

Effect of the Guided Inquiry Learning Model on Students' Creative Thinking Ability

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Abstract: The Merdeka Curriculum places the graduate profile as the primary reference for developing students' character and competencies. One of its key profiles is creativity, defined as the ability not only to master knowledge but also to generate ideas and develop various alternative solutions to problems. This study aimed to determine the effect of the Guided Inquiry Learning Model on eighth-grade students' creative thinking ability on the topic of Work and Energy at MTs Madinatussalam. This study employed a quantitative approach using a quasi-experimental design, specifically a nonequivalent control group design. Data were collected through a creative thinking ability test administered as a pretest and posttest. Hypothesis testing was conducted using the Mann-Whitney U Test with the assistance of IBM SPSS Statistics. The results showed that the mean posttest score of the experimental class was 64.62, while that of the control class was 57.02. The hypothesis test yielded an Asymp. Sig. (2-tailed) value of $0.005 < 0.05$, leading to the rejection of H_0 and acceptance of H_a . Therefore, a significant difference was found in students' creative thinking ability between the experimental and control classes. These findings indicate that the Guided Inquiry Learning Model has a significant effect on students' creative thinking ability in the topic of Work and Energy.

Keywords: Creative Thinking; Guided Inquiry; Work and Energy.

Introduction

The Merdeka Curriculum positions graduate profiles as a primary reference for developing students' character and competencies. One of the emphasized profiles is creativity. Students' creative thinking skills are regarded as an important competency standard for developing holistic and character-based individuals [1]. Creative thinking is not only related to the mastery of knowledge but also to the ability to generate ideas, develop various alternative solutions to problems, and produce meaningful works [2]. In science learning, this ability is essential because science is designed to actively engage students through observation, experimentation, and discussion activities [3].

However, students' creative thinking skills in science learning remain relatively low. Students' creative thinking skills in science learning were still in the low category [4]. This condition may be caused by the lack of teacher stimulation in challenging students to think creatively, limited opportunities for experimentation, and learning models that have not optimally empowered students' creative thinking potential [5]. In addition, teacher-centered learning and the dominance of lecture-based methods cause students to focus more on memorization than understanding, so creative thinking, as one of the essential twenty-first-century skills, has not developed optimally [6].

Based on the initial test of students' creative thinking skills at MTs Madinatussalam on the topic of work and energy, the results indicated that students' abilities were still in the poor category. The percentages for each indicator were 56.11% for fluency, 53.61% for flexibility, 55.28% for originality, and 54.72% for elaboration. The results of

interviews and classroom observations also showed that science learning was still dominated by a teacher-centered approach. Students tended to be passive, depended on teacher explanations, and were not accustomed to expressing new ideas or using various alternative solutions to problems.

One effort to overcome this problem is to implement the guided inquiry learning model. This model provides students with opportunities to explore, discover, and construct knowledge through systematic stages of investigation under teacher guidance [7]. Guided inquiry learning is consistent with constructivist theory because students construct their own knowledge through direct learning experiences. Through activities such as formulating questions, developing hypotheses, conducting experiments, analyzing data, and drawing conclusions, students are trained to think flexibly, originally, and elaborately. Guided inquiry-based learning has also been found to improve students' creative thinking skills [8].

The topic of work and energy was selected because it has conceptual characteristics that are closely related to everyday phenomena yet is often considered abstract by students. Difficulties in understanding the concepts of work and energy may arise because the material is not sufficiently connected to students' real-life experiences [9]. Therefore, learning this topic requires not only computational ability but also the ability to interpret phenomena, propose assumptions, and relate concepts to various situations.

Several previous studies have shown that the guided inquiry learning model can improve students' creative thinking skills. The implementation of guided inquiry in science learning improved creative thinking skills in the indicators of fluency, flexibility, elaboration, and originality

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[10]. However, studies that specifically implement guided inquiry on the topic of work and energy while emphasizing the teacher's role in guiding the investigation process are still needed. Based on this rationale, this study aims to determine the effect of the guided inquiry learning model on students' creative thinking skills in the topic of work and energy in Grade VIII at MTs Madinatussalam.

Several previous studies have shown that the guided inquiry learning model has the potential to improve students' creative thinking skills. The implementation of guided inquiry in science learning improved the indicators of fluency, flexibility, elaboration, and originality [11]. Nevertheless, the implementation of guided inquiry on the topic of work and energy still requires further investigation, particularly because it requires students to understand abstract concepts, relate them to real-life phenomena, and develop alternative solutions to problems. In addition, the teacher's role in guiding the investigation process needs to be clearly emphasized so that students do not merely follow learning procedures but are also encouraged to construct ideas and discover concepts actively. Therefore, this study is necessary to provide empirical evidence regarding the effect of the guided inquiry learning model on students' creative thinking skills in the topic of work and energy in Grade VIII at MTs Madinatussalam.

Research Methods

This research was conducted at MTs Madinatussalam in Deli Serdang during the even semester of the 2025/2026 academic year. This study employed a quantitative approach using a quasi-experimental design with a nonequivalent control group. The population consisted of all Grade VIII students, comprising four classes totalling 134 students. The

sample was selected using cluster sampling, resulting in two classes: the experimental class, which received treatment using the guided inquiry learning model, and the control class, which was taught using the direct instruction model.

Data were collected through pretests and posttests of creative thinking skills in both classes. The instrument used was an essay test on the topic of work and energy, developed based on Torrance's creative thinking indicators, namely fluency, flexibility, originality, and elaboration [12]. Each response was assessed using a scoring rubric ranging from 0 to 4 for each indicator. The instrument was validated through expert judgment for content validity and empirical validity using the Pearson Product-Moment correlation. The quality of the instrument was also examined using reliability, difficulty, and item discrimination analyses.

The data were analyzed using IBM SPSS Statistics version 31.0.2. The prerequisite tests included the Shapiro-Wilk normality test and Levene's Test for homogeneity. Furthermore, the hypothesis was tested using a one-tailed independent samples t-test. If the data were not homogeneous, the analysis referred to the "equal variances not assumed" result or Welch's correction. The testing decision was determined at a significance level of 0.05.

The instrument used in this study was a creative thinking assessment developed independently by the researcher, based on Torrance's creative thinking framework, which includes the dimensions of fluency, flexibility, originality, and elaboration. The score obtained from each essay question ranged from 0 to 4 points. The scores were then summed to obtain the total score using the following formula. The score was calculated by dividing the total score obtained by the maximum total score, then multiplying the result by 100. The rubric and scoring criteria for the creative thinking instrument are presented in Table 1

Table 1. Rubric for Assessing the Creative Thinking Instrument

Creative Thinking Indicator	Learning Achievement Indicator	Scoring Criteria	Score
Fluency	Able to provide answers to the given questions completely and smoothly.	No answer provided.	0
		Provides an irrelevant answer or an incorrect answer	1
		Provides a relevant answer, but the presented data are incomplete	2
		Provides an answer appropriate to the problem, but only part of the required data are complete	3
		Provides an answer fully appropriate to the problem, and all required data are complete	4
Flexibility	Able to generate various ideas related to a problem using diverse approaches	No answer provided	0
		Provides an irrelevant or incorrect answer	1
		Provides varied answers, but still relevant to the problem	2
		Provides varied answers, but only some are consistent with the interpretation of the problem	3
		Provides varied answers that are fully consistent with the interpretation of the problem	4
Elaboration	Able to develop a detailed explanation of a given idea based on presented concepts	No answer provided	0
		Develops an idea, but the answer is incorrect	1
		Develops an idea, and the answer is correct but incomplete	2

Originality	Able to identify unusual or rare problems and generate different solutions from those commonly proposed by others	Develops an idea in detail, but some parts of the answer are still incorrect	3
		Develops an idea in detail, and the answer is entirely correct	4
		No answer provided	0
		Proposes an idea similar to that of most students, but the idea has not been completed	1
		Proposes an idea similar to that of most students, but the idea has been completed	2
		Proposes an independent idea classified as unique or novel, but the idea has not been completed	3
		Proposes an independent idea classified as unique or novel, and the idea has been completed	4

Results and Discussion

The quantification of students' creative thinking abilities was derived from the results of the initial (pretest) and final (posttest) tests. This experiment compared the

effectiveness of the guided inquiry model implemented in the experimental group with the direct instruction model applied in the control group. The development of students' creative thinking abilities, both before and after the intervention, is presented in detail in Table 2.

Table 2. Mean Scores of Pretest and Posttest on Students' Creative Thinking Ability

Class	N	Min	Max	Mean	Std. Deviation
Pretest Control Class	10	31.25	88.75	52.95	13.150
Posttest Control Class	12	48.75	83.75	64.61	8.050
Pretest Experiment Class	14	12.50	75.00	49.13	12.180
Posttest Experiment Class	12	30.00	80.00	57.02	11.540

Based on the data presented in Table 2 and Table 4.1, students' creative thinking skills in both the experimental and control classes improved after the learning process was implemented. In the experimental class, the mean pretest score increased from 52.95 to 64.61 on the posttest. The minimum score also increased from 31.25 to 48.75, although the maximum score decreased from 88.75 to 83.75. This increase in the mean score indicates that implementing the guided inquiry learning model contributed to the development of students' creative thinking skills. In addition, the standard deviation in the experimental class decreased from 13.150 on the pretest to 8.050 on the posttest, indicating that the distribution of students' scores became more homogeneous after the treatment.

Meanwhile, the control class also showed an improvement in students' creative thinking skills after the learning process. The mean pretest score of 49.13 increased to 57.02 in the posttest. The minimum score increased from 12.50 to 30.00, while the maximum score rose from 75.00 to 80.00. These data indicate an improvement in students' creative thinking skills in the control class, although the increase was smaller than that in the experimental class. The standard deviation in the control class decreased from 12.180 on the pretest to 11.540 on the posttest, indicating that students' ability variation became more evenly distributed after the learning process was implemented.

Before hypothesis testing was conducted, the students' creative thinking score data were first subjected to prerequisite tests, including the normality test using the Shapiro-Wilk method and the homogeneity test using Levene's Test. The normality test was performed using IBM SPSS Statistics version 31.0.2. The detailed results of the normality test for both pretest and posttest data in the experimental and control groups are presented in Table 3.

Table 3. Results of the Normality Test of Creative Thinking Ability in the Experimental and Control Groups

Group	Significance	Conclusion
Pretest Experiment	0.243	Normal
Posttest Experiment	0.173	Normal
Pretest Control	0.522	Normal
Posttest Control	0.964	Normal

The criterion for the normality test states that the data are considered normally distributed when the significance value is greater than 0.05. Based on the analysis results, the significance values for all variables, including the experimental group pretest, control group pretest, experimental group posttest, and control group posttest, were consistently above the threshold of 0.05. Therefore, it can be concluded that all research data were normally distributed.

Table 4. Results of the Homogeneity Test of Creative Thinking Ability in the Experimental and Control Groups

Group	Sig. Based on Mean	Sig. Criterion ($\alpha = 0.05$)	Conclusion
Pretest of Control and Experiment Group	0.409	0.243	Homogeneous
Posttest of Control and Experiment Group	0.032	0.173	Not Homogeneous

The data that had been confirmed as normally distributed were subsequently subjected to a homogeneity

test using Levene's Test with the assistance of IBM SPSS Statistics version 31.0.2. The homogeneity test was conducted to determine the equality of variances between groups. The results of the homogeneity test are presented in Table 4.

Based on the testing criteria, the data are considered to have equal variances (homogeneous) when the significance value is greater than 0.05. The pretest data met this assumption, with a significance value of 0.409. However, at the posttest stage, the analysis showed a significance value of 0.032, indicating that the assumption of homogeneity was not fulfilled for the final research data.

The results of the homogeneity test were considered when determining the appropriate statistical test for hypothesis testing. Hypothesis testing was conducted using the Mann-Whitney U test in IBM SPSS Statistics version 31.0.2. This non-parametric test was applied to examine differences in students' creative thinking ability scores between the experimental and control groups after the intervention. Since the data did not meet the assumption of homogeneity of variances, the Mann-Whitney U test was considered more appropriate than the Independent Samples t-test. A summary of the hypothesis testing results is presented in Table 5.

Table 5. Results of the Mann-Whitney U

Group	N	Mean Rank	Sig. (One-Sided <i>p</i>)
Experiment	33	40.14	0.005
Control	33	26.86	0.005

Based on the results of the hypothesis testing using the Mann-Whitney U test, the Asymp. Sig. (one-sided *p*-value) was obtained as 0.005, which is lower than the significance level of 0.05. This result indicates that H_0 is rejected and H_a is accepted. Therefore, there is a significant difference in students' creative thinking skills between the experimental and control classes.

The mean rank of the experimental class (40.14) was higher than that of the control class (26.86), indicating that students in the experimental class tended to have better creative thinking skills compared to those in the control class. These findings suggest that implementing the guided inquiry learning model improves Grade VIII students' creative thinking skills on the topic of Work and Energy at MTs Madinatussalam.

The guided inquiry learning model actively stimulates and facilitates students' efforts to address a range of problems [13]. The relevance of this model in improving creative thinking skills lies in positioning students as the main subjects in the knowledge discovery process [14]. This is in line with the research findings from the Mann-Whitney U hypothesis test, which yielded a significance value of 0.005 (< 0.05). These data provide strong evidence that implementing the guided inquiry model significantly improves Grade VIII students' creative thinking skills on the topic of Work and Energy at MTs Madinatussalam.

The guided inquiry learning model implemented in the experimental class was carried out in accordance with the designed learning stages, as evidenced by the implementation observation sheet, which indicated that the learning syntax was properly executed throughout the

learning process. The nature of guided inquiry provides students with opportunities to actively observe problems, formulate hypotheses, collect information, process findings, and draw conclusions under the teacher's guidance [15]. Such a process is relevant to the development of creative thinking skills because students do not merely receive explanations but are trained to generate ideas, consider various possible answers, and formulate solutions more openly [16].

The results of this study also indicate that the initial abilities of both classes were relatively similar, as shown by the average pretest scores of 52.95 in the experimental class and 49.13 in the control class. After the treatment was administered, the average posttest score of the experimental class increased to 64.61, while that of the control class increased to 57.02. This difference in final outcomes indicates that the guided inquiry learning model is more effective in stimulating students' creative thinking skills. The significance of the model's effect was also confirmed through previous inferential statistical analyses. This pattern of superiority in the experimental class is consistent with findings [17], which stated that implementing innovative learning models in experimental classes tends to produce more optimal learning outcomes than in control classes.

The implementation of guided inquiry learning in the experimental class required students to be actively involved. This involvement was evident when students were not only receiving explanations of the material but also directed to observe phenomena, respond to guiding questions, engage in group discussions, formulate hypotheses, conduct simple investigations, and present their findings to the class. Such learning situations provide broader opportunities for students to develop fluency of thought, flexibility in expressing answers, and confidence in expressing ideas. The findings of this study support the argument that the model can facilitate an integrative learning cycle [18]. By combining stages of observation, problem formulation, teamwork, and public discourse through presentations, the guided inquiry model creates opportunities for students to explore ideas creatively. The entire sequence of processes is important in enhancing students' creative thinking capacities.

During the first meeting in the experimental class, guided inquiry learning began with the stages of investigating a phenomenon and focusing on questions. With initial guidance from the teacher, students were first directed to observe images of a person pushing a box and pushing a wall, then guided to answer questions about force, displacement, and work. Subsequently, the teacher guided students in organizing themselves into groups to encourage more active discussions and facilitate the exchange of ideas. Activities in Investigation Worksheets 1 and 2 showed that students were not only asked to determine which events represented work and which did not, but also to identify various activities shown in the images that they believed involved work, explain their reasoning, and create other similar situations based on their daily experiences. Such task demands indicate that the initial syntax of guided inquiry plays a role in developing fluency, as students are required to generate more than one relevant answer and to begin demonstrating originality by creating new examples using their own language and self-generated situations.

Findings from the learning process revealed that students' responses evolved from initially brief answers to

more varied explanations. Responses such as “pushing a stalled car is considered work because the car moves,” “lifting a sack of rice is considered work because there is force and upward displacement,” or “pushing a wall is not considered work because there is no displacement” indicate that students began to connect concepts with examples. Other responses, such as pulling a suitcase at a station, lifting a gallon of water, or kicking a ball until it moves, demonstrate that students not only understood the concept of work but also became more fluent in generating ideas from different situations. However, during implementation, some students remained passive in group discussions and tended to follow their peers’ answers rather than develop their own ideas. In addition, some students still had difficulty distinguishing between the concepts of force and work, thus requiring more teacher guidance. This finding is consistent with the stated view that the success of group learning is strongly influenced by the active participation of each group member [19].

At the second meeting, students observed the phenomena of pushing or pulling a table and compared them with a person running on a treadmill. They then formulated hypotheses regarding the relationships among the magnitude and direction of force, displacement, and work. This activity fostered flexibility and elaboration because students were not merely expected to provide a single answer but to view a problem from multiple perspectives. Findings during the learning process showed that students began to explain differences among conditions with more complete reasoning. Nevertheless, not all students were able to formulate hypotheses independently within their groups. Some students were still confused about how the variables were related, causing discussions to take longer and requiring additional teacher guidance to help students understand the differences among the observed conditions.

Development was also evident during the third meeting, when students recorded their observations. At this stage, some students had difficulty identifying variables and arranging experimental procedures. Students were also confused about organizing the experimental steps systematically, thus requiring additional guidance from the teacher so that observation activities could proceed according to the learning objectives. Furthermore, some students were inaccurate in recording observation results, resulting in considerable variation in data across groups. This condition caused the analysis process to take longer because each group had not yet become independent in conducting its own observations. This finding is consistent with the opinion that teacher guidance in guided inquiry learning remains an important factor in enabling students to carry out the investigative process optimally [20].

At the fourth meeting, the stages of constructing new knowledge and communicating new knowledge became increasingly evident in fostering fluency. Students were asked to identify various uses of energy in their surroundings, explain different ways of utilizing energy, propose electricity-saving measures, and describe energy transformation processes, such as how solar panels can generate electricity to light a lamp. Such tasks provided students with opportunities not merely to repeat learned material but also to generate new, more contextualised ideas [21].

Responses such as “electrical energy is used for lamps, fans, refrigerators, and televisions,” or “solar energy can be used for drying clothes, powering solar panels, and supporting plant photosynthesis” indicate the development of fluency because students were able to generate several examples simultaneously. Other ideas proposed by some groups, such as creating a duty schedule to turn off lights and fans when the classroom is empty or opening windows during the daytime to reduce the need for lighting, demonstrate originality, as students began to formulate solutions relevant to their own environment. However, many students still generated relatively simple ideas and tended to follow the teacher's examples, indicating that originality had not yet developed evenly among all students.

These findings demonstrate that the improvement in creative thinking skills observed in this study was reflected not only in the higher posttest scores of the experimental class but also in the improved quality of students’ responses throughout the guided inquiry learning process [22]. Fluency developed when students were required to generate numerous examples; flexibility emerged when they compared several conditions; elaboration increased when experimental results had to be explained scientifically; and originality became evident when students were asked to formulate their own solutions or ideas based on the concepts of work and energy [23].

This condition differed from that of the control class, which also participated in learning activities but had fewer opportunities to explore ideas, test hypotheses, and construct answers independently compared with the experimental class. This situation indicates that the more active and structured learning experiences provided in the experimental class were among the factors supporting the development of students’ creative thinking skills. Differences in learning experiences between the experimental and control classes contribute to differences in students’ final learning outcomes [24].

At the end of the learning process, students were given a posttest to assess their abilities following the learning activities. The average posttest score in the experimental class was 64.61, indicating an improvement over the average pretest score of 52.95. This improvement demonstrates that students’ creative thinking skills developed after the implementation of the guided inquiry model [25]. This result is closely related to the use of a learning model that provides opportunities for students to actively observe problems, formulate hypotheses, collect data, process information, and draw conclusions. These findings are consistent with the study [26], which found that implementing the guided inquiry model can develop students’ creative thinking skills.

The influence of the guided inquiry model on creative thinking skills can be explained through the dimensions of creativity itself, namely fluency in generating ideas, flexibility in thinking, originality of ideas, and elaboration of responses. When students are confronted with questions or phenomena, they are not merely required to recall concepts but must also formulate alternative answers, compare possibilities, interpret evidence, and refine their ideas in response to feedback. Such a sequence of activities provides opportunities to develop diverse ideas while simultaneously demanding deeper reasoning.

Conclusion

Based on the research conducted, the implementation of the guided inquiry learning model had an effect on the creative thinking abilities of eighth grade students on the topic of work and energy at MTs Madinatussalam. Students' active involvement was evident in each stage of the learning process, starting from identifying problems, which trained fluency and elaboration, formulating hypotheses, which encouraged originality, collecting and analyzing data, which developed flexibility, and drawing conclusions, which enhanced elaboration. This active involvement provided students with opportunities to generate, develop, and explore various ideas in solving problems, thereby supporting the development of their creative thinking abilities.

Author's Contribution

N.H. Ainanur: Conceived and designed the study, carried out data collection, conducted statistical and data analyses, and drafted the manuscript. H. Simatupang: Provided conceptual direction, supervised the research procedures and methodology, and critically reviewed as well as revised the manuscript. L. Parapat: Contributed as a subject-matter practitioner by providing classroom insights through interviews and facilitating access to the research setting.

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