

The Effectiveness of Using Difa Tara Interactive Learning Media in Increasing Critical Reasoning Abilities and Independence in Science Subjects in Elementary Schools

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ABSTRACT

Teachers are less aware of and ignore the diversity of students, so that in the learning process they still use learning models that do not accommodate student diversity. This condition causes students to be less able to develop critical reasoning skills and independence. One way that can be done to respond to the characteristics and identify problems of diverse students is to implement differentiated learning strategies with the interactive learning media Difa Tara. This research aims to test the effectiveness of using Difa Tara Interactive Learning Media to increase critical reasoning abilities and independence in science subjects in elementary school. This research uses a quantitative approach to the Quasi-Experimental research type. Data collection techniques were carried out using tests and questionnaires. Data analysis techniques use instrument validity and reliability tests, normality and homogeneity tests as prerequisite tests. Test the hypothesis using the T test. The results of the research show that the Difa Tara Interactive Learning Media is effective for critical reasoning abilities and independence. It has been stated from the hypothesis test that the significant value is 0.000, which means that H0 is rejected and H1 is accepted.

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1. INTRODUCTION

It is very ironic when a teacher forces all students to have the same competencies with the same treatment. However, the potential, interests, needs and ways of understanding each student are different. Just as fish cannot be forced to fly, birds cannot be forced to swim. Students are not a piece of white paper that can be drawn on as the teacher wishes. However, on the paper there are many various thin strokes. The teacher's duty is to thicken the strokes according to their nature.

Ki Hajar Dewantara said that the purpose of education is to guide all the natural strengths that exist in children, so that they as humans and members of society can achieve the highest safety and happiness. Every child is unique and has their own nature. The teacher's job is to provide a learning environment that allows each child to grow and develop optimally according to their individual nature, and ensure that in the process, the children feel safe and happy.

Each student is a unique individual and has their own characteristics, talents and interests which will become the basis for the learning practices carried out by the teacher. Apart from that, it also becomes a reference for evaluating the learning practices that teachers have carried out in the classroom. By believing that each student is unique, teachers will open their eyes to the diversity of students in the class. Based on this idea, teachers must carry out a learning revolution, whereas classroom management was originally oriented towards the teacher's teaching style, so now teachers must migrate to managing learning according to students' unique learning styles.

As is the case in sixth grade of SD Negeri 1 Pagedongan, Pagedongan District, it has students with a variety of diversity. However, sixth grade teachers are less aware of and ignore this diversity, so that in the learning process they still use learning models that do not accommodate student diversity. This condition causes students to be less able to develop critical reasoning abilities. As with the current educational paradigm, apart from providing knowledge, it also encourages the growth of character in accordance with the Pancasila student profile.

Based on the results of observations made by researchers regarding the dimensions of the Pancasila student profile, it turns out that the dimensions of critical reasoning and independence during science learning show the lowest category compared to other dimensions. Of the total number of students of 26 children, it shows that 12 children or 46% have critical reasoning abilities in the good category, the remaining 14 children or 54% have critical reasoning abilities in the moderate and low categories. Meanwhile, in the dimension of independence, only 15 children or 58% had an attitude of independence in the good category or 42% had an attitude of independence in the moderate and low categories.

In line with the objectives of science learning, ideally students have the ability to reason critically about natural and social phenomena. As time changes, natural and social phenomena always change and are dynamic. Instilling critical reasoning skills becomes a basis for students in reading natural and social dynamics.

Bunga Nurul (2022) believes that critical thinking is an effective thinking step that a person has so that he is able to make, assess and implement decisions that are relevant to what he believes and does. In line with the opinion of Hidayah (2017) who states that someone who is able to think rationally and logically in receiving information and systematically in solving problems is a characteristic that someone has the ability to think critically.

As stated in the Decree of the Head of BSKAP, Ministry of Education and Culture, Research and Technology Number 009/H/Kr/2022, students who reason critically are able to objectively process information, both qualitative and quantitative, build relationships between various information, analyze information, evaluate and conclude. The elements of the critical reasoning dimension include obtaining and processing information and ideas, analyzing and evaluating reasoning, reflection of thought and thought processes in decision making.

Independence is a process that an individual wants to achieve in his life. Even though humans are actually born as social creatures who cannot be separated from the help of other people to fulfill their life needs. However, basically humans must be able to escape from this dependence by learning to be independent.

According to Dewi Wahyuningsih (Wahyuningsih, 2020:2) learning independence is one thing that is needed to support student learning success in daily learning activities at home and at school, students who have learning independence can be seen from the way they organize themselves in learning, such as It's about having a study strategy that isn't influenced by other people, planning a study schedule that isn't restrictive for oneself, and understanding one's own abilities.

Learning independence according to Hadi & Farida (Hidayat et al., 2020) emphasizes that "learning activities that take place are driven more by one's own abilities, one's own choices and one's own responsibility in learning". Where a student is able to learn independently if he is able to complete his learning assignments without depending on other people. Basically, learning independence is a behavior of someone who is able to take the initiative, is able to overcome problems and obstacles, has good self-confidence and can do things by himself without help from other people.

The facts show that class VI students at SD Negeri 1 Pagedongan have diverse characteristics, with different uniqueness, strengths and learning needs. Of course, this needs to be responded to and addressed appropriately by researchers as sixth grade teachers at SD Negeri 1 Pagedongan. If it is not followed up immediately, a learning gap will occur, where the learning outcomes shown by students do not match the potential for achievement that they should. One way that teachers can respond to the characteristics and identify problems of diverse students is by implementing differentiated learning strategies.

nnDifferentiated learning is a teacher's attempt to adapt the learning process in the classroom to meet the individual learning needs of students. According to Tomlinson in Mariati Purba (2022:36) that in a class that implements differentiated learning, a teacher makes consistent efforts to respond to children's learning needs.

There are four aspects that need to be considered in differentiated learning, namely aspects of content, product, process and learning environment (Andriani, et al: 2023). Teachers can determine how these four aspects will be implemented in classroom learning. Teachers have the opportunity and ability to change the content, processes, products and learning climate in their classes to suit student profiles.

In implementing differentiated learning in science subjects, teachers can use appropriate learning media according to students' needs and in accordance with current developments. Technology and information are moving very fast in the 21st century. Education is required to be adaptive in responding to developments over time. The rapid pace of change needs to be balanced with educational practices that are in line with the demands of the times. Education is the main element in improving the quality of human resources. The 21st century education framework is undergoing adjustments to the required competencies. The Partnership for 21st Century Learning (Akhwani, 2021) has initiated competencies that students must master, 1) learning and innovative skills (Critical Thinking, Creative, Communication, Cooperation), 2) Knowledge, Media and Technology Skills and 3) life and career skills (Battelle for Kids, 2019; Gelen, 2018).

The media that can be used in science differentiated learning is DIFA TARA Interactive Learning Media which is an abbreviation for Solar System Differentiation. This learning media contains differentiated science learning content that can accommodate students' learning styles. Some of the content contained in this media is images, writing, videos, puzzles, quizzes and summative assessment questions.

According to Gerlach & Ely, quoted by Arsyad (2020), media, when understood in broad terms, are humans, materials, which build conditions that enable students to acquire knowledge, skills or attitudes. Difa Tara's interactive learning media was created using the very easy Canva application. However, it is interesting and fun for students. This media can integrate various content such as images, video, audio, simulations and interactive text that offers additional information and real examples. By presenting diverse resources, interactive media expands the scope and depth of students' knowledge (Jafnihirida et.al, 2023).

Based on these problems, it is important to carry out further research with a problem formulation of how effective the use of Difa Tara Interactive Learning Media is in increasing critical reasoning abilities and independence in science subjects in elementary school?

2. METHOD

This research uses a quasi-experimental quantitative research approach using a nonequivalent control group research design in which the experimental class is given treatment using interactive learning media (MPI) Difa Tera. Quasi-Experimental research aims to obtain information that is an approximation of the information that can be obtained by actual experimentation in circumstances where it is not possible to control or manipulate all relevant variables (Sugiyono, 2017).

This research was carried out in Pagedongan District, Banjarnegara Regency, Central Java. The samples taken were two schools, sixth grade of SD Negeri 1 Pagedongan, totaling 26 children as the experimental group and sixth grade of SD Negeri 1 Gentansari, totaling 24 children as the control group. The characteristics of students in the experimental group were: 6 auditory students, 12 visual students and 6 kinesthetic students.

The data collection techniques used in this research used tests and questionnaires. The test method is a data collection technique by providing questions that are used to obtain scores as a research measuring tool. In this study, a test instrument was used where the post test questions were given to students after being given treatment at the end of the research (Lestari, 2015). The test used in this research is a subjective test (description) because it can make it easier for researchers to identify students' critical reasoning abilities through responses to the solar system material test. Meanwhile, to measure student independence using a questionnaire instrument. According to Sugiyono (2017: 142) a questionnaire or questionnaire is a data collection technique that is carried out by giving a set of questions or written statements to respondents to answer. The questionnaire or questionnaire used in this research is a type of questionnaire or closed questionnaire, because respondents give marks to one one answer is considered correct.

Before use, the validity and reliability of the instrument is tested first. To test the validity of the critical reasoning ability test instrument, the researcher used a senior teacher, in this case the principal, as a construct validity tester. Apart from using senior teachers, researchers conducted validity tests using the Pearson Product Moment correlation. There are 10 questions given to all students in the validation class. They are said to be valid if the calculated r is greater than the r table. The results obtained are that all the test items are valid or valid, nothing needs to be thrown away or replaced. Therefore, test instruments can be used to test experimental classes and control classes. Testing the validity of the independence questionnaire instrument on 26 students, the r table value was determined, namely 0.388. It was found that the results of the calculated r calculation for the 24 questionnaire items were greater than the correlation value of the r table. Therefore, 24 questionnaire items were declared valid, while the other 6 items were invalid and could not be tested. Furthermore, 24 questions can be tested in the experimental class and control class.

The reliability test is comparing the significance level used with the Cronbach's Alpha value (Budi Dharma, 2021). The significance level used in this test is 0.6 and with the test criteria if the Cronbach's Alpha value is > 0.6 then the instrument is reliable. The reliability test results of the "Cronbach's Alpha" test instrument were $0.857 > 0.6$, meaning that according to the criteria for taking action the instrument was reliable. The reliability

test results of the "Cronbach's Alpha" independence questionnaire instrument were $0.928 > 0.6$, meaning that according to the criteria for taking action the instrument was reliable.

The next test is a hypothesis test, namely using the t test, but before that you have to test the prerequisites first. The prerequisite test contains a normality test and a homogeneity test, if both pass the test then the T test continues. If the calculated t value $< t$ table and if the probability (significance) $> 0.05 (\alpha)$, then H_0 is accepted, meaning the variable is partially independent (individual) does not influence the dependent variable significantly. If the calculated t value $> t$ table and if the probability (significance) is $< 0.05(\alpha)$, then H_0 is rejected, meaning that the independent variable partially (individually) influences the dependent variable significantly.

3. RESULTS AND DISCUSSION

Result

The research entitled "Effectiveness of Using Difa Tara Interactive Learning Media in Increasing Critical Reasoning Ability and Independence in Science Subjects in Elementary Schools" was carried out in sixth grade at SD Negeri 1 Pagedongan as an experimental group, while the control group was at SD Negeri 1 Gentansari. The two elementary schools are in Pagedongan District, Banjarnegara Regency, Central Java. The research was carried out in Semester 2 March-May 2024.

The samples in this study were two schools, sixth grade students at SD Negeri 1 Pagedongan, totaling 26 children, as the experimental group and sixth grade students at SD Negeri 1 Gentansari, totaling 24 children, as the control group.

Data collection techniques were carried out using test and questionnaire techniques. Before use, the validity and reliability of the instrument is tested first. The next test is a hypothesis test, namely using the t test, but before that you have to test the prerequisites first. The prerequisite tests include a normality test and a homogeneity test, if both pass the test then continue with the T Test.

The normality test is carried out as a prerequisite test to reveal facts about whether data is normal or not before carrying out a parametric t test or non-parametric t test. The parametric t test is run when the data is normally distributed, if it is not normal then it is necessary to run a non-parametric t test. The normality test in this test uses the Kolmogorov-Smirnov statistical test, with the test criteria being that if the significance number is > 0.05 then the data is normally distributed and if the significance number is < 0.05 then the data is not normally distributed.

Hypothesis testing in this study used the Independent T-Test to answer the problem formulation, the following results were obtained:

1. Increased Critical Reasoning Ability

The results of the test instrument in this test were tested using the Independent T-Test type t-test. This test was carried out to determine the effectiveness of the Difa Tara Interactive Learning Media in improving critical reasoning abilities. Following is the results table:

Table 1. Hypothesis Testing Critical Reasoning Ability Test

		Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Bernalar Kritis	Equal variances assumed	.035	.853	6.752	48	.000	8.817	1.306	6.192	11.443
	Equal variances not assumed			6.749	47.617	.000	8.817	1.306	6.190	11.444

Based on the SPSS "Independent Samples Test" output above, it shows that the Sig. Levene's Test for Equality of Variances is $0.853 > 0.05$ so that the data variance between the experimental class and the control class is the same or homogeneous.

Next, in the Equal variances assumed column row, it is known that the Sig (2-tailed) value is $0.000 < 0.05$. Based on the Independent T-Test test action, it can be stated that H_0 is rejected and H_1 is accepted. In connection with this, a conclusion was drawn that there was a significant or real difference between the average critical reasoning abilities of students in the experimental and control classes.

Based on the output above, you can also see the difference between the average values of the two classes, namely through the Mean Difference column, which is 8.817. On the other hand, there is a calculated t value in the output above of $6.752 > t$ table of 2.008 so it can also be interpreted that H_0 is rejected and H_1 is accepted. So a conclusion can be drawn that the use of Difa Tara Interactive Learning Media is effective in improving the critical reasoning abilities of sixth grade students.

2. Increased Independence

The results of the experimental and control class questionnaire instruments in this test were tested using the Independent T-Test type t-test. This test aims to test the effectiveness of using Difa Tara Interactive Learning Media in increasing the independence of sixth grade students in the solar system material. The test was run using the SPSS application, here is the results table:

Table 2. Independence Questionnaire Hypothesis Test

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Kemendirian	Equal variances assumed	.023	.880	4.795	48	.000	13.173	2.747	7.650	18.696
	Equal variances not assumed			4.797	47.739	.000	13.173	2.746	7.651	18.695

Based on the SPSS "Independent Samples Test" output above, it shows that the Sig. Levene's Test for Equality of Variances is $0.880 > 0.05$ so that the data variance between the experimental class and the control class is the same or homogeneous.

Next, in the Equal variances assumed column row, it is known that the Sig (2-tailed) value is $0.000 < 0.05$. Based on the Independent T-Test test action, it can be stated that H_0 is rejected and H_1 is accepted. In connection with this, a conclusion was drawn that there was a significant or real difference between the average independence of students in the experimental and control classes.

Based on the output above, you can also see the difference between the average values of the two classes, namely through the Mean Difference column, which is 13.173. On the other hand, there is a calculated t value in the output above of $4.795 > t$ table of 2.008 so it can also be interpreted that H_0 is rejected and H_1 is accepted. So a conclusion can be drawn that the use of Difa Tera Interactive Learning Media is effective in increasing the independence of sixth grade students.

Discussion

The aim of the researchers in carrying out the test was to determine whether or not the use of the Difa Tara Interactive Learning Media implemented in the experimental class and control class was effective in improving the critical reasoning abilities and independence of class students in science learning in the sixth grade of elementary school. The two classes selected as test samples used different learning models to find out the differences, namely the experimental class with the help of the Difa Tara Tera Interactive Learning Media on the other hand, the control class without the help of the Difa Tara Interactive Learning Media.

Before carrying out data collection in the experimental class and control class, the two instruments were tested first to reveal facts about the level of each item. Among these tests are validity tests and reliability tests. The results of these tests have proven that the instrument is suitable for use as research material.

After carrying out the research in the experimental class and control class, the prerequisite tests were carried out, namely the normality test and homogeneity test. In the prerequisite test, both test data and questionnaires have been proven that the significance value of both tests is more than 0.05, meaning the data is normal and homogeneous. Then the last, very vital testing stage is hypothesis testing, to answer the hypothesis formulation. The following is a presentation of research results to answer the problem formulation:

1. The Effectiveness of Difa Tara Interactive Learning Media in Increasing Critical Reasoning Ability in Science Learning in Elementary Schools

The use of Difa Tara Interactive Learning Media in this research aims to test whether it is effective or not in improving students' critical reasoning abilities. The research was carried out in two classes, namely 26 students in the experimental class and 24 students in the control class. Data were collected on both samples using test instruments.

The instrument is in the form of a test which contains 10 descriptive questions within the scope of sixth grade elementary school solar system material, which is given to the experimental class or control class. The control class was given conventional learning without media and the experimental class was given learning using Difa Tara Interactive Learning Media, then both classes were given test questions. This aims to uncover facts about how effective the Difa Tara Interactive Learning Media is in improving students' critical reasoning abilities with or without learning media.

After collecting the post test data for each class, the data was tested using the Independent T-Test via the SPSS application. Based on this test, an average or mean value was produced, namely the posttest results for the experimental class were 40.19, while the average score for the control class posttest was 31.38. Based on these average results, the post test score for the control class was smaller than the post test score for the experimental class. This means that between the two classes there is a difference in the average learning outcomes with or without media assistance.

The next result is the Sig (2-tailed) value of the two classes, namely 0.000, because it is less than 0.05, based on the Independent T-Test test criteria, H₀ is rejected and H₁ is accepted. The calculated t value in SPSS is 6.752, because the result is more than the t table, namely 2.008, it means that H₀ is rejected and H₁ is accepted.

Taking action from the Independent T-Test test results is based on the hypothesis formulation, namely H₀ is rejected and H₁ is accepted. The existence of significant or real differences in the average post test results of the two classes proves that the Difa Tara Interactive Learning Media is effective in improving students' critical reasoning abilities.

This is in accordance with research (Firdaus et al., 2020) that the interactive multimedia developed is feasible, practical and effective for improving students' critical thinking skills. This opinion is confirmed by Reme, et al, (2023) who stated that interactive multimedia is more effective on students' critical reasoning abilities than conventional learning models.

2. The Effectiveness of Difa Tara Interactive Learning Media in Increasing Independence in Science Learning in Elementary Schools

Research on the effectiveness of Difa Tara Interactive Learning Media in increasing the independence of sixth grade students was carried out in two classes, namely the experimental class and the control class. Data collection for both samples used a questionnaire instrument containing five indicators. The five indicators are measuring variables that represent independence criteria.

After carrying out learning with or without Difa Tara Interactive Learning Media from each class and carrying out data collection through questionnaires to measure student independence, then the data was tested using the Independent T-Test test via the SPSS application. Based on this test, the average or mean score for the control class was 83.75 out of a total of 24 students. On the other hand, the average of the experimental class was 96.92 out of a total of 26 students. This means that in the two classes there were differences in the average results of independence with or without media assistance.

The next result, namely the Sig (2-tailed) value of the test, is 0.000, because it is less than 0.05, based on the Independent T-Test test criteria, H₀ is rejected and H₁ is accepted. The calculated t value in SPSS is 4.795, because the result is more than the t table, namely 2.008, based on the Independent T-Test test criteria, it is interpreted that H₀ is rejected and H₁ is accepted.

Taking action from the Independent T-Test test results is based on the hypothesis formulation, namely H₀ is rejected and H₁ is accepted. The existence of significant or real differences in the average results of the two classes proves that the Difa Tara interactive learning media is effective in increasing student independence.

This is in accordance with the opinion of Ekaputra & Hasanah (2021) who stated that the use of interactive learning media can make students increase their learning activities. This opinion is also in line with the results of research conducted by Effendi et al., (2018) which states that the increase in student learning outcomes can also be caused by the learning media used being easily accessible to students at any time, so that students' learning independence also increases. Furthermore, Robiana & Handoko (2020) in their research stated that the application of learning media can increase learning independence.

4. CONCLUSION

Difa Tara Interactive Learning Media is effective for critical reasoning abilities and independence, which has been stated in the average results between the Independent T-Test tests in the previous discussion. The results of data collection from the two samples produced differences in the critical reasoning abilities and independence of experimental class students which were better than those in the control class. The results of the hypothesis test have a significant value of 0.000, because it is less than 0.05, based on the Independent T-Test test criteria, H₀ is rejected and H₁ is accepted.

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