Improving High School Students' Creative Thinking Skills through Role-Playing Learning Models on Digestive System Material

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Abstract

This research This exploration intends to further develop understudies' innovative reasoning abilities through role-playing learning models on the digestive system material at senior high school of SMAN 2 Sidikalang, Dairi Regency. In order to accomplish this goal, A quasi-experimental with a nonequivalent control group was utilized in a quantitative study design. There were 60 subjects in all; The experimental and control group was using 30 person second grade (XI) MIPA on each part. the hypothesis was tested using t-independent data analysis to see how much influence and there was a difference in the students ability for creative thinking between the class that exclusively used the conventional method of learning and other class. The data for this study used an instrument, namely essay questions in the form of pre-test questions (before being treated) and post-test questions (after being treated), to quantify creative thinking skill. The SPSS v26 factual investigation results showed that The experimental class had an average worth of 80.00, whereas the control class had an average worth of 75.00, the T-test was performed to further demonstrate whether the difference was significant, where the Sig value (2-tailed) was 0.027 <0.05. In descriptive statistics, There were differences in the average level of creative thinking among students in the experimental and control groups. The t-test results showed that there was a significant difference between role-playing and simulation learning in terms of enhancing students' capacity for creative thinking skill.

Keywords: *Creative Thinking; Digestive system; Role Playing and Simulation Learning*

INTRODUCTION

Prevent and solve the problems of the twenty-first century, students must possess the 4 C's: communication, critical and decisive thinking, imaginative thinking, and work skills (Hudayati et al., 2021). It is imperative to cultivate the capacity to think imaginatively through educational experiences. Creative thinking, associated with

mental capacity and the pursuit of solutions to problems, is a component of imaginative thinking. Especially in a global economy reliant on science, the capacity to think imaginatively is crucial for all individuals (Haka et al., 2020).

Creative thinking is one of the peak developments in a person's growth stages. 5 indicators of creative thinking according to Guilford (1980) are (1) *fluency* (2) *fleksibilitas* (3) *orisinalitas*, (4) *elaborasi* (Ruzniar et al., 2018). Education is significantly impacted by the ability to think with creativity. The significance of the capacity to think creatively is contingent upon four factors, namely: 1) the capacity to solve a variety of problems in a variety of ways; 2) the production of valuable items for oneself; 3) the provision of satisfaction to individuals; 4) the skill to enhance the quality of life for humans. Biology education experiences can be utilized enhance creative thinking skills (Azzahra et al., 2023). According of the TIMSS (2015) were called for Trends in International Mathematics and Sciences Study, which demonstrate that Indonesia ranks 44th out of 49 countries with a score of 397, indicating a dearth of creative reasoning skills. Their lack of imaginative reasoning will influence students' inability to solve problems (Mukti & Soedjoko, 2021). The digestive system was selected as a subject because it has the potential to demonstrate the creative skills of students in the field of biology (Agustina et al., 2019).

Interviews and observations with Biology subject teachers reveal that There is no previous history of using the role-playing simulation learning approach in a teach or learning process, especially when it applies to the digestive system material at SMA Negeri 2 Sidikalang. Aspects of discussion and group work are practical in this material, but the student learning outcomes are less innovative and varied. Observations also indicate that students are less enthusiastic about learning, which results in less than satisfactory learning outcomes. Lecture and discussion are educators' primary learning models when instructing students on digestive system topics. Even though group work is implemented at each meeting, discussions are less effective. Learning needs to be more integrated and more teacher-centered. In this model, the teacher exclusively provides students with informative information. Students' Fluency, flexibility, originality, and elaboration, an each of the four elements of creative thinking are also less effective due to their lack of creativity, which is also evident. It affects the creative thinking skills and low learning outcomes of students, as well as their unsatisfactory test scores.

It necessitates the implementation of learning variations that are engaging, innovative, and more interactive for students. Learning models function as extrinsic motivation tools, as they can enhance student learning outcomes by stimulating students from the outside. The role-playing model is one learning model that can potentially engage students. This model allows each student to acquire a learning experience and develop their knowledge. Nevertheless, the role-playing model does not apply to all subjects, as it entails the reenactment of an event. This model is appropriate for materials defined by events, processes, or mechanisms, such as the digestive system. In practice, the activity continues with discussions in small groups after the acting is completed.

To motivate students to take part fully in the educational experience, it is necessary to implement suitable learning models. Role-playing is one model that can be implemented or implemented during the biology learning process. Models of role

playing Nurhasanah et al., (2016) are learning model in which students can take engagement with the process of learning either directly or indirectly, mastering demonstration material that is modified according to the student's level of imagination and interest without being limited by the teacher but still being directed by the teaching material.

According to Siska (2011) young person's behavior can be inferred from their role-playing. This action is explicated by employing the narrative in the article and the repetition of remembered pleasant behavior. Applying the role-playing model to the subject matter is anticipated to foster a greater sense of motivation and interest among students. It, in turn, has the potential to enhance students' learning outcomes. The observations mentioned above can be used to identify any issues that may arise concerning this research. Therefore, it is imperative to conduct research to ascertain whether pretend learning strategies have an impact on students' ability for creative thinking skill when working with the framework material. This learning model will aid in students' comprehension of the material and facilitate the completion of lessons for both teachers and students.

Rahayu et al., (2024) conducted previous research on the influence of role-playing on high school students' creative thinking revealed that the experimental group fared better than the control group because role-playing is an effective learning strategy that may involve students in the process of learning, thereby fostering an increase in their creative thinking skills. Additionally, previous research has extensively explored role-playing models but has yet to address the students' creative thinking skills, instead concentrating on the results. Student learning (Aura et al., 2022), critical thinking skills (Rahmadani, 2022), and student learning activities (Umratun, 2017). Nevertheless, this research presents a chance for researchers to evaluate students' creative thinking skills on digestive system material by employing role-playing models. Subsequently, it concentrates on students' learning activities (Umratun, 2017). Nevertheless, this research presents a chance for researchers to evaluate students' creative thinking skills on digestive system material by employing role-playing models.

METHOD

The quasi-experimental method was used in this investigation along with a quantitative strategy. study design using a nonequivalent control group in a quasi-experiment. The research design (nonequivalent control group design) is shown in Table 1.

Population and Sample

The even semester of the study project was completed in the 2023/2024 academic year. The study was carried out at senior high school of SMA Negeri 2 Sidikalang in Jl. Clean Water No.46-57, Batang Beruh, Kec. Sidikalang, Dairi Regency, North Sumatra 22219. All students were the population of interest in this investigation of the Science second grade of senior high school, called as class XI MIPA at SMA Negeri 2 Sidikalang, total population is 214 students. Meanwhile,

The Cluster Random Sampling method was used to get the samples in this population. An each group using thirty students for class XI MIPA 1 as experimental group, and class XI MIPA 2 as control group.

Table 1. Research design (nonequivalent control group design)

Class	Pre-test	Treatment	Post-test
E	O_1	X	O_2
K	O_3	-	O_4

Information :
E : Experimental class Control class
O_1: Pre-test experimental class
O_2: Post-test experimental class
O_3 : Pre-test control class
O_4 : Post-test control class

X: The treatment given is a role playing and simulation learning model on the digestive system material
- : No treatment given

Instrument

The instrument involved a written test with imaginative reasoning instructions as exposition. Article tests were given during additional explanatory questions are included in the pre- and post-tests, and the validator assesses their validity and reliability test. Test validity is assessed during the evaluation process instrument for each item was adjusted to the indicators of creative thinking. Analysis of creative thinking skills was scored through a written description exam, the results of which were calculated using a formula. The formula used to calculate the proportion of students' creative thinking scores was modified (Riduwan, 2015), specifically by multiplying the result by 100% and dividing the score by the maximum test score.

$$\% \text{ Creative Thinking Skill} = \frac{obtained\ score}{maximum\ score}\ x\ 100\%$$

This research involveed tools in learning, including the Learning Implementation Plan (RPP) and also LKPD.

Procedure

There were three phases to this study project: arrangement, implementation, and improvement. While getting ready in the preparation stage, initial observations were carried out, determining the research population and sample, preparing a learning implementation plan (RPP), making student worksheets (LKPD), preparing instrument grids, assessments, essay questions, and interviews with teachers and students. The implementation phase involved two classes: the experimental moreover, the control class. Both classes received the same treatment at the beginning of the learning activity: a pre-test of one essay question according to creative thinking indicators. Furthermore, the experimental class was given treatment through role playing and simulation learning, while the control class used the lecture method. A final test consisting of essay questions is given at the end of the lesson.

The steps for the role-playing learning model (Hudayati et al., 2021) were:
1. The teacher arranged/prepared the scenario to be shown
2. The teacher appointed several students to study the scenario
3. The teacher formed student groups
4. The teacher provided an explanation of the competencies to be achieved
5. The students did a role playing with one of the group representatives
6. Each student observed and worked on the LKPD that is distributed
7. Each group presented its conclusions
8. The teacher provided general conclusions and evaluations

Table 2. Creative thinking questions (Luthfiyah et al., 2019)

Indicator of creative thinking skill	Measured aspects	Question form	Cognitive aspect
Fluemcy	Providing more than one answer	Essay	C4
Flexibility	Providing various interpretations of an image or problem	Essay	C4
Elaboration	Providing correct solutions using his own language and thoughts	Essay	C4
Originality	Providing detailed ideas or answers by writing down the steps	Essay	C4

Data Analysis

The data analysis method employed the t-test for independent samples to ascertain if a distinction existed between the average of creative thinking among students in the experimental-control class and to derive conclusions by identifying distinct data groups according to Sudaryono (2021). The data was initially assessed for homogeneity and normality prior to using the t-test to evaluate the research hypothesis about the impact of each variable.

The Kolmogorov-Smirnov test was employed in this normalcy test, which employed the following benchmarks to ascertain if the data distribution is normal category or not (Herlina, 2019): a. The null hypothesis (H0) was rejected and the data was deemed normally distributed if the significance level (Sig) was greater than (> 0.05). b. The data may not have been regularly distributed if the sig value was less than (< 0.05), the null hypothesis (H0) was accepted.

The homogeneity test stage was conducted using SPSS to determine whether the dependent variable had the same variance in each category of the independent variable demonstrated by Levene's test of Equality of Error variance, Slamet & Andhita (2020) which was determined by the sig value and the following conditions:

- If the Levene's test value had a sig value <0.05, then H_0 was rejected, which meant the that the data group had different variants or was not homogeneous.
- If the Levene's test value had a sig value > 0.05, then H_0 was accepted, which meant the data group had the same variance or was homogeneous.

RESULTS AND DISCUSSION
Results

Based on this research, the role-playing learning model is the independent variable, and the capacity for creative thought is the dependent variable. The data regarding creative thinking abilities was obtained through tests in the form of essay questions. The researchers collected data from classes that used the role playing learning model to measure the effectiveness of the learning program. The data analysis was carried out using SPSS 26.0.

Before being given to students, the validity of the pre- and post-test questions was evaluated in the experimental and control classes. First of all, the researchers used SPSS 26.0 to carry out validity and reliability tests. Table 3 presents the results of question validity calculation. Table 3 presents the results of question validity calculation

Table 3. Results of Question Validity calculation

Question	R_{count}	r_{table}	Information
1	1,000	0,632	Valid

Because the value of the calculation results carried out is $r_{count} > r_{table}$, the data in table 3 shows that question 1 is valid as a research data collection tool, so this conclusion can be drawn (Wiratna, 2014). Table 4 presents the results of calculating the reliability of questions.

Table 4. Tesults of calculating the reliability of questions

Question	r_{table}	Cronbach's Alpha	Information
1	0,632	1,000	Reliable

Considering that the Cronbach's Alpha value is greater than r table in table 4, it can be concluded that question 1 is valid as a research data collection tool (Wiratna, 2014). In addition, the average value, or frequency and percentage, of the pre- and post-test outcomes is compared to obtain the data. The findings of the descriptive statistics are shown in Table 5. Table 5 presents that the pre-test result data shows differences from the experimental class, with a mean pre-test score of 42.00, a standard deviation of 7.944 and a variance of 63.103, with a minimum score of 25 and a maximum score of 55. The control class, on the other hand, has an average pre-test score of 30.33. with a standard deviation of 12.452, a variance of 155.057, a minimum of 0, and a maximum of 50. Furthermore, the students' creative thinking

post-test data shown to be different from the post-test from the experimental class, which applied the learning paradigm of role-playing and simulation.

Table 5. Descriptive Statistics Results

Data	Pre-test Eksperiment	Post-test Eksperiment	Pre-test Control	Post-test Control
Mean	42,00	80,00	30,33	75,00
Median	42,50	80,00	32,50	75,00
Std. Deviation	7,944	7,428	12,452	9,469
Variance	63,103	55,172	155,057	89,655
Minimum	25	65	0	50
Maximum	55	95	50	90

The results for that class had an average score of 80.00, a standard deviation of 7.428, a variance of 55.172, a minimum 65 or more, with a maximum score of 95. Meanwhile, the average score of the control class was calculated using the conventional model was 75.00, standard deviation 9.469, variance 89.655, minimum 50, and maximum 90. The results obtained from the descriptive statistical analysis were then tested for normality and homogeneity. Table 6 presents the results of normality test.

Table 6. Normality Test

Class		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	Df	Sig.	Statistic	Df	Sig.
Results	Experimental class pre-test	0,147	30	0,096	0,946	30	0,130
	Experimental class post-test	0,150	30	0,081	0,943	30	0,110
	Control class pre-test	0,156	30	0,060	0,939	30	0,088
	Control class post-test	0,135	30	0,174	0,953	30	0,206

Table 6 presents that the normality test results using the Liliefors test are obtained with a degree of significance if the α value > 0.05; then, the data is usually distributed. It is known that the experimental pre-test with A post-experimental test with a significance value of 0.081 > 0.05 indicates that the data are normally distributed, and a significance value of 0.096 > 0.05 indicates that the data are normally distributed. In the same context, a pre-control test with a significance level of 0.60 or more indicates that the data are normally distributed. Moreover, the control post-test with a significance value of 0.174 > 0.05 is usually distributed, and then hypothesis testing can be carried out parametrically using the independent sample t-test. Table 7 presents the homogeneity test.

Table 7. Homogeneity Test

Test of Homogeneity of Variances

		Levene Statistic	Sig.	Information
Student learning outcomes	Based on trimmed mean	1,596	0,212	Homogeny

The homogeneity test aims to determine whether the research data is homogeneous or not. Levene's test is used for this test. Table 7 displays the data testing results for practice questions, with a levene value of 1.596 and a critical value based on an average of 0.212>0.05. The homogeneity test of the dependent variable produces a sig value greater than 0.05, indicating that the Levene test's information requirements are homogeneous. Therefore, this research uses statistical tests to compare two unpaired samples using statistical analysis. Because of the post-test scores from the experimental and control classes, the two unpaired classes will be the focus of this review. Table 8 presents the results of statistical analysis results

Table 8. Statistical Analysis Results

Group Statistics

	Class	N	Mean	Std. Deviation	Std. Error Mean
Student learning outcomes	Experimental class	30	80,00	7,428	1,356
	Control class	30	75,00	9,469	1,729

Table 8 presents that the amount of information about creative thinking abilities is known. Thirty students made up the experimental and the control class. The average post-test score for the experimental class was 80.00, whereas the control group scored 75.00 on average. Therefore, the average difference in the experimental and control classes' students capacity for creative thinking abilities can be known from descriptive statistics.

Following the conventional and homogeneous distribution of the material, a supposition test employing the t-test is conducted to see whether learning the role-playing model significantly differs from habitual techniques in terms of students' ability for creative thinking. Table 9 presents independent ample hypothesis test results using t-test for creative thinking skill.

Table 9. The Hypothesis Test Results using t-test for Creative Thinking Skill

Independent Samples Test

		t-test for Equality of Means
		Sig. (2-tailed)
Results	Equal variances assumed	0,027
	Equal variances not assumed	0,027

Table 9 presents that the Sig (2-tailed) hypothesis test value is 0.027 < 0.05, so H_a is accepted. The dynamics of evaluation in the free Independent t-test differ

significantly between students' creative thinking abilities on digestive system material using the role-playing and simulation learning model in the experimental class and everyday strategies in the control class.

Discussion

The role-playing model is an educational experience in which students imitate an action or act as an artist in a manner that is not predetermined to achieve specific learning objectives, such as reliving an honest atmosphere (Ertmer & Letwich, 2010). Students can employ role-playing techniques to acquire the skill to solve individual problems with the assistance of groups that consist of their friends (Yanto, 2015). Role-playing can enhance communication, inference, application, and observation skills (Lutfri et al., 2020). Role-playing also serves a practical purpose as a method for students to (1) investigate their emotions, (2) identify motivation and comprehension that influence their thought patterns, values, and perceptions, (3) cultivate critical thinking skills and imaginative perspectives, and (4) gain a comprehensive understanding of the subject matter (Uno, 2014).

The aim of the pre-test and post-test in the experimental and control classes is to assess the creative reasoning skills of students in class XI SMA regarding the digestive system. The control and experimental classes were administered identical examinations to determine how much the students comprehended the material being taught. The research findings indicate that the role-playing simulation learning model at SMA N 2 Sidikalang can potentially enhance students' creative thinking skills. The pre-test and post-test results indicate that students' creative thinking abilities have improved. In everyday life, the mind executes actions through the activity or process of thinking (Fahrurrozi et al., 2022). The results will illustrate the creative thinking cycle in individuals or students. A unique reasoning interaction is the result or consequence of a particular component of the creative reasoning cycle, and the reasoning process is conducted in novel and unexpected ways. Consequently, creative thinking skill is a cycle of human reasoning that is designed to generate novel ideas (Irham & Ardy, 2017). In conventional classes, the average learning outcomes of students with creative reasoning abilities increased from 30.33 to 75.00. In contrast, the experimental class that utilized the role-playing model increased from 42.00 to 80.00, according to the research results. The t-test results indicate that the role-playing learning model significantly increases learning outcome scores compared to conventional strategies.

According to the research and observations of the activities conducted by students during the research, classes that employ conventional learning and those that employ role playing and simulation models are distinct. Students who engage in casual study frequently need more interest and attempt to disregard the instructor's explanations. They are not participating in the question-and-answer session, and their capacity to think creatively about the material being taught needs to be improved. Consequently, more than conventional education is needed.

In contrast to the experimental class, which employs the role-playing learning model, the learning environment in the class is more engaging and enjoyable because students are previously unfamiliar with this model. Students are liberated, and exhibit increased creativity in problem-solving and thinking. The teacher is a

facilitator, allowing students to engage with the material, be creative, and take action. Additionally, the class competes and collaborates among its groups to articulate the outcomes of their critical thinking or discussions. In agreement with (Hamdayama, 2014), the benefits of role-playing include the skill for students to freely express and determine their opinions, the potential to increase collaboration, the skill for teachers to evaluate each student's comprehension through observations during role playing, and the provision of role-playing opportunities for development.

According to research conducted by previous researchers Rahayu et al., (2024), role-playing to ascertain the actions taken can encourage students to participate in their learning, thereby fostering the development of their creative thinking skills. Additionally, role-playing models have been shown to enhance students' conceptual comprehension and creative thinking capabilities, as indicated by data analysis. It encourages researchers to conduct additional research to investigate the potential of role-playing and simulation learning models on students' creative thinking abilities.

Based on the results of this research, there is a vast difference between classes taught using conventional strategies and classes taught using the role-playing learning model. Students who are taught using the role-playing learning model influence further development of students' creative thinking abilities because, during the learning experience, students get a new learning model so that they are more likely to understand the material presented and demonstrated by educators so that students become active, enthusiastic and happy. They are studying time.

CONCLUSION

The conclusion that can be drawn from the research and discussion above is that students in the experimental class who utilized role playing and simulation learning models had higher post-test scores. The post-test result in the experimental class was 80.00. The control class post-test was 75.00, so the role-playing simulation learning model influences students' creative thinking abilities. The role-playing simulation learning model focuses on students. At the same time, the teacher is only a facilitator; students are more creative in thinking and solving problems, and there is cooperation and competition between groups.

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