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Application of the POE Learning Model to Improve Biology Learning Outcomes in Grade VII Students

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Abstract:
This research explores using the Predict, Observe, and Explain (POE) model to enhance the learning process in elementary schools, particularly in biology lessons. The study conducted at SMP Berea Tondano with class VII focuses on how the POE model affects student understanding and engagement, specifically in classifying living organisms. A classroom action research (CAR) approach was employed in two cycles, each involving planning, action, observation, and reflection. Nine students from class VII participated in the study. Data were collected through observations, student activity sheets, and tests at the end of each cycle to evaluate the impact of the POE model on learning outcomes and student engagement. The research findings revealed significant improvements in student engagement and learning outcomes across the two cycles. In the first cycle, 55.56% of students achieved the learning goals, which increased to 88.89% in the second cycle. Similarly, student activity levels rose from 35.71% in the first cycle to 78.57% in the second cycle, reflecting greater participation and motivation. The study concludes that the POE model effectively enhances student learning outcomes and promotes active engagement. By involving students in prediction, observation, and explanation, the POE model aids in better understanding and retention of biological concepts. Further research is suggested to explore its application in other subjects and educational contexts.

Keywords: Biology, Classroom Action Research, Learning Outcomes, POE Model, Student Engagement.

Introduction

Education is basically a process to influence students to be able to adapt as best as possible to the environment and thus will bring about changes in them that will allow them to function strongly in society (Hamalik, 2013; Amaliyah, 2019; Domu & Mangelep, 2019). According to the Law of God. 20 In 2003, the goal of national education was to develop the potential of students to become human beings who believe and fear God Almighty, have a noble character, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens. Increasing student's potential is an important step that must be taken in education (Banjarnahor & Silitonga, 2018; Domu & Mangelep, 2020). Increasing student potential includes increasing knowledge, skills, attitudes, and values that apply in society (Bektiarso, 2015; Domu & Mangelep, 2023). In optimizing student potential, the participation of parents, schools, and the community is needed (Campbell & Reece, 2008; Domu et al., 2023). Thus, education and learning have a big role in improving human life and being able to make a difference in life.

As learning agents, teachers are required to manage the learning process as well as possible to facilitate and motivate students to learn. As stated by Mulyasa (2006), as a facilitator, the most important task of teachers is to "facilitate learning", not just teach or teach, because teachers are an important factor that greatly influences the success of learning. The success of learning can be seen from the learning process and student achievement in accordance with the goals set in the learning plan (Domu & Mangelep, 2024). Because the learning process and results can be used as a basis for collecting data and information about the achievement of student competencies, which can be used for decision-making and improvement of the learning process (Mangelep, 2013; Domu et al., 2023). Sanjaya (2011), explains that: "A learning is said to be successful when students can achieve their goals optimally. The success of achieving goals is an indicator of the success of teachers in designing and implementing the learning process".

Biology is one of the sciences that includes principles, processes, results, laws, and scientific facts, requiring students to think critically in solving a problem (Mardhiyah et al., 2021). Biology comes from the Greek words "bios", which means life, and "logos", which means science, so it can be said that Biology is the science that studies living things. Biology is a science that studies the diversity and interaction of all living things on Earth. Biology is related to how to find out about nature systematically, so biology is not only the mastery of a collection of knowledge in the form of facts, concepts, or principles but also the process of discovery. (Campebell & Reece, 2008). Biology learning requires investigative activities as part of scientific work. Therefore, teaching biology materials requires special strategies to solve problems that arise in biology learning.

Based on the results of observations and interviews with teachers at Berea Tondano Junior High School, it turns out that there are still many problems faced in biology learning, namely the learning process that is still centred on the teacher as the main source of information, students rely a lot on the teacher's explanation so that their success depends on what the teacher has, such as preparation, knowledge, and the ability to speak and manage the class. Students are less fully involved in learning and are not trained to explore their' initial knowledge, process information, make the right decisions, and solve problems; students are only recipients of information, so students are more passive in the learning process. In the learning process, Biology is still based on memorizing theories and concepts, not student experience. Students also lack exploration of initial knowledge. Biology learning is the study of knowledge products and the process of discovery of knowledge products. Knowledge discovery must be considered in the process of learning biology in schools.

Biology learning can be interpreted as a teaching and learning process that studies nature and its events. This concerns science in the form of understanding concepts, laws, theories, principles, and their application in the ability to carry out processes (Mangelep, 2015; Scott et al., 2021; Kumesan et al., 2023). Based on these problems, researchers choose the right learning and can make students active in Biology learning to increase student learning outcomes. The learning model has a considerable role in teaching and learning activities (Mangelep, 2017; Lohunauman et al., 2023). One of the learning processes is found in schools; in learning in schools, learning activities are the most basic activities (Manambing et al., 2018; Mangelep et al., 2020). Students' ability to understand lessons can be influenced by the selection of relevant, effective, and efficient learning models to be applied so that they are expected to get better learning outcomes (Mangelep et al., 2023). Bektiarso (2015) states, "Teachers play the role of conveyors of information and, in this case, must use various appropriate and varied media. The information provided can be procedural, i.e. knowledge of how to do something or knowledge of how to do something or declarative knowledge, i.e. knowledge about something that can be in the form of facts, concepts, principles or generalizations".

Based on these problems, solutions are needed that can change classroom learning activities to optimize student activities and learning outcomes. The appropriate and appropriate learning model is the Predict Observe Explain (POE) model (Shoimah & Listiana, 2019; Mangelep et al., 2024). White and Gustone introduced the Predict Observe Explain model in their book "Probing Understanding" 1995 (Susanto et al., 2017). The POE model is suitable for bringing learning to Biology subjects in high school (Banjarnahor & Silitonga, 2018; Mangelep et al., 2025). According to White and Gustone (1992), the POE learning model is efficient for generating students' ideas or ideas and conducting discussions about their ideas. There are more opportunities for students to ask questions and express their opinions when learning using the POE model because students are required to make predictions and observe their own problems. The POE model is a learning model that begins by exposing students to a problem; then students are invited to predict at the beginning of learning to find out the initial concepts that students have; then to prove their predictions, students observe by conducting experiments and making explanations. In this model, student-centred learning. The POE model is one of the learning models used in learning activities, helping students form their knowledge first through the senses. By seeing, hearing, touching, smelling, and feeling a problem, that is, making predictions about learning problems, making observations, and making explanations.

Applying the POE learning model has deceived students physically, involving all students' senses (Restami et al., 2013). Some researchers have also proven that with this model, students are invited to build their own concepts by predicting, observing, and explaining an event in detail. The advantages of this POE learning model are: (1) it stimulates students to be more creative, especially in making predictions; (2) students can compare hypotheses with reality; and (3) the learning process becomes more interesting and can reduce verbal (Mangelep et al., 2023). The POE model can help students explore and confirm their ideas, especially during the prediction and reasoning stages. The observation stage helps students to prove their predictions. To prove the prediction, students make observations with this observation that students can explain about a problem. After making observations, students will be able to explain their predictions. With the POE learning model, it is hoped that students will build their own knowledge so that the knowledge learned by students can be attached for a long time. The ability to remember material such as concepts, theories, principles, principles and laws that have been learned is usually called retention. Clear and concrete objects will be easier for students to remember than abstract ones. The observation stage supported by this experimental method is expected to invite students to discover their own concepts through a process that trains students to observe experiments carried out by themselves, which is expected to improve student learning outcomes and students' sensitivity to the material taught.

This POE model is based on the constructivist learning theory, so it demands creating knowledge through thinking skills by seeking the concept of understanding independently and actively during learning (Yuliani et al., 2019). This process will make learning more meaningful (Amaliyah & Nasruddin, 2019). Therefore, research on the application of the POE model to improve learning outcomes and learning activities is important in an effort to improve the quality of learning and students in accordance with the demands of the 21st century.

Based on the problem of this description, the researcher is interested in conducting research entitled "Application of the Learning Model "Predict, Observe, Explain (POE) to Improve Biology Learning Outcomes in Grade VIII Students of Berea Tondano Junior High School".

Literature Review

Learning is a mental activity that involves active interaction between an individual and his or her environment, resulting in changes in knowledge, skills, attitudes, and values. Various experts provide

definitions showing that learning is a process of behaviour change because of experiences recognized as real learning experiences, not due to natural factors or physical growth (Mardhiyah et al., 2021). Learning is an active process that includes thoughts, feelings, and interactions with the world around you (Mulyasa, 2005). The learning process is an interaction between teachers and students with the aim of achieving certain learning outcomes (Restami et al., 2013). This learning also involves an evaluation to measure the extent to which the learning objectives have been achieved, which take place in a predetermined space and time.

The main components involved in the teaching and learning process include educational objectives, students, teachers, teaching planning, teaching methods, teaching media, and teaching evaluation. The purpose of education is to provide guidelines for teachers and students so that the teaching process runs effectively (Sainab & Rahman, 2021). Students need special attention to support the desired behaviour change as the main subject in the teaching and learning process (Sanjaya, 2021). Teachers, as teaching facilitators, must prepare carefully and plan and choose the right methods to support the student learning process (Shary et al., 2022). Teaching media is also important in improving student understanding while teaching evaluation measures teaching outcomes and effectiveness.

Learning outcomes are behavioural changes in students after participating in learning activities. Learning outcomes can be measured through changes in students' cognitive, affective, and psychomotor aspects (Shoimah & Listiana, 2019). An effective learning process will significantly change students' knowledge, skills, and attitudes (Suranti et al., 2018). Factors that affect student learning outcomes include internal factors (such as students' physical and psychological conditions), external factors (social and family environment), and applied learning approaches (Susanto et al., 2017). Learning outcomes are assessed through various tests, including formative, summative, and summative (Sulistyaningsih et al., 2018).

The POE learning model is an approach that invites students to make predictions, observe phenomena, and explain the results of their observations. This model develops students' critical thinking skills and observation skills. This process involves three stages, namely Prediction (Students guess about what will happen), Observation (Students observe and record the phenomena that occur), and Explain (Students explain the results of their observations and compare them with predictions made previously) (Sulistyaningsih & Mangelep, 2019). This model has advantages, such as increasing students' active participation, exploring their initial ideas, and deepening their understanding of the concepts learned (Sulistyaningsih et al., 2023). However, this model also has drawbacks, requiring careful preparation and adequate experimental tools (Tiwow et al., 2022).

The classification of living things is the process of grouping living things based on the similarities of certain characteristics. Historically, this grouping began with two kingdoms (plants and animals), and as knowledge grew, the classification system expanded to five or six kingdoms. The placement of living things in this taxon is based on various criteria, such as morphology, anatomy, benefits, or genetic similarities. The current evolving classification system includes a system of six kingdoms: Eubacteria, Archaebacteria, Protista, Fungi, Plantae, and Animalia.

Several studies have shown that applying the POE model can improve student learning outcomes. For example, research at SMAN 2 Merangin showed that the POE model significantly improved students' biology learning achievement. Other research at SMAN 1 Sendana and SMAN 3 Cimahi City also found that this model can improve student activities and learning outcomes in biology subjects. This model is

effective for improving students' critical thinking skills and activeness, which in turn can improve their understanding of concepts and overall learning outcomes.

Based on the framework of thinking that has been prepared, it can be concluded that the application of the POE model at Berea Tondano Junior High School is expected to improve student learning outcomes in the classification of living things. This model leads students to be more active in the learning process, increase motivation to learn, and generate a deeper understanding of the material being studied.

Methods

The type of research used in this study is class action research (PTK), also known as class action research. According to Arikunto (2008), classroom action research is an effort to observe teaching and learning activities with actions deliberately raised in a shared classroom. This research aims to provide information on appropriate actions to improve student learning outcomes, especially in Biology, about the classification of living things using the Predict, Observe, Explain (POE) Learning Model. The research procedure is carried out as a repetitive cycle until the expected goal is achieved.

This research was carried out in two cycles. Each cycle consists of four stages: planning, action, observation, and reflection. In each cycle, actions are carried out in two meetings, ending with a learning outcome test to assess the success of the learning process implemented using the POE Learning Model. This cycle process can be repeated until the desired result is achieved. The success of each cycle is assessed based on the improvement in student learning outcomes and their involvement during the learning process.

The class action research stage begins with planning, including problem identification, problem formulation, problem cause analysis, and intervention development. At the implementation stage, the planned actions are implemented in the classroom. After that, observations are made to collect impact data from the actions taken, followed by reflection to evaluate the changes. This reflection assists the researcher in identifying the problems that arise and planning improvements for the next cycle.

The subject of the study was grading VII students of Berea Tondano Junior High School with 9 students, consisting of 8 male students and 1 female student. This research was conducted in grade VII of Berea Tondano Junior High School about the classification of living things. The research was conducted in the odd semester of the 2023/2024 school year. This research is designed in two cycles, with each cycle going through the stages of planning, implementation of actions, observation, and reflection to assess the success of each learning cycle.

In this study, data was collected using two techniques: test and non-test. The non-test technique is in the form of observation sheets used to observe student activities during learning using the POE Learning Model. Meanwhile, test techniques measure student learning outcomes through multiple-choice questions and essays at the end of each cycle. The success of the research is measured by predetermined criteria, namely a minimum score of 75 for learning outcomes and a learning completion rate of 80% of the total students. Student learning activities were also assessed based on the percentage obtained from the observation sheets, with the activeness categories ranging from very good to not good.

Result

This class action research was carried out at Berea Tondano Junior High School grade VII, which consisted of 9 students, namely 8 male students and 1 female student. This research uses the stages of class action research, which include planning, implementation, observation, and reflection. This research was conducted in two cycles, with the first cycle starting with the planning stage. At this stage, the researcher prepares a

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Learning Implementation Plan (RPP) in accordance with the subject matter using the Predict, Observe, Explain (POE) learning model. The researcher also prepares subject matter and test tools for evaluation and observation during learning.

At the implementation stage of the first cycle, the researcher acts as a teacher who applies the POE model in learning. Learning is divided into three stages: the initial (introductory) activity, the core activity, and the final activity (closing). In the early stages, teachers provide motivation and perception by asking questions and bringing ferns to arouse students' curiosity about the study material. The teacher then conveys the learning objectives in accordance with the POE model. In the core activity, the teacher explained the material about environmental pollution by paying attention to the reading text and exploring information from the text. The teacher asks students to study the material and complete the prepared Student Worksheet (LKPD).

After each group completed the LKPD, they were allowed to present their work results. Teachers also provide opportunities for students to exchange information by asking and answering each other. In the closing stage, the teacher asks the students if there is anything they have not understood and directs them to ask. The teacher then asks the students to draw conclusions from the learning carried out and strengthen the conclusions. Thus, the first cycle ends with evaluation and reflection on the learning that has been carried out.

Table 1. Description of Cycle II Activities

Activities	Step	Activity description
Introduction	Creating perception and motivation and (*Prediction*)	1. The teacher greets and prays and asks how the students are doing. 2. Teacher checks student attendance 3. The teacher brings the fern plant into the classroom to attract attention and focus the student's mind on learning The teacher asked: Do you know what kind of plant this is?  1. The teacher conveys the learning objectives. 2. Students predict the characteristics of the observed fern plants, then write down the initial answer on paper
Core activities	Watch	1. Students make observations about plant classification materials in the surrounding environment.

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Activities	Step	Activity description
	Ask	Examples of questions: 1. From the results of observations in the field, what plants have the same characteristics? 2. Can their characteristics group these plants?
	Information collection	1. The teacher explained a little about the plant material, then the teacher immediately divided the students into 3 groups consisting of 3 people 2. Teachers share LKPD (student worksheets) about plant classification, teachers, plant characteristics and examples.
	Associate	1. Teachers monitor and direct student activities during field observation 2. Teachers monitor student activities in completing the LKPD that has been given and help groups that are experiencing difficulties by visiting and asking questions to each discussion group 3. The teacher supervises the students in expressing their opinions on the answers to the questions that the teacher has given
	Communicate (Explain)	1. The teacher asked representatives from each group to present the results of their discussion 2. The teacher asked the other group to respond to the results of the other group's discussion 3. The teacher leads the discussion to reaffirm the student's answers and gives students the opportunity to ask questions that have not been understood 4. The teacher gives rewards (e.g., praise or other forms of appreciation) to the group that does a good job of completing the task in the group 5. Teachers condition the classroom as before
Closing	Conclude	1. Students and teachers conclude the material from today's discussion 2. The teacher gives suggestions and an overview for the next lesson, and the teacher gives the final exam to the student 3. The teacher closes the lesson with a prayer

Observations are made on student activities and learning outcomes, as well as recording things that occur during the implementation of learning. The learning activities carried out in the first cycle were obtained from student learning results and the observation results of student learning activities in Table 2.

Table 2. Observation Results of the First Cycle of Learning Activities

No	Observed Activity	Value	Information
1	Students are motivated to learn	1	Not Good
2	Listening/paying attention to the teacher's explanation	2	Enough
3	Students are active in groups	2	Enough

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No	Observed Activity	Value	Information
4	Helping colleagues	1	Not Good
5	Work on assigned tasks	1	Not Good
6	Students conclude learning	1	Not Good
7	Students answer evaluation questions	2	Enough
Total		**10**	
Percentage		**35,71%**	**Not Good**

Based on Table 2, it can be seen that student activities during the learning process through the predict, observe, explain (POE) learning model in the first cycle obtained poor results of student learning activities, namely students are less motivated in paying attention to explanations from teachers, students in groups do not help each other, still do not understand how to work on the correct LKPD and also how the percentage of students who are not in accordance with direction of the teacher and still do many irrelevant activities during the learning process. So that it has an impact on the low learning outcomes of students. The percentage value of student activity in the first cycle obtained a result of 35.71% which is included in the bad category.

The activities carried out in the second cycle are almost the same as the activities in the first cycle, which include the initial activities, core activities, and the final activities. At the end of the lesson, test questions are also given as well as cycle I, namely cycle II test questions.

Table 3. Description of the First Meeting of Cycle II

Activities	Steps	Activity description
Introduction	Creating perception and motivation and (*Predict*)	1. The teacher greets and prays and asks how the students are doing 2. Teacher checks student attendance 3. Teachers present a wide variety of animal drawings that have been pasted on cardboard to attract attention and focus students' minds on learning 4. The teacher asked: Do you know what kind of animal this is? 

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Activities	Steps	Activity description
		 5. The teacher conveys the learning objectives 6. Students predict the observed images, then Write down the initial answer on paper
Core activities	Observe	1. Students observe animal classification materials in the surrounding environment.
	Ask	The example of the question: 1. From the images that have been observed, what animals have similar characteristics? 2. Can these animals be grouped based on their characteristics?
	Information collection	1. The teacher explained a little material about animals, then the teacher immediately divided the students into 3 groups consisting of 3 people 2. Teachers distribute LKPD (student worksheet) about the classification of animals, their division, the characteristics of animals and examples
	Associate	1. The teacher monitors and directs student activities during observation in the field 2. The teacher monitors the students' activities in completing the LKPD that has been given and helps the group in difficulty by visiting and asking questions to each discussion group 3. The teacher supervises the students in expressing their opinions on the answers to the questions that have been given by the teacher.
	Communicating (*Explain*)	1. The teacher asked the representatives of each group to present the results of the discussion 2. The teacher asked the other group to respond to the results of the other group's discussion 3. The teacher leads the discussion to reaffirm the students' answers and gives students the opportunity to ask questions that they have not yet understood 4. The teacher gives rewards (e.g. praise or other forms of recognition) to the group that does a good job of completing the task in the group 5. Teacher conditions classroom conditions as before
Closing	Conclude	1. Students and teachers concluded the material from today's discussion

Activities	Steps	Activity description
		2. The teacher gives the final test to the student 3. The teacher closes the lesson with a prayer

Student learning outcomes in the 2nd cycle have increased compared to the 1st cycle. Based on the list of learning outcome scores above, it shows that the number of students who achieved the completeness of learning outcomes in the first cycle classically was 5 students or 55.56%, while 4 students or 44.44% were incomplete, then in the 2nd cycle there was an increase in the value of learning outcomes showing that the number of students who achieved the completeness of learning outcomes in the second cycle classically was 8 students or 88.89% while 1 student or 11.11% are incomplete. Based on the KKM set at Berea Tondano Junior High School, a student is said to have completed his or her studies if he has an individual completion score of > 75 and classically, 80% of the students in the class complete their studies.

Student learning activities have increased, namely in cycle 1 with a percentage of 35.71 categories of activities that are not good, increasing in cycle 2 with a percentage of 78.57, including the good category. This is because there has been an increase in several aspects of the activities observed, namely that students are more motivated to learn, are more active in group work, and can answer evaluation questions given by teachers very well.

Based on the research results from the two cycles, improvements have been made in the second cycle so that in carrying out the learning process, students have collaborated well with group pairs and are enthusiastic about the predict, observe, and explain (POE) learning model. Students are more active in learning even though they are still under the guidance of teachers. Teachers optimize the guidance process for students during learning to run smoothly, and the available time can be used to the maximum.

Discussion

This class action research consists of cycles I and II, carried out in two meetings, respectively. Each cycle includes several stages: planning, action, observation, and reflection. In cycle II, the stage carried out is an improvement from the previous cycle to improve the quality of learning and student activities. In this study, the learning model used is Predict, Observe, Explain (POE), which is expected to increase student engagement and learning outcomes.

In cycle I, the observation results showed that student activity during the learning process was still relatively low. Student activity was recorded at only 35.71%, which is classified as not good. Some of the problems found include the lack of cohesiveness in group work, students who do not pay attention to the teacher's explanations, and the inability of students to complete assignments on the Student Worksheet (LKPD) properly. In addition, many students are not able to conclude the material studied. Therefore, improvements need to be made in the next meeting, such as directing students to focus more and concentrate on group work and paying more attention to the teacher's explanations.

In cycle II, student learning activities showed a significant increase. Observation data showed that student activity reached 78.57%, which is included in the very good category. This improvement shows that the improvements are successful, and students become more active and focused on following learning. The implemented POE model is maintained in the second cycle, focusing on the right principles and measures so that students are more involved in learning.

This increase in learning activities also aligns with the findings from Sainab & Rahman (2021), which show that the POE learning model can improve students' learning activities. This model makes students more active and focused in following the implementation of learning. Fauziah (2016) also stated that the POE model focuses on exploring students' understanding by asking them to perform three main tasks: predict, observe, and explain. This model refers to constructivist learning theory, allowing students to build their knowledge through hypotheses. With the help of teachers, they can discover new things and construct the acquired knowledge.

There is a dominant interaction between students during learning with the POE model. Students discuss with each other, remind each other of misconceptions, and work together to conclude the material. This interaction allows students to actualize their knowledge and skills, which is very much in line with the current constructivist approach. The POE model empowers students' potential and allows them to be more active in learning.

In addition to increasing learning activities, this study also shows increased student learning outcomes in the second cycle. The researcher provides a test at the end of each cycle to measure students' understanding of the material studied. The test results in the first cycle showed that 4 students had not completed their learning results (44.44%), while 5 students (55.56%) had achieved learning completion. Because the completeness of student learning in the first cycle has not reached 80%, the research is continued to the second cycle.

In cycle II, test results showed a significant increase, with only 1 student (11.11%) having not completed it, while 8 students (88.89%) had achieved learning completion. Thus, the completeness of students in classical learning has reached 80%, which means that the learning goals have been achieved. This success cannot be separated from the efforts of teachers who always try to improve the implementation of learning at every meeting. Teachers prepare for the various needs of students and always guide them so that students are more active and can explore their knowledge well.

This research aligns with research conducted by Shary et al. (2022), which shows that the Predict, Observe, Explain (POE) learning model significantly improves student learning outcomes. The results of this study show that the POE model is very effective in improving student learning outcomes and can be applied to other subject matter with good results. Thus, it can be concluded that the POE learning model can improve students' learning activities and outcomes, making it a good choice in learning.

Conclusion

Based on the results of data analysis and discussions that have been carried out, it can be concluded that the application of the Predict, Observe, Explain (POE) learning model has succeeded in improving student learning outcomes and learning activities. In the first cycle, the completeness of student learning outcomes reached 55.56%, while in the second cycle, it increased to 88.89%, with an increase of 33.33%. In addition, student learning activities also increased, from 35.71% in cycle I to 78.57% in cycle II, which showed an increase of 42.86%. These results show that the POE model effectively increases student engagement and understanding in learning.

Based on the results of this study, it is suggested that teachers can use various appropriate learning methods, especially in biology learning, to motivate students and improve their learning outcomes. Teachers need to study the POE model more deeply so that it can be applied effectively in various learning materials. In addition, the results of this study can be a reference for biology teachers and teachers of other subjects to

improve the quality of education. It is also recommended that other parties conduct similar research on different materials as comparison materials to improve the quality of further learning.

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