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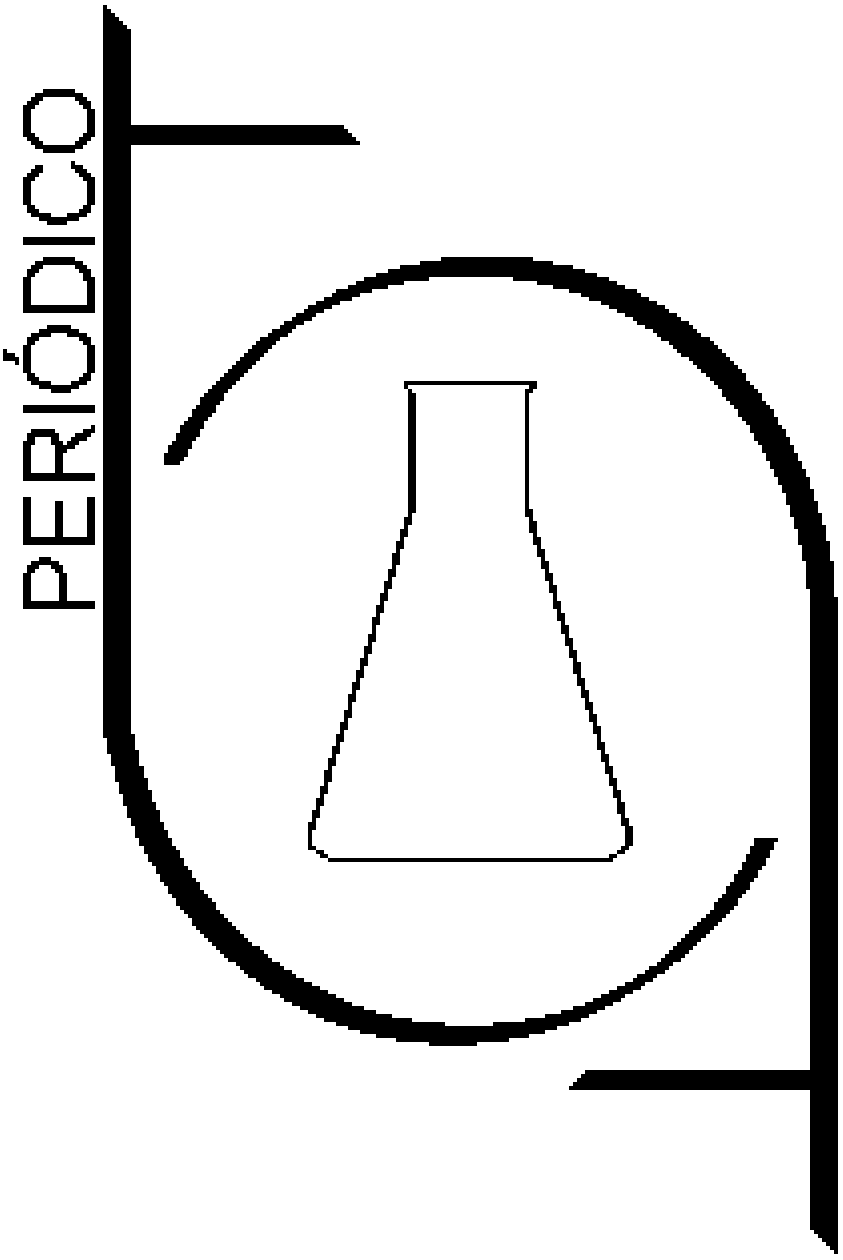

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Índice

PERIÓDICO TCHÊ QUÍMICA
ARTIGO ORIGINAL

USANDO O APRENDIZADO BASEADO EM PROBLEMAS PARA MELHORAR AS HABILIDADES CRÍTICAS DOS ESTUDANTES PARA LIDAR COM INFORMAÇÕES ENGANOSAS EM QUÍMICA

USING PROBLEM-BASED LEARNING TO IMPROVE STUDENTS' CRITICAL THINKING SKILLS TO DEAL HOAX INFORMATION IN CHEMISTRY

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RESUMO

O pensamento crítico é a capacidade de pensar racional e reflexivamente sobre o que deve ser feito ou acreditado. Essa habilidade permite tomar decisões lógicas, com base nas informações obtidas e processadas de acordo com a habilidade. O desenvolvimento de habilidades de pensamento crítico na aprendizagem é importante porque permite que os alunos lidem efetivamente com problemas sociais, científicos e práticos. Portanto, esta pesquisa teve como objetivo descrever a efetividade da aprendizagem baseada em problemas para melhorar as habilidades de pensamento crítico dos alunos para lidar com informações fraudulentas em química. Esta pesquisa foi realizada utilizando um grupo controle e outro experimental. Os dados foram coletados de 60 alunos do 11º ano do ensino médio da província de Lampung, na Indonésia, e analisados pelo SPSS versão 23.0. A efetividade da aprendizagem baseada em problemas foi mensurada com base no ganho n. O valor de ganho n das classes experimental e controle foi de 0,709 (alto) e 0,332 (médio), respectivamente. Os resultados indicaram que a aprendizagem baseada em problemas facilitou e é eficaz para melhorar as habilidades de pensamento crítico dos alunos.

Palavras-chave: *habilidades de pensamento crítico; informações fraudulentas; aprendizagem baseada em problemas; aprendizagem prática*

ABSTRACT

Critical thinking is the ability to think rationally and reflectively about what must be done or believed. This skill allows one to make logical decisions based on information obtained and processed according to ability. The development of critical thinking skills in learning is essential because they enable students to deal effectively with social, scientific, and practical problems. Therefore, this research aimed to describe the effectivity of problem-based learning to improve students' critical thinking skills to deal with hoax information in chemistry. This research was carried out through the control and experimental groups. Data were collected from 60 the 11th-grade students of the State High School in Lampung Province, Indonesia, and analyzed by using SPSS version 23.0. The effectivity of problem-based learning was measured based on the n-gain. The n-gain value of experimental and control classes was 0.709 (high) and 0.322 (medium), respectively. The results indicated that problem-based learning has facilitated and effective to improve students' critical thinking skills.

Keywords: *critical thinking skills; hoax information; problem-based learning; hands-on learning*

1. INTRODUCTION:

The world is now in the era of the industrial revolution of 4.0. In this era, there was a rapid development of science and technology, both censorship, interconnection, and data analysis, thus bringing up ideas to be integrated into various fields of industry. Due to the fast development of science and technology, the problems faced are increasingly numerous and complex. On the other hand, the 4.0 industrial revolution will affect not only the industry, but also the labor market (Van den Bergh *et al*., 2006; Lowden *et al*., 2011; Danczak, Thompson, and Overton, 2020). Workforce needs have been transformed from routine work to shift to non-routine work (Trilling and Fadel, 2009). Because of this, a problem solver is needed to overcome them.

As a problem solver, knowledge alone is not enough to deal with increasingly complex problems in the current disruptive era. The contemporary job market demands the production of someone who can work in a disruptive and ill-defined environment, face non-routine and abstract work processes, make decisions, take responsibility, and work in teams (Van den Bergh *et al*., 2006; Baygin *et al*., 2016; Diawati *et al*., 2017; Diawati *et al*., 2018; Fadiawati, Diawati, and Syamsuri, 2019). This ability is related to skills demanded in the 21st century, one of which is critical thinking skills (CTS).

Critical thinking (CT) is rational and reflective thinking with an emphasis on making decisions about what to believe and do (Norris and Ennis, 1989). Based on the Delphi Report, CT is self-regulation in deciding which has goals that produce interpretations, analyzes, evaluations and inferences as well as concrete, conceptual explanations, as well as having methods, criteria or contextual considerations on which these decisions are based (Facione, 1990; Dwyer, Hogan, and Stewart, 2014; Stephenson and Sadler-McKnight, 2016).

The development of CTS has been the main focus of several researchers (Halpern, 2014; Moore, 2015; Butler and Halpern, 2020; Danczak, Thompson, and Overton, 2020). CTS is important because they enable students “to deal effectively with social, scientific, and practical problems” (Shakirova, 2007). Some cognitive psychology researchers report that CTS could be developed within a variety of discipline areas to make knowledge retrieval easier. McMillan (1987) argued that standalone and integrated courses were equally successful in developing CTS. On the other hand, Ennis (1990) accepted that CTS also could be effectively improved with or without discipline-specific areas. Davies (2013) agreed that CTS is a fundamental skill at the basis of all disciplines of knowledge. CTS can be a need to accommodate the discipline-specific needs in higher education. CTS could be transferred to situations encountered in daily life (Butler and Halpern, 2020); one of them is about hoax information circulating through social networks.

Facebook, Youtube, WhatsApp, dan Instagram are social networks that are widely accessed by internet users. Among social networks, Facebook users number 2.414 billion, while Youtube with 2 billion active users, WhatsApp users number 1.6 billion, and Instagram with 1 billion active users (Clement, 2020). Fellow social networks users share a variety of news broadcasts dan information. Other users can quickly see both.

However, not only real news and information but also fake and mislead (hoax) news and information shared. Hoax information was made based on individual opinions that cannot be accounted for, and they shared in a chain through social networks. Related to circulating hoax information, CTS is needed in media literacy. Some learning models which suggested to developing CTS in chemistry are problem-based (Kek and Huijser, 2011; Martyn *et al*., 2014), open-ended practical (Klein and Carney, 2014), and inquiry (Gupta *et al*., 2015).

In this article, it is described the results of developed CTS dealing with hoax information by using problem-based learning (PBL). Fogarty (1997) defines PBL as a learning model that deals with real-life or real-world problems that are ill-structured, open-ended, and ambiguous. In these learning, students are faced with hoax information problems related to some food and drinks circulating through social networks. For example, hoax information received by the public is related to noodles and carbonated water. Based on information flowing, noodles and carbonated water are considered poisonous and dangerous. This is because if noodles with iodine drop, they will turn purple. On the other hand, carbonated water contains high levels of acid so that it can dissolve bones and teeth.

This corresponds with the outbreak of hoax information in Indonesia has become a national problem. The survey results of the Indonesian Telematics Society (2019) that a variety of hoax information that is often accepted by the public. Some of them are issues about health by 40.70%, issues about food and drinks by 30.00%, and

issues about science and technology by 20.00%. As a result of the circulation of the hoax information, the community became restless and was overtaken by excessive fear (Zuria and Suyanto, 2018). On the other hand, noodles and carbonated water producers suffer losses due to competition and trademark pollution (Apriyani, Fadiawati, and Syamsuri, 2017).

Furthermore, based on the hoax information in circulation, students look for information from reliable sources, conduct investigations, and use their knowledge and to be analyzed and confirm whether the information can be trusted or not. Therefore, this research aimed to describe the effectivity of PBL to improve students' CTS to deal with hoax information in chemistry.

2. MATERIALS AND METHODS:

This research is a quasi-experimental and carried out in the State High School in Lampung Province, Indonesia, by using nonequivalent control-group design (Creswell and Creswell, 2017). The population of this research is the 11th-grade students totaling 200 students. By using purposive sampling obtained 60 students, and every one declares to agree to participate in this research. Furthermore, students are grouped into experimental and control classes. Purposive sampling is done with consideration to obtain samples with the same or relatively similar characteristics based on prior information of a population (Fraenkel, Wallen, and Hyun, 2011).

Before the intervention, both the experimental and control classes were given pretest Norris-Ennis's CTS in the form of open-ended questions (Appendix 1). Next is the intervention stage by applying PBL in the experimental class and conventional learning in the control class.

Learning begins by orienting students to the hoax information problems. In the organized students' phase, students are asked to gather information related to the problem. Furthermore, students make investigation design and apply it to confirm whether or not the hoax information is being faced. Data obtained are then presented. In the last phase, students will be asked and answered on the work between groups to bring up various opinions or ideas. The learning process is guided by student worksheets to match the PBL syntax. During the learning process, student performance is also assessed. At the end of the learning, both classes were given a post-test Norris-Ennis's CTS in the form of open-ended questions.

Statistical testing with SPSS version 23.0 was carried out on the results of the pretest through normality (One Sample Kolmogorov-Smirnov's Test), homogeneity of variance (Levene's Test), and independent sample t test . Increasing the score of each class (n-gain) also statistically tested through normality and One Way ANOVA. The n-gain categorized as high, medium, or low (Hake, 1998).

3. RESULTS AND DISCUSSION:

3.1. Results

Average scores of the pretest and post-test students' CTS were presented in Figure 1. Table 1 informed the results of the statistical analysis of the pretest score where the significance value (sig. > 0.05) indicates that average scores of the pretest come from populations that were normally distributed and have homogeneous variances. Based on the significance value (sig. > 0.05) on the independent sample t-test results obtained information that there was no difference between average scores of the pretest in the two classes.

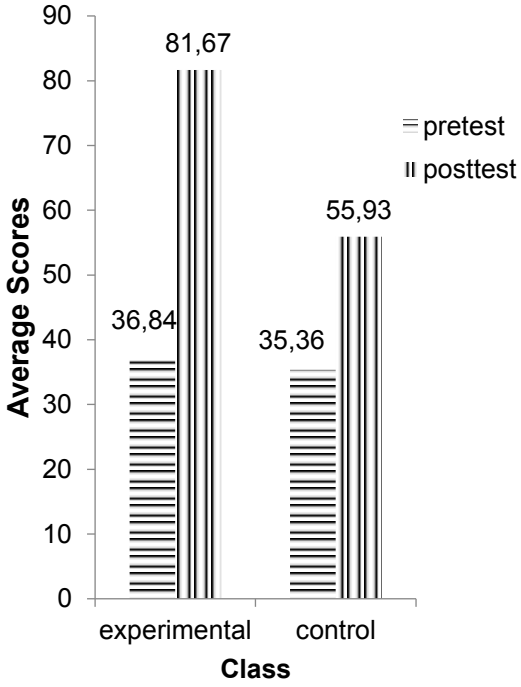

Figure 1. *The average scores of pretest and post-test students' CTS.*

The average n-gain of the experimental and control classes was presented in Figure 2.

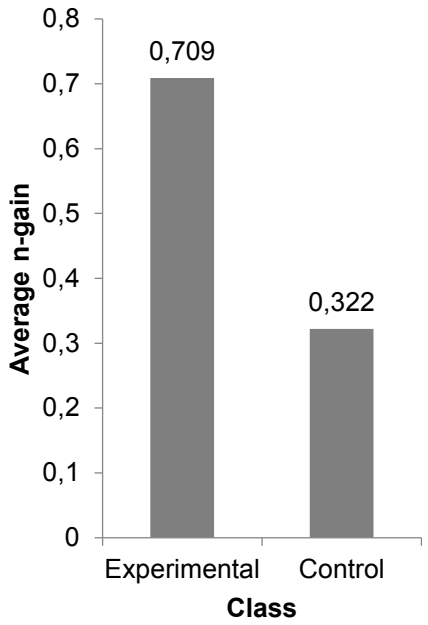

Figure 2. *The average n-gain students' CTS.*

Based on Table 2, normality test results for n-gain indicate that the significance value obtained (sig.) was greater than 0.05. This indicates that the average n-gain of CTS comes from a normally distributed population. One Way ANOVA test results show the significance value obtained was less than 0.05. Thus it could be said that there is a difference between the average n-gain of CTS between the experimental and control classes. Based on the significance value (sig. <0.05) on the independent sample t-test results obtained information that n-gain average of the experimental class was higher than the control class.

3.2. Discussion

The above description informs that the PBL model was effective in improving students' CTS compared to conventional learning. Students' CTS were trained at each stage of problem-based learning guided by student worksheets.

3.2.1 Phase 1, Student Orientation to the Problems

At this phase, students were faced with a problem related to hoax information circulating in the community packaged into the discourse. The discourse contains information that instant noodles contain poisons that harm the body. If noodles with iodine drop, they will turn purple. In a different discourse also informed that carbonated water contains acids that can clean the toilet and iron rust. When taken by mouth, the acid content is illustrated will mix and react with gastric acid in the stomach. This makes people who used to consume both noodles and carbonated water uneasy. Regarding their information and understanding of discourse were presented in Figures 3 and 4 (the authentic source was availabled in Appendix 2). Based on this, this phase trains students' CTS.

Q: What information do you know based on the discourse above?
A: 1) Instant noodles contain free radicals which are proven by changes in color when dipped in iodine solution
2) Instant noodles are dangerous because they are made from chemicals

Q: What information do you not know based on the discourse above?
A: The content of instant noodles

Figure 3. Students' understanding of the discourse of the danger of noodles.

Q: What information do you know based on the discourse above?
A: 1) Carbonated water are dangerous to consume because they contain acids that can clean iron rust and toilets
2) Carbonated water added to glasses filled with clear liquid turn into chocolate foam, it is possible the same thing happens in our stomach

Q: What information do you not know based on the discourse above?
A: The content of carbonated water

Figure 4. Students' understanding of the discourse of the danger of carbonated water.

After students understand the problem critically, students were asked to formulate the main questions critically. Based on discourse, students should first consider the truth of the information. In the 1st worksheet, several students wrote question statements that do not fit the content of the discourse. A similar thing happened in the 2nd worksheet. Some students were not confident and were doubtful about the formulation of the questions they asked. The following were some of the questions written by students in Figures 5 and 6 (the authentic source was available in Appendix 2).

In learning, the formulation of the main questions raised was not appropriate to the problems listed in the discourse. Related to this, the teacher guided the students to determine the

main question of the air following late to the content of the discourse. Based on the direction was given by the teacher, students improved the statement of question formulation in the 1st and 2nd worksheets, as shown in Figure 7 and Figure 8 (the authentic source was available in Appendix 2).

Question Statement

1) Why instant noodles are still being sold in the market?
2) Why did the instant noodles dip in iodine solution turn purple?

Figure 5. Question statement in the 1st worksheet is not appropriate to the content.

Question Statement

1) Why carbonated water are still being sold in the market?
2) Why carbonated water can be used to clean toilets?

Figure 6. Question statement in the 2nd worksheet is not appropriate to the content.

Question Statement

1) Is it true that instant noodles are dangerous if consumed?
2) What are the ingredients of instant noodles?
3) Why do instant noodles turn purple when dipped in an iodine solution?
4) What chemicals are contained in instant noodles?
5) Do instant noodles contain free radicals?

Figure 7. Question statement in the 1st worksheet, which has been fixed.

Question Statement

1) Is it true that carbonated water are harmful to the body?
2) Is it true that information that carbonated drinks can be used to clean toilets?
3) What are the compositions contained in carbonated water?
4) Why carbonated drinks can clean iron rust?
5) What acid compounds are contained in carbonated water?

Figure 8. Question statement in the 2nd worksheet, which has been fixed.

Based on the improvement of the question statement raised information obtained that students could critically determine the problems that exist in the discourse. Besides, students were increasingly skilled in making questions related to discourse.

In this study, the skills to understand the problems given critically could be said to increase. An increase in skills to understand the problem critically was also supported by student activities in learning. Students were frequently seen asking questions and giving their opinions. Therefore, PBL could increase information literacy, one of which was identifying issues or problems faced (Chu, Tse, and Chow, 2011).

3.2.2 Phase 2, Organize Students

To answer the questions that have been asked, students were asked to gather information from various sources relevant to the discourse. In its completion, students were guided by an assignment sheet. There were two activities, namely defining the problem and organizing learning tasks related to discourse, as well as gathering appropriate information so that they can submit hypotheses. Students in groups were given three days to define the problem and collect information along with the source. The same thing was done in the 2nd worksheet.

By teacher's guide, students answered the formulation of questions by finding and gathering information related to the problem, including: (1) the content contained in instant noodles and beverage drinks; (2) information about the color changes that occur in instant noodles after dipped in a solution of iodine and pH in carbonated drinks; (3) information about any food ingredients that have a content that is not much different from instant noodles or drinks or solutions that have a pH not much different from carbonated drinks. Through these activities, students were expected to be able to sort out relevant and trusted information in solving problems carefully. Accordingly, this phase trains the skills to gather relevant information. The results of the assignments were presented in Figures 9 and 10 (the authentic source was available in Appendix 2).

During these activities, students were asked to report the results of the task to the teacher periodically. The teacher evaluated the assignment and given direction when there was less relevant information, and the source was not credible. For this advice, students made improvements and obtain information on the 1st worksheet, among others: (1) the content

contained in instant noodles, (2) the content contained in the iodine, (3) carbohydrate testing, and (4) the cause of the occurrence discoloration of instant noodles after dipping the solution of iodine. On the other hand, information obtained in the 2nd worksheet includes: (1) the content contained in carbonated water, (2) the acidity of carbonated water, (3) buffering solutions in the blood, and (4) metal corrosion.

Assignment Sheet

Q: Find information from various sources regarding the content of instant noodles!
A: content of instant noodles: carbohydrates, fats, proteins, cholesterol, sodium, vitamins, calcium, iron

Q: Find information from various sources regarding the color change in iodine-dripped instant noodles!
A: discoloration of instant noodles that are dropped with iodine indicates carbohydrate content

Q: Find information from various sources about some food ingredients that have the same content as instant noodles!
A: rice, bread, corn, potatoes

Figure 9. *Information obtained by students related to instant noodles.*

Assignment Sheet

Q: Find information from various sources regarding the composition of Cola!
A: content of cola: carbonated water, sugar, caramel coloring, phosphoric acid, caffeine, citric acid

Q: Find information on the pH of carbonated water!
A: Carbonated water has a pH = 3

Q: Find information on types of drinks or solutions whose pH is the same as carbonated water!
A: lime juice, vinegar, tamarin juice, lemon juice

Figure 10. *Information obtained by students related to carbonated water.*

Based on observations, at first, students still found it difficult to sort out credible and relevant information, especially if it was connected with chemical material. Most of the students' answered contain general things and not following the learning objectives, as well as information questions about food in the form of macromolecules that are absorbed by the nutritional content, students answer “protein and carbohydrate” without knowing that there are still many nutrients that are absorbed by the body. This might be due to a lack of understanding of problems and questions and accustomed to taking information from web blog sources, news, or literature whose clarity has not been proven.

To overcome this, a discussion was held for 25 minutes, in turn, eight groups consulted about students' answers with the teacher, so that information was obtained following problem-solving. In consultation activities, the teacher directed students’ answers to solutions related to chemical materials, and the answers obtained were the nutrient content absorbed by the body, including “glucose, amino acids, vitamins and minerals, and water.” To convince students, then the teacher invited students to conduct a literature study on other people's research related to the nutrient content absorbed by the body. This activity could indirectly train students’ CTS, especially on indicators considering the credibility of the source.

CTS could be done by figuring out what to believe or what to do and doing it reflectively and reasonably (Ennis, 1990). Therefore, to obtain reliable information, students must conduct investigative activities to obtain appropriate conclusions so that meaningful construction of knowledge does not occur.

3.2.3 Phase 3, Individual and Group Research Guide

In the 1st worksheet, an experiment was carried out on a carbohydrate test on several foods with a solution of iodine. Investigation activities require students to be actively involved and train students in their opinions to get explanations and problem-solving. Something that is not much different was done in the 2nd worksheet regarding the removal of rust on iron with a solution or drink that has the same pH or almost the same as carbonated water.

Before investigation activities were carried out through experimental activities, students were required to make experimental designs. The intended experimental design includes: (1) identifying variables; (2) controlling variables; (3) compile experimental procedures; (4) identifying

tools and materials used; and (5) design an observation table (Fadiawati and Syamsuri, 2016; 2018). The experimental design was then consulted with the teacher. Based on the direction given by the teacher, students improved the design of the experiment.

Furthermore, students conducted experiments based on the results of experimental designs. In the 1st worksheet, students were asked to compare colors in instant noodles before and after dipping in iodine solution. In the 2nd worksheet, students were directed and guided to conduct experiments, ranging from measuring the volume of each solution as much as 10 mL, match by using universal indicators, comparing the amount of rust on nails that have been immersed in each solution for 10 minutes. Investigative activities through practicum make the learning process of students more meaningful (Hodson, 1990; Garnett, Garnett and Hacking, 1995; Hofstein and Lunetta, 2004; Hofstein and Mamlok-Naaman, 2007; Abrahams and Millar, 2008).

Faced this situation, students were required to be critical and careful in observing each process and the results obtained during the experiment to be able to conclude precisely and reasonably. On the other hand, through this activity students will get used to working together in groups so that it will foster a disciplined, honest, and thorough attitude in conducting learning activities and group discussions. Diawati *et al*. (2018) suggest that when students are assigned to work on worksheets and undertake learning activities and group discussions, students practice working together between group members to discuss the tasks contained in worksheets. Through this group discussion, students exchange opinions, assess the views of friends regarding problems correctly.

3.2.4 Phase 4, Develop and Present the Work

After conducting an investigation and experiment, students were then asked to develop and present their work in the form of observations during the experiment which are then submitted to the teacher. Furthermore, students wrote the experimental data, answered questions that were challenging related to the experimental data to be able to develop ideas or ideas by linking the results obtained during the experiment with various information that they have obtained from various sources, and reported the solution obtained as a work.

In the initial phases of developing and presenting the results of an experiment, students have not been very active in discussions to analyze the results of experiments and draw conclusions. To overcome this, the teacher provided guidance and checks the work of students in each group if there are difficulties. At the next meeting, it was seen that students were increasingly actively discussing and even asking critical questions to the teacher. Students' inference skills have improved.

In this condition, when students were assigned to work on a worksheet with their study groups, students practiced being able to work together between group members to discuss the tasks contained in worksheets. Through discussion activities, students exchanged opinions, assess the opinions of friends, or reject or accept the opinions of friends so that they are expected to be able to give the right conclusions. Thus, student activities in doing assignments, working together, and discussing supported the improvement of students' CTS.

Syamsuri and Fadiawati (2019) revealed that inference means identifying and obtaining the elements needed to draw acceptable conclusions. Inference skills can be trained in the stage of developing and presenting work. At this stage students also do information processing to find the linkage of one information with other information, so students can conclude the linkages of that information.

3.2.5 Phase 5, Analyze and Evaluate the Problem-Solving Process

In the last phase, student learning outcomes were evaluated in terms of the material learned and ask each group to communicate their work. In this way, students will be asked and answered on the work between groups to bring up various opinions, or ideas, such as the use of used plastic cups instead of chemical cups. Thus they will be understood the problem more deeply and can be developed ideas more broadly.

Through PBL, students were trained to be able to formulate the main questions. Students were also required to gather the information needed to confirm the truth of information circulating based on discourse. In searching for information, students were trained to choose sources that are relevant and credible, so that the information they get could be trusted, and then students can make inferences (Syamsuri and Fadiawati, 2019). Through investigation activities, students could determine what actions should be taken to confirm the truth of information circulating based on discourse. In presenting the work, could bring up various ideas. Students were also able to

communicate their work to others. With this learning phase, students' CTS could certainly be trained (Dehkordi and Saeed, 2008; Fadiawati, Diawati, and Syamsuri, 2019; Hung and Amida, 2020).

4. CONCLUSIONS:

By using PBL to deal with the circulating hoax information, students look for information from reliable and credible sources, conduct investigations, and use their knowledge and to be analyzed and confirm whether the information can be trusted or not. Additionally, the n-gain value of the experimental class in high categorized, while the n-gain value of the control class in medium categorized. Therefore, it could be said that PBL applied in this research has facilitated and effective in improving students' CTS.

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Table 1. *Statistical testing result of average score of the pretest*

	Experimental Class	**Control Class**
Normality test		
Kologorov-Smirnov Z	0.125	0.155
Significance value	0.200	0.063
Homogeneity test		
F value	1.059	
Significance value	0.308	
Independent sample t-test		
t value	-0.255	
Significance value	0.800	

Table 2. *Statistical testing result of average n-gain*

	Experimental Class	**Control Class**
Normality test		
Kologorov-Smirnov Z	0.138	0.104
Significance value	0.147	0.200
One way ANOVA test		
F value	114.636	
Significance value	0.000	
Independent sample t-test		
t value	10.707	
Significance value	0.000	

APPENDIX 1

Pretest Questions

DISCOURSE 1

Read the following discourse to answer the questions below!

Have you ever seen a viral video on Youtube (https://www.youtube.com/watch?V=dUGndfBS5Fk) about an experiment of instant noodles with iodine drop? What will happen after a few minutes? It turns out that instant noodles immediately change color to purple.

The following information is obtained from Facebook (https://www.facebook.com/91201988700/posts/temanstaukah-kalian-kalau-mie-instan-mandung-radikal-bebas-yang-sangat-berbah/10153784538233701/) In the news was informed that instant noodles contain free radicals which are very dangerous for the body. This is proven by dipping instant noodles in the iodine solution. The result is a color change in instant noodles to purple. The change in color indicates that instant noodles contain negative toxins derived from chemicals.

Based on this discourse, answer the following questions!

1. **CTS indicator: understanding the problems critically**.
   Do you believe the information in the discourse above? Explain with reasons!
2. **CTS indicator: making the questions**.
   Ask questions related to the discourse above, regarding:
   a. main question
   b. questions besides the main questions
3. **CTS indicator: collecting and considering the pieces of information**.
   What information do you need to answer the questions you ask

DISCOURSE 2

Read the following discourse to answer the questions below!

Coke Cola is a carbonated drink that tastes good when thirsty. Almost all people like this drink. But lately, there has been information circulating on social media such as Youtube, Whatsapp, Facebook, Twitter, and Instagram that illustrates the dangers of carbonated drinks when mixed with stomach acid. On social media Youtube (https://www.youtube.com/watch?v=lSGJkA1T8fY), a video is displayed when a colorless liquid in a glass container is added with carbonated drinks. When the two are mixed, it turns out to react to form a blackish-brown froth which over time looks solid. The uploader of the video illustrates the same thing would happen if carbonated drinks in the stomach were mixed with gastric acid.

There are also other videos on social media Youtube (https://www.youtube.com/watch?v=Zj1MXEZ-90M) that shows the use of carbonated drinks as a toilet cleaner. On social media Youtube (https://www.youtube.com/watch?v=KYcVJt6_cSQ) also shows videos related to the use of carbonated drinks to clean iron rust. The use of carbonated beverages as a toilet cleaner and iron rust is associated with the acid content in the drink.

The videos then spread sequentially through Whatsapp, Facebook, Twitter, and Instagram. The distribution of the videos is accompanied by information that illustrates the dangers of carbonated drinks. As a result, many people assume that carbonated cola drinks are very dangerous for the body because they are made from hazardous chemicals.

Based on this discourse, answer the following questions!

4. **CTS indicator: understanding the problems critically**.
   Do you believe the information in the discourse above? Explain with reasons!
5. **CTS indicator: making the questions**.
   Ask questions related to the discourse above, regarding:
   a. main question
   b. questions besides the main questions
6. **CTS indicator: collecting and considering the pieces of information**.
   What information do you need to answer the questions you ask

APPENDIX 2

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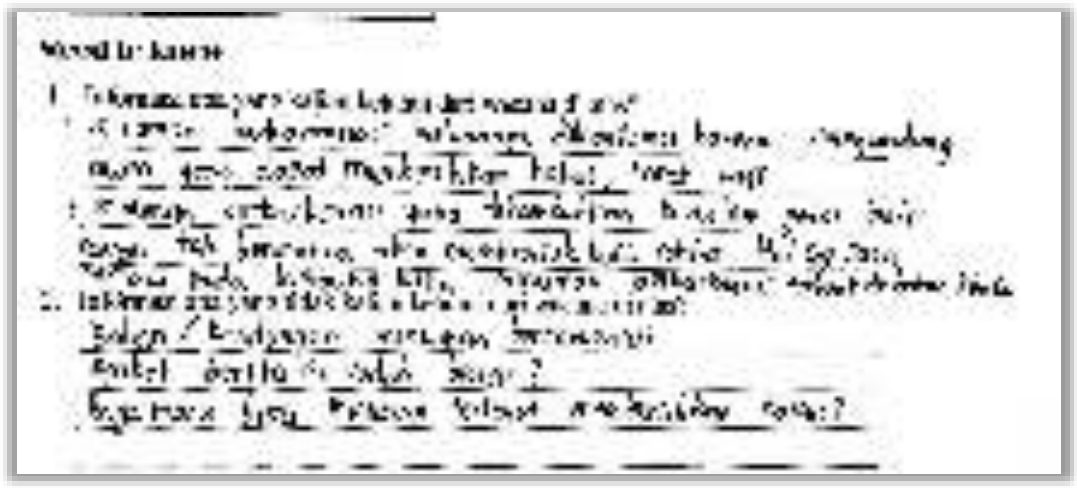

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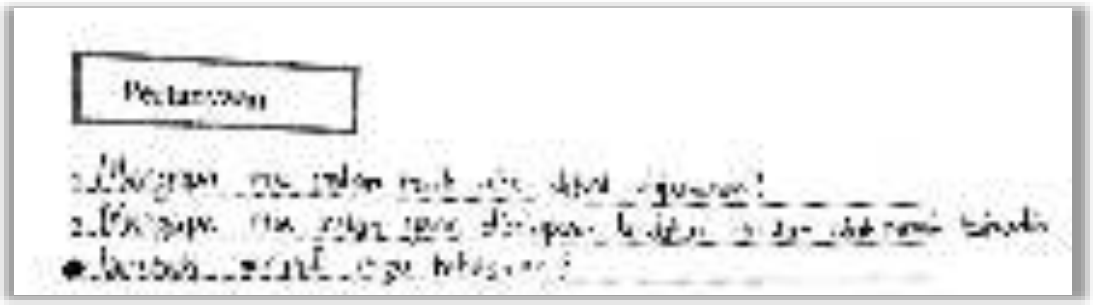

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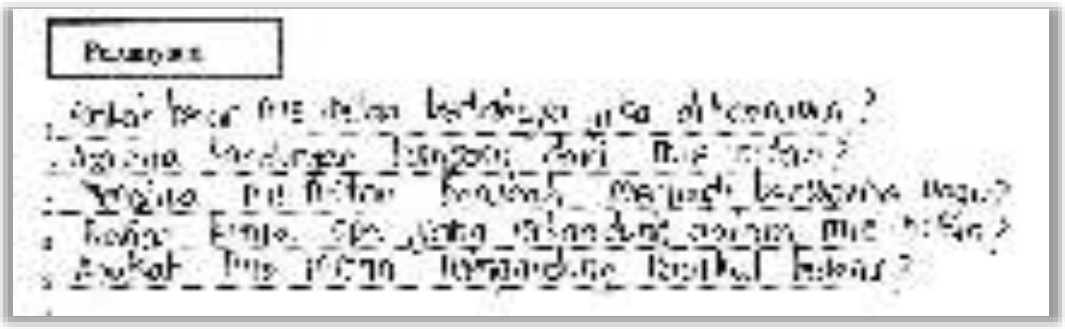

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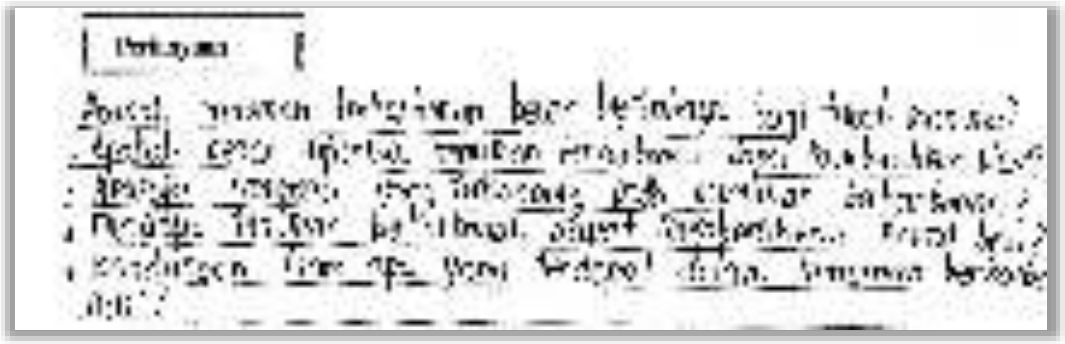

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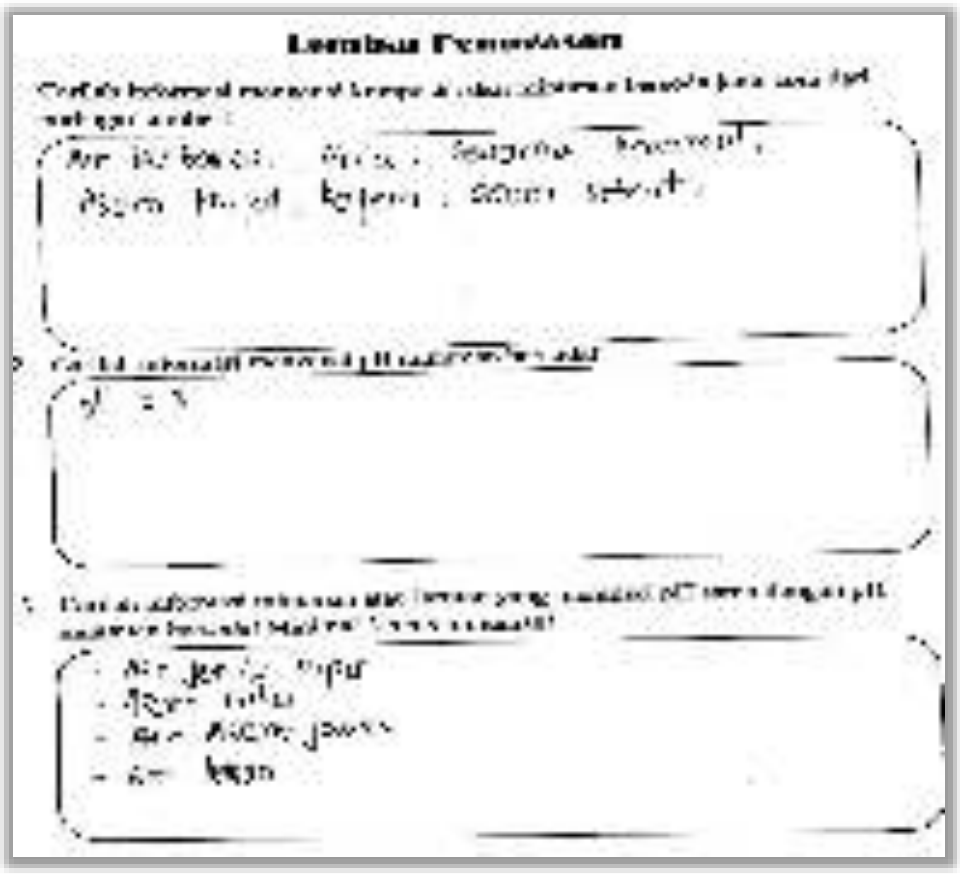

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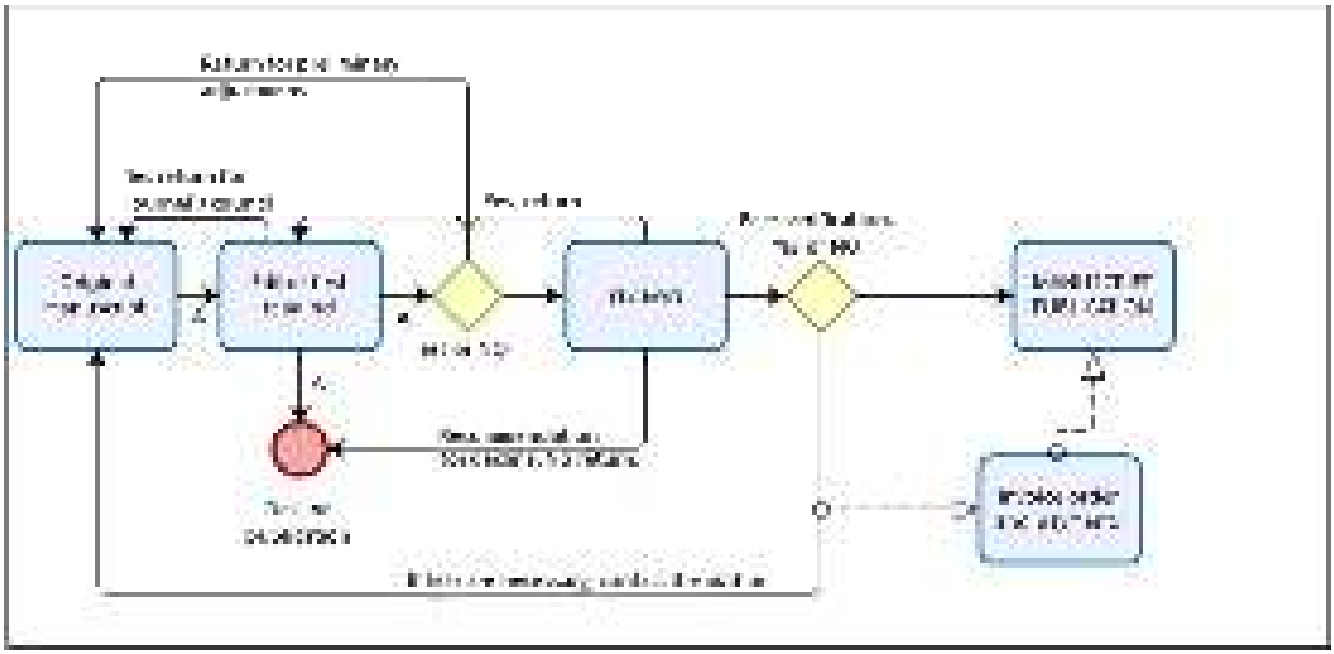

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