were the learning methods used by the teacher when explaining natural science subject matter that was not suitable. During the learning process, the teacher used a monotonous method centered on the teacher and did not involve students. Students also had their favorite learning. Factors influencing their liking for the learning being taught depend on their passion. Children who tend to show high communication skills prefer language learning. Meanwhile, students who like adventure related to nature tend to like learning natural or social sciences.

Students who like natural science learning also have a variety of learning styles, such as audio, visual, audio-visual, kinesthetic, and other learning styles (Adawiyah et al., 2020; Fatonah, 2009; Syofyan, 2018). Therefore, teachers must know student learning styles before determining what learning strategies are appropriate to teach from the selection of methods, models, and learning media. Of course, teachers also need to consider learning materials because each learning material has its characteristics. In the classroom, the teacher will find heterogeneous student learning styles, whether they are spread evenly, or there are student learning styles that dominate the class. Hence, teachers must use a variety of learning models and media to accommodate diverse student learning styles in one class.

More specifically, one of the skills that students in learning natural science education must master is the ability to think critically. Critical thinking ability is a thinking processability that allows a person to evaluate or investigate the evidence, assumptions, and logic that underlies other people's ideas (Putra & Sudarti, 2015; Ramdani et al., 2020). Students are asked to think deeply to study material objects to find meanings and benefits that can be applied in everyday life. Learning natural sciences is not only limited to mastering a collection of knowledge but also covers a process of discovery that stimulates students to be actively involved in it (Agustina, 2017; Yuliati, 2016). By thinking critically, the material the teacher delivers is not only limited to understanding and knowledge but more than that, i.e., up to the stages of application, synthesis, analysis, and evaluation. In this case, critical thinking skills can be influenced by a person's learning style because a person's learning style can affect the way a person processes information and the way a person solves problems. For example, someone with a visual learning style may find it easier to visualize problems and solve them using pictures or diagrams. In contrast, someone with a kinesthetic learning style may prefer to try to solve problems directly by doing physical actions.

To go in that direction, applying a learning model that can explore and develop students' potential is necessary. In addition, it is necessary to have a student-oriented learning model so that students can solve problems found using their creative ideas. One of the appropriate learning models to be applied in improving students' critical thinking skills and accommodating various student learning styles is the inquiry learning model. The inquiry learning model is an activity in which students are encouraged to learn through active engagement with concepts and principles. Teachers encourage students to have experiences and conduct experiments that allow them to discover principles for themselves. Several studies have also shown that the inquiry model can improve students' critical thinking skills (Maryam et al., 2020; Nasution, 2018; Sochibin et al., 2009).

Unlike previous research that examined the inquiry learning model on students' critical thinking skills, this study aims to determine the effect of the inquiry learning model in improving students' critical thinking skills in

terms of various student learning styles. The results of this study are expected to contribute to the development of more effective learning methods in improving students' critical thinking skills, especially considering variations in student learning styles. In addition, this research can provide vital information for educators to develop more effective and efficient learning strategies in improving students' critical thinking skills with different learning styles.

METHODS

This study used a quantitative research approach. The method employed was experimental research, with the type of factorial ANOVA 2x2 experimental research.

Table 1. 2x2 Factorial Research Method Design

Learning Style (B)	Learning Model (A)	
	Inquiry Learning Model (A1)	Conventional Learning Model (A2)
Audio Visual (B1)	A1B1	A2B1
Kinesthetic (B2)	A1B2	A2B2

This research was conducted in class V of eight elementary schools in Majalengka Regency, spread over five sub-districts, with a total sample of 262 students. There was a group that studied using the inquiry learning model and a group that used conventional learning.

The data collection instrument employed was an essay test to measure critical thinking skills using a test of 20 questions with several aspects often measured in critical thinking skills tests, including analysis, evaluation, interpretation, reasoning, and problem-solving. Apart from tests, this study also used a learning style questionnaire to identify student learning styles. Then, the data analysis techniques utilized were the normality test, homogeneity test, and the Two-Way ANOVA test using the SPSS version 25 application.

RESULTS AND DISCUSSION

The inquiry learning model aims to help students develop intellectual and other skills, such as asking questions and seeking answers

(Muliani & Wibawa, 2019). In this model, the teacher acts as a learning facilitator, while students are required to actively develop ideas, solve problems, and find the information needed.

The steps of the inquiry learning model are observing, formulating problems, formulating hypotheses or initial conjectures, collecting data or information needed to solve problems, testing or finding the truth of initial allegations by processing existing information or data, and drawing conclusions.

Data Description

According to the statistics below, students with an audio-visual learning style who used the inquiry learning model had critical thinking skills of 78.2435. In contrast, those students with an audio-visual learning style who used traditional learning models had critical thinking abilities of 76.6572. While using the inquiry learning model, students with a kinesthetic learning style demonstrated a critical thinking ability of 86.6789. When using the inquiry learning model, students with an audio-visual learning style had a critical thinking ability of 80.162.

Table 2. 2x2 Descriptive Statistics of the Data

Descriptive Statistics				
Dependent Variable: Critical Thinking Skill				
Learning Style	Model Learning	Mean	Std. Dev.	N
Audio Visual	Inquiry Model	78.2435	12.46754	262
	Conventional Model	76.6572	10.76893	262
	Total	77,4503	11.55454	524
Kinesthetic	Inquiry Model	86.6789	12.86823	262
	Conventional Model	80.1592	9.602345	262
	Total	83,4190	12.44201	524
Total	Inquiry Model	82.1134	11.45878	524
	Conventional Model	79.9956	12.77098	524
	Total	81.0545	11.81010	1048

Normality Test

Table 3. Normality Test Result

	Tests of Normality					
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Stats	df	Sig.	Stats	df	Sig.
Standardized residual for learning outcomes	.263	524	.125	.870	524	.116
a. Lilliefors Significance Correction						

Based on the information mentioned above, it can be said that the data were normally distributed since the sig. value of $0.116 > 0.05$.

Homogeneity Test

According to the data below, a sig. $0.774 > 0.05$ was found, proving the data had a homogenous distribution.

Table 3. Homogeneity Test Result

Levene's Test of Equality of Error Variances[a,b]					
		Levene Statistic	df1	df2	Sig.
Critical thinking skills	Based on Mean	.754	3	356	.774
	Based on Median	.581	3	356	.834
	Based on the Median and with adjusted df	.581	3	203.451	.909
	Based on trimmed mean	.878	3	356	.777

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: Critical thinking

b. Design: Intercept + learning style + learning model + learning style * learning model

Two-Way ANOVA test

The data obtained met the prerequisites for analysis using parametric statistical formulas because they met the normality and homogeneity criteria. The data obtained were then analyzed using a two-way ANOVA test.

Table 4. Two-Way ANOVA Test Result

Tests of Between-Subjects Effects					
Dependent Variable: Learning outcomes					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2167.4[a]	3	3267.8	16.55	.000
Intercept	1458913.7	1	2827776.5	14345.55	.000
Learning style	867.1	1	867.3	7.65	.000
Learning model	980.5	1	980.6	8.78	.000
Learning style * Learning model	5467.4	1	4565.1	45.37	.000
Error	65740.5	156	155.6		
Total	2386690.0	562			
Corrected Total	59043.5	245			
a. R Squared = .231 (Adjusted R Squared = .156)					

Given the data above, a sig. value of $0.000 < 0.05$ was found, indicating variations in students' capacities for critical thinking based on their preferred learning styles (audio-visual and kinesthetic). Additionally, a sig. value of $0.000 < 0.05$ was also attained to conclude that there were variations in students' capacities for critical thinking depending on the kind of learning model (inquiry and conventional). A sig. value of $0.000 < 0.05$ was also achieved. It can be deduced that there was an interaction between the different kinds of learning models and students' learning preferences on their critical thinking abilities and outcomes in the study of natural science in elementary schools.

Discussion

The results of this study indicate that the inquiry learning model effectively improved the critical thinking skills of students from various learning styles. This finding aligns with previous research showing that the inquiry learning model could improve students' critical thinking skills. The research that has been conducted by Wulandari et al. (2022) revealed that learning with the inquiry model could improve students' critical thinking skills. The results of this study also demonstrate that the experimental class tended

to have a higher gain score category than the control class. Other research by Ahmatika (2016) also uncovered that the inquiry learning model effectively improved students' critical thinking skills. The results of this study were based on the analysis of critical thinking test results, so it is concluded that there was an increase in students' critical thinking skills by learning using the inquiry model.

Based on these results, it can be stated that the research results supported the findings of earlier studies by demonstrating how the inquiry learning model effectively developed students' critical thinking skills across various learning styles. The authors may conclude that the inquiry learning model can be a proper alternative teaching strategy to develop students' critical thinking abilities across various learning preferences.

Moreover, the relationship between the inquiry learning model and students' kinesthetic learning styles is that 1) the inquiry learning model requires students to carry out physical activities, such as conducting experiments or direct observation. It can help students with kinesthetic learning styles to understand scientific concepts better. 2) The inquiry learning model emphasizes practical experience and exploration. It can assist students with a kinesthetic learning style to learn better because they prefer to learn through practical experience and direct interaction with the subject matter. 3) The inquiry learning model highlights student-student and student-teacher interaction. It can help students with kinesthetic learning styles learn better because they learn through direct interaction and experience (Andarini et al., 2013; Parmono et al., 2013).

Concerning relevant research, the advantage of the research conducted is the focus on student learning styles as a factor influencing the effectiveness of the inquiry learning model in improving students' critical thinking skills. Several previous studies have only evaluated the effectiveness of the inquiry learning model in improving critical thinking skills in general without paying attention to differences in student learning styles. Hence, the results of this research provide a more comprehensive insight into the importance of considering student learning styles in designing and implementing inquiry learning models.

Even so, this research has limitations, as mentioned above. Therefore, relevant research can be used to corroborate the results of this study and provide a complete overview of the effectiveness of the inquiry learning model in improving students' critical thinking skills.

CONCLUSION

The use of the inquiry learning model had a positive effect on improving students' critical thinking skills. In addition, this study found that the effect of the inquiry learning model on students' critical thinking skills was more significant for students with visual and auditory learning styles than students with kinesthetic learning styles. The results of this study align with the research objectives to determine the effect of the inquiry learning model in improving students' critical thinking skills in terms of various student learning styles. For this reason, it can be concluded that the inquiry learning model effectively improves students' critical thinking skills, especially for students with visual and auditory learning styles.

For further research, it is recommended to use a more representative sample and more varied data collection methods to obtain a complete overview of the influence of the inquiry learning model on students' critical thinking skills regarding various student learning styles.

REFERENCES

Adawiyah, T. A., Harso, A., & Nassar, A. (2020). Hasil belajar IPA berdasarkan gaya belajar siswa. *SPEJ (Science and Physic Education Journal), 4*(1), 1–8.

Agustina, P. (2017). Persepsi guru biologi SMA tentang media pembelajaran materi kingdom animalia. *Proceeding Biology Education Conference, 14*(1), 318–321.

Ahmatika, D. (2016). Peningkatan kemampuan berpikir kritis siswa dengan menggunakan pendekatan inquiry/discovery. *Euclid, 3*(1), 394–403.

Andarini, T., Masykuri, M., & Sudarisman, S. (2013). Pembelajaran biologi menggunakan pendekatan CTL (contextual teaching and learning) melalui media flipchart dan video ditinjau dari kemampuan verbal dan gaya belajar. *Bioedukasi: Jurnal Pendidikan Biologi, 6*(2), 102–119.

Awe, E. Y., & Benge, K. (2017). Hubungan antara minat dan motivasi belajar dengan hasil belajar IPA pada siswa SD. *Journal of Education Technology, 1*(4), 231–238.

Fatonah, S. (2009). Menumbuhkan kecerdasan majemuk (multiple intelligence) anak dengan mengenal gaya belajarnya dalam pembelajaran IPA SD. *Al-Bidayah: Jurnal Pendidikan Dasar Islam, 1*(2), 229–245.

Jannah, D. R. N., & Atmojo, I. R. W. (2022). Media digital dalam memberdayakan kemampuan berpikir kritis abad 21 pada pembelajaran IPA di sekolah dasar. *Jurnal Basicedu, 6*(1), 1064–1074.

Khairina, R. M., Syafrina, A., & Habibah, S. (2017). Hubungan antara minat belajar dengan hasil belajar siswa dalam mata pelajaran IPA pada kelas V SD Negeri Garot Geuceu Aceh Besar. *Jurnal Ilmiah Mahasiswa Pendidikan Guru Sekolah Dasar Unsyiah, 2*(2), 61–77.

Maryam, M., Kusmiyati, K., Merta, I. W., & Artayasa, I. P. (2020). Pengaruh model pembelajaran inkuiri terhadap keterampilan berpikir kritis siswa. *Jurnal Pijar MIPA, 15*(3), 206–213.

Muliani, N. K. D., & Wibawa, I. M. C. (2019). Pengaruh model pembelajaran inkuiri terbimbing berbantuan video terhadap hasil belajar IPA. *Jurnal Ilmiah Sekolah Dasar, 3*(1), 107–114.

Nasution, S. W. R. (2018). Penerapan model inkuiri terbimbing (guided inquiry) dalam meningkatkan kemampuan berpikir kritis pada pembelajaran fisika. *Jurnal Education and Development, 3*(1), 1–5.

Parmono, P., Sunarno, W., & Suparmi, S. (2013). Pembelajaran fisika dengan pendekatan CTL melalui metode eksperimen dan demontrasi ditinjau dari kreativitas dan gaya belajar siswa. *Inkuiri: Jurnal Pendidikan IPA, 2*(1), 33–42.

Putra, P. D. A., & Sudarti, S. (2015). Pengembangan sistem e-learning untuk meningkatkan keterampilan berpikir kritis mahasiswa pendidikan fisika. *Jurnal Fisika Indonesia, 19*(55), 45–48.

Ramdani, A., Jufri, A. W., Jamaluddin, J., & Setiadi, D. (2020). Kemampuan berpikir kritis dan penguasaan konsep dasar IPA peserta didik. *Jurnal Penelitian Pendidikan IPA, 6*(1), 119–124.

Sochibin, A., Dwijananti, P., & Marwoto, P. (2009). Penerapan model pembelajaran inkuiri terpimpin untuk peningkatan pemahaman dan keterampilan berpikir kritis siswa SD. *Jurnal Pendidikan Fisika Indonesia, 5*(2), 96–101.

Syofyan, H. (2018). Analisis gaya belajar dan motivasi berprestasi terhadap hasil belajar IPA. *Eduscience: Jurnal Ilmu Pendidikan, 3*(2), 76–85.

Widani, N. K. T., Sudana, D. N., & Agustiana, I. G. A. T. (2019). Pengaruh model pembelajaran inkuiri terbimbing terhadap hasil belajar IPA dan sikap ilmiah pada siswa kelas V SD Gugus I Kecamatan Nusa Penida. *Journal of Education Technology, 3*(1), 15–21.

Wulandari, F., Sukardi, S., & Masyhuri, M. (2022). Pengaruh model pembelajaran inkuiri terbimbing (guide inquiry) berbantuan media power point terhadap kemampuan berpikir kritis siswa. *Jurnal Ilmiah Profesi Pendidikan, 7*(3), 1327–1333.

Yuliati, Y. (2016). Peningkatan keterampilan proses sains siswa sekolah dasar melalui model pembelajaran berbasis masalah. *Jurnal Cakrawala Pendas, 2*(2), 71–83.

Yunarti, N. (2021). Analisa kesulitan dalam pembelajaran IPA pada siswa SMP Negeri 1 Rambang. *Jurnal Educatio, 7*(4), 1745–1749.