STIMULATION OF PRESSURE ON LIQUID CONCEPT IN STAD LEARNING MODEL TO IMPROVE RATIONAL THINKING SKILLS AND LEARNING OUTCOMES OF STUDENTS

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STIMULATION OF PRESSURE ON LIQUID CONCEPT IN STAD LEARNING MODEL TO IMPROVE RATIONAL THINKING SKILLS AND LEARNING OUTCOMES OF STUDENTS

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ABSTRACT

The research aims to determine the effect of using cooperative learning model type STAD on learning science to students' performance in rational thinking skills and learning outcome. The point of view of this influence is seen from the presence or absence of improvement rational thinking skills activity of cognitive learning outcomes after treatment. The research used experimental method with the design One Shot Case Study and took place in SMPN 3 Gorontalo. The data obtained were students' performance in rational thinking skill and learning outcome gathered by observation sheet of students' activity and test sheet. The result show that increase in average score of students' performance in rational thinking in the third meeting compared to the first meeting by indicators of information digging, information processing, problem solving, and conclusion formulating. The overall result shows that the students' performance in rational thinking skills achieves good criteria; additionally, the students' learning outcomes achieve average score of 83.81, categorized as B (good).

ABSTRAK

Penelitian ini bertujuan melihat pengaruh penggunaan model kooperatif tipe STAD pada pembelajaran IPA terhadap kecakapan berfikir rasional dan hasil belajar kognitif siswa. Pengaruh ini dilihat dari ada atau tidaknya peningkatan aktivitas kecakapan berfikir rasional dan hasil belajar kognitif siswa setelah diberikan perlakuan. Penelitian ini menggunakan metode eksperimen dengan desain One Shot Case Study yang dilaksanakan di SMP Negeri 3 Gorontalo. Data yang diperoleh berupa aktivitas kecakapan berfikir rasional siswa dan hasil belajar kognitif yang dijaring dengan menggunakan lembar pengamatan aktivitas siswa dan lembar tes. Hasil yang diperoleh menunjukkan terjadi peningkatan rerata skor aktivitas siswa untuk kecakapan berfikir rasional pada pertemuan ketiga bila dibandingkan dengan pertemuan pertama untuk masing-masing indikator menggali informasi, mengolah informasi, memecahkan masalah dan membuat kesimpulan. Hasil penelitian secara keseluruhan menunjukkan perolehan dengan kriteria sangat baik untuk kecakapan berfikir rasional siswa, dan untuk hasil belajar kognitif siswa diperoleh rerata skor sebesar 83.81 dengan predikat B (baik).

INTRODUCTION

Efforts to provide mastery of basic competencies to students in the learning process that lead to mastery of life skills need to be done, so that they have the courage to face problems in life and be able to solve these problems creatively. Research conducted by Mugambi and Muthui (2013) shows that life skills enable students to overcome life's problems and make important choices for their lives now and in the future. Other studies by Khera and Khosla (2012) show that by developing life skills oriented learning, in general can help students in translating knowledge, attitudes and values in healthy living behavior. Permendikbud 2013 states that the goal of science edu-

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cation emphasizes the understanding of the natural environment and natural resources that need to be preserved within the framework of physics, chemistry and biology. This indicates that science learning not only emphasizes the mastery of a collection of knowledge, but also a process of discovery that actively involves students and is oriented towards life skills that act as a tool to help students develop learning abilities (Kemendikbud, 2016).

Life skills that are intended are skills which refer to a variety of abilities of a person to be able to obtain life with success, happiness, and dignity in society. Setiorini and Munoto (2016) explained that life skills are the ability and courage to deal with life's problems, then proactively and reactively seek and find solutions to overcome them. According to the concept, life skills can be divided into five parts, namely:

(1) The ability to know oneself (self awareness), which is often called personal ability (personal skill). These capabilities include: (a) self-esteem as creatures of God Almighty, members of society and citizens, (b) realizing and grateful for the strengths and weaknesses that they possess as well as making them capital in improving their quality as individuals who benefit themselves and their environment

(2) Thinking skills. These skills include: (a) the ability to gather and find information, (b) the ability to process information and make decisions, (c) creative problem solving skills;

(3) Social skills which include: (a) communication skills with empathy, (b) the ability to work together, empathize, understanding attitude and the art of communication is not just conveying messages, but the content and arrival of messages accompanied by good messages, will foster a harmonious impression,

(4) Academic skills. Often called the ability to think scientifically (scientific method), including, among others, identification of variables, formulating hypotheses, and carrying out research, and

(5) Vocational skills (vocational skills) which are also called vocational skills, meaning that skills are associated with certain work fields contained in community (Ministry of National Education, 2007).

Science learning according to the 2013 Curriculum for junior high school / MTs is a learning integration of various concepts in integrated science subjects that use the transdisciplinarity approach. Through this integrated learning, making science as contextual learning enables students to actively seek, gather and discover scientific concepts and principles holistically, meaningfully and authentically both individually and in groups (Kemdikbud, 2016). Based on this description, it is expected that students can find the concept of science as a whole and authentic, so that they can have life skills and shape the personality of students who excel in solving various problems.

The reality in the field shows that the application of science education that integrates life skills so far has not been fully designed in learning. The achievement of these educational goals is only seen as a nurturant effect which is automatically formed along with the mastery of the subject matter. In addition, almost all schools found a learning pattern that was very product-oriented, so that the learning activities intended to foster the skills of educational processes and goals that included honesty, discipline, mutual tolerance, rational thinking, critical, etc. which were actually identical with skills. life in general or general life skills cannot be implemented (Depdiknas, 2006).

The results of interviews with science teachers in a number of junior high schools (SMP) and Madrasah Tsanawiyah (MTs) located in the city of Gorontalo indicate that the emphasis on life skills aspects in the science learning process, especially in the field of physics on the topic of pressure on liquids is not optimal. More than 85% of teachers stated that learning activities that integrate life skills that are identical with the skills of this process have not been included in the learning design. It was also stated that some of the students' skills were quite low, namely the students' skills in exploring and finding information, the ability to process information and make decisions, students' skills in process of concept discovery, students' communication skills (communicating experimental results), students' skills in applying mathematical operations and understanding mathematical language in solving science problems. This results in low student learning outcomes.

The results of the initial analysis carried out on students' rational thinking abilities (such as exploring and processing information, solving problems, and making conclusions) on the material pressure on liquids in SMP Negeri 3 Gorontalo, obtained results that when given a visionization of the phenomenon associated with sub-sections the topic of pressure on liquids (such as hydrostatic pressure, vessel contact and float, float and drowning events / Archime-

des' Law) there are 75% of students who have not been able to express what information they have obtained from the visualized phenomenon. Based on this situation it can be concluded that students have learning difficulties on the topic of pressure on substances, especially the pressure on liquids. This was confirmed by the results of the 2016/2017 Computer-Based National Examination (UNBK) published by the Ministry of Education and Culture (2017), the average score of students, especially in science subjects in a number of SMP / MTS throughout Gorontalo City, decreased compared to the academic year previous.

The decrease in the average score of students in 2016/2017 UNBK, especially in science subjects, based on the results of interviews with a number of science teachers, was due to teachers' difficulties in explaining abstract topics, including the topic of pressure on liquids. This is similar to what was stated by Loverude et al. (2003) that the material pressure on liquid and its application in everyday life is an abstract topic, so students experience problems in understanding the concepts taught in this topic. One of the impacts that will be caused by students' difficulties in understanding concepts is the low ability of students to solve problems (Johnson, 2012; Reddy & Panacharoensawad, 2017)

Based on the description above, the researcher tries to overcome it by implementing lifeskills oriented learning, especially rational thinking skills, by using cooperative learning model type Student Teams Achievement Division (STAD). The use of STAD type cooperative learning model was chosen due to it's advantages, namely helping students understand difficult concepts is also very useful to foster the ability to cooperate, critical thinking skills and communication skills (Sadieda & Avivah, 2011; Ernawati, 2014; Rahmawati et al., 2016).

Based on the advantages of the STAD type of cooperative learning model, the purpose of this study is to determine the effect of the use of STAD type cooperative learning model on science learning on rational thinking skills and student cognitive learning outcomes. This influence, seen from the presence or absence of an increase in the score of rational thinking skills activity and cognitive learning outcomes of students after being given treatment

METHOD

The research carried out is quantitative descriptive research and the method used is an experimental method with the One Shot Case Study research design, in which this design uses only one experimental class without comparison and also without the initial test. In this study treatment of the experimental class was given to determine the effect of the treatment (Arikunto, 2011).

The research was carried out in SMP N 3 Gorontalo 2016/2017 Academic Year with the population being all eighth grade students in 7 classes, grades VIII-A to VIII-G. The sample selection was determined by using Cluster random sampling technique or group sampling conducted by lottery method, so that class VII-IC was chosen as the experimental class. The instrument used in the study is rational thinking skills assessment sheet, which consists of student activity assessment sheets and test sheets that lead to indicators of rational thinking skills. Data collection techniques used observation and test methods.

The data obtained were analyzed quantitatively descriptive, by assessing the activities of students' rational thinking skills during the learning activities. This activity was observed by two observers with reference to the assessment rubric. The test results of students' rational thinking skills are interpreted according to the criteria for scoring and determining the predicate contained in the assessment guide book for SMP / MTs in the 2013 Curriculum, as listed in Table 1.

Table 1. Score Interval and Predicate of Students' Rational Thinking

Score Interval	Predicate	Annotation
> 90 – 100	A	Very Good
> 80 – 90	B	Good
≥ 70 – 80	C	Moderate
< 70	D	Poor

RESULTS AND DISSCUSSION

General Description of Research Implementation

In the initial stages of the implementation of learning activities by using the STAD type learning model on the topic of pressure on liquids presented the IPA phenomenon in the environment around them. Phenomenon given such as (1) the phenomenon of water entered in a bottle of mineral water, which then the bottle is perforated at varying levels, (2) the water

put in a teapot with different neck heights, (3) paper, safety pins and plasticine converted into various shapes, then put in a vessel filled with water. From these activities, students are asked to explore what information they can provide, both related to physical concepts and what physical quantities of the visualized phenomenon. Then from the information presented, students are then asked to process the information they get by asking questions / formulation of the problem. From the questions / formulation of the problems created by students this will be a guide for students in finding ways to solve problems.

The activity of asking students questions or problems about the phenomenon of science that they observe has the potential to train students to find and explore information, so they can process the information, and finally they can solve the problem well. This is in line with the facts put forward by Keles and Ozsoy (2009), that if students are able to express basic concepts well, then students will also have the ability to solve scientific problems well.

The next step in learning activities is that students work in groups, do practicums with the help of Student Worksheets (LKS). In this activity students are asked to carry out the practicum to answer the questions / problems they raised before. The solution to the problems they do through practical activities can be seen from the conclusions that they provide. In this session, the teacher as the facilitator gives comments, suggestions and input on students' conclusions, while strengthening the concept. Students who can solve problems properly and correctly are also shown by their ability to make conclusions. This is in line with the opinion of Zewdien (2014) that students who can convey ideas well, show that they are able to process the information they explore well, so that they can connect these ideas to be meaningful in a form of conclusion.

Overview of Results of Assessment of Students' Rational Thinking Skills

The results of assessment of life skills, especially students' thinking skills, are obtained through observing student activities during the learning process (for three meetings) which refers to indicators of rational thinking skills carried out by 2 (two) observers. The indicators of rational thinking consist of (1) the ability to gather information, (2) the ability to process information, (3) the ability to solve problems, and (4) the ability to make conclusions. Gene-

ral description of the results of the assessment of students' thinking skills at each meeting as presented in Table 2.

Based on the data presented in Table 2, which is then associated with Table 1, it can be seen that the giving of treatment is by using the STAD type cooperative learning model, students' rational thinking ability is in good criteria. This data is supported by the fact that most students (as indicated by the mode score) have a score of rational thinking skills of 80.16, 82.04, and 87.92 respectively at the first, second, and third meetings. In addition, the percentage of students who have a rational thinking skill score above the mean score reaches 52.38%. Based on these results it can be said that STAD cooperative learning has a positive impact on students, such as encouraging students to create a situation where one's success is determined by the success of the group.

In this learning, the teacher acts as a facilitator and students have the opportunity to be actively involved in every learning activity. Students are also more active in discussing with friends a group to solve problems, actively asking the teacher and being active to present the results of the discussion. Even so, there are still students at the first and second meetings on certain indicators that still get the title C (enough) and D (less) due to several factors such as class atmosphere that is less supportive, less optimal teachers in classroom management activities, so students are not focused , students who are not accustomed to conducting experiments cause the amount of time wasted explaining the steps of work and guiding students, as well as the differences in students' ability to absorb information conveyed by the teacher.

As stated by Ibrahim et al. (2010), that the mastery of teachers and students on the skills of planning and conducting experiments is the main provision needed to develop themselves and seek answers or solutions to problems faced in learning science in the classroom and in everyday life. In addition, the teacher plays a major role in the creator of a learning environment that is conducive to the growing development of students in mastering life skills.

Students' Rational Thinking Skills for each Indicator

Judging from each indicator of rational thinking proficiency also obtained an increase in scores of students' rational thinking skills as presented in Figure 1. Based on Figure 1, it ap-

Table 2. Overview of Results of Assessment of Students' Rational Thinking Skills

Meetings	Scores						
	Lowest	Highest	Average	Modus	Median	Varians	Deviation Standar
First	65.63	93.75	80.06	84.38	81.25	24.72	4.97
Second	75.00	93.75	85.42	87.50	84.38	12.51	3.53
Third	84.38	96.88	89.14	87.92	87.50	5.11	2.26
Average	75,00	94,79	84,87	86.60	84,38	14,11	3,59

pears that overall there was an increase in the average score of rational thinking skills at the third meeting for all indicators compared to the first meeting. The following is exposure to the results obtained for each indicator of rational thinking ability.

Ability to Gather Information

The aspect of rational thinking skills in the indicators of information gathering, as shown in Figure 1, shows that at the second meeting decreased by 0.78% from 76.79 to 76.19 and at the third meeting the average score increased to 89.29 or increased by 17.19%. This shows, that students have been able to gather information from reading, listening, seeing relevant phenomena and discussing and being able to emphasize as important information.
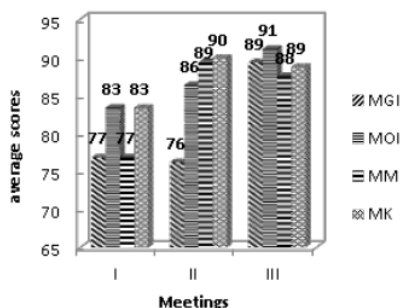
where: MGI: Exploring Information
MOI: Processing Information
MM: Solving Problems
MK: Making Conclusions

Figure 1. Average Score of Student Activity Refers to the Indicator of Rational Thinking Skills

Students' activities in exploring information at the first and second meetings are still low, in the sense that they are still in the sufficient category. The low score of these activities is due to students not yet accustomed to and rarely given the opportunity to read or look for

reading material related to topics taught and practicum activities independently, so that students are not used to dig deeper information.

In this study, in the stage of presentation of material by teachers conducted through audio-visual shows and assisted by students' worksheet, students are given the opportunity to find and gather information based on the outlines of the information presented by the teacher. Then, students are given the opportunity to explain the findings of the information they have obtained.

Providing explanations and opportunities in searching for literature related to the topic of pressure being taught, making students accustomed to digging up information related to pressure topic from the literature/reading material presented. In addition, the material delivery activities always begin by explaining the learning objectives to be achieved at the meeting, as well as in the teacher learning process assisted by the media, demonstrations, questions or real problems that occur in everyday life.

The use of STAD type cooperative learning models in this study causes students to find information from various sources and learn from fellow group students. Not only smart students will always be active but all students. As stated by Slavin (2009: 143) that groups in STAD can increase students' confidence to find information from various sources and learn from fellow group students.

Furthermore, as stated by Arends (2008: 7-12) that one important aspect of cooperative learning is that in addition to that approach it helps improve cooperative behavior and better group relations among students, at the same time it will help students in academic learning. Thus it can be assumed that students with less learning abilities work side by side with those who have more abilities and these more capable groups benefit from the process of acting as tutors for their less fortunate friends. This is then suspected to be the cause of increasing students' ability to dig up information, as can

be seen from the reduced number of students with a C (enough) in each meeting from a total of 6 students at the first meeting to 3 students at the third meeting.

Information Processing Ability

In the learning process that takes place during the study, students are used to processing the information provided and what they get according to the concept well. This condition makes students' rational thinking ability on the indicator to process information at each meeting experience significant improvement.

The indicator processing information based on Figure 1, shows that there was an increase in the mean score from 83.33 at the first meeting, an increase of 9.29% to 91.07 at the third meeting. This average score increase shows that students process information through serious thinking and try to discuss the information. In this activity it is expected that the entire process of its activities can take place well, so that information can be entered in students' long-term memory as meaningful information.

In addition, an increase in the mean score of students for aspects of processing information, as well as in the aspect of exploring information, is thought to be caused by the use of the learning model used. The formation of a team in this learning makes students more enthusiastic in learning. The number of ideas that emerge, of course, will further enrich students' knowledge and understanding, so that students can improve processing information obtained.

Based on the findings obtained in this study, students who provide responses, ideas or input can help them to better process the information they obtain. So that students can straighten the wrong concept together. This is in line with what Morgan (1995) stated in his research, that in the STAD type of cooperative learning process indirectly there will be discussions between students both in one group and between groups, students are trained to express opinions/ideas, respect opinions/ideas friends, gather and find information, process information, make decisions, and solve problems.

The ability to solve problems

One of the stages in learning using the STAD model is grouping students into heterogeneous groups totaling 4-5 students. By grouping students into small groups gives an opportunity for them to discuss problems faced,

exchange ideas, and obtain alternative solutions to problems that can be used. In addition, in small groups, students may be able to solve problems better than when working individually. Even though working together can take longer, the results of the study show that when working in groups, students are able to show better abilities in understanding the problem in more depth. This finding is in line with the results of Khan and Inamullah's (2011) study which suggests that STAD as a type of cooperative learning is able to meet students' needs in critical thinking, problem solving, and integrating knowledge with experience. For this reason, the use of cooperative learning models can improve the quality of learning because students can actively participate in a small group in learning activities to achieve the expected goals.

The results showed that on the problem solving indicator, the average score at the first meeting was 76.79, an increase of 16.28% to 89.29 at the second meeting. This data shows that students have been able to solve problems related to their duties in teaching and learning activities, although at the third meeting decreased by 2.00% to 87.5. The average decrease in scores at the third meeting was due to students being too preoccupied in teaching and learning, sometimes losing focus on the core problems that would be tried to be solved in the ongoing learning process. In addition, several students were observed to be in a hurry in completing the assignment, so they did not have time to review the results they had obtained.

As explained in Piaget's development theory, that the age of the eighth grade junior high school is the transition age from the concrete operational phase to formal operations, in this phase the majority of students will deal with the problems they face in a less systematic manner. One strategy that can be used to solve this problem is by giving students direct experience through practicum activities which are guided by student worksheets and the presentation of each group's activities makes students more able to process information, then solve problems faced so they can make conclusions from the topics being discussed (Nugroho et al., 2009).

Based on the findings of students in the field, the data obtained is that students often ask questions and express their ideas to friends in the group as well as to teacher things related to the practice questions that are on the student worksheet. Another step that can be done

is to train students not to make conclusions in a hurry and the teacher should provide more opportunities for students to brainstorm or brainstorm, so that students' ability to solve problems will increase (Nur & Wikandari, 2000).

Ability to Draw Conclusions

As with the problem-solving indicator, the average student score increased at the second meeting compared to the first meeting, with the average score at the first meeting of 76.79. Subsequently at the second meeting increased by 16.28% to 89.29, then at the third meeting decreased by 1.32% to 88.69. This data shows that students have attempted to make conclusions based on group opinions or relevant theories and with teacher guidance, students are able to solve problems related to their tasks in teaching and learning activities.

The problems that arise at this stage are the general condition of students who are less systematic in handling the problems they handle and the nature of students' hurry in completing the given task. Overall, based on the results of the assessment of the average score of students' rational thinking skills classically there was an increase in score of 10.18%, from 80.06 at the first meeting to 89.14 at the third meeting. The improvement of students' rational thinking skills is allegedly caused by treatment during learning activities. This happens because the STAD grouping has improved these aspects. When the process of discussion and problem solving takes place, students in one STAD group actively communicate with each other to solve the given problem. There was a discussion activity involving the measurement ability of each student so that the measurement aspect also increased. In addition, in solving problems together, students in the STAD group discuss to get the same perspective so that they can draw the final conclusions from the problems that have been solved. Thus, the concluding aspect also increases.This is in line with the results of research obtained by Ajaja and Eravwoke (2010) that cooperative learning, such as type STAD can increase student learning activities, such as in problem solving activities and drawing conclusions.

Based on the results of this study it can be seen that with the use of STAD type cooperative learning model can increase the average score of students for each indicator of rational thinking skills. Assessment of students' rational thinking skills in this study obtained optimal results with good and very good predicate. This

is like the results obtained by Jufri and Djafar (2010) and Rahmawati et al. (2016) who succeeded in improving students' thinking skills by using the integration of STAD and TGT cooperative learning models. In line with this, Setiorini and Munoto (2016) also succeeded in improving students' life skills (including rational thinking skills) using STAD type cooperative learning models. In addition, as stated by Deming and Cracoline (2004) that the development of the quality of thinking skills, including the ability to think rationally can be done through the application of learning models that can actively involve in the process of thinking. So using the right learning model like the STAD type cooperative model can make students more active.

Student learning outcomes

In addition to observing the activities of students in thinking activities based on indicators during the learning process, at the end of the meeting an assessment was also given in the form of a written test. This test aims to measure students' knowledge after participating in life skills oriented learning activities in this case is rational thinking skills. The score of students' learning outcomes was measured using a 9-item description test which refers to the indicator of measured rational thinking skills, which consists of the C1-C6 cognitive domain with a maximum score of 75 as shown in Figure 2.
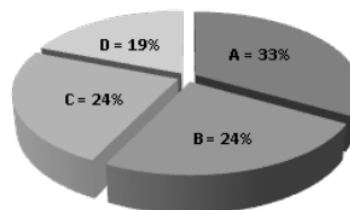

Figure 2. Score Percentage of Students' Rational Thinking Test

Percentage of junior high school students' post-test results on material pressure on liquid, from 21 students there were 33% of students (7 students) who received the title A (very good), 24% of students (5 students) who received the title B (good) and C (enough), and 19% (4 students) who received the title D (less). Based on the classical completeness criteria (KKM) that have been determined that is equal

to 75 and the determination of the predicate based on the assessment guidelines issued by the Ministry of Education and Culture in 2016 as presented in Table 1, the average score of student learning outcomes is 83.81 with the title B (good). However, from 21 students there are 4 students who have not yet completed. This means that classically it is categorized as complete, because based on the defined KKM which is 75, the percentage of students with a score above KKM reaches 80.95%.

The completeness of the material taught in this study was allegedly caused by the use of the STAD model. Therefore, the indicators and items arranged by the researcher can be said to have been mastered by students so that it can be said that life skills oriented learning, especially rational thinking skills by using STAD type cooperative learning models can help students to achieve learning completeness. This is supported by the results of research conducted by Setiorini and Munoto (2016) which states that the learning outcomes of students' knowledge competencies after being taught with cooperative learning models Type STAD obtain 100% completeness.

Judging from the increase in the average score of rational thinking skills and students 'cognitive learning outcomes that were learned by the STAD type cooperative model in this study, it was seen that there was a very strong relationship between students' rational thinking skills and learning outcomes. This very strong relationship is expressed by the results of testing the correlation between the scores of the results of the assessment of rational thinking skills with students' cognitive learning outcomes obtained a correlation coefficient of 0.88. In line with this study, the increase in learning outcomes obtained in this study is reinforced by the results of research conducted by Muliyani and Kurniawan (2014) which states that STAD type cooperative learning can improve student learning achievement, and there is a positive relationship between the ability to think with student learning outcomes cognitive domain.

CONCLUSION

The use of STAD type cooperative learning model can be used to improve students 'rational thinking skills and can complete students' cognitive learning outcomes classically for pressure material on the liquid. The results obtained showed an increase in the average score of student activity for rational thinking skills at the third meeting when compared to the first meeting, from categories with sufficient predicate at the first meeting, increasing to categories with good and very good titles at the third meeting. For students' cognitive learning outcomes, the mean of learning outcomes with the predicate B (good) was obtained, with 33% of students who received an A (very good), 24% of students who received the title B (good) and C (enough), and 19% get the title D (less). From these results it is suggested that in the future learning practice the teacher must pay more attention to these indicators.

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STIMULATION OF PRESSURE ON LIQUID CONCEPT IN STAD LEARNING MODEL TO IMPROVE RATIONAL THINKING SKILLS AND LEARNING OUTCOMES OF STUDENTS