
RESEARCH ARTICLE

The Students' Brain Dominance in Learning English by Using Problem Based Learning at Vocational High Schools

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ABSTRACT

In terms of intrinsic motive in learning, aptitude, need, interest, learning pace, strategy, and style, each student is unique. Each student is a distinct individual with a wide range of talents and abilities, and each is committed to lifelong growth and development. The present study investigated the student's brain dominance from selected public and private Vocational High Schools. The participants of this study were 101 students who had learnt by using Problem Based Learning. The questionnaires were adopted from Mariani (1996), which consisted of 20 numbers with 3 choices to see the brain left/brain preference of students. In addition, most students were observed to lean slightly toward either the left or the right hemisphere of the brain. The report concludes by discussing ideas for helping educators adapt lesson plans to accommodate individual students' learning styles.

KEYWORDS

Brain Dominance, Problem Based Learning, Vocational High School.

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1. Introduction

Professional development greatly enhances lecturers' knowledge of teaching techniques, enabling them to offer students opportunities for high-quality learning. The professionalism of university lecturers is influenced, among other things, by their pedagogical abilities, which facilitate effective subject delivery and student engagement. Therefore, lecturers should update themselves with creative approaches to enhance their teaching practice in order to stay on top of the different student learning objectives. (Mkonto, 2015, Cekiso, 2015).

Conceptual understanding in the classroom has a significant impact on students' actions, decisions, and problem-solving strategies (Kuning, 2012). It can be done by learning and problem-solving rely heavily on a solid foundation of conceptual understanding, which is crucial in both the classroom and the real world (Hamzah, 2016). Here are a few signs that a person has grasped an interesting idea: starting from (1) Definition restatement (2) Recognize things by specific features (conceptually); (3) Give an example, not an example of a concept; (4) Show how the concept may be represented mathematically; (5) Define what criteria must be met for the concept to be applicable; (6) Employ and pick a particular set of operations. And (7) Use a theory or approach to a problem (Yulianti & Indra, 2019).

By enhancing the lecturers' and teachers' capacity to transmit knowledge, the quality of the teaching and learning process as a whole can be improved (Kono et al., 2016; Safaruddin, Ibrahim et al., 2020). Selecting an appropriate learning model can aid instructors in conveying content in a way that is readily grasped by their pupils. According to Uliyandari and Elly (2020), a learning model is "a collection of structured presentations of teaching materials, including aspects before, during, and after the teacher's

learning process, and all associated facilities used directly or indirectly" in that process. Consistent with these aims, the researcher conducted this research to see the student's identical learning preferences by identifying their brain-dominance after being taught Problem Based Learning in the classroom. Essentially, the researcher hopes that after conducting this investigation, the adjustments related to teaching aid and preparation will be made based on what the teachers think the students need.

The importance of the current study is that knowing more about the student's style of learning can make both students and learners interact well in the process of learning in classroom practice. The study also has limitations in that it focuses on some Vocational Schools as samples in Makassar.

The problem of the study is that many students in Makassar's Vocational High Schools have difficulties focusing on learning English, which should fulfil their skill in the future workforce, and their level is not in demand even in their advanced stages of study when compared to the nations that are nearby Makassar. This is a problem because English is a skill that should be fulfilled in the future workforce.

2. Literature Review

2.1 Problem Based Learning

As a form of progressive active learning, problem-based learning takes an unstructured, learner-centered approach as its point of departure. Using a wide range of skills and knowledge, PBL equips students to tackle the unknown and adapt to change (Wulandari, 2013). Problem-based learning (PBL) is a method that helps students develop their analytical and deductive reasoning abilities, as well as their ability to apply previously acquired knowledge to new situations. The primary goals of problem-based learning are to improve critical thinking, problem solving, and intellectual skills and to encourage students to become self-directed learners (Erdogan & Senemoglu, 2014; Masril, 2020)

In problem-based learning, problems or social situations are used as the first pedagogical building blocks. Problem-based learning (PBL) involves introducing a real-world issue and having students work to find a solution. Students are encouraged to uncover and discover concepts or principles by being presented with real-world problems that are both complex and fundamental. (Nurtanto & Sofyan, 2015). Sharma (2012) has proposed procedures for introducing the PBL approach to education consisting of several stages, including (a) directing students to the problem, (b) organize students to study, (c) assist with independent investigations and groups, (d) develop and present reports, videos, models, etc. and (e) analyze and evaluate the troubleshooting process. Also included are the problem-based learning (PBL) traits of exploring the issue at hand until a workable solution emerges.

This model has as its primary goals the investigation of specific information, processing capacity, problem-solving, and real-world study challenges. The goal of adopting this strategy is to inspire students to develop their research, analytical, and creative skills (Kassab et al., 2017). Therefore, the PBL paradigm can be useful in getting students to do more than merely memorize and regurgitate information (Trianto, 2010). Masek and Yamin (2011) state that using a problem-based learning (PBL) approach can inspire students to study more. Asyari et al. (2016) and Safaruddin, Degeng, et al. (2020) both note that PBL encourages student participation in class discussions.

Medical schools were among the first to use PBL as a method of instruction. In the PBL method, students are encouraged to use the challenges as a springboard for further inquiry and exploration. When we study, we try to figure out how to fix issues (Orozco & Yangco, 2016). Synder and Wiles (2015) argue that project-based learning (PBL) and other student-centered pedagogical approaches can help students improve their critical thinking skills. There is a good correlation between using PBL and students' critical thinking skills, as stated by J. Oja (2011). However, PBL assessments of critical thinking need to be more stringent. The researcher at the University of Bengkulu attempted to use the PBL model with fourth-semester students in the Science Education program in order to enhance their conceptual comprehension and critical thinking skills, as described.

2.2 Brain Dominance

The way in which we choose to acquire, comprehend, and communicate information is an indication of the dominant side of our brain. The way in which the brain primarily thinks is referred to as the brain's dominant mode of thought. The left and right sides of the brain each make up one half of the organ. The term "hemisphere" refers to each of the two halves.

The concept of "brain dominance" refers to the way in which one's word choice complements a particular or broad context. The use of the common term "dominance," on the other hand, can call for additional scrutiny regardless of the context. One other conclusion that can be drawn from the study of human laterality, in general, is that, despite the fact that each hemisphere of the brain has its own set of specialized functions, the two sides of the brain nevertheless communicate with each other (interact via the corpus callosum) to varying degrees, and this depends on the difficulty of the activity being performed. The concept that one hemisphere is "dominant" and the other is "non-dominant" is possibly too simplistic for characterizing most tasks (Gabbard, 1997).

Although a function may depend more on one hemisphere than on the other (for example, language or motor control), the notion that one hemisphere is "dominant" and the other is "non-dominant" is still possible.

Brain dominance is defined as an individual's innate predisposition to process information on one side of the brain. While our right hemisphere is known to be intuitive and spontaneous, our reasoning is supposed to reside in our left hemisphere. The right hemisphere, on the other hand, is predominantly involved in global and spatial processing. The left hemisphere is analytical, abstract, verbal, digital, logical, sequential, and rational. The right hemisphere, on the other hand, is holistic, concrete, nonverbal, visuospatial, intuitive, simultaneous, and analogous. (McCarthy, Germain & Lippitt, 2006). However, according to Dülger (2012), In information processing, people are either left-brain or right-brain dominant; however, some people are equally dependent on both hemispheres. Whole-brain or bilateral dominance. One of the researcher's favorite areas of study has always been brain functioning and its impact on English acquisition. She was intrigued as an English instructor when she first heard of a link between brain dominance and learning English; as mentioned by Aslan's (1999) stated that she became curious about the effect of right-brain or left-brain dominance on students' academic performance in learning English.

Much of the hypothesis of left and right specialization has come from studying patients. These patients' brains were injured as a result of various accidents. Those who had left hemisphere damage demonstrated that language processing takes place in the left brain. Morris (2005) stated that Nobel laureate Dr. Roger W. Sperry did a study to see what occurs when the portions that connect the left and right hemispheres are cut. Also, Morris (2005) Found that the typical conclusion of this study was to present an image which connected the right side of the brain to the left eye of a patient who was unable to name an object by using the left-brain language center but could Select a similar object with the left hand in term of right hemispher. The results of this research indicated that there are specific differences between the two hemispheres.

The right brain is better at copying designs, discrimination shapes, understanding geometric properties, reading faces and music, global holistic processing, understanding metaphors, expressing emotions and reading emotions. The left brain is better at language skills, skilled movement and analytical time sequence processing. Hermann (1995) stated that brain dominance is expressed as the way we prefer to learn, understand and express something. First, the domain provides automated responses to any situation, improving the ability to respond quickly and efficiently by removing the decision-making step. Second, superiority gives us a higher level of skill that we otherwise wouldn't be able to achieve. Domination is part of the normal human condition.

Since brain research is a relatively recent field of study, many of its conclusions and ramifications are debatable. 'Brain laterality' and 'hemispheric dominance' are two of the concepts that are most frequently mentioned in this context. According to reports, the brain has two hemispheres with distinct functions and dominance; this fact has a direct bearing on how one learns. As pointed out by Williams (1983), Davies et al. (1994) and McCarthy, Germain & Lippitt (2006), the two halves of the brain work and process information in separate ways. The right hemisphere is in charge of managing global, holistic, tangible, intuitive, and visual-spatial operations, whereas the left hemisphere is focused on what is verbal, sequential, analytical, abstract, and logical. In general, humans use both hemispheres holistically, but the majority of people choose to adopt techniques that are largely associated with one hemisphere; as a result, they are referred to as left-brain dominant or right-brain dominant. Bilateral dominance is the tendency for certain individuals to have preferences that are roughly even.

Certain people have characteristics that give them a twofold or even triple dominating status. They are able to make equal use of both hemispheres of their brain thanks to their preferred method of thinking. People who exhibit double dominance are able to employ both hemispheres of their brains simultaneously to logically interpret information, thoughts, and decisions that have their own inherent values and origins. The typical person's left hemisphere is responsible for the processing of their thoughts.

According to McCluskey and Parish (1993), the left hemisphere of the brain has been described as having an analytical orientation, which means that it concentrates on specific elements within a field and evaluates those elements sequentially. In the vast majority of people, speech is also controlled by the left hemisphere of the brain, and there is mounting evidence to suggest that the left hemisphere of the brain is superior to the right when it comes to the analysis of small details in vision, audition, and touch (Haseltine, 1999). To put it another way, the left hemisphere of the brain is responsible for processing verbal and nonverbal sequential information.

The right hemisphere of the brain, on the other hand, is regarded to be more creative and relational in character, and it also has a natural tendency to view wholes simultaneously (McCluskey and Parish, 1993). In contrast, the right cerebral hemisphere is superior to the left in its ability to interpret facial expressions, decipher the tone of voice in speech, and understand the broad picture when presented with visual, aural, and tactile stimuli. Processing in a single stage, simultaneously, of many different aspects of information as a single whole is the responsibility of the right hemisphere of the brain.

The majority of people are more comfortable using their right hands and feet. According to Haseltine (1999), the right sides of their bodies are controlled by the left portions of their brains, which are better equipped for performing fine motions.

According to Herrmann (1995), emotions, as well as intellectual reasoning, are controlled by the right side of the brain. Because of this, people who are right-handed and right-eyed tend to be more analytical in nature because the left side of their brain is more prominent than the right side (McCluskey and Parrish, 1993). On the other hand, those who are left-handed and left-eyed are regarded to be more holistic and creative in nature because the right side of their brain is more dominant.

The majority of traditional educators provide lectures to groups of students that are all part of the same class without taking into account the variety of interests held by the students. However, if they take into account the various interests and capabilities of the learners as a heterogeneous group, better and more effective learning can be achieved.

When it comes to some students, many educators struggle with issues such as keeping them calm and engaged, completing assignments, remaining organized, and understanding the concepts in the manner in which they are instructed. In 2006, Morris provided an explanation that was especially tied to one side of the brain becoming dominant. In addition to that, he stated that children with left brain dominance had analytical thinking. They create to-do lists and timetables. They are constantly concerned with learning the rules and adhering to them. They acquire knowledge through the processes of analysis, observation, and thought. They don't struggle too much when it comes to putting their thoughts into words. They are careful in their selection of words. Their linguistic abilities are of such a high caliber. In addition to this, they are proficient in deciphering mathematical expressions and symbols.

People who operate mostly from their right hemisphere rely on their gut instincts to determine whether or not something is true. Their thoughts jump around quickly from one to the other, which makes it difficult for them to finish the chores. They are holistic learners, which means that they must first take in the big picture before breaking it down into its component elements and gaining an understanding of each one. They have a vivid imagination and a creative spirit. Anything that requires creativity, such as singing, music, art, writing, or design, comes naturally to them. They look at the world through the lens of their own unique experiences and backgrounds while forming their opinions. Children who use their right hemisphere to think are aware of exactly what they mean but struggle to put their thoughts into words. They learn best through seeing, and they have the ability to form mental images in three dimensions. They prefer it when things are clear and tangible; therefore, they like to look at, feel, or touch the actual thing. There are also children with entire brains who make use of a variety of the learning processes described above. People who have more of a right brain may also have more of a left brain tendency, or vice versa.

Furthermore, Morris (2006) focused on the various instructional methods employed in schools. He remarked that the conventional educational system tends to favor those with a left-brain orientation. The majority of the pupils' education is provided by left-brained teachers, who place a high value on organization, planning, and sequential thinking. Learners with a dominant right-brain function may not always be able to fully appreciate the benefits or get a grasp of alternative methods of information processing. There are also children with entire brains who make use of a variety of the learning processes described above. People who have more of a right brain may also have more of a left brain tendency, or vice versa.

In addition, Morris (2006) focused on the various instructional methods employed in schools. He remarked that the conventional educational system tends to favor those with a left-brain orientation. The majority of the pupils' education is provided by left-brained teachers, who place a high value on organization, planning, and sequential thinking. Learners with a dominant right-brain function may not always be able to fully appreciate the benefits or get a grasp of alternative methods of information processing.

3. Methodology

In this study, a mixed-methods approach was used to gain a better understanding of the brain dominance of student's in learning English by using Problem Based Learning. Quantitative data were collected via an online questionnaire using Googleform, while qualitative data were collected via online interviews. The gathered data were analysed using SurveyMonkey and SPSS software (version 21)

3.1 The Participants

Participants were students from selected public and private vocational high schools of the same level but different disciplines. Student participants were those who were learning online when the survey was conducted. All students completed the problem-based learning task before the questionnaire was distributed at the end of the meeting. The online questionnaires included 15 multiple-choices that tested the student's brain dominance, and the duration was limited to less than 20 minutes.

3.2 The Instruments

3.2.1 Googleform

The Google form was the tool to create and share the questionnaire via an active hyperlink, which was sent to the student's school email accounts. The online questionnaire consisted of one section only. All items were closed-ended and asked students to respond using three multiple choices, which will help to determine the hemispheric dominance of the participants; the researcher used The Brain Dominance Inventory (BDI), which was composed of 39 items. The test was first developed by an unknown author and then revised by Davis (1994). Each test item was followed by three alternatives. The participants' total of a's, b's, and c's had to be 39; otherwise, the score would be incorrect. It is also worth mentioning that BDI suggests a continuum for individuals' hemispheric dominance. Based on the results, people are assigned to one of the categories of very strong left/right brain dominant, left/right brain dominant, with a moderate preference toward the left/right, with a slight preference toward the left/right, or whole-brain dominant (bilateral). Therefore, following in the previous researchers' footsteps mentioned above, individuals' Hemispheric Preference is what is called brain dominance in this study. In addition, at the end of the questionnaire, an item for providing contact information was added as a request for students to volunteer for the follow-up interview.

3.2.2 Interview

Some students were interviewed through an online questionnaire. The purpose of the interviews was to better understand the students' online English learning experience with problem-based learning, and both interviews were conducted in individual telephone interviews. Prior to the interview, we contacted the student via WhatsApp/Telegram, arranged an appropriate interview time, obtained consent via Google Forms, and used an audio recorder to record the conversation during the interview. Both interviews were semi-structured, less than 10 minutes per participant, and focused on examining student perceptions of online English activities using problem-based learning. So, the main questions are: What do you do when a single task is online? After conducting the interviews, we transcribed the interview notes and analyzed the transcripts for key patterns (Braun & Clarke, 2006), analyzed the interview data, and then examined the results with emphasis.

The researchers have taken a number of different ethical factors into account. Also, the students were asked to sign an acknowledgement form prior to the questionnaire and interview, which guaranteed confidentiality and attained the participants' approval. Prior to the beginning of the study, the researchers obtained online data collection approval from them; also, the researchers asked the students to sign an acknowledgement form prior to the questionnaire and interview. In addition, the acknowledgement form emphasized that the involvement of students was entirely optional and that they were free to withdraw from the activity at any time without incurring any penalties. The interviews were taped after receiving their permission to do so, but no personally identifying information was collected from the students in order to protect their information.

4. Results and Discussion

Table 1. The Frequency Distribution of Left -Brain Dominant and Right-Brain Dominant Learners

Learner Type	Count	Percentage
Left Brain-Dominant	7	6,93%
Right-Brain Dominant	88	87,13 %
Whole Brain Dominant	6	5,94%

Table 1 shows that 6.93% of the student body (or 7 out of 101) is left-brained. So-called "left brain" thinking is characterized by logical, analytical, sequential, and rational thought, and it is a combination of the functions of the left cerebral hemisphere (analytical) and the left limbic system (sequential). All language, math, and analytical tasks are left-hemisphere dominating for the LBD students. The ideal way for left-brained students to learn is through lectures that present information in a structured, rule-based format. To elaborate on this, Enomoto said that LBD students take neat notes, have an ordered binder, don't find timed tests too difficult, read directions properly, use sequential reasoning, and look for ultimate answers and closure. The left hemisphere of their brains is more adept in word and letter recognition, logic and reasoning, attention to detail, and analytical thought, but they have trouble seeing the big picture. In addition, the left hemisphere helps students learn and create by directing their focus, isolating, fixing, and making obvious particular qualities. Melina said that LBD students' left brains were responsible for precise logical and mathematical calculations.

Regarding hemisphericity, educators must choose a range of approaches. Left-brained students benefit most from the discovery problem-solving technique, which the instructor can implement by using tools like true/false statements, multiple choice and matching activities. Reading and writing projects that need extensive analysis, graphs, charts, and tables are suggested. Since they can process information in a linear and sequential fashion, the typical lecture format is also effective for these students (Kinsella, as cited by Kang, 1999). An official teacher-student relationship is ideal, as is the practice of rewarding students for doing the right thing.

On the other hand, 87.13 percent of the students, or 88 out of 101, had right-brain dominance (Table 1). The two regions located on the right side of the brain, the right limbic system (which is responsible for interpersonal functions) and the right cerebral hemisphere (which is responsible for imaginative functions), were combined to reflect what is known as "right brain thinking." This type of thinking is distinguished by global perception, intuition, synthesis, and emotional expression. Learners with a greater capacity in their right hemispheres for the examination of spatial relationships and geometrical forms and shapes are referred to as Right Brain-Dominant learners. As he explained it, it allowed the students to put the pieces of the puzzle together because it showed the right hemisphere of their brain as the creative side that has the ability to see the whole from the parts. According to Enomoto, RBD thinkers are individuals who scan directions rather than listen to or read directions in depth; visualize a picture to assist them in remembering facts; have a tendency to daydream and lose track of time; thrive on hands-on learning; but struggle with sitting, listening, and taking notes. The right hemisphere of these students' brains allows them to see the big picture, have a broad perspective, be able to see things from the point of view of another person and foster the development of empathy and the social aspect of human nature. The right hemisphere of the brain was primarily responsible for spatial and imagistic thinking, as well as nonverbal, nonmathematical, and nonsequential processes. The right hemisphere of the brains of right-brain dominant (RBD) learners is responsible for some mathematics but only for making estimates and making comparisons. The findings from Oflaz (2011) similarly said that the brain preference of students has a great impact on learning; therefore, the idea of knowing students' brain-dominant would also make a significant difference in teachers' preparation for teaching and selecting suitable teaching media for students.

In the figure, the specifics of the students' left brain and right brain dominance were given separately for each student. The specifics of left and right brain dominance in each individual are described.

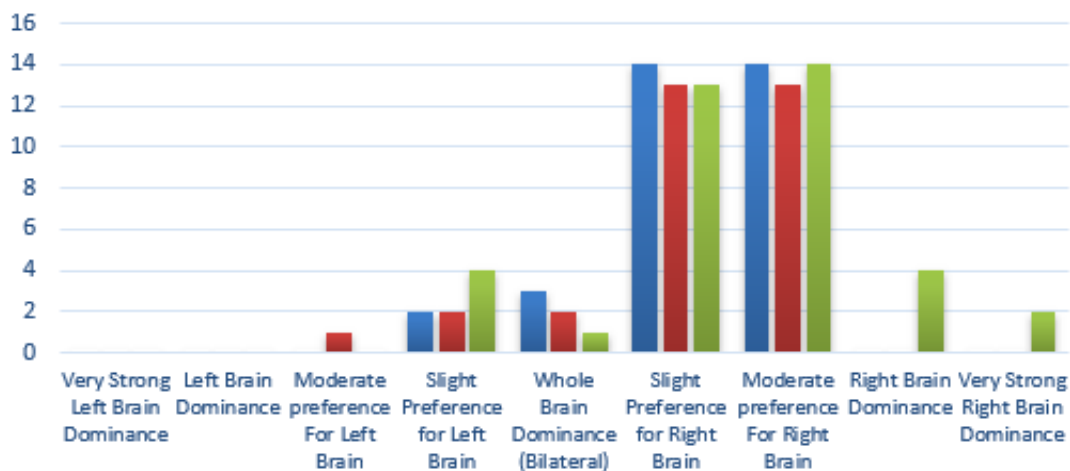


Figure 1. The frequency of response on Brain-Dominant

The distribution of the student's brain's dominant hemisphere was represented by the presence figure. It was clear to observe that the majority of students fell into the categories of having a modest preference for their right brain or having a considerable preference for their right brain. On the other hand, 5.94% of the student population fell into the category of having whole brain dominance. The findings of this study point to the conclusion that the dominant hemisphere of a person's brain has an impact on how well they do academically in English classes. When all of these factors are considered, instructors are better able to determine which methods will work best in their own classes. Therefore, instructors are in a position to determine what kinds of activities kids require to develop other parts of their brains in addition to the section that is considered to be their dominant one. If a teacher is aware of the dominant mode of his or her own brain, it will be easier for him or her to avoid teaching only via that mode. The teacher may enhance the efficiency of his or her own teaching, boost the success rate, and also advise the students on learning tactics and memorizing information if the instructor determines the brain dominance of the students and then gives tasks based on that information. All of this information may be helpful to teachers in ensuring that they appeal to all learners, including those whose brains are dominant in various areas, and that they provide their students with experiences with all three modes of learning. They need to find a method to integrate all three in order to help their students improve, create an environment that makes learning simpler and more pleasant, and assist students in bolstering their knowledge with activities that have some sort of relevance to their lives.

Students take the brain-dominance exam soon after PBL is implemented in the classroom, so this information was taken directly from previous surveys to answer the second study question as follows.

Table. 2 Student’s Brain-Dominance Associated with Learning English using PBL.

	Class	Mean of the Use of PBL in English Learning.
Right Brained Students	School A	80,66
	School B	76,84
	School C	72,62
Left-Brained Students	School A	42,33
	School B	62,82
	School C	62,78
Whole Brained Students	School A	76,15
	School B	62,28
	School C	70,26

5. Conclusion

Students who scored well on the English activity section tended to be those with a right brain who responded well to visual cues and instructions. They were both receptive to and skilled at the writing activities. Students who are strong in the use of logic and analysis to solve problems and recognize subtle distinctions performed well in the Reading and Use of English sections.

It appeared that students who could use both hemispheres of their brains equally performed poorly on standardized tests. The findings of this study show that students' brain dominance influences their performance in English classes. This is also supported by the student’s interviews, which underpin some important things such as the learning media, the learning strategies and the learning environments. The participants who got the chance to be interviewed confessed to similar statements regarding their perception of PBL learning, which dominantly mentioned the teaching and learning process.

By keeping all of this in mind, educators can develop effective methods for their own classrooms. Therefore, educators can determine the best ways to stimulate students' non-dominant hemispheres of the brain. Teachers who are self-aware about their own patterns of brain dominance can avoid imposing those patterns on their students. Therefore, teachers can help their students succeed in class, boost their own success rate, and get advice on study techniques by determining which hemisphere of the brain each student predominantly uses. Teachers can use this data to ensure they are catering to students with varying degrees of linguistic, spatial, and temporal modal dominance. They need to figure out how to integrate all three to assist their students in improving, to make learning easier and more fun, and to aid in the reinforcement of students' knowledge through purposeful activities. In addition, it could be a suggestion for teachers in the future.

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