The Effects of Socio-Scientific Approach on Junior High School Students' Learning Outcomes

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ABSTRACT

In learning. students are expected to get success in learning. One of the factors that can influence the success of student learning is the selection of appropriate learning approaches. The Socio-scientific Issue learning approach is a learning approach that examines facts on an event based on social issues related to science in society. The purpose of this research is to find out and examine the effect of the socio-scientific issue learning approach on junior high school student learning outcomes. This type of research is quasi-experimental with quantitative data and processed using non-parametric statistical data analysis techniques to determine the effect of treatment on the dependent variable by controlling the independent variables. In this study. the results showed that the initial ability of the two groups was 31.8 for the control class and 21.8 for the experimental class. After the experimental class received learning using the Socio-scientific Issue approach. it obtained a better average score than the control class. namely 80.9 for the experimental class and 58.8 for the control class. Based on data analysis and discussion. it can be concluded that the Socio-scientific Issue approach has a significant effect on student learning outcomes.

1. INTRODUCTION

Learning is a process carried out to get changes in behavior for the better (Chusni. 2019). The learning process is expected to get success in learning. Learning outcomes are changes in behavior in the form of an improvement in a better direction in a person that can be observed and measured in terms of knowledge. attitudes. and skills (Hamalik. 2016). Learning success can be influenced by various factors. both internal factors (student interest and motivation) and external factors (family. school environment. and community environment). One of the factors that can be controlled by teachers in schools is teaching materials or learning approaches. if teaching materials are less attractive it can cause students' motivation or interest in learning to decrease. so that it will affect student learning outcomes.

The learning approach is a perspective on the learning process (Bastian & Reswita. 2022). The learning approach is a method or strategy used by the teacher to achieve learning goals (Rahim. 2021). The learning approach is used to obtain an educator's frame of mind in implementing learning activities so that they are efficient and have high effectiveness (Rachmawati. 2020). The student center learning approach is a learning approach that focuses on student's needs. abilities. interests. and student learning styles with the teacher as a facilitator in the learning process

Students play an active role in the learning process not only as recipients of knowledge (Baslini & Syafryadin. 2022). Natural Science (IPA) subjects can apply student-centered learning activities. In this science subject. students are expected to be able to use knowledge in the fields of science and technology to think critically by identifying questions. drawing conclusions based on existing evidence. and making changes to nature through human activity (Pertiwi dkk.. 2018).

Therefore. the learning approach is very important to achieve the learning objectives. The learning approach emphasizes the strategy and planning of activities that will be carried out during learning. One of the approaches that can be used in natural sciences is the socio-scientific issue learning approach. The socio-scientific issue learning approach is a learning approach that examines the facts of an event based on social issues within the community. This approach can train students in critical thinking or higher order thinking (Utami Dea Sismawarni dkk.. 2020).

Using the socio-scientific issue learning approach. it is hoped that students can develop the potential for scientific thinking and can improve students' communication skills (Lestari. 2020). According to Nava & Prasetyo (2018) the Socio-Scientific Issue learning approach is an approach related to the environment and issues around it. This approach demands students to think critically and think systematically. This approach uses observations or observations needed to formulate hypotheses or collect data (Suparsawan. 2020). The application of the Socio-Scientific Issue approach requires students to be active. Methods that can help the learning process using a scientific approach include: problem based learning. project based learning. inquiry. and group investigation (Budiyanto. 2016). According to research by Gulacar et al (2020) student learning motivation increases. students are able to make connections between information included in subject matter after using the Socio-Scientific Issue learning approach in the curriculum.

The advantages of the socie-scientific issue approach include: students are taught to solve problems. so students are easier to understand and realize in the surrounding environment. students can think critically and can improve students' ability to accept the material being taught (Putriana dkk.. 2018). Students are taught to solve problems. so that students more easily understand and realize the environment around them. Students can think critically. this approach has shown good results in improving students' ability to accept the material being taught (Putriana dkk.. 2018). According to Sadler in Nava & Prasetyo (2018) the Socio-Scientific Issue approach can train students' argumentation and reasoning skills from various perspectives.

Based on observations and interviews conducted by researchers. it was found that the teacher carried out learning activities using the lecture method. This learning method is believed to be the fastest method for completing the material. However. this method can cause students to easily get bored in learning activities. resulting in decreased student interest in learning which can lead to decreased student learning outcomes. Teachers need to pay attention to the right approaches and methods in carrying out learning activities so that students can acquire new knowledge that is fun and satisfying learning outcomes. Therefore. the purpose of this research is to identify and examine the effect of the socio-scientific issue learning approach on junior high school student learning outcomes.

2. MATERIALS AND METHODS

2.1. Type and Research Design

This research is included in the quasi-experimental research with non-equivalent group pretest-posttest research design. The research design is presented in (**Table 1**).

Table 1. Research Design

Group	Pretest	Independent variable	Posttest
A	Y1	X	Y2
B	Y2	-	Y2

Description:
Y1: control class
Y2: experimental class
X: experiment implementation

Quasi-experimental research is research conducted by measuring the effect of independent variables on the dependent variable with research subjects. namely humans (Sohilait. 2020). In this study the researcher will use two groups of subjects who will be randomly selected. then the researcher will give pretest questions to the two groups of subjects. Giving a pretest is done to determine the initial abilities possessed by students. Then the researcher will give treatment to one of the randomly selected groups. After the learning activities have been carried out. the researcher will give posttest questions to the two groups of subjects. Researchers will compare the changes in pretest and posttest scores and then compare the posttest scores between the two groups of subjects.

2.2. Research Place and Time

2.2.1. Research Place

This research was carried out in State Junior High Schools.

2.2.2. Samples and Sampling

2.2.2.1. Sample   : *this study used 2 classes with a total of 56 students. 1 class as experimental class and 1 class as control class.*
2.2.2.2. Sampling   : *Class sampling was carried out by cluster random sampling technique.*

2.3. Data and Data Sources

Data and data sources are presented in (**Table 2**).

Table 2 Data and Data Sources

Data	Sources	Method	Instrument
Student learning outcomes:			
1. Cognitive	Student	Test	Pretest and posttest question sheets
2. Affective	Student	Observation	Observation sheet
3. Psychomotor	Student	Observation	Observation sheet

2.4. Data Collection Techniques and Instruments

Data collection techniques in this study are:

2.4.1.   Test

The test was conducted to measure the knowledge possessed by students. Before questions with biotechnology material are tested on students. the questions must be validated by two experts. the questions must be validated by two experts. If the questions are declared feasible. the questions are tested on students and then tested for the validity of the items. discriminating power. level of difficulty. and reliability of the questions.

2.4.1.1. Validation Test.

This test was conducted to find out whether the questionnaire was valid or not to be used as a research data collection tool. The validity test in this study was carried out with the help of the IBM SPSS Statistics 20 program. The validity test results are presented in (**Table 3**).

Table 3. Validity Test Results

Question Number	r Table	r Count	Description
1	0.388	0.460	Valid
2	0.388	0.658	Valid
3	0.388	0.439	Valid
4	0.388	0.502	Valid
5	0.388	0.477	Valid
6	0.388	0.350	Invalid
7	0.388	0.420	Valid
8	0.388	0.527	Valid
9	0.388	0.458	Valid
10	0.388	0.475	Valid

2.4.1.2. Discriminating Power Test

The reliability test was carried out to determine the extent to which the questionnaire can be trusted or relied upon. The criteria for a research instrument are said to be reliable if the reliability coefficient (r_{11})> 0.6. or compared to the r table (Product Moment) if the Alpha Conbach reliability coefficient value is greater than r table. then it is declared reliable. and vice versa. Reliability test results are presented in (**Table 4**).

Table 4. Reliability Test Results

Reliability Statistics

Cronbach's Alpha	N of Items
.619	10

Known N = 26. α = 5% 0.05; N in 10 items. then the obtained r table is 0.388. From the output results. the value of r_{11} = 0.619 > t table = 0.388. it can be concluded that the questions are reliable.

2.4.1.3. Difficulty Level Test

Difficulty level test is used to find out if a question is included in the easy. medium or difficult category. According to Arikunto in Nurcahyanto (2018) Interpretation of the level of difficulty as contained in (**Table 5**).

Table 5. Interpretation of Difficulty Level

Difficulty level (TK)	Interpretation or Explanation TK
TK < 0.30	Hard
0.30 ≤ TK ≤ 0.70	Medium
TK > 0.70	Easy

The results of the Difficulty Level Test are presented in (**Table 6**).

Table 6. The results of the Difficulty Level Test

Question Number	Interpretation of difficulty level	Description
1	0.269	Hard
2	0.269	Hard
3	0.808	Easy
4	0.538	Medium
5	0.654	Medium
6	0.615	Medium
7	0.269	Hard
8	0.5	Medium
9	0.615	Medium
10	0.231	Hard

2.4.1.4. Differentiating Power Test

The differentiating power test is to find out the magnitude of the differential power of the items. According to Nurcahyanto (2018) Interpretation of the level of differentiating power as contained in (**Table 7**).

Table 7. Interpretation of Differentiating Power Levels

Differentiating Power (DP)	Interpretation or Explanation (DP)
DP ≥ 0.70	Very well
0.40 ≤ DP ≤ 0.70	Good
0.20 ≤ DP ≤ 0.40	Enough
DP < 0.20	Bad (Revise)

The results of the differentiating power level test are presented in (**Table 8**).
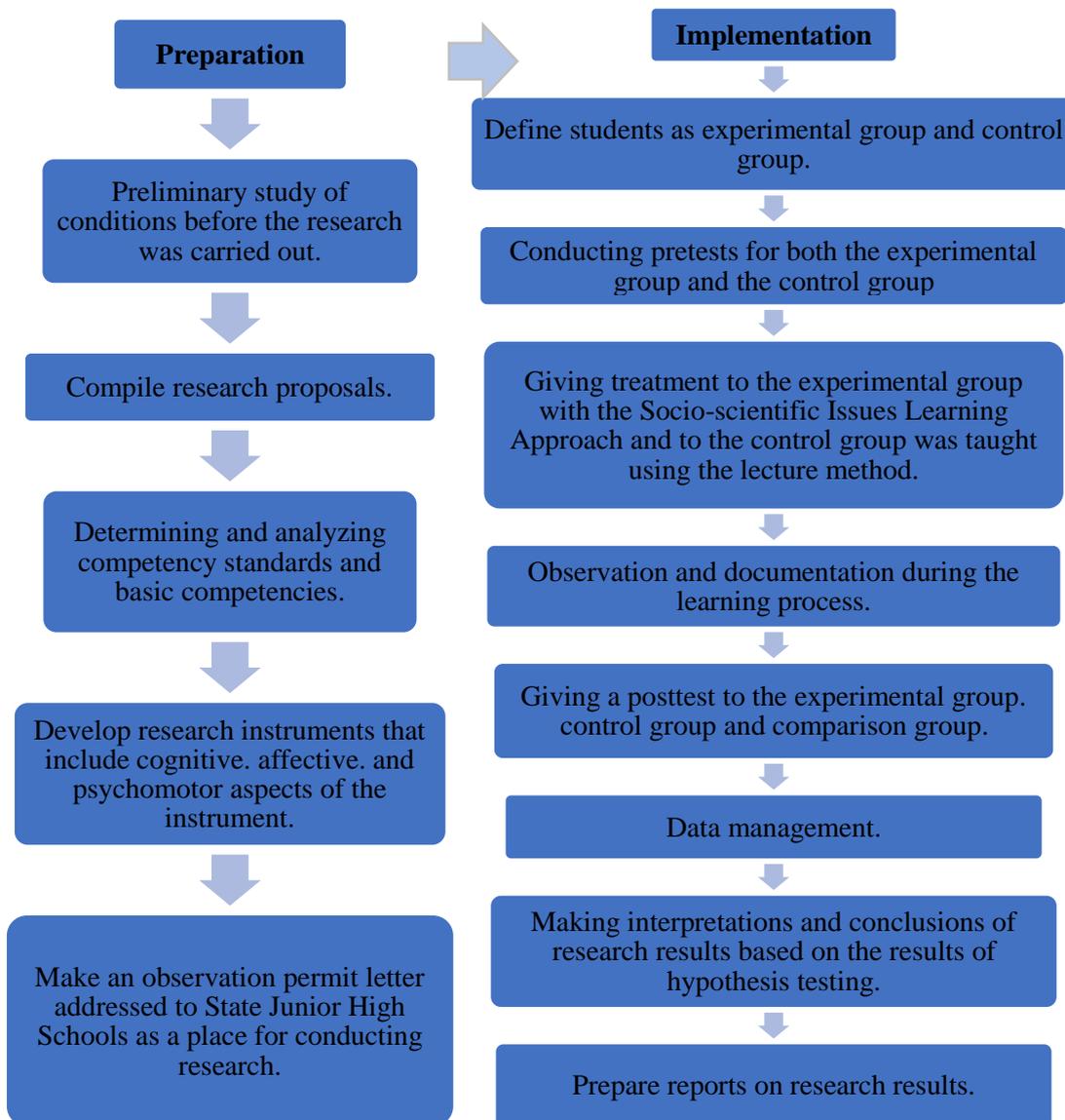
Table 8. The Results Of The Differentiating Power Level Test

Question Number	Interpretation of differentiating power level	Description
1	0.231	Cukup
2	0.231	Cukup
3	0.385	Cukup
4	0.461	Baik
5	0.384	Cukup
6	0.307	Cukup
7	0.231	Cukup
8	0.23	Cukup
9	0.307	Cukup
10	0.462	Baik

2.4.2. Observation

Make observations during the teaching and learning process to observe student activities during the learning process using a scientific approach by filling out the observation sheet provided. This research uses Participant Observation which allows researchers to be involved in activities carried out by the sample (Rahmawati & Amar. 2017).

2.4.3. Phases of Research Activity

Preparation

Preliminary study of conditions before the research was carried out.

Compile research proposals.

Determining and analyzing competency standards and basic competencies.

Develop research instruments that include cognitive. affective. and psychomotor aspects of the instrument.

Make an observation permit letter addressed to State Junior High Schools as a place for conducting research.

Implementation

Define students as experimental group and control group.

Conducting pretests for both the experimental group and the control group

Giving treatment to the experimental group with the Socio-scientific Issues Learning Approach and to the control group was taught using the lecture method.

Observation and documentation during the learning process.

Giving a posttest to the experimental group. control group and comparison group.

Data management.

Making interpretations and conclusions of research results based on the results of hypothesis testing.

Prepare reports on research results.

Figure 1. Implementation Activities Stages

2.5. Research Data Analysis

The data in this research is quantitative data. so the research data is processed using descriptive statistics to summarize the data so that it is easier to understand. This data analysis was carried out with the help of the IBM SPSS Statistics 20 computer program to process the research. Before the hypothesis test is carried out. it is necessary to carry out the prerequisite analysis test. namely the normality test and homogeneity test. The normality test was carried out to determine whether the data obtained from the population was normally distributed or not. The homogeneity

test was carried out to test whether the variation of the population was homogeneous or not for the two treatment groups (Nurcahyanto. 2018).

Prerequisite analysis test is carried out to find out the hypothesis test that will be carried out on research data. If the results of the normality test and homogeneity test are normally distributed and homogeneous data. the data can be tested by means of a parametric statistical test. However. if the results of the normality test and hygienity test are data that are not normally distributed and homogeneous. then the data can be tested by means of a non-parametric statistical test Kruskal Wallis (Misbahudin & Iqbal Hasan. 2022).

3. RESULTS AND DISCUSSION

This research is based on the results of observations and interviews that have been conducted in state junior high schools. where problems were found. namely the low learning outcomes of science subjects on certain materials. The lack of use of the learning approach resulting in a lack of student interest in learning is one of the causes of low student learning outcomes. Referring to these initial conditions. the researcher aims to determine the effect of the socio-scientific issue approach to learning on student learning outcomes. After being applied to learning activities. it is hoped that students will have an interest in learning so that students get better learning outcomes.

In this discussion. researchers will explain the differences in student learning outcomes with learning using the socio-scientific issue learning approach and learning without using the socio-scientific issue learning approach. The following is a description of the research results.

3.1. The Influence of the Socio-Scientific Issue Approach to Cognitive Learning Outcomes.

Cognitive learning outcomes data were obtained from pretest and posttest scores in both sample groups. The pretest was carried out to determine students' initial abilities while. it was carried out to determine the progress of students' abilities in Biotechnology and food production material after learning was carried out according to the treatment of each class. The following presents the results of students' cognitive learning in (**Table 9**).

Table 9. Cognitive Learning Outcomes After Studying The Material Of Biotechnology And Food Production

Description	Control Class		Eksperiment Class	
	Pretest	Postest	Pretest	Postest
N	28	28	28	28
Max	50	80	60	100
Min	25	35	10	65
Rata-rata	31.8	58.8	21.8	80.9
Standard deviations	7.9	8.3	11.4	13.6

After the posttest was carried out for the two sample groups. the pretest scores and posttest scores will be analyzed hypotheses using the help of the IBM SPSS 20 application to determine the effect of the socio-scientific issue approach on student learning outcomes. Before the hypothesis analysis is carried out. the data that has been obtained is carried out to test the prerequisite analysis first. Data analysis prerequisite test for normality analysis is presented in (**Table 10**). and the prerequisite test data for hypothesis analysis are presented in (**Table 11**) and (**Table 12**).

Table 10. Normality Test Data Analysis.

Tests of Normality

	Kelas	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Hasil Belajar kognitif	Pretest eksperimen	.328	28	.000	.707	28	.000
	Postest eksperimen	.260	28	.000	.826	28	.000
	pretest kontrol	.302	28	.000	.791	28	.000
	postest kontrol	.416	28	.000	.712	28	.000

a. Lilliefors Significance Correction

Table 11. Homogeneity Test Data Analysis

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Hasil Belajar kognitif	Based on Mean	1.850	3	108	.142
	Based on Median	1.607	3	108	.192
	Based on Median and with adjusted df	1.607	3	90.218	.193
	Based on trimmed mean	1.883	3	108	.137

Table 12. Homogeneity Test Data Analysis

Test of Homogeneity of Variances

Hasil Belajar kognitif

Levene Statistic	df1	df2	Sig.
1.850	3	108	.142

Based on (**Table 10**) Normality Test Data Analysis obtained a significance value of 0.000. Due to the significance value <0.05. it can be concluded that the data obtained is not normal. Based on (**Table 11**) and (**Table 12**) Analysis of Homogeneity Test Data obtained a significance value of 0.142. Due to the significance value > 0.05. it can be concluded that the variance of the data from these groups is the same (homogeneous). Both of these tests were carried out to determine the hypothesis test that would be carried out by the researcher. Therefore. the data obtained by the researcher was carried out by testing the non-parametric hypothesis.

The non-parametric hypothesis test uses the Kruskal Wallis test. which is an alternative test to the ANOVA test. The Kruskal Wallis test aims to test the difference between the dependent variable and the independent variable if the data scale of the dependent variable is ordinal but not normally distributed. The basis for decision making on the Kruskal Wallis test is based on a comparison of probability values (Asymp.sig.) If probability (Asymp.sig.) > 0.05. H0 is accepted and if probability (Asymp.sig.) < 0.05. H0 is rejected. Analysis of the Kruskal wallis hypothesis test is presented in (Table 13).

Table 13. Analysis Of The Kruskal Wallis Hypothesis Test

Test Statistics[a,b]

	hasil Belajar Kognitif
Chi-Square	34.343
df	1
Asymp. Sig.	.000

a. Kruskal Wallis Test

b. Grouping Variable: Kelas

Based on (**Table 13**) (Kruskal Wallis) above. the value of Sig. is 0.000. Because the Asymp.Sig. is smaller than the significance level (0.05). then H0 is rejected and Ha is accepted. It can be concluded that there is a statistically significant difference regarding the average cognitive scores of science subjects in Biotechnology material between the control class and the experimental class. So this means that the socio-scientific issue learning approach has a significant influence on students' cognitive values.

The application of the Socio-scientific issue learning approach is expected to improve students' cognitive learning outcomes. In this study. the results showed a significant increase in student learning outcomes in the experimental class. This can be seen in (**Table 9**) which shows that the average initial ability of the two groups was 31.8 for the control class and 21.8 for the experimental class. After the experimental class received learning using the Socio-scientific issue approach. it obtained a better average score than the control class. namely 80.9 for the experimental class and 58.8 for the control class. The results of the analysis of research data processed with non-parametric statistical Krusskal Wallis test obtained statistically very significant results.

This is in line with research conducted by Rosana & Hestiana (2020) on class VII students of SMP Negeri 6 Yogyakarta. it was found that science learning outcomes using the Socio-scientific issue approach had higher learning outcomes. The pretest and posttest scores of these students were then analyzed using statistical ANOVA hypothesis testing to obtain significant results. These results can be interpreted that the Socio-scientific issue approach affects the cognitive learning outcomes of class VII students of SMP Negeri 6 Yogyakarta. (Kartina dkk.. 2022) conducted research to find out the increase in the Minimum Competency Assessment Ability (AKM) through scientific learning in class VIII students of Payaraman 2 Public Middle School. the results showed increased student activity and AKM literacy abilities as seen from the learning outcomes. This can be interpreted that the socio-scientific issue approach has an effect on students' cognitive learning outcomes. Research conducted by Nava & Prasetyo (2018) which was conducted on class VII students of junior high school showed that science learning with the Socio-scientific issue approach significantly affected the scientific literacy of junior high school students.

3.2. The Influence of the Socio-Scientific Issue Approach to Affective Learning Outcomes..

This research was conducted by observing students during learning activities. Observations were made directly by observing and assessing student behavior during the student learning process and then the researcher recorded it on the observation sheet. Affective learning outcome data are presented in (**Table 14**).

Table 14. Affective Learning Outcome Data After Studying The Material Of Biotechnology And Food Production

Description	Control Class	Experiment Class
N	28	28
Max	100	100
Min	25	25
Average	36.2	42.4
Standard deviation	24.6	25.1

Based on the table above. it was found that the students' affective learning outcomes between the experimental class and the control class had not too much difference. These results indicate that the average of the two groups is 42.4 for the experimental class and 36.2 for the control class. This is in line with research that has been conducted by Siska et al (2020) which says that the Socio-Scientific Issue approach is an approach that is taken in the learning process requiring students to be able to play an active role. Thus the use of the Socio-Scientific Issue approach is expected that students will not only be able to improve cognitive learning outcomes but also be able to shape student character.

3.3. The Influence of the Socio-Scientific Issue Approach to Psychomotor Learning Outcomes

This research was conducted by observing students during the learning process. Observations were carried out by researchers directly by observing learning activities and then recorded in the observation sheet. The psychomorphic learning outcomes in this study included two things. namely students' enthusiasm in asking questions and students' enthusiasm in answering questions posed by teachers and other students. Psychomotor learning outcomes data are presented in (**Table 15**).

Table 15. Psychomotor Learning Outcomes Data After Studying The Material Of Biotechnology And Food Production

Description	Control Class	Experiment Class
N	28	28
Max	75	95
Min	65	75
Average	68.6	81.1
Standard deviation	4.0	7.8

Based on the table above. there are differences in psychomotor learning outcomes between the control class and the experimental class. These results can be seen in (**Table 15**) which shows that the average ability of the two groups. namely 81.1 for the experimental class. while the control class got a score of 68.6. This is in line with the research of Siska et al (2020) which states that the socio-scientific issue approach uses aspects of everyday life in the community. so that it can generate curiosity in students. Tsai (2018) said argumentation can encourage students to use logic and reasoning when faced with problems. The argumentation process can train students' deductive and inductive reasoning skills as well as coordination skills by providing evidence. According to Dewantari et al research (2022) that through the socio-scientific issue approach. students can gather information from various sources. such as observing. asking. trying. or gathering information from various sources. According to Wicaksono research (2020) the Socio-Scientific Issue approach has an effect on students' critical thinking abilities in various educational units from

elementary to high school. This approach provides an opportunity for students to understand the lesson from solving the presented problems.

4. CONCLUSIONS

Based on the results of data analysis and the discussion on cognitive. affective. and psychomotor learning outcomes in biotechnology and food production. it can be concluded that the socio-scientific issue learning approach has a significant effect on student learning outcomes. This is because there are statistically significant differences between the average cognitive scores of the control class and the experimental class. Affective and psychomotor learning outcomes obtained higher results in the experimental class where students actively asked questions and expressed their opinions about the problems presented.

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