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# The Media Puzzle Assisted Guided Inquiry Model: Its Use of Students' Critical Thinking Skills

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**Abstract:** The aim of this research was to photograph the application of the guided inquiry model (GIM) with puzzle media to students' critical thinking skills (CTS). The design used was pretest posttest non-equivalent control group. The research sample was VIIB class students as the experimental class and VIIC class as the control class who were selected through cluster random sampling technique. The research data is in the form of quantitative data, namely the average pretest, posttest, and N-gain values which are then analyzed by statistical t-test with a significance level of 5% using SPSS 22. The results show GIM that the media puzzle has a significant effect on students' CTS with an average of N -the experimental class gain was higher (0.45) while the control class (0.22), and sig. 0.00 < 0.0. Thus, it can be concluded that learning science using GIM with puzzle media has a significant effect on students' CTS.

**Keywords:** critical thinking skills, effect, guided inquiry learning model, puzzle media, students

## Introduction

The current era of globalization opens opportunities and challenges for humans to develop their potential. This century requires a person to have reliable life skills that will become a provision for students in their lives. One of them, critical thinking skills (CTS) which allows students to make logical conclusions so they can solve their problems (Association of American Colleges and Universities, 2005; Dwyer et al., 2014). CTS can make quality human beings because they play a very important role in a person's ability to solve problems in his life. Students with this ability can face problems with existing challenges rationally (Feldman, 2010). If without the provision of CTS, students are unable to retrieve, process, and utilize the available information to face the challenges of everyday life, then critical thinking skills become a necessity in the learning process (Achmad, 2007).

Classroom learning is the implementation of the curriculum. In the curriculum, students are required to be active, creative, and innovative to solve problems faced at school (BNSP, n.d.). In order to fulfill the demands of the curriculum, students are directed toward learning that hones appropriate skills. Fulfillment can be carried out in all subjects, including learning science. Science as a subject requires scientific processes. The process of learning science can also be taught through scientific inquiry so that thinking skills develop and passive learning becomes active. Schools need to develop students' learning experiences directly in the form of knowledge, process skills, and a scientific attitude (Rusman, 2015).

Science learning consists of a collection of knowledge about nature that teaches objects, phenomena, and processes in nature in a systematic way. The nature of science contains how to think and investigate knowledge, how technology and its development in society (Chiappetta & Koballa, 2015). Meanwhile, (Gizzi, 1972) formulates three main elements in science, namely attitude, process methods and products The discovery process students learn how to learn as the core of thinking skills which is a description of learning science (Kunandar, 2007).

### *Research problem*

Currently, students are required to have this century skills including CTS. Meanwhile, the CTS of students in Indonesia is still low as shown by its achievements below other countries based on the results of the Program for International Student Assessment (PISA) survey released by the Organization for Economic Co-operation and Development (OECD) (Dhiva Syabila, 2021; OECD, 2022). Innovation is needed in learning so that traditional learning cannot fulfill the skills needed. It is the use of puzzle media through guided inquiry learning that allows for an increase in student CTS.

Science is a means for students to develop scientific skills, attitudes and values, preparing students to become part of a society that has insight into

science and the application of technology, and even about how science is conceptualized. Students not only have knowledge, but they also have thinking skills that can be used effectively to solve problems in everyday life. One form of thinking skills is CTS, in line with (Achmad, 2007) critical thinking, according to him, is one of the skills students need in solving problems.

Critical thinking is an intellectually active process that builds concepts, uses information and analyzes it based on observations and experiences as a reference for action (Tawil & Liliasari, 2013). CTS is reflective in nature, thinks rationally so that it can focus on problem solving decision making (Kurniawati et al., 2014). Critical thinking allows students to analyze their thoughts and draw the right conclusions when making decisions. Construction of knowledge becomes more meaningful when educators train students to criticize, identify, evaluate and solve problems correctly. However, the reality of learning in schools has not developed students' CTS. In learning in the process directs students to memorize and collect information without further understanding the information. This means that after graduation, students can only explain the theory, and lack the application level (Arsyad, 2015).

*Research focus*

Guided inquiry learning for Indonesia is one part of efforts to improve and develop learning. GIM reinforced with puzzle media is expected to answer the challenges of learning in the 21st century today and in the future. In order to increase CTS, Indonesia recommends student-centered learning models and guided inquiry assisted by media puzzles needed to improve junior high school students' learning.

Guided inquiry is an active learning model that can engage students in taking an active role in their learning while also improving their critical thinking skills. (Anam, 2016) explains that the GIM is a form of inquiry-based learning in which there are stages in the learning process that can train students' CTS. Data collection experiments, analyzes to test hypotheses, and drawing conclusions based on the data and analyzes performed. Through this learning, students actively solve problems and find answers to questions asked. Media is used to assist educators in communicating learning and achieving learning objectives. The medium used in this study is a puzzle medium. Puzzles are media that play by installing or matching specific boxes or pieces to eventually form a specific pattern that contains information (Yuliani, 2008). Students are actively involved in learning by using puzzle media, because they can directly compose puzzles and discuss them with their peers.

Puzzle media can improve writing skills (Amalia & Napitupulu, 2022), puzzle media is suitable for use as learning media (Sanjaya et al., 2019; Yulanda, 2022), guided inquiry-oriented puzzle media can improve learning outcomes (Karuniawati, Utomo, & Setiadi, 2022; Karuniawati, Utomo, Setiadi, et al., 2022). This study emphasizes the importance of using the GIM as an

appropriate model in teaching science, aided by puzzle media that can hone CTS and increase good activities in learning so that the achievement of 21st century skills is achieved.

*Research Objectives*

The purpose of this study was to photograph the effect of using puzzle media through GIM in increasing students' CTS. In addition, an overview of students' critical thinking is explained in this article.

*Research Questions*

The research questions developed in this study are: 1. How does the use of puzzle media through GIM affect students' CTS? 2. What is the description of students' critical thinking to face the demands of the 21st century?

## Research Methodology

The population used was all students of class VII SMP Negeri 15 Bandar Lampung, Indonesia. The sample is class VII B as the treatment class and class VII C as the control class. Sampling was sampled using cluster random sampling technique. This research is a quasi-experimental study with pretest posttest nonequivalent control group (Table 1)

Table 1. pretest posttest nonequivalent control group research design

| Group | *Pretest* | Independent Variable | *Posttest* |
|---|---|---|---|
| E | Y1 | X | Y2 |
| C | Y1 | - | Y2 |

Resource: (Adnan et al., 2020)
Explanation:
Y1 : Pretest
Y2 : Posttest
E : Experimental Class
C : Control Class
X : Treatment using GIM assisted by a media puzzle
- : Treatment using the discussion method

The types of data captured in this quantitative research. Quantitative data is in the form of data on students' CTS test results from the pretest, posttest, and worksheet on the subject matter of environmental pollution. Data collection techniques by means of tests to measure CTS. The data used are pre-test and post-test results, as well as excerpts from student worksheets. Critical thinking tests refer to indicators (Ennis, 1996) which are limited to giving simple explanations, concluding, providing further explanation, strategies, and also tactics. Critical students in providing simple explanations and advanced explanations of the problems given in learning. In addition, students can develop strategies and tactics in solving the problems given and efforts to react to them so that in the end students can conclude logically about learning material and are expected to be applied in their lives.

The data analysis technique was a quantitative data analysis technique using SPSS version 22. The analysis used N-Gain data, the sample data normality test used Kolmogrov-Smirnov and homogeneity test through the Levene Test. The N-Gain results use the following formula.

$$N - Gain = \frac{postest\ score - pretest\ score}{maximum\ score - pretest\ score} x\ 100$$

(Meltzer, 2002)

Hypothesis testing uses an independent sample t-test to test the significance of the difference in the mean of the two groups in the study. The independent sample t-test serves to determine the average difference between the two populations in the study with test criteria. If the p-value <0.05 then H0 is rejected and if the p-value ≥ 0.05 then H0 is accepted.

**Research Results**

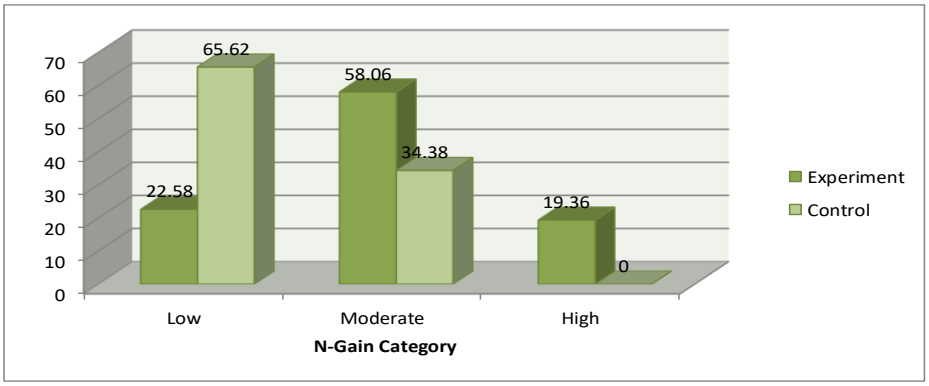
GIM with puzzle media can improve the CTS of seventh-grade junior high school students. Middle school students who are transitioning from elementary school like playing puzzle media while studying. This can be seen in the comparison between the pretest, posttest, and N-gain scores in the following table.

Table 2. The tabulation results of pretest, posttest and, N-gain values

| Class | Average of *Pretest* | Average of *Postest* | *N-Gain* | Interpretation |
|---|---|---|---|---|
| E | 54,78 | 78,3 | 0,45 | Moderate |
| K | 47,54 | 60,26 | 0,22 | Low |

Based on the table above, it can be seen that the CTS of students in the experimental class has "moderate" criteria while the comparison class has "low" criteria. The percentage distribution of N-Gain CTS in the experimental class and the control class can be seen in the following figure:

Figure 1. Distribution of N-Gain Values for CTS



The distribution of N-gain values for CTS in the experimental class is mostly found in the moderate criteria of 58.06 with as many as 19.36 students reaching the high criteria. Thus, the CTS of students who learn using the GIM with puzzle media are higher than those of students who learn using the discussion method. The results of the T test in Table 3 also show that the use of the GIM with puzzle media on the subject matter of environmental pollution greatly influences the improvement of students' CTS.

Table 3. Results of the N-gain Statistical Test Tabulation

| Class | Normality | Homogeneity | Independent Sample t-test |
|---|---|---|---|
| E | Sig. 0,58 > 0,05 | Sig. 0,34 > 0,05 | Sig. (2tailed) 0,00 < 0,05 |
| C | Sig. 0,56 > 0,05 | | |

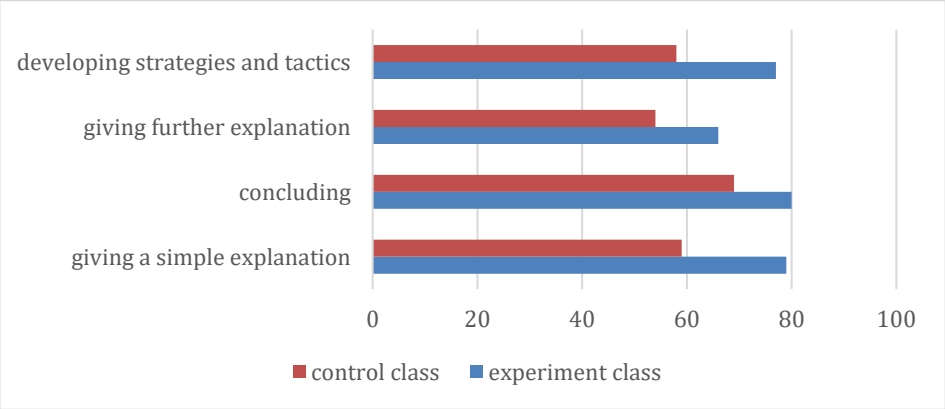
E = Experiment, C=Control

The results show that the samples come from populations that are normally distributed in both the experimental class and the control class. Homogeneity testing using the Levene Test on pretest, posttest, and N-gain students' CTS revealed that the data tested has a homogeneous variant. After testing the normality and homogeneity of the data, the Independent Sample t-Test was carried out to test the significance of the difference in the average of two classes between students in the experimental class and the control class, the results were sig. 0.00< 0.05, which means that the CTS of students between the experimental class and the control class differ significantly. The use of guided inquiry can develop student learning outcomes, learning experiences, and critical thinking (Duran & Dökme, 2016; Luska, 2022; Murnaka et al., 2019; Nisa et al., 2018, 2018; Wang et al., 2016).

Through GIM using puzzle media, students are guided to observe the images given and identify problems. This stage builds basic skills by practicing critical thinking on indicators, providing brief explanations when educators conduct questions and answers while studying, and discussing problems related to the facts presented. In addition to problem identification, students are guided to formulate problems based on those in the worksheet. A worksheet based on guided inquiry stimulates students to think critically (Yasin et al., 2019). At the problem formulation stage, educators ask and answer questions while students are studying, directing them to formulate problems related to the facts presented, thus providing brief explanations related to learning indicators in developing critical thinking skills. After formulating the problem, students are also encouraged to formulate hypotheses. Educators guide students by reviewing what they have learned so far and relating it to what they will learn. At the hypothesis formation stage, students learn by formulating hypotheses and providing further explanations that enable them to provide hypotheses to reconstruct their arguments. Students' self-

confidence in being directly involved in the learning process can influence interest in learning biology and ultimately be related to students' thinking processes (Jeffery et al., 2016). A comparison of critical thinking achievements in the experimental and control classes is presented in the following figure.

Figure 2. Comparison of each indicator of CTS




## Discussion

Each of the critical thinking indicators has increased. The most developed skill is the ability of students to provide simple explanations and organize the use of strategies and tactics in solving problems. This is due to the guided inquiry learning model encouraging students to discuss concepts and theories that they have discovered for themselves, checking the results of discussions with the literature, proving the correctness of the results with the hypotheses proposed, and encouraging students to present their results. At the hypothesis-testing stage, strategies and tactics, which are indicators of CTS, are finally explained and provide further explanation. Even though the indicators provide further explanation, the experimental class experienced the lowest increase, but the increase was superior to the control class. Students' activeness and writing critical answers have an impact on better critical thinking skills (Gupta et al., 2015; Putra et al., 2018, 2018; Styers et al., 2018). The use of the guided inquiry model helps students examine more in-depth content about environmental pollution.

In the learning process, educators encourage students to be active learners. Interesting learning encourages students to actively participate in learning,

including using puzzle media. Media puzzle is an educational game that develops CTS by having players compile answers from words to answer predetermined questions. The use of media in the form of jigsaw puzzles helps students understand the concept. In addition, emphasize that very fun activities such as compiling puzzles allow students to reach their potential and train their CTS. Through active learning, it is necessary to familiarize students with critical thinking so that they can independently solve their own problems (Pursitasari et al., 2020).

The last activity in GIM with puzzle media is formulating conclusions. During this phase, educators assist students in learning to conclude the results of investigations using puzzle media. Critical thinking students are trained in strategic and tactical aspects, practice concluding, and design further or more in-depth explanations. Using guided inquiry allows students to make discoveries that require their high-order thinking skills, such as critical thinking, so that student achievement increases. in the learning process (Murnaka et al., 2019). Critical thinking is an important part of science education because it teaches students how to think as providers in their lives (Vieira & Tenreiro-Vieira, 2016). Therefore, science learning must be able to hone students' thinking skills. Guided inquiry can involve students in discovering, drawing conclusions, and reporting findings so as to improve students' CTS and problem solving (Irwanto et al., 2018; Maxwell et al., 2015; Yasin et al., 2019).

This finding implies that inquiry learning needs to be prioritized in science learning at all levels of education, especially in junior high schools. Therefore, students need to get the opportunity to think about facts and concepts, then the teacher provides guidance on how to criticize existing phenomena, determine good solutions to problems, and provide critical explanations. Furthermore, they are used to developing strategies and tactics using their ideas, and ending by concluding exposure to existing phenomena until they can reflect on their findings.

## Conclusions and Implications

The conclusion of this study is that the use of GIM models assisted by media puzzles can improve students' CTS on environmental pollution material. In learning science, it is very important to instill thinking skills, including critical thinking. These skills will help students now and in the future as they face the challenges of the twenty-first century.

Learning using GIM through puzzle media can be an alternative to improve students' CTS. A combination of learning models with the right media is a solution to achieve 21st century skills, one of which is the application of the GIM using puzzle media, especially for junior high school students.

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