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The Effect of Problem Solving-Based Learning Journal on Critical Thinking Ability Motivation and Student Learning Outcomes on the Concept of the Human Blood Circulation System

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***Abstract**: This study was conducted to determine the effect of the use of problem-solving-based learning journals on the critical thinking skills, motivation, and learning outcomes of students to the concept of the human circulatory system. The research design used in this study is experimental research (experimental research) using a pretest-posttest control group design. The results showed that there was an effect of using problem solving-based learning journals on students' critical thinking skills and the effect of using problem solving-based learning journals on students' learning motivation and the effect of using problem solving-based learning journals on student learning outcomes. Overall it can be concluded from this study that the critical thinking skills, motivation, and student learning outcomes can be improved through the use of learning journals using a problem-solving approach.*

***Keywords**: Learning Journal, Problem Solving, Critical Thinking,*

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I. Introduction

The learning process is essentially an interaction between students with the object being studied that has an impact on improving the quality of education. Efforts to improve the quality of education, especially in the field of biology by optimizing the role of the teacher to activate students, create learning that can increase student motivation, so that the material presented by the teacher can be easily understood.

Biology is a science that studies living beings. Learning biology is not necessary to read and memorize, nor just a matter of communication and interaction of teachers to students. According to Suratsih (2010), essentially biology learning emphasizes the interaction between students and the object being studied. This interaction can provide opportunities for students to practice learning to think critically and understand how to learn, develop rational thinking potential, skills and personality as well as recognize problems and their assessments. By examining problems in biology lessons through planned learning in schools, they can train, develop critical thinking skills, increase motivation so that it affects learning outcomes.

One of the goals of learning can help students to develop higher-level thinking skills such as critical thinking, motivated as stock students through learning activities that encourage critical thinking skills make students able to interpret, analyze, and provide solutions to a problem that will be faced.

Critical thinking is the ability of students to think neutral, have a logical reason, a strong desire for clarity and accuracy of information. Based on the opinion of Anderson (2001) if critical thinking can be developed, students will tend to seek the truth, think openly, tolerant of new ideas, can analyze problems well, and have a high curiosity. One of the strengths of a critical thinker is being able to identify important points in a problem, being focused and able to observe, tolerant of new points of view, willing to acknowledge the advantages of other people's points of view, and having analytical skills that can be used in various situations (Cottrell, 2005).

Critical thinking skills are closely related to motivation. Overall motivation is the driving force in students that could cause the spirit of learning activities, which ensures continuity of learning and giving direction and learning activities so that the desired activity is achieved by either (Sardiman, 2011). One of the factors that influence the success of teaching and learning is student learning motivation. The greater the student's learning motivation, the more successful it is in achieving maximum learning outcomes. Staton (2009) suggested that a student will succeed in learning if in itself there is a desire or motivation to learn and has a high learning motivation in students.

In learning activities, motivation is an important factor, because motivation can make students study seriously. According to Uno (2007), motivation and learning are two things that influence each other. Motivation can play a role in strengthening learning when students are faced with a problem that requires problem-solving, and can only be solved with the help they have been through (Purwanto, 2007). Therefore, it can be concluded that motivation can be a learning reinforcement for students if the students themselves are motivated to learn.

One of the factors causing low ability students' critical thinking and lack of motivation to learn and student learning outcomes can be caused by the teacher in choosing the method or model of applied learning in the learning process so that the impact on student achievement. Therefore, learning journals can be one of the means or learning tools that can be used to overcome these problems and are expected to increase students' interest or desire to learn in learning so that it affects the achievement of student learning outcomes.

A Journal study (also called the learning journal) is a written document, which contains a collection of notes, observations, ideas, and relevant materials prepared by the students after undergoing a process of teaching and learning in the classroom (Moon, 2010). The use of learning journals can make students aware of what they have learned and experienced during learning activities and can measure the learning progress that has been achieved and identify things that are not understood by students (Yeyendra, 2017). Thus, it can be concluded that writing a learning journal can make students evaluate their learning process to what extent is known and to what extent is not known.

According to (Kartono, 2010) the intended use of learning journals for students to improve learning outcomes through the act of writing and thinking training. The use of learning journals is an activity that must be accustomed to students to train thinking processes as well as train higher-order thinking. Meanwhile, according to Santrock (2009), students' thinking processes can involve manipulating and transforming information in memory and forming concepts, reason, think critically and creatively, make decisions and be able to solve problems (problem-solving)p

Use of this research study journal in applied problem-solving approach. Problem-solving raised by Polya (2004) includes the steps as follows: (1) understanding of the issue/problem analysis (2) through a settlement plan (3) the implementation of the plan of solving / implementation (4) a review of the results of troubleshooting. Fathonah (2016) research results reveal that learning to solve problems is very important for students to learn more actively and creatively because solving problems can train students to solve a problem and empower the thinking process to get a new idea. Therefore, the use of problem-solving-based learning journals can increase the achievement of good learning outcomes.

From the results of initial observations on the material of the human circulatory system that the material is difficult for students to understand, but the teacher has provided it by the demands of the 2013 curriculum and both schools already have adequate learning facilities to support the learning process. Another obstacle is the habit of learning which is still teacher-centered so that it becomes constrained to train students' critical thinking skills. This is because there are still many students who are not actively asking and expressing opinions, a large number of students tend to choose silence when a teacher gives problems or cases that require student responses. Student learning outcomes are still low, this can be seen from the large number of students who have not reached the KKM, which is 60% (learning outcomes). Based on the results of research conducted by Jauharah (2018) at MAN 2 Banda Aceh there are only 40% of students reach the KKM, the rest do remedial. While at the MAS Ulumul Qur'an School the same thing also happened, the school (teachers) stated that they had implemented learning methods/models that we're able to improve student learning outcomes, but there were still many students who had not reached the KKM as much as 60-70%. Therefore, by utilizing learning journals using a problem-solving approach in the teaching and learning process, it is expected to be able to overcome problems.

II. Materials and Methods

This study was included in experimental studies to determine whether there is a result of something that is imposed on the subject inquired. In other words, experimental research tries to examine whether or not there is a causal relationship (Arikunto, 2010). The study involved two classes, namely the class teaching and learning process using learned journals with problem-solving approach (experimental group) and the class teaching and learning process in the conventional (control group). Before conducting the research conducted pretest (initial test) in advance to know is there any difference in the ability of the start of the second class and after getting the treatment done post-test (final test) to know is there any difference in the ability of the end of second grade.

In this study, researchers used a quantitative descriptive approach that is all the information embodied in the figures and analyzed based on statistical analysis. The research method used is an experimental method (experimental research) using a pretest-posttest control-group design research design (Sugiyono, 2010). The pretest-posttest control-group research design can be seen in Table 1.1

Tabel 1.1 *Pretest-Postest Control-Group Design*

Sample	Group	Pretest	Treatment	Posttest
Random	A (Experiment)	O_1	X_1	O_2
Random	B (Control)	O_3	X_2	O_4

Source: Sugiyono (2010)

Information:
X1 = Learning using problem solving-based learning journals
X2 = Problem solving based learning without the use of study journals
O1 = Pretest score of the experimental class
O2 = Experimental class posttest score
O3 = Control class pretest score
O4 = Control class posttest score

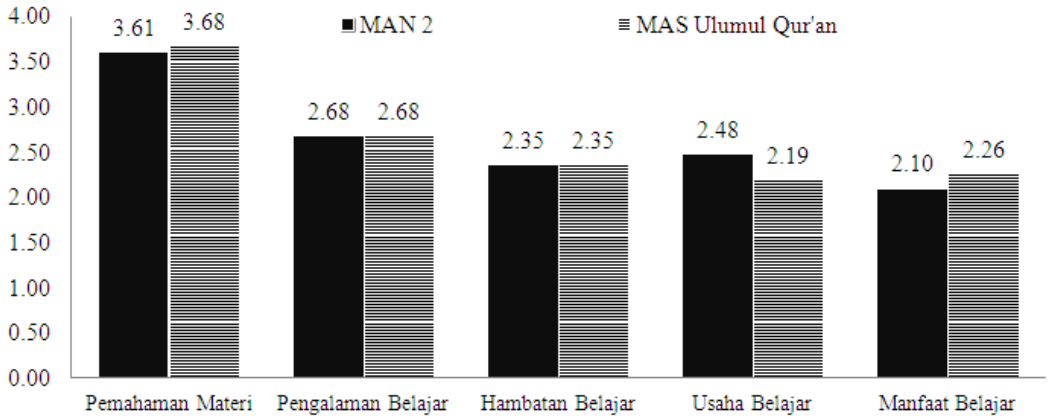
The population in this study were all students of class XI MAN 2 Banda Aceh and class XI students of MAS Ulumul Qur'an with a total population of 178 students. The research sample was taken using the Purposive Sampling Technique, namely by determining the special characteristics in determining a sample in a study. The research sample amounted to 124 students who were divided into two groups, namely the experimental class and the control class. In the experimental class as many as 62 students and the control class as many as 62 students were taken based on the results of the initial abilities of the two classes being the same/homogeneous.

The instrument used in this study a multiple-choice test with 20 items tests about critical thinking skills, motivation questionnaire students consisting of 25 items of revelation, and the test results to learn as many as 40 items of multiple-choice questions (multiple choice) that has been validated by a validator expert. The test was conducted twice, namely before the learning process (pre-test) and at the end of the learning (post-test). The questions before being applied must go through a test first, namely in the form of a validity test and a test reliability test, so that the questions that will be given are feasible to be applied.

III. Results and Discussion

1. Student Learning Journal Use

Learning journals are assessed based on students' ability to write reflections on their learning after carrying out the learning process with a problem-solving approach. The student-written study journal contains five aspects. These five aspects include knowing what has been learned (evaluation), the difficulties encountered and determining the steps for completion (monitoring), what needs to be studied further (planning), feelings and benefits of the learning process (monitoring), and determining learning strategies for the achievement of learning objectives. (planning). The results of using the average score of the experimental class and control class students' learning journals can be seen in Figure 1.1



The graph in Figure 1.1 shows a score of problem-solving-based learning journals created by 124 students in five aspects: the material understanding reached (3.61) at the MAN 2 at the high category and in the Qur'an Ulumul MAS reached (3.68) also are in the high category. While the lowest category is in the aspect of learning benefits with a percentage (2.10) in MAN 2 and MAS Ulumul Qur'an the lowest category is in the aspect of learning efforts with a percentage (2.19).

Results showed that most of the students have been able to identify their learning well through study journals. This is because the teacher gives directions in advance to students about how to use learning journals so that students do not feel foreign to the use of learning journals. With the ability of students to reflect on learning activities well so that they can find out their weaknesses and strengths and plan learning activities which are the basic capital in learning (Laurens 2011). Writing a learning journal makes students have meaning in learning. Although the writing of learning journals is carried out at the end of the learning process, there are still students who are not serious about writing learning journals. This is caused by several factors that hinder the writing of learning journals (Silberman, 2006).

Several factors hinder the process of writing student learning journals. The first factor is the time of writing learning journals (Dwianto, 2010) learning journals written by students at school right after the learning process, the time used is insufficient to write learning journals and it is feared that students will not be free because they are in a hurry with the next lesson. The second factor is the lack of motivation of students to write learning journals. This can be caused by the low culture of students in writing.

However, because of that, it is based on research that writing learning journals by students at the end of learning are very beneficial for students. Students can write down all experiences and obstacles encountered during learning so that there are solutions for students to their problems. Students who feel awkward or afraid to ask about material that they don't understand can write questions on the learning journal sheet so that the teacher can answer them at the next meeting. Questions that were not asked during the lesson but could be written in the learning journal. Teachers can provide reflections and feedback on the learning journals that students write down next. This helps students understand the learning material.

According to Lianto (2018) writing a learning journal in the classroom is very important because it can help teachers find out how far the students' ability to understand the lessons they have received. For students, reflection activities can shape students to understand the best way to learn for themselves, increase responsibility, and can improve problem-solving skills. Reflection activities are a means to gain in-depth knowledge and better understanding for students. King (2002) in his journal states, journal writing has become a common approach to develop writing skills, increase motivation, and lead students to higher-order thinking skills.

2. Students Analytical Thinking Ability

Data on the results of students' critical thinking skills were obtained from objective questions in the form of multiple-choice which were arranged based on indicators of critical thinking skills according to Ennis (2011) including (1) providing simple explanations (2) building basic skills (3) drawing conclusions (4) providing further explanations and (5) perform strategies and tactics. The results obtained from the post-test value data in the experimental class and control class obtained the average value of each class as shown in Table 1.2.

Table 1.2 Average Test Results of Students' Critical Thinking Ability After Learning in Experiment Class and Control Class

School	Class	Average	Normality *	Homogeneity **	Significance ***
MAN 2	Control	66,71	$X^2_{hitung} < X^2_{Tabel}$ 0,215 < 5,99	$F_{Hitung} < F_{Tabel}$ 2,857 < 3,15 (homogen)	$t_{hitung} > t_{tabel}$ 2,394 > 2,000 (berbeda nyata)
	Experiment	69,74	$X^2_{hitung} < X^2_{Tabel}$ 0,231 < 5,99		
MAS Ulumul Qur'an	Control	48,68	$X^2_{hitung} < X^2_{Tabel}$ 0,152 < 5,99	$F_{Hitung} < F_{Tabel}$ 1,102 < 3,15 (homogen)	$t_{hitung} > t_{tabel}$ 2,147 > 2,000 (berbeda nyata)
	Experiment	54,65	$X^2_{hitung} < X^2_{Tabel}$ 0,188 < 5,99		

Note. *¬¬) = Chi Square Test (Normal, X2hit value < X2tab, = 0.05)
**) = F test (homogeneous, F hit value < F tab, = 0.05)
***) = t test (Significant, thit > ttab, = 0.05)

The results of the analysis in Table 1.2 show the average value of critical thinking skills after learning at MAN 2 in the experimental class with an average (69.74) and the control class with an average (66.71). While at MAS Ulumul Qur'an in the experimental class with an average (54.65) and the control class with an average (48.68). This shows that the average value of the experimental class treated is higher than the average value in the control class which is only given a problem-solving approach without being accompanied by a study journal both at MAN 2 and at MAS Ulumul Qur'an.

Students' critical thinking skills have increased from the low category to the high category in MAN 2 and an increase from the medium category to the high category at MAS Ulumul Qur'an. According to (Munawaroh, 2015) The use of learning journals as a reflection after learning can improve students' critical thinking skills. The ability to think critically will emerge in students if during the learning process in the classroom the teacher builds a pattern of interaction and communication that emphasizes the process of actively forming knowledge by students. This shows that the steps of a problem-solving approach by using a learning journal after learning can be a support to improve students' critical thinking skills (Darmawan, 2010).

Learning journal writing made by students can involve their thinking skills in reasoning what is in the minds of students from what they experience. According to Zulkarnaini (2011), writing is a process of students' critical thinking skills related to discovery, a compilation of experiences, and the accuracy of word choice. The use of learning journals as a reflection of students in learning can be a place for students to reason what is on their minds, what they are experiencing, and train them to be communicative in the learning process so that learning objectives are achieved.

3. Student Learning Motivation

Data on student learning motivation was obtained by providing a motivational questionnaire (ARCS) by Keller (2004) with indicators consisting of attention, relevance, confidence, satisfaction. The results obtained from the motivation questionnaire score data obtained the average value in each school can be seen in Figure 1.2.

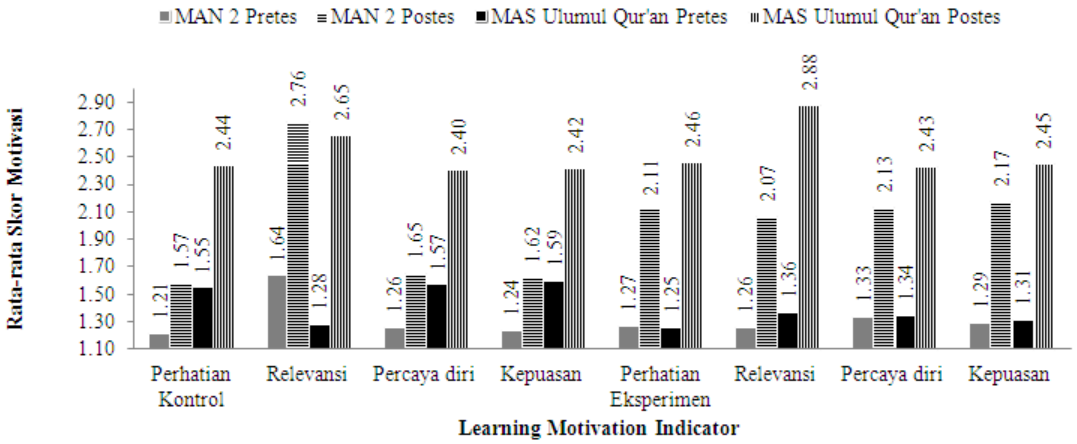


Figure 1.2 Average Score of Students' Learning Motivation at MAN 2 and MAS Ulumul Qur'an

The average indicator of students' learning motivation before learning is highest at MAS Ulumul Qur'an in the control class, namely the satisfaction indicator (Satisfaction) with an average value (1.59) and the lowest is the relevance indicator (Relevance) with an average value (1.28). While the highest indicator experimental class is the relevance indicator (Relevance) with an average value (1.36) and the lowest is the attention indicator (Attention) with an average value (1.25). Motivation to learn after learning at MAS Ulumul Qur'an is the highest indicator in the control class on the relevance indicator with an average value (2.65) and the lowest indicator on the confidence indicator with an average value (2.40). Meanwhile, the highest indicator in the experimental class is the relevance indicator (relevance) with an average value (2.88) and the lowest in the confidence indicator with an average value (2.43).

In learning activities, motivation is an important factor for student success. Learning outcomes will be optimal if there is the right motivation (Sardiman, 2011). According to Uno (2007), motivation and learning are two things that influence each other. The stronger a person's motivation in learning, the more optimal in carrying out learning activities, the higher the results obtained, it can be said that the intensity of learning is largely determined by learning motivation. Another research finding (Nasution, 2004) that learning outcomes generally increase when the motivation to learn increases, therefore efforts to increase student learning motivation play an important role in achieving optimal learning outcomes.

4. Student Learning Outcomes

a. Initial Ability (pretest) Experiment Class and Control Class

The learning outcomes in this study were the results of the concept mastery test scores on the human blood circulation system obtained through pretest and posttest, totaling 40 multiple-choice item test items with 4 answer choices. The results of the students' initial ability analysis (pretest) can be seen in Table 1.3

Table 1.3 Test Results Mean Pretest Score Learning Outcomes Experiment Class and Control Class

School	Class	Avarege	Normality*	Homogenity**	Significant***
MAN 2	Control	66,55	$X^2_{hitung} < X^2_{Tabel}$ 0,812 < 5,99	$F_{Hitung} < F_{Tabel}$ 1,526 < 3,15 (homogen)	$t_{hitung} > t_{tabel}$ 5,017 > 2,000 (berbeda nyata)
	Experiment	77,16	$X^2_{hitung} < X^2_{Tabel}$ 0,158 < 5,99		
MAS Ulumul Qur'an	Control	67,71	$X^2_{hitung} < X^2_{Tabel}$ 0,191< 5,99	$F_{Hitung} < F_{Tabel}$ 2,764< 3,15 (homogen)	$t_{hitung} > t_{tabel}$ 4,690 > 2,000 (berbeda nyata)
	Experiment	79,73	$X^2_{hitung} < X^2_{Tabel}$ 0,159 < 5,99		

Note. *) = Chi Square Test (Normal, X2hit value < X2 Tab, = 0.05)
**) = F test (Homogeneous, F hit value < F tab, = 0.05)
***) = t test (Significant, thit > ttab, = 0.05).

The results of the analysis in Table 1.3 obtained the mean pretest score of students in MAN 2 in the control class (38.97) in the experimental class (39.16). While the average pretest score at MAS Ulumul Qur'an in the control class (35.77) and the experimental class (36.58). This shows that the ability of these two classes is still low. In the normality test, the result is that the value of X2count < X2table, this indicates that the two data are normally distributed. Furthermore, the homogeneity test was carried out based on Table 1.3, it is known that Fcount < Ftable (2.734 < 3.15) in MAN 2 while at MAS Ulumul Qur'an the value of Fcount < Ftable (2.035 < 3.15) this indicates that the data has a homogeneous variance. The results of the significance of the t-test results are tcount > ttable (2,144 > 2,000) in MAN 2 while at MAS Ulumul Qur'an the result is tcount > ttable (2,598 > 2,000), it can be concluded that the data is significant or significantly different between the experimental class and the class. control both at MAN 2 and at MAS Ulumul Qur'an.

b. Final Ability (posttest) Experiment Class and Control Class

After the teaching and learning process was carried out, a post-test was given to determine the level of students' understanding of the human circulatory system material after being taught by being given treatment using problem solving-based learning journals in the experimental class while the control class was only taught with a problem-solving approach without the use of learning journals. The results of the final ability analysis (posttest) are in Table 1.4.

Table 1.4 Test Results Mean Postes Learning Outcomes Experiment Class and Class Controls

School	Class	Average	Normality*	Homogenty**	Significant***
MAN 2	Control	66,55	$X^2_{hitung} < X^2_{Tabel}$ 0,812 < 5,99	$F_{Hitung} < F_{Tabel}$ 1,526 < 3,15 (homogen)	$t_{hitung} > t_{tabel}$ 5,017 > 2,000 (berbeda nyata)
	Experiment	77,16	$X^2_{hitung} < X^2_{Tabel}$ 0,158 < 5,99		
MAS Ulumul Qur'an	Control	67,71	$X^2_{hitung} < X^2_{Tabel}$ 0,191< 5,99	$F_{Hitung} < F_{Tabel}$ 2,764< 3,15 (homogen)	$t_{hitung} > t_{tabel}$ 4,690 > 2,000 (berbeda nyata)
	Experiment	79,73	$X^2_{hitung} < X^2_{Tabel}$ 0,159 < 5,99		

Note. *) = Chi Square Test (Normal, X2hit value < X2tab, = 0.05)
**) = F test (homogeneous, F hit value < F tab, = 0.05)
***) = t test (Significant, thit > ttab, = 0.05).

The results of the analysis in Table 1.4 the average post-test score of students in MAN 2 in the control class obtained the average score (66.55) and the experimental class the average value (77.16). While the posttest score at MAS Ulumul Qur'an in the control class obtained an average value (67.71) and the experimental class obtained an average value (79.73). Meanwhile, in the normality test, it is known that the value of X2count < X2table so that it can be stated that the two data are normally distributed. Furthermore, the homogeneity test was carried out so that the Fcount < Ftable (1.526 < 3.15) in MAN 2 and at MAS Ulumul Qur'an the Fcount < Ftable (2.764 < 3.15) so that the data had homogeneous variance. The results of the significance of the t-test

results are tcount > ttable (5,017 > 2,000) in MAN 2 and tcount > ttable (4,690 > 2,000) in MAS Ulumul Qur'an, it can be concluded that the data on student learning outcomes is significant or significantly different between the experimental class and the control class in both MAN 2 and MAS Ulumul Qur'an. So Ha is accepted, which means that the use of problem solving-based learning journals affects student learning outcomes. This is caused by the ability of students in the experimental class to reflect on the learning activities in the learning journal that have been done well.

Through learning journals, students can reflect on their thoughts in the form of notes about awareness of inconsistencies and confusion and comment on how to care about the difficulties they face (Anggraeni 2009). According to Jayadi (2008), the use of learning journals in biology learning has increased student participation in the learning process. The courage of students to express opinions and questions through study journals and the ability of students to describe what they have learned, including writing down things that they feel are weak, have had an impact on improving student learning outcomes.

Research that has been done by Atfiyah (2013) that the use of learning journals can improve students' cognition in learning. Furthermore, the research conducted by Fadllia (2012) also showed that the average learning outcomes of the experimental class were greater than the control class who were not given a study journal but only studied with the JAS approach, namely 78.54 (experimental class) and 72.30 (control class). Based on the results of research that has been done by Septiyana (2013) states that through learning journals the student's learning process becomes meaningful, namely learning that makes learning experiences part of the learning process. Students are allowed to reflect on learning activities so that they can diagnose their weaknesses and strengths which can be used to arrange learning activities both when studying, learning strategies, and constantly monitoring in the learning process to optimize learning outcomes.

IV. Conclusion

The results showed that there was an effect of using problem solving-based learning journals on students' critical thinking skills and the effect of using problem solving-based learning journals on students' learning motivation and the effect of using problem solving-based learning journals on student learning outcomes. Overall from this study it can be concluded that critical thinking skills, motivation and student learning outcomes can be improved through the use of learning journals using a problem solving approach.

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