Implementation of the Jigsaw Model Assisted by E-Modules in Science Learning on Ecosystem Material for Class V Elementary Schools

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Abstract: Critical thinking skills, independence, and low learning outcomes for most students are the essential background for this research. This problem causes the learning process carried out in class not to run optimally. This research aims to determine the influence of implementing the Jigsaw learning model assisted by e-modules on students' critical thinking abilities, independence, and learning outcomes. The approach in this research is quantitative with a Quasi-Experimental research type. The design of this research is Posttest Control Group Design. The population is classes VA and VB using total sampling techniques where all population members are used as research samples. Data collection techniques include questionnaires (measuring critical thinking abilities and learning independence) and tests to measure learning outcomes. The analysis shows the influence of using the Jigsaw-type cooperative learning model assisted by e-modules on critical thinking skills, independence, and student learning outcomes in grade 5 elementary school ecosystem material. Thus, learning with the Jigsaw model can overcome students' learning problems and needs.

Keywords: Critical Thinking, Independence, Learning Outcomes, and Jigsaw Models

Introduction

In an era where the increasingly strong influence of globalization requires that the Indonesian state education system must be able to prepare each individual and the young generation with quality to compete amidst current developments (Aisyiah, 2016; Khairati et al, 2021). A forum is needed so that humans can develop and prepare themselves to be able to compete, one of which is school (Cornivia & Suwanda, 2022; Nuraini, Asri, & Fajri, 2023). These human resources must continuously be improved from an early age because they are the foundation for education.

In achieving national education goals, all parties' active role and contribution is essential, including teachers as educators (Asi, Retnoningsih, & Irsadi, 2021; Huda, 2017). In this case, the teacher is a necessary element because it can determine the success of the learning carried out. Therefore, teachers are needed who have qualifications according to their field of expertise. Apart from understanding and mastering subject matter and teaching methods, teachers must also understand the basics of education (Dalyono & Agustina, 2016; Sholihah & Supriatno, 2023).

Every student must understand the lesson material their teacher presents as best as possible. This also needs to be supported by the teacher's ability to stimulate students' interest in learning and explore information independently in direct education (Situmorang et al., 2018). The learning process is also maximized so that there is an interactive, fun, inspiring learning process that creates motivation so that students can contribute actively and also provide space for students to develop their creativity and learning independence (Mariyaningsih & Hidayati, 2018). Teachers also need to

focus learning on a higher-level thinking process, especially critical thinking.

Critical thinking is a mental process that includes problem-solving, the ability to make decisions, analyzing ideas, and conducting scientific research (Haeruman et al., 2017). This critical thinking skill is required of every individual to analyze a problem in detail to arrive at related information and ultimately succeed in finding the most appropriate solution to the problem they encounter.

Apart from critical thinking skills, another essential aspect for every student is independence in the learning process. Independence in learning is characterized by active behavior in education and being able to monitor, evaluate, and manage learning more effectively (Amral & Asmar, 2020). This is done to save time in completing assignments, organize study time to be more effective, and ultimately get the best score in science learning.

However, all of this cannot be fully achieved by every elementary school student. Teacher-oriented learning was still found during the learning process in class V of SDN Brambang. Most teachers still use the lecture method when explaining material to students. This certainly has an impact on the level of understanding of students, which is mostly very low. The large amount of material also influences this in the form of concepts in elementary science learning. Students often feel bored and even bored when implementing learning using monotonous methods. Students less like science subjects, which arises from actual material not being presented with real examples that relate to students' daily lives. Apart from that, when studying science, teachers are always required to memorize the material or concepts, so students' learning motivation tends to be low.

Based on the analysis results regarding students' success at SDN Brambang 1, it shows that students' critical thinking abilities are pretty low, namely below 41%. This follows the opinion of Arikunto (2018), where a value <41% is in the low category. The indicator for the ability to provide simple explanations received a score of 41.5%, the hand for building basic skills 38%, the ability to conclude 35.7%, the indicator for making further explanations 38%, and the indicator for managing strategies and tactics received a score of 36.3%.

Regarding the attitude of independent learning, it was found that most of the indicators showed results below 41%, which means that independent learning is relatively low. This is demonstrated by the results of the analysis, which show that aspects of independent attitude scored 39.2%, not depending on others 36.7%, being brave in making decisions 40.3%, able to solve problems 41%, acting creatively 40.7%, daring to try new things 40% and dare to express opinions got a score of 40.3%.

Apart from that, based on the results of interviews with students and teachers at SDN Brambang 1, information was also obtained, including that the majority of students were passive during the learning process, there were still students who were embarrassed to ask questions and express their opinions, the online learning model was not able to facilitate investigations, the teaching method was still It is an assignment and the material taught is not yet connected to daily life problems so that students have difficulty understanding the material presented. This is reinforced by data on student learning outcomes, which shows that only 43% of students have met the KKM, and the remainder have not met the KKM, amounting to 57%.

Based on the findings above, it is known that most students' critical thinking skills, independent learning attitudes, and learning outcomes are still low and do not meet expectations. Such problems need to be addressed and given appropriate treatment. One way that can be done to overcome this is by implementing innovative learning models to encourage a pleasant learning atmosphere for students. One of these learning models is Jigsaw-type cooperative learning with the help of e-modules.

Aronson developed this Jigsaw learning model. The Jigsaw learning model is included in the cooperative learning category. According to Lubis & Harahap (2016), the Jigsaw learning model can be used in several lessons, one of which is natural science (science) subjects and is suitable for application in all classes. This Jigsaw model was designed with two groups, namely the home group and experts, to increase students' responsible attitudes towards their learning and also towards other people (Juniawan & Wikanta, 2023; Susanti et al., 2019; Suzanti, Murni, & Hasibuan, 2023). In line with this, Hanifah (2016) stated that Jigsaw is a type of cooperative learning where several members in one group are tasked with learning material and are responsible for teaching it to members in other groups. Thus, the learning model requires each student to work together and be interdependent with other students.

Implementing the Jigsaw model in learning is expected to generate new ideas for students to understand the subject matter (Florentina & Leonard, 2017; Maielfi & Wahyuni, 2020; Odja, 2023). Apart from that, students can also use the subject matter studied to improve their critical thinking skills so that they can solve problems encountered in everyday life (Doyan, Gunada, & Adriani, 2015; Ibrahim, Marwan, & Firmansyah, 2023; Soeprianto, 2016).

Based on the explanation of the problem above, science learning activities are not optimal, as evidenced

by unsatisfactory learning outcomes, so it is necessary to research the influence of the Jigsaw model on science learning to improve critical thinking skills, independence, and learning outcomes for each student. On this basis, research was conducted entitled "Implementation of Jigsaw Models with the Assistance of E-Modules in Class V Ecosystem Material Science Learning."

Method

This research is included in the type of quasi-experimental research using a Posttest Control Group Design (Gumay & Bertiana, 2018). This research design has two class groups: experimental and control. The experimental class in this research was the class that received the Jigsaw learning model treatment with the help of e-modules. In contrast, the control class received no treatment, meaning the learning was conventional.

The population in this study were all class V students at SDN Brambang 1. At the same time, the sample was taken using a total sampling technique where all population members were sampled, namely class V A, as many as 26 people, and class V B, as many as 23 people. The data collection techniques in this research are documentation, tests, and observations. Before use, the posttest questions are tested for validity, reliability, discrimination, and difficulty index to ensure that the test can be said to be appropriate so that it can be used to measure cognitive abilities in students. Meanwhile, the questionnaire instrument is only tested for validity and reliability.

The data from the research results were then tested for requirements by carrying out a normality test and homogeneity test (Usmadi, 2020). After the data is declared normal and homogeneous, the next step is to test the hypothesis by testing the hypothesis to find out whether Ha or Ho is accepted. Apart from that, a univariate significance test was also carried out to prove whether or not there was an influence of the Jigsaw model on students' independent learning and critical thinking.

Result and Discussion

Trial of Test Instruments

At the testing stage of the test instrument, the questions that have been prepared are tested to see their validity, reliability, differentiation, and difficulty level. Table 1 presents the results of the instrument validity test, and it is known that all 15 questions were declared valid. Then, the reliability test results also showed high results, namely 0.938, and included in the very high-reliability category. Regarding differential power, there

are eight questions in the very good category and seven items in the good category. The posttest questions were also tested for difficulty level, with the results of 6 items in the easy category and nine in the medium difficulty category.

Table 1. Results of Posttest Instrument Trials

Validity	Reliability	Different Power	Levels of Difficulty
15 items valid	0.938 (very reliable)	8 points (very good) 7 points (good)	6 points (easy) 9 points (medium)

Description of research data

Based on information from the results of multiple-choice tests, questionnaires, and observations, it is known that using the Jigsaw learning model assisted by e-modules can influence students' critical thinking skills, independence, and learning outcomes. The following is a description of the research data for each class.

Table 2. Description of Research Data

Class	Experiment	Control
Critical thinking	82.31	55.04
Learning Independence	69.00	47.57
Learning outcomes	82.08	53.57

It is seen in Table 2 that it is known that the average critical thinking score for the experimental class is 82.31, which is far different from the control class, which only got a score of 55.04. This means that there is a difference in average scores caused by using the Jigsaw learning model assisted by e-modules.

Regarding the description of learning independence in the two sample classes, it shows that the average learning independence in the experimental class obtained a score of 69, while the average in the control class was only 47.57. Then, about student learning outcomes, the average score of the experimental course is superior to the control class. The experimental class got an average score of 82.08, while the control class only got 53.57.

The three aspects above, such as critical thinking, independence and learning outcomes, show that the average value of each variable in the experimental class is higher than the value in the control class. This means that learning using the Jigsaw model is suitable and can be implemented in science learning for class V elementary school, especially in ecosystem material.

Analysis Prerequisite Test

Before testing the hypothesis, the data must be ensured to be normally distributed and homogeneous. From Table 3 it is known that the three aspects of the

entire sample class are normally distributed. This is because the significance value for each variable in the two sample classes is >0.05.

Table 3. Normality Test Results

Aspect	Sample Class	Sig	Information
Critical thinking	Experimental Class	0.850	Normally Distributed
	Control Class	0.505	Normally Distributed
Learning Independence	Experimental Class	0.575	Normally Distributed
	Control Class	0.209	Normally Distributed
Learning outcomes	Experimental Class	0.120	Normally Distributed
	Control Class	0.066	Normally Distributed

Table 4 above shows that the research data from the three aspects have the same or homogeneous variance because the calculated sig is > 0.05 significance.

Table 4. Homogeneity Test Results

Aspect	Sig	Information
Critical thinking	0.056	Homogen
Learning Independence	0.690	Homogen
Learning outcomes	0.087	Homogen

Hypothesis testing
Multivariate Test

Based on the multivariate test results, a significant value of 0.000 was obtained. Thus, with the help of e-modules, the Jigsaw learning model shows an influence on the dependent variable (critical thinking, independence, and learning outcomes).

Test of Between Subjects Effects

Based on the results of the multivariate test, a significant value of 0.000 was obtained. Thus, with the help of e-modules, the Jigsaw learning model shows an influence on the dependent variable (critical thinking, independence, and learning outcomes). In the critical thinking aspect, the F value was 463.199. In the independent learning aspect, the F value was 196.427; in the learning outcomes aspect, the F value was 81.440 with a sig of 0.000 (0.000 < 0.05). This shows that the univariate Jigsaw model assisted by e-modules affects critical thinking, independent learning, and student learning outcomes, especially in grade V elementary school ecosystem material.

Discussion

Implementing the Jigsaw model in class V learning has helped students become actively involved in learning. Students already have an understanding of the subject matter that they have discovered independently. Before implementing the Jigsaw learning model, it was known that many students had low learning independence, low critical thinking skills, and poor cognitive abilities.

At the first learning meeting using the Jigsaw model, there were still many students who were still confused about the learning flow. As a result, each stage of Jigsaw at this stage did not run well. Learning activities are structured based on heterogeneous (diverse) groups, so it takes quite a long time for both students and the teacher to adjust. During discussion activities in class, learning using the Jigsaw model was still not conducive. This was because students were not used to it and had to adapt to the flow of learning activities being implemented. When presenting the results of their work, most students still look less confident and shy, so the presentation does not run optimally.

The findings at the first meeting above gradually improved in subsequent sessions. Sometimes, we still find a small number of students who are less active in the learning process in class. However, when students presented their work, they showed confidence and were not embarrassed when giving it to the class. During the discussion activities, critical thinking skills began to emerge. At the next meeting, the learning situation had improved and showed the expected learning. Most students looked active, discussion activities were conducive, and students showed their critical thinking when faced with a problem that had to be solved.

Based on the analysis of critical thinking skills, independence and student learning outcomes, it is known that the experimental class is superior to the control class. It is known that the experimental class received Jigsaw learning model treatment with the help of e-modules, while the control class received no treatment at all.

In the first hypothesis, it is known that there is an influence of the Jigsaw model with the help of e-modules on students' critical thinking abilities, especially in ecosystem material. The results of this research align with Handayani's (2020) research with the result that learning by implementing the Jigsaw-type cooperative model can significantly impact students' critical thinking abilities. Learning with the Jigsaw collaborative model has been proven to be able to improve student's necessary thinking skills; this is because this model is designed to increase each student's responsibility

towards themselves and others in learning (Juniawan & Wikanta, 2023; Wati & Anggraini, 2019). In line with this, Setiawan & Pebrina (2019) also explained that there was indeed a significant difference in the critical thinking abilities of experimental class students who used the Jigsaw cooperative model with students in the control class who only used the lecture (conventional) method.

The second hypothesis is that the Jigsaw learning model assisted by e-modules can influence students' learning independence, especially in ecosystem material. Learning independence can determine the success or failure of learning in achieving satisfactory student learning outcomes. Therefore, learning that can accommodate students to be independent needs to be carried out. By learning using the Jigsaw model, students will actively seek out what information is needed according to their abilities (Ibrahim, Marwan, & Firmansyah, 2023; Odja, 2023).

When implementing learning using the Jigsaw model, students must be able to ask questions, express opinions, find important information from hidden sources, and find the best solution to solve problems. This is included in the indicators or characteristics of independent learning. According to Yuliani (2019), one learning method that influences students' learning independence is the Jigsaw method. With the existence of a learning model, students can generally condition themselves to learn independently (Masitoh et al., 2022; Suzanti, Murni, & Hasibuan, 2023). Learning in a Jigsaw setting is also known to be effective in increasing students' independent learning behavior; this is because students must be responsible in learning activities and actively seek out the necessary information according to their abilities (Soeprianto, 2016; Sugandi, 2013).

Then, based on the influence of applying the Jigsaw model in learning, this model strongly influences student learning outcomes in ecosystem material. Classroom learning must be designed efficiently, effectively, and optimally to achieve learning objectives as expected. It is necessary to implement a learning model that suits the needs of students so that learning outcomes align with what is expected. The Jigsaw model can address one of these learning needs (Heriwan & Taufina, 2020). Apart from that, the use of Jigsaw in the classroom learning process also an influences on students' ability to understand concepts and increase their ability to solve problems (Harefa et al., 2022).

Thus, implementing the Jigsaw learning model in teaching, especially ecosystem material, positively impacts elementary school student's critical thinking skills, independence, and learning outcomes. This e-module-assisted Jigsaw learning has proven effective in overcoming problems and meeting the learning needs of elementary school students.

Conclusion

Based on the research results, it can be concluded that implementing the Jigsaw cooperative model in elementary school learning, especially ecosystem material, can influence critical thinking skills, independence in learning, and student learning outcomes in a better direction. Thus, learning using this model is highly recommended to be applied so that there are changes and improvements in the quality of learning.

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

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