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Learning Cycle 7E: a Learning Model to Improve Junior High School Students' Problem-Solving Skills in Science Subjects

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Abstract

This research aims to determine the effect of the Learning Cycle 7E (elicit, engage, explore, explain, elaborate, evaluate, extend) model on the problem-solving skills of junior high school students in the context of ecology and biodiversity in Indonesia. The research method used is a quasi-experimental design with a pretest-posttest non-equivalent control group design. The research sample consists of 64 students of SMP Negeri 158 Jakarta, with each class comprising 32 students selected through simple random sampling. The research instruments used pretest and posttest questions in the form of essay questions and observation sheets of learning implementation. Based on hypothesis testing using independent sample t-test, the $t_{hitung} > t_{tabel}$ value was obtained with a significance value of 0.007 < α (0.05) then H_0 was rejected, so it was concluded that there was an effect of the Learning Cycle 7E model on the problem-solving skills of junior high school students in the context of ecology and biodiversity in Indonesia. The results of this study imply that the Learning Cycle 7E model can be an alternative for enhancing students' problem-solving skills in the context of ecology and biodiversity in Indonesia.

Keywords: *Problem Solving Skills, Learning Cycle 7E, Science*

Learning Cycle 7E: Model Pembelajaran untuk Meningkatkan Kemampuan Pemecahan Masalah Siswa SMP pada Mata Pelajaran IPA

Abstrak

Penelitian ini bertujuan untuk mengetahui pengaruh model Learning Cycle 7E (elicit, engage, explore, explain, elaborate, evaluate, extend) terhadap kemampuan pemecahan masalah siswa SMP pada materi ekologi dan keanekaragaman hayati di Indonesia. Metode penelitian yang digunakan adalah kuasi eksperimen dengan desain penelitian pretest-posttest non-equivalent control group. Sampel penelitian terdiri dari 64 siswa SMP Negeri 158 Jakarta, dengan masing-masing kelas terdiri dari 32 siswa yang dipilih secara acak. Instrumen penelitian menggunakan soal pretest dan posttest berupa soal essai dan lembar observasi keterlaksanaan pembelajaran. Berdasarkan uji hipotesis menggunakan independent sample t-test, didapatkan nilai $t_{hitung} > t_{tabel}$ dengan nilai signifikansi sebesar 0,007 < α (0,05) maka H_0 ditolak, sehingga disimpulkan terdapat pengaruh model Learning Cycle 7E terhadap kemampuan pemecahan masalah siswa SMP pada materi ekologi dan

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keanekaragaman hayati di Indonesia. Hasil penelitian ini mengimplikasikan bahwa model Learning Cycle 7E dapat menjadi salah satu alternatif untuk meningkatkan kemampuan pemecahan masalah siswa SMP dalam konteks ekologi dan keanekaragaman hayati di Indonesia.

Kata kunci: *Kemampuan Pemecahan Masalah, Learning Cycle 7E, IPA*

INTRODUCTION

21st century learning refers to the need for students to acquire skills that match the needs of the times. The merdeka curriculum currently used in education helps students prepare for an increasingly complex and rapidly changing future by focusing on developing the skills needed in the 21st century (Hanipah, 2023). Problem solving skills are one of the important components of 21st century education. Problem solving skills are the ability to identify problems, find various solutions, and make decisions to solve problems (Bariyyah, 2021). The process of problem solving skills can result in the formation of new knowledge independently, thus making learning more meaningful. Therefore, problem-solving skills are very important for students (Indah Sari et al., 2022).

The results of the 2022 Program for International Student Assessment (PISA) survey show that Indonesian students' problem solving skills are ranked 69th out of 80 countries, with an average of 366 out of 500 (average international score). Students fail to solve PISA problems because they are not accustomed to doing the problem-solving process correctly (Arsyad et al., 2022). In the learning process, problem solving does not only expect students to listen, record, and memorize subject matter, but also expects them to think actively, communicate, search, and process data, and finally make conclusions (Palennari et al., 2021).

Science learning is a type of learning that focuses on direct experience to gain the ability to explore, discover, and understand the concepts or phenomena of the surrounding nature scientifically (Kanga et al., 2022). Given the importance of science in everyday life, it is important to instill the right concepts. By embedding the right concepts, learning science will be more interesting and useful for learners. If learners learn science separately from their daily lives, they will quickly forget and cannot apply science in real life situations. As a result, science learning becomes less interesting because the teacher

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does not connect science ideas with children's real-life experiences (Suryanda et al., 2021).

In science learning, the problem-solving process is suitable to be applied because it can help students improve their ability to think critically, logically, creatively, and innovatively (Arsyad et al., 2022). This statement is reinforced by one of the objectives of the merdeka curriculum junior high school science competency which states "Students develop themselves according to the profile of Pancasila students and are able to formulate to solve problems through real activities and participate in solving problems related to themselves and the surrounding environment." (Kemendikbudristek, 2022). Based on this statement, it is hoped that students can acquire and develop problem-solving skills in science learning in the classroom.

The reality in the field shows that current science learning methods are not in accordance with the 21st century learning paradigm. As in SMP Negeri 158 Jakarta where this research was conducted, science learning is still dominated by the teacher as the center of learning and students are not used to solving problems that require a lot of literacy skills. The low problem-solving ability of students in this school can be proven when the teacher gives an instrument of problem-solving ability that contains story problems of an ecology and biodiversity in Indonesia problem with a level of difficulty that is quite high than the problems that are often done daily, only a few students can answer the question correctly. As a result, students are not actively involved in the learning process and do not have the ability to develop 21st century skills. Until now educators still face the challenge of choosing the right model in assessing problem solving skills (Yulistiawati et al., 2019).

One alternative learning model that is learner-centered and can be applied to improve problem solving skills in the learning process is the Learning Cycle 7E model. This learning model uses a constructivism approach, which prioritizes the involvement or activeness of students in the learning process that allows them to learn independently and obtain a lot of information outside the school environment (Septianingrum, 2022). The learner-centered Learning Cycle 7E learning model can help learners to understand concepts better. This model has the ability to make learners actively participate in the learning process and develop concepts (Eisenkraft in Hanum et al., 2020).

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Based on previous research relevant to this study, research conducted by Nufus et al. (2019); Samsidar et al. (2023); Utami et al. (2022) shows that the Learning Cycle 7E model has a significant effect in improving mathematical problem solving skills. According to the statement from the results of the relevant research, the Learning Cycle 7E learning model makes students actively obtain and explore ideas to solve problems, such as expressing opinions, concluding and expressing their own results. In the relevant research that uses the Learning Cycle 7E model, students are also required to solve problems independently, so that they can build students' knowledge to be broader and more meaningful and can foster students' self-confidence and responsibility. Based on the results of the relevant research, teacher guidance in the learning process with the Learning Cycle 7E model is very helpful for students to develop their problem solving skills for the better. The difference between this research and previous research is in the material studied, the indicators of problem solving ability used, and the learning model applied to the control class. Previous research serves to analyze and enhance the discussion of research. This research was conducted as a support for the above studies.

This learning model is a development of 5E which is included in the Learning Cycle model. The 5E Learning Cycle learning stages consist of engage, explore, explain, elaborate, and evaluate. In Learning Cycle 7E, the engage stage develops into elicit and engage, the elaborate and evaluate stages develop into elaborate, evaluate, and extend. So the Learning Cycle 7E learning model consists of seven interrelated stages, namely elicit, engage, explore, explain, elaborate, evaluate, and extend (Siswanto & Amanah, 2022). The Learning Cycle model is suitable for learning that is memorization, calculation, experimentation, understanding of material, and application in everyday life Andani & Utami (2019). Therefore, the Learning Cycle 7E learning model is ideal to be applied to ecology and biodiversity in Indonesia context because it is in accordance with its scope which examines the interaction of living things with the environment, so it is hoped that students in their groups can contribute to each other based on their daily experiences and can improve students' problem solving skills. Based on the description above, it is necessary to conduct research to determine the effect of the Learning Cycle 7E Learning Model on the Problem Solving Skills of Junior High School Students in the Context of Ecology and Biodiversity in Indonesia.

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RESEARCH METHODS

This research is a quantitative research using quasi-experimental method. The variables in this study are the Learning Cycle 7E learning model as the independent variable and problem solving skills as the dependent variable. This research design uses a pretest-posttest non-equivalent control group design (Table 1).

Table 1. Pretest-Posttest Non-Equivalent Control Group Design

Group	Pretest	Treatment	Posttest
Experiment	O_1	X	O_2
Control	O_3	C	O_4

In this design, there are two study groups, namely the experimental group and the control group. Each class will conduct a pretest to determine the initial problem solving skills before being given treatment in the form of a learning model. After the pretest, the experimental group will be given treatment in the form of applying the Learning Cycle 7E learning model and the control group in the form of applying the *Student Teams Achievement Division* (STAD) learning model. Then, both classes are given a posttest to determine the effect of the Learning Cycle 7E learning model on students' problem solving skills.

The population in this study were students of SMP Negeri 158 Jakarta in the 2023/2024 school year. The population reached VII grade students spread over six parallel classes. Two classes were selected by cluster random sampling, namely class VII D as an experimental class with the application of the Learning Cycle 7E learning model and class VII E as a control class with the application of the Student Team Achievement Division (STAD) learning model. The sample in this study was selected by simple random sampling using the Slovin formula. The number of samples used in this study were 64 students with each class totaling 32 students. The research instruments used pretest and posttest questions in the form of essay questions and observation sheets of learning implementation. The problem solving skills test instrument in this study is in the form of a essay question with a score range of 0-4 as many as 13 valid questions in accordance with the indicators of problem solving skills according to Krulik & Rudnick (1988) which consists of read the problem, explore, select a strategy, solve, and look back.

Data analysis techniques used in this study are descriptive statistical analysis

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includes lowest score, highest score, score range, mean, standard deviation, variance. The gain score analysis was also carried out to determine the difference in pretest and posttest scores, so that it could be seen the improvement of students' problem solving skills. After that, the Normalized Gain (N-Gain) test was conducted to measure the effectiveness of each use of the learning model applied to the experimental and control classes. The formula for the N-Gain (g) test according to (Hake, 1999) is as follows.

$$g = \frac{nilai\ posttest - nilai\ pretest}{100 - nilai\ pretest}$$

Table 2. N-Gain Score Criteria

Limitation	Category
g > 0,7	High
0,3 < g ≤ 0,7	Medium
g ≤ 0,3	Low

Data analysis requirements test consisting of normality test and homogenity test to conduct hypothesis testing. All tests were carried out using SPSS version 29. The hypotheses in this study are as follows:

H_0 : There is no effect of using the Learning Cycle 7E learning model on the problem solving skills of junior high school students in the context of ecology and biodiversity in Indonesia.

H_1 : There is an effect of using the Learning Cycle 7E learning model on the problem solving ability of junior high school students in the context of ecology and biodiversity in Indonesia.

RESULT AND DISCUSSION

The research data was obtained based on the results of the problem solving skills test before (pretest) and after (posttest) learning on the context of ecology and biodiversity in Indonesia. The effect of the learning model is seen based on the average scores of the pretest and posttest. Based on the descriptive statistical data in Table 3, the difference in the average pretest scores in the two classes is not too far away, indicating that the initial

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ability of students in the experimental and control classes is almost the same. This is because the two classes have not been given different treatments. The initial ability of students is very important to measure in order to find out how far the development and knowledge of students in the learning process, so that later it can be measured how much the improvement is (Rasyid & Gaffar, 2019).

Table 3. Descriptive Statistics of Problem Solving Skills Test

Description	Experiment Class (Learning Cycle 7E)		Control Class (STAD)	
	Pretest	Posttest	Pretest	Posttest
Lowest Score	25,00	65,00	23,00	62,00
Highest Score	65,00	92,00	60,00	87,00
Value Range	40,00	27,00	37,00	25,00
Average	42,00	81,00	40,84	73,66
Standard Deviation	11,00	7,59	10,42	8,07
Variance	121,16	57,74	108,65	65,20
n	32			

After being given treatment in the form of different learning models, the average posttest results in the experiment class and control class increased. The experiment class obtained an increase in the average posttest score which was higher than the control class. This shows that the application of a learning model can develop students problem solving skills (Mansyur & Sunendar, 2020). Other research results by Azrai et al. (2022) stated that the stages of the learning model on the measured variables are one of the components that affect the difference. This is because the stages of the learning model contain steps or rules that must be followed to implement the learning model.

After the treatment, the variance and standard deviation values decreased in both classes. The variance of the control class is slightly larger than the experiment class, meaning that the control class has more varied data than the experiment class. The standard deviation value of the experiment class is also smaller than the control class. This means that the experiment class has a distribution of data that is closer to the average value than the control class. This shows that models that have a larger decrease are more effective in leveling the distribution of values and increasing the uniformity of students' problem solving abilities (Karlina Muzianti et al., 2024).

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The effectiveness of the use of a treatment (learning model) is also measured through the calculation of the Normalized Gain (N-Gain) value.

Table 4. N-Gain Category of Experiment Class and Control Class

Learning Model	N-Gain	Category
Learning Cycle 7E	0,67	Medium
STAD	0,55	Medium

Based on Table 4, the N-Gain value of the experiment class is higher than the control class. This shows that the Learning Cycle 7E model is more effective in improving students problem solving skills, because this model uses a constructivism approach, where students in the experiment class are trained in building their knowledge and finding concepts independently. Almost every stage in the Learning Cycle 7E model also trains students to make decisions and apply the concepts they get themselves, so that students in the experimental class are more active in learning. Accordance with the research of Samsidar et al. (2023) which revealed that the active role of students when participating in learning can improve students problem solving skills.

The normality test in this study used the Kolmogorov-Smirnov test at the significance level $\alpha = 0.05$ with the help of the SPSS version 29 application. Based on Table 5, the results of the normality test on the pretest, posttest, and gain score data show a significance value (Sig.) > α (0.05) which means that H_0 is accepted, so the data is normally distributed.

Table 5. Kolmogorov-Smirnov Normality Test Results

Data	Class	Statistic	df	Sig.
Pretest	Eksperimen	0,091	32	0,200
	Kontrol	0,113	32	0,200
Posttest	Eksperimen	0,138	32	0,125
	Kontrol	0,121	32	0,200
Gain Score	Eksperimen	0,108	32	0,200

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Kontrol	0,100	32	0,200

The homogenity test in this study used the F-test at the significance level α = 0.05 with the help of the SPSS version 29 application. The data has a significance value (Sig.) > α (0.05) which means H_0 is accepted, so the data has the same variance (Table 6).

Table 6. F-Test Homogenity Test Results

Data	Statistik	df_1	df_2	Sig.
Pretest	0,085	1	62	0,771
Posttest	0,697	1	62	0,407
Gain Score	0,245	1	62	0,622

After that, the hypothesis test was carried out using the Independent Sample t-test, the significance value of the gain score data was smaller than the significance level (α) (Table 7), so that H_0 was rejected, which means that there is an effect of the Learning Cycle 7E model on the problem solving skills of junior high school students on the context of ecology and biodiversity in Indonesia. This result is relevant to the research of Nuzulia et al. (2023) which suggests that the Learning Cycle 7E model affects students' problem solving skills, because the seven stages are well organized and related to indicators of problem solving skills, so that it can help students to improve problem solving skills.

Table 7. Independent Sample t-Test Results

Data	T	df	Sig. (2-tailed)
Gain Score	2,769	62	0,007

The steps of the Learning Cycle 7E learning model consist of seven related stages, namely elicit, engage, explore, explain, elaborate, evaluate, and extend (Eisenkraft in Dinah, 2023). The first stage of learning by using the Learning Cycle 7E model is elicit.

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Figure 1. Elicit Stage

At this stage, the teacher asks basic questions to students about ecology and biodiversity in Indonesia context which is related to daily life to stimulate and find out the extent of the initial knowledge possessed by students (Figure 1). In the learning process, some students are very excited in expressing their answers simply according to the knowledge they have. Based on research by Hanum et al. (2020) also revealed that at the elicit stage, students were very enthusiastic about mentioning examples of the material being studied by being associated with everyday life, but at each meeting there were several students who faced difficulties answering the teacher's questions because they did not really understand the material.

The second learning stage is engage which means the teacher starts to involve students in the problem by attracting their attention. This research uses videos or pictures of real phenomena related to ecology and biodiversity in Indonesia context found in everyday life to increase their knowledge and curiosity. In the learning process, students are asked to think about the content of the video or pictures shown so that later they can understand the concept of the problem to be discussed (Figure 2). In line with (Suryanti et al., 2024) the purpose of the problem explanation is to increase students' learning motivation. During the research, some students were able to convey the information contained in the video or picture and answer questions from the teacher about the problem based on the real phenomenon. According to research by Astari et al. (2023) this activity helps students to focus on any problems related to the material, as well as think about concepts that they have not understood from the video or image, so that the questions that arise from students will become material for group discussions later. At the engage stage,

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students are also organized into several groups to discuss the problems given by the teacher at the next stage of learning. Based on the research results of Agustina et al. (2024), the Learning Cycle 7E model helps students understand the problem well through the elicit and engage steps, where they are given questions that support understanding by the teacher.

The third stage of learning is explore. Explore is the stage where students investigate or discuss a problem regarding ecology and biodiversity in Indonesia that has been given by the teacher in the form of LKPD. Learners are given the opportunity to work in groups to develop hypotheses or build their own concepts of ecology and biodiversity in Indonesia context without direct guidance from the teacher (Figure 3). In line with the research of Utami et al. (2022) in the explore stage, students express opinions to each other and are required to solve the problems presented in the LKPD, so that this group discussion activity makes students able to solve problems better than working alone, because group discussions provide opportunities to discuss the problems faced, exchange ideas between learners, and discuss alternative problem solving. The presence of LKPD encourages students to concentrate on problem-solving exercises, helps them overcome obstacles, and fosters their independence (Gede Swiyadnya et al., 2021). This activity also encourages learners to make inferences from their experiments or observations.

Furthermore, the fourth stage is explain, at this stage students present the results of group discussions related to problem solving packaged in a knowledge concept using their own language, so that it can make students not easily forget the concepts they have learned (Figure 4). Research by Sukmawati et al. (2024) stated that if someone really understands the concepts they learn and is able to explain using their own words and does not change the meaning, then someone is said to have mastered the concept. At the end of the presentation, there was a question and answer activity where members of other groups were given the opportunity to ask questions which were then answered by the presenting group.

During the learning process, at each meeting only one group made a presentation due to limited learning time, but required representatives from each other group to provide questions or responses to the explanation of the presenting group. Giving questions or

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responses can help students to exchange ideas if there are different answers between groups, so that all groups can build the same concept. The teacher's role in this phase is to listen critically to students' explanations and provide facts and clarification of the results of group discussions (Yulianti, 2021). The explore and explain steps of the Learning Cycle 7E model help students improve their problem-solving skills, because at this stage students are trained to organize and make solutions to problems (Agustina et al., 2024).

The fifth stage of learning using the Learning Cycle 7E model is elaborate. In this phase, students are trained to solve problems using the new knowledge and concepts they gained in the previous stage. Learners again discuss in groups to solve new problem solving problems on LKPD (Figure 5). Learning conditions such as discussions will allow students to analyze the truth of existing opinions, explain things related to facts, and choose the best solution to solve the problems presented (Komala et al., 2021). During the discussion, the teacher supervises and encourages students to be actively involved in problem solving activities in their respective groups. During the learning process, most students have understood the concepts that have been learned and find it easier to answer questions on the LKPD given by the teacher. They have also begun to understand examples of the application of concepts that have been learned. In accordance with the statement in the research of Samsidar et al. (2023), by practicing a lot, students can improve their ability to solve problems related to real-life problems. However, because learners have to try harder to think to answer the questions given at the elaborate stage, some learners still have difficulty applying the concepts that have been obtained. According to (Harahap et al., 2020), ecosystem material requires students to understand the concept of ecosystems from the simplest to the most complex material. In line with the results of research by Hanum et al. (2020), the difficulty in applying this concept can be influenced by one factor, namely that students do not understand how the material learned can be applied to daily life problems. The problem solving ability of students that can appear at the elaborate stage is to train students to solve problems using the concepts they have learned by answering new problems on the LKPD (Amna & Musdi, 2023).

The sixth stage of the Learning Cycle 7E model is evaluate which is the stage where the teacher provides a through evaluation of the explanation of ecology and biodiversity

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in Indonesia context to verify that students understand their own knowledge and ask open questions to learners individually to evaluate the extent to which students understand the topics that have been learned (Figure 6). This evaluation can be done either in writing or orally at the end of class through questions. In line with research by Aprianingsih et al. (2020), the purpose of the evaluate stage is to evaluate students' entire learning experience, including their knowledge and skills, application of concepts, and changes in the way they think.

The last stage of this model is extend, learners are invited to expand the concepts they have obtained by means of the teacher providing explanations by linking the concepts of ecology and biodiversity in Indonesia that students have obtained to other examples broadly. Learners are also guided by the teacher to identify the relationship between the concepts they have learned and other concepts they have not learned and assist students in making conclusions about the results of learning activities (Figure 7). In line with the research of Utami et al. (2022) which states that in this activity students are trained to recheck the steps that have been taken and understand the solutions obtained in the previous stages, so that at the evaluate & extend stage this can help students improve problem solving skills, namely in the look back indicator (review or recheck).

This is different from the syntax in the control class which uses the Student Teams Achievement Division (STAD) learning model. The learning stages in this model consist of six stages, namely delivery of goals, information presentation, group formation, group mentoring, evaluation, and appreciation (Wulandari, 2022). Experiment class students who use the Learning Cycle 7E model are required to develop basic concepts independently based on prior knowledge that they already have in small groups through observing, collecting data, analyzing information, and drawing conclusions on concrete problems so that they can find their own knowledge concepts and apply the principles of the knowledge concepts they already have to other concepts (Sonny et al., 2023). Meanwhile, according to Suparmini (2021), students in the control class using the Student Teams Achievement Division (STAD) model are more demanded on activities and interactions between students to motivate and help each other in mastering the material explained by the teacher through group work, so that they can achieve maximum achievement.

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In line with research conducted by Rini et al. (2020), stated that the STAD learning model is a cooperative learning model that relies on group discussions, this model does not encourage students to construct knowledge independently. As a result, this model is less effective in providing students with experience with the learning process. The difference in activity emphasis in the two models caused the Learning Cycle 7E model to be more effective than the STAD model. In line with the research of Intan et al. (2021) which revealed that the activities contained in the Learning Cycle 7E model were more effective than the STAD model. The indicators of problem solving ability used in this study are according to Krulik & Rudnick in Suryaningsih (2019) who introduced five stages of problem solving as heuristics. Heuristics are steps in solving something without having to be done sequentially. The five stages consist of read the problem, explore, select a strategy, solve, and look back.

Table 8. Average of Each Indicator of Problem Solving Ability Test

Problem Solving Ability Indicator	Experiment Class		Control Class	
	Pretest	Posttest	Pretest	Posttest
Read The Problem	45,31	83,07	46,35	79,69
Explore	41,67	85,15	36,98	73,96
Select a Strategy	37,90	78,13	41,40	70,70
Solve	42,45	79,43	42,19	75,78
Look Back	41,01	76,95	35,16	63,67

Based on Table 8, the read the problem indicator has the highest average pretest score in the experimental class and control class with a fair category. In the problem-solving skills instrument, the read the problem indicator measures students' ability to be able to formulate and identify a problem from a text on ecology and biodiversity in Indonesia that is related to everyday life. Students can answer the question before being given treatment, because the text contained in the problem can help students systematically describe all the data contained in the problem, consisting of things they already know and what is asked. In addition, the text can train students to understand each question in general even though the answers during the pretest are still not correct and not appropriate. After being treated with different learning models, the average posttest value of each indicator of problem solving ability in the experimental class has a higher increase than the control class. The average posttest value of the highest problem solving ability

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indicator in the control class is the read the problem indicator. This can happen because in the STAD model there is an information presentation and group formation stage which trains students in understanding a problem through explaining the concept of material from the teacher and working on LKPD in groups which emphasizes that each student in the group must work together and help each other to understand the subject matter. When working on LKPD in groups, students ensure that all group members understand the material being taught, so that later they can get high scores for their groups (Marheni et al., 2020). Discussion activities will improve their problem solving skills because they will exchange ideas to build aspects of problem solving skills.

The next indicator of problem solving ability is explore. This indicator assesses students' ability to identify biotic and abiotic components, describe the food chain, and identify and explain the biogeochemical cycle process based on the text presented. Based on the average posttest score, the explore indicator is the indicator with the highest score in the experimental class. This is because the stages in the Learning Cycle 7E model train students to organize and process problem information based on what they know and what is asked. After that they will understand the concepts that can be used to solve the problem and write down the concepts or principles that will help them solve it (Lindy et al., 2023).

The select a strategy indicator where in this indicator students are expected to be able to choose a strategy to solve the problem of damage to protected forest and mangrove ecosystems, as well as cases of loss of biodiversity. The select a strategy indicator has the second lowest average with a good category in the experimental and control classes. This shows that students have been able to choose and apply strategies to solve a problem even though there are still answers that are less precise. These results are in line with the research of Lindy et al. (2023) which shows that after being given an understanding of problem solving using the select a strategy step, the average posttest results of students increased from a percentage of 25% to 56%. The increase in this step from the ability category is less to sufficient and is the lowest increase. This is because the select a strategy step is a foreign step and is rarely used by students in solving problems.

The solve indicator has an average value with a good category in both classes. In this category means that students are good at writing solutions based on existing discourse to solve problems and choosing problem solving steps to get answers. The elaborate stage

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in the Learning Cycle 7E model and the group formation stage in the STAD model help students to solve problems with the solve indicator, because at that stage students apply their understanding of the concepts previously obtained to solve problems in groups. Based on Widiastuti & Kania (2021), solving problems in groups can encourage students to think critically and communicate their opinions rationally and objectively about how to solve problems.

The last indicator is look back which is an indicator that requires students to be able to check or review all answers, develop answers, and discuss answers. The look back indicator has the lowest average posttest score in the experimental and control classes in the good category. This is due to several reasons such as limited time when working on the instrument, students already feel confident in their answers so they don't need to check back, so many answers are not appropriate, and 158 Jakarta Junior High School students who have not been trained in working on science problems in the form of problem solving. In line with the results of research by Nufus et al. (2019) which revealed that in the look back indicator, most students ignored this stage, because students were satisfied with the final results without having to check again and also many students were still confused. Another statement from research by Meutia et al. (2020) stated that the reason students have not understood the look back indicator is because they do not re-check the accuracy and sequence of the solutions they write and are more concerned with the final answer. Based on Damayanti & Kartini (2022), it also states that low scores on look back indicators are caused by students who are only accustomed to working on problems that can be done quickly without requiring deep understanding.

In addition to using instruments in the form of pretest and posttest questions, an instrument in the form of a learning implementation observation sheet is also used to see the suitability of learning implementation for the learning syntax that has been listed in the teaching module (Table 9). Based on observations of learning implementation three times, the results of teacher activities carried out in the experiment class had an average percentage of 92.75% and in the control class of 92.59%. In line with that, the average percentage of learner activities carried out in the experiment class was 91.30% and the control class was 90.74%. The percentage of learning implementation shows that the effective learning process during learning activities in the experiment class has a greater

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impact on the problem solving ability of students to solve problems about ecology and biodiversity in Indonesia context.

Table 9. Percentage of Learning Implementation

Observation Subject	Class	1st Meeting	2nd Meeting	3rd Meeting	Average
Teacher	Experiment	91,30%	95,65%	91,30%	92,75%
	Control	88,88%	94,44%	94,44%	92,59%
Students	Experiment	86,96%	95,65%	91,30%	91,30%
	Control	83,33%	94,44%	94,44%	90,74%

The percentage of teacher activity that has a very good category in both classes according to Dwi Amanda & Maulida Fauziah (2022), shows that the teacher has been able to apply the learning model according to its syntax, so as to increase the intensity of student involvement effectively in the learning process. This is supported by Rahayu et al. (2019) which states that good learning implementation shows that the teacher in applying the learning model is in accordance with the syntax and the teacher succeeds in provoking students to be actively involved in learning by organizing material concepts so that students can understand the subject matter freely. Some activities that were not implemented in this study were caused by the teacher's adaptation period with the learning model used, so that there were some activities that were forgotten and there were some activities that were combined at the next meeting, then there was poor time management, and was influenced by the activeness of students in asking and answering questions that were still lacking in one of the phases.

CONCLUSION

Based on the results of the gain score hypothesis test using the t test, it is obtained that t_count > t_table is 2.769 > 2.042 with a significance value (Sig. 2-tailed) of 0.007 < α (0.05), then reject H_0 so it can be concluded that there is an effect of using the Learning Cycle 7E learning model on the problem solving skills of junior high school students on

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the material of ecology and biodiversity of Indonesia. Therefore, the learning cycle 7E learning model can be an alternative to improve students' problem solving skills, especially on the context of ecology and biodiversity Indonesia.

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