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Ethnobioconservation with a Predict, Observe, Explain (POE) Strategy Against Student Cooperative Skills

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Abstract: Student cooperative skills are an internal representation of the conceptual understanding of Maluku's natural resource conservation biology. Currently, students still have difficulty explaining the relationship between biological conservation and biological, physical and chemical conditions of a natural resource phenomenon, at a concrete level. These difficulties require research, through Predict, Observe, Explain (POE) Strategy, Ethnobioconservation Development of Maluku Natural Resources. This study aimed to reveal the development and differences in students' cooperative skills after learning Bioconservation with POE and conventional learning. Indicators of students' cooperative skills were adapted from Johnson, & Holubec, (2002). The topic of Maluku Natural Resources Ethnobioconservation combined with the POE Strategy consists of five topics, namely 1) Burning rocks in Maluku Tenggara Barat Indonesia; 2) *Sasi* Lompa Opening Ceremony in Haruku Village, Maluku Indonesia; 3) Timba Laor, Latuhalat Village, Ambon Maluku Indonesia; 4) Meti Kei Ceremony in Southeast Maluku Indonesia; and 5) The Opening Ceremony of *Sasi* Teripang in Noloth Village, Saparua Island, Maluku Indonesia. The findings indicated that the POE strategy resulted in better student cooperative skills. The N-Gain scores of students in the class using the POE and conventional strategies were found to be 71.43 and 47.73, respectively. Meanwhile, the value of coopetarif skills was higher (36.67%) compared to conventional learning. Thus, it can be concluded that POE Strategy learning is effective in increasing the cooperative skills of students. This research recommends that POE is very important and useful for use in biology learning. because the POE strategy facilitates student concept change.

Keywords: Ethnobioconservation; Maluku Natural Resources; POE strategy; Cooperative skills

Introduction

Learning biology in the 21st century empowers students to think at a higher level and using local wisdom as a learning resource are two important components in learning biology and will increase student awareness of local potential and wisdom (Ramdiah et al., 2020). Using the POE strategy is effective in collecting predictions and students' reasons for predicting research results (Kala et al., 2013). Therefore, integrating ethnopaedicine is a concept of local wisdom in the development of conservation biology teaching materials using the POE Strategy to provide benefits to students. Ecologically, local wisdom shows a harmonious relationship between humans and their natural environment. The application of POE learning strategies provides opportunities for students to be active in building knowledge, communicating thoughts through discussion and writing, enabling students to be able to master concepts, and having an effect on improving learning outcomes (Hsu et al., 2011).

Ecologically, local wisdom shows a harmonious relationship between humans and their natural environment (Humaida et al., 2018). Local wisdom forms a positive character which is indicated in student performance, including caution, honesty and responsibility for environmental problems (Shamir-Inbal et al., 2016). POE strategies are needed to help students develop students' critical thinking and understand concepts (Coştu et al., 2012). Actualizing scientific progress is the use of learning strategies. Therefore, the role of teachers in overcoming practical science skills is to assist students by equipping them with activity-oriented practical skills, as well as

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cognitive and psychomotor skills (Adebayo, 2015). According to the application of POE learning strategies, it has a relationship with creative thinking skills and learning outcomes (Akpınar, 2014).

In learning activities, students must actively participate in it. Students have the right to be involved not only in learning activities but also in the assessment process. Student involvement in assessment activities is expected to assist students in spurring their self-awareness to increase student achievement. In addition, the development of current learning models such as cooperative, constructivist and scientific learning that requires students to be able to work together in groups and exchange ideas, causing other students to have the right to assess their fellow students because they experience the learning process together (Hsiao et al., 2017).

Maluku has an ecosystem with high biodiversity wealth. Therefore, the importance of other biodiversity inventories is to detect, monitor, measure, and estimate fluctuations in diversity lists and the implications of their changes on ecosystem function. Integrating Ethnopaedagogy in the Development of Conservation Biology Teaching Materials is good (Ridho et al., 2021). One way to bring this concept into learning biology is by using POE Strategies to improve student cooperative Skills.

Maluku Province also has a lot of local wisdom related to biodiversity conservation, such as local wisdom in treating nature in Maluku Indigenous People. Local wisdom is knowledge, policies, and decision making related to resolutions to achieve social harmony and ecosystem balance (Kanhadilok et al., 2013). The 21st century learning agenda recommends that to increase public awareness of the importance of biodiversity, appropriate learning is based on local culture or ethnopedagogy or local wisdom-based learning. Learning in the 21st century must be able to prepare the generation of Indonesian people to welcome advances in information and communication technology in social life (Chai et al., 2017). The POE learning strategy, which is expected to improve understanding of science concepts and process skills, support the learning process, guide students to carry out activities in a structured manner empowering cooperative skills. This is in accordance with the demands of learning characteristics that produce 21st century learning characters in young people or the younger generation, namely multitasking, multimedia, online social networking, and online information searching (Ejikeme et al., 2017).

The application of POE learning strategies provides broad opportunities for students to observe phenomena, describe them simultaneously, ask questions, make hypotheses on the questions posed, make predictions based on the constructed hypotheses, test the validity of predictions by experiments, and reconstruct hypotheses to get valid explanations about related phenomena (Ipek et al., 2010). The advantage of learning POE is to stimulate students to be creative, especially in sending predictions (Ayvaci, 2013). One of the strategies in the scientific learning process that can support students to understand concepts and develop students' critical thinking skills is POE (Berek et al., 2016). The POE learning strategy is an efficient step to create student discussions about scientific concepts, involving students in predicting a phenomenon, making observations and their previous predictions. This method causes the concepts obtained by students to be embedded in their memories, and students will understand what they are learning, so that later students will feel the learning process more meaningful (Hartini et al., 2018).

The POE learning strategy directly involves students in the learning process by conducting experiments and gaining more meaningful knowledge (Suryamiati et al., 2019). The POE strategy has three stages that are suitable for students because it involves students actively in learning, especially in asking questions, and communicating to support science through observing phenomena that are close to students' real lives. The observation stage can be done through discussion and collaboration, the explaining stage can be done through linking and communicating the results of the experiment and working on questions given by the teacher.

The learning with POE strategies trains students' critical thinking skills. Predictive activities can be used by teachers to find out the initials of students in understanding a problem. Observation of activities helps students to prove the correctness of their predictions so that students can distinguish between claims and facts and make decisions about problem-solving solutions (Arsy et al., 2019). Those who teach and learn science, can follow the development of science and technology with ease, and can adapt to overcome natural events easily that provide for their needs (Özdemir et al., 2011).

The results of the study prove that the POE strategy is effective and attractive in learning scientific concepts (Banawi et al., 2019). The positive effect of teaching with the POE strategy is that students are able to overcome misunderstandings they experience and encourage actively to improve their learning outcomes, teachers only convey concepts to students (Wu et al., 2005). Students must also be able to understand the process of a phenomenon through practical activities so that they can build knowledge based on their own experiences and improve science process skills (Chang et al., 2013; Senel et al., 2015). The purpose of this study is to determine the Cooperative Skills of Students through Ethnobioconservation with the predict, observe, Explain (POE) Strategy.

Method

Research Design

This study used the development of the Four-D Model. The four D development is a model for developing teaching materials. The 4D development model consists of 4 main stages, namely: Define, Design, Develop and Disseminate follow Thiagarajan (Lawhon, 1976). The Four-D model was then applied using the Biological conservation-oriented POE strategy which was developed to be tested on students. This design aimed to obtain quantitative and qualitative data. Therefore, qualitative and quantitative data complement each other to form a better understanding of the problem. Quantitative data were obtained through quasi-experimental research, while qualitative data were collected by conservation and interviews. The Four-D model combined with the POE Strategy and the conventional method is independent variables while the Student Cooperative Skill is the dependent variable.

Research Population and Sample

The study population was all students of the Pattimura University Biology Education study program, batch 2018. The sample of this study consisted of 54 students who were randomly drawn from students offering conservation biology courses. The experimental group (n = 27) had the POE strategy combined with the Four-D Model, while the control group was instructed by the conventional method. Conservation Biology lessons take three hours a week for all students. The teaching intervention totaled 10 weeks (300 class hours) for the Four-D Model combined with the POE Strategy and the conventional method. The conventional method included several varied learning methods such as lectures, assignments, and discussions. The Four-D model was combined with the POE Strategy. Topics investigated included biodiversity and its interactions with the environment, components of biodiversity, distribution, benefits, problems and threats of biodiversity in the Maluku islands, forms and steps in their management and conservation.

Instruments and Procedures

The Four-D Model test combined with the POE Strategy with 15 structured questions was used for data collection (see Table 1 sample questions). The researchers developed the instrument and used the validation method based on the assessment of two validators, namely a lecturer of material experts and a lecturer of education experts. The results showed that the instrument had high validity (0.76) and reliability (0.91). In this study, the assessment of the POE Strategy was measured using a diagnostic test consisting of questions in the form of a two-layer test in the form of answers and reasons for answering or completing the concept of conservation biology following Bayrak (2013) assessment rubric. Then the researcher added up all the scores and divided them by the total score.

Table 1. Two-Level Test Scores

Criteria	Score
Correct answer + Correct reason	2
Correct answer + Wrong reason	1
Wrong answer + Correct reason	0
Wrong answer + Wrong reason	0

The results of the assessment of student cooperative skills followed a modification from (Johnson et al., 2000). The instrument assessed for Student Cooperative Skills included 3 aspects of assessment, namely the need for teamwork skills, understanding of cooperation learning skills, training and encouraging the mastery of cooperation skills, the ability to provide feedback on the use of cooperation skills, and the ability to practice collaboration skills. The students' answers were then categorized into four categories, namely correct (B), partially correct (C), partially incorrect (K), and incorrect (S).

This study followed the procedure as follows: 1) The stages of the Four-D model development consisted of four stages, namely the define stage, the design stage, the develop stage and the disseminate stage. 2) Coordinated with the conservation biology teaching TEAM to discuss planned learning activities, research procedures, and prepare tools and materials for biological conservation. 3) Randomly assigned to the experimental group the Four-D Model combined with the POE Strategy and conventional control. 4) Did a pretest to the group. 5) Conducted teaching interventions in the experimental and control groups and observe models of learning activities. 6) Managed posttest to the group, and 7) Conducted interviews to confirm student work on each topic.

Data Analysis

The qualitative data were analyzed descriptively in this study. The level of development of the application of the Four-D Model combined with the students' Predict, Observe, explain (POE) Strategy was evaluated by normalizing N-Gain <g> In an American Educational us survey (Hake, 2002), while quantitative data was analyzed through the covariance test (ANCOVA) in SPSS 20. The normality and homogeneity test as prerequisite test used showed that the data were normally distributed and homogeneous.

Result and Discussion

This section presents the results of the POE. Picture Topic 1. Stone Burning Tradition In West Southeast Maluku, Indonesia

Figure 1. Stone Burning Tradition in West Southeast Maluku, Indonesia

As shown in Table 1 - 5, student responses to the questions reached an average qualification. The post-test results reveal that the highest score for ednobioconservation of Maluku natural resources appears on each topic in the class where the application of learning used the POE strategy and the topic of the Meti Kei ceremony in Southeast Maluku, Indonesia for conventional classes. The lowest achievement appeared on the topic of the Timba Laor ceremony, in Latuhalat village, Ambon, Maluku, Indonesia for the POE class and in the conventional class on the topic of the stone burning ceremony in Tanimbar, Southeast Maluku, Indonesia (see Figure 2).

The results showed that the value of the presentation of the responses to the questions in the students' understanding of Ednobioconservation of natural resources was categorized as good, moderate and at the simple level. Also, some students didn't even give answers at all. After receiving treatment, students could perform better. However, the frequency of student responses using POE has a deeper and higher understanding in the experimental class (POE) than the control class (conventional). As shown in Figure 3, students reach an in-depth understanding or the topic of the burning stone tradition in West Maluku, Maluku Indonesia.

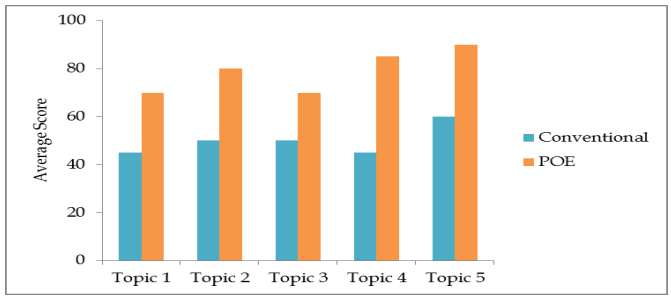

Figure 2. The average score of student responses to questions in application ednobioconservation of natural resources for conventional class and poe class.

Description:

Topic 1	:	Stone Burning Tradition in West Southeast Maluku, Indonesia
Topic 2	:	*Sasi* Lompa Opening Ceremony in Haruku Village, Maluku Indonesia
Topic 3	:	Timba Laor Ceremony, Latuhalat Village, Ambon Maluku Indonesia
Topic 4	:	Meti Kei Ceremony in Southeast Maluku, Indonesia
Topic 5	:	*Sasi* Teripang Opening Ceremony in Noloth Village, Saparua Island, Maluku Indonesia.

Table 1. Predict, Observe, Explain (POE) Measurement and Its Category

Questions	Answers	Category
Image of the results of conservation biology observations by students: Burning Stone Culture in the Tanimbar Islands, West Southeast Maluku. Location: Larat Island, North Tanimbar District, Indonesia (2020)		
1.Give your prediction about the prospect of developing the potential for rock burning in the Tanimbar Islands, Southeast Maluku as well as the challenges and opportunities in relation to the availability of existing technology.	*Prediction:* • The development of the potential for rock burning in the Tanimbar Islands of Southeast Maluku is very good for introducing community practices in processing food material from natural forests that are hygienic and healthy. • The tradition of burning stones in the Tanimbar Islands of Southeast Maluku creates the values of mutual cooperation, togetherness, kinship and solidarity in the life of local communities. The tradition of burning stone in the Tanimbar islands of Southeast Maluku uses natural management methods that will maintain the nutritional value of food.	2
2.After observing the stone burning process for 30 minutes, identify the nutritional content of the food, and its effects to the body's health	*Observation:* • The stone burning process is carried out for 30 minutes. Food, especially meat and fish, is free of fat • The stone burning process in tubers is rich in fiber and nutrients are not reduced • The process of burning stones in food, needs to be controlled by temperature and the source of heating so as not to reduce the nutritional quality of the food being burned • The government needs to conduct an analysis of soil types and soil nutrients to be able to determine their effects and ensure the safety of food burned from various compounds that are in the soi	2

Questions	Answers	Category
3.Explain what things you get from the natural stone burning method compared to modern technology food processing	*Explanation*: • The tradition of burning stones in the Tanimbar islands of Southeast Maluku prevents people from consuming fast food • The process of burning stone on food will save the community from toxic additives and synthetic cooking spices • The processing of food materials using modern technology is guaranteed while the natural processing of foodstuffs by burning stones requires caution in maintaining the cleanliness of food ingredients.	2

Table 2. The Descriptions of The Students' Pretest, Post-Test, and N-Gain Scores

	POE group		Conventional group	
Statistical description	Pre-test	Post-test	Pre-test	Post-test
Highest test score	77	90	71	80
Lowest test score	58	80	56	72
Maximum N-gain score		71.43		47.73
Minimum N-gain score		36.67		6.25
Average		70.55		27.64

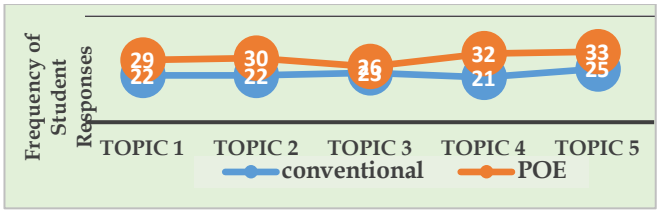

Figure 3. The average score of the frequency of student responses to questions in application

Based on the results of the calculation of the N-gain test above, the average N-gain score for the experimental class (POE Strategy) is 70.55 or 70%, including in the quite effective category with a score of at least 36.67% and a maximum of 71.43%. Meanwhile, the N-gain for the conventional class was 27.64 or 28% in the ineffective category with an N-gain score of at least 6.25% and a maximum of 47.73%.

Table 3 presents an increase in Student Cooperative Skills which includes 5 aspects of assessment which are divided into 20 categories, namely the need for teamwork skills, understanding cooperation learning skills, training and encouraging the mastery of cooperation skills, the ability to provide feedback on the use of teamwork skills, ability in providing feedback and the ability to practice the skills of students after learning conservation biology. The students' abilities are then categorized.

Table 3. Student Cooperative Skills Assessment Results

Aspect Assessment	Indicators	Category			
		B (%)	C (%)	K (%)	S (%)
Team work skills	Develop social skills to enhance group work	89.60		10.31	
	Able to understand the issues discussed	93.12		6.82	
	Able to play an active role in the group	27.61		44.88	27.61
Cooperative learning skills	Skills in verbal and nonverbal behavior	59.22	6.32	17.23	17.23
	The intensity of practicing skills in student groups	27.60	54.87	17.23	0.30
	Integrate collaborative and cooperative behavior in groups	93.10	6.90		
	Perform collaborative and cooperative behavior independently	27.60	31.05	24.55	16.80
Motivation for teamwork skills	The intensity of using cooperation skills	62.10	20.70	17.20	
	Willingness to show skills in front of other friends	6.80	79.33	13.87	
	Ability to encourage friends	75.80	10.35	13.85	
	Ability to improve teamwork skills	0.30	17.23	58.64	23.81
Ability to provide feedback	Ability to provide specific feedback for new skills	10.30	6.80	34.50	48.40
	Ability to engage in skills more effectively	37.80	48.34	0.80	13.06
	The ability to communicate effectively that occurs in the learning process	21.19	65.50	10.31	
	The ability to provide positive feedback to groups in an effort to help others learn	77.80	13.19	9.01	
Ability to practice skills cooperation	Ability to engage in teamwork skills	80.15	17.63	2.22	
	Ability to use skills but not authentic (Fake)	89.62	10.38		
	The ability to Mechanically integrate teamwork skills occurs naturally	15.27	66.39	93.11 18.24	6.89 0.10
	Ability to accept or reject decisions	27.61	31.07	34.52	6.80

The results of the analysis of the category of student teamwork skills in each aspect varied widely. Aspects of being able to face problems and develop social skills to improve group work, category B was very high. But, on indicator of integrating collaborative and cooperative behavior in groups was in high category. This shows that students have excellent abilities in building teamwork. The sentence structure of the questions made by students was very good and in accordance with the specified topic. The aspects of cooperative learning skills vary in category B and C. This suggests that students' ability to identify conclusions still needs to be improved.

The motivation for cooperation skills built by students is quite high, and they have the skills to build cooperation. Integrating collaborative and cooperative behavior in groups is quite high. The ability to encourage friends is quite high, but the ability to improve student cooperation skills needs to be improved.

The aspect of the ability to provide feedback is dominated by the B aspect. Students are able to demonstrate the ability to provide positive feedback to the group as an effort to help others in learning. However, it is also necessary to increase the ability to engage in skills more effectively. Likewise, the ability indicator in providing specific feedback for new skills needs to be varied and improved. Indicators of the ability to communicate effectively that occur in the learning process in students have not achieved optimal results so that there needs to be an increase.

Aspects of the ability to practice student cooperation skills, especially on indicators of the ability to engage in cooperation skills and the ability to use skills but not authentic or fake, including Category B is very high. This shows that the ability of students' cooperative skills in providing solutions to problems is very good. However, almost all indicators of students' ability to accept and reject decisions are very low. The low ability of students to accept and reject decisions can have an adverse impact on further education. Therefore, the ability of students to accept and reject decisions needs to be trained.

Table 4. The ANACOVA Test Results on Student Cooperative Skills

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3594.596[a]	2	1797.298	122.314	0.000
	236.953	1	236.953	16.126	0.000
POE Strategy	138.594	1	138.594	9.432	0.000
Class	237.279	1	237.279	16.148	0.000
Error	690.624	47	14.694		
Total	305839.000	50			
Corrected Total	4285.220	49			

a. R Squared = .839 (Adjusted R Squared = .832)

Table 4 shows that the Ethnobioconservation of Maluku Natural Resources with the Predict, Observe, Explain (POE) strategy has an effect on the students' cooperative skills (p <sig. 0.05). While the results of the post hoc test for students' cooperative skills are presented in Table 5. Table 5 shows a significant difference between them through the results of the LSD advanced test.

Table 5. LSD Test Results

Learning Strategy	Mean	Notation
POE	85.333	a
Conventional Learning	68.652	b

Table 5. shows that the POE strategy notation and conventional learning models are the same in improving students' cooperative skills, but the average score shows a difference of 16.68 points. Ethnobioconservation studies are very important to the richness of flora and fauna in Maluku. It has been known for centuries, but many are in the critical and endangered category. Flora and fauna are exploited for the improvement of the community's economy and Maluku is ecologically vulnerable to erosion of genetic resources, causing irreversible and irreplaceable damage to resources (Leunufna et al., 2014). Various threats to biodiversity must become environmental awareness and knowledge of various parties involved and one of them is through the inheritance of local knowledge. Nisiforou et al. (2012) explain that the close relationship between action and local environmental awareness can be seen from an educational point of view.

Cooperative Skills, especially students' responses to conservation biology problems, show sufficient skills. Especially, the need for teamwork skills is very important. Social skills are also needed for teamwork, and the relevance of control over the number of students in a group, basic social skills, or student academic level are factors that need to be considered (Mendo-Lázaro et al., 2018). To improve the ability to understand the problems discussed, Yu et al. (2015) explained the need to develop students' abilities to create and analyze questions and then choose and develop solutions. In addition, project design cultivates students' ability to evaluate results and apply feedback.

The last century there has been a significant shift from manufacturing services to services that emphasize more information and knowledge on cooperative skills. Knowledge itself grows and expands exponentially. Information and communication technology has changed the way we learn, the nature of work that can be done, and the meaning of social relationships. Joint decision making, sharing information, collaborating, innovating, and working speed are very important aspects at this time (Cecchini et al., 2020).

The findings show that in order to understand the richness of ecosystems, species and varieties of plants and animals in the Maluku islands, students need to be encouraged to be able to play an active role in groups. This shows that students still have the motivation to play an active role in the group. Stevahn et al. (2017) describes cooperation between students who pursue success, encourage each other to work together, and learn to work together regardless of ethnic background or whether they are male or female, intelligent or struggling, disabled or no, still rare. Therefore, the learning together technique, which is one of the cooperative learning methods, is more effective than traditional learning methods in improving listening comprehension and listening skills (Casey et al., 2019). Thus, in applying the POE Strategy to students, students must in real-time predict, observe demonstrations, and finally discuss the results with peers, to produce their own conceptual knowledge through reconciliation and negotiation between their previous knowledge and new experiences.

The results also show that the ability of students in the POE class (experimental) has the motivation to play an active role in the group and has a very good understanding in the group and according to the specified topic. The factors of the nature of the concepts studied in relation to the difficulty of understanding, adequate basic knowledge, motivation, concentration, curriculum load and language affect the ability of students to follow the teacher's explanation (Kibirige et al., 2014). The development of predict-observe-Explain strategies facilitate conceptual change and effectiveness in student understanding of condensation. It is better conceptual for the concept of condensation and allows students to retain new conceptions in their long-term memory. Learning achievement is also a self-perception of the success of one's academic goals (Al-Abyadh et al., 2022).

The results showed that students still faced difficulties in answering questions related to the ednobioconservation concept. The students have difficulty in describing several bioconservation concepts in relation to physical environmental problems. For example, in the Timba Laor concept, students still find it difficult to explain why Laor only appears in March every year. How to relate it to the physical and chemical conditions of marine waters. The lack of students 'ability to solve problems or phenomena related to the environment is due to learning strategies that do not facilitate students' problem solving skills (Xiao et al., 2019). In addition, students cannot understand the concepts or principles and rules of physics and chemistry because of their inability to understand questions and lack of motivation (Salta et al., 2020).

The results showed that the POE learning strategy was very well developed for the concept of Bioconservation. This learning strategy is effective to find the students' ability to predict and their reasons for making these predictions regarding the symptoms of something that aims to reveal students' ability to predict (Chu et al., 2012). In understanding collaborative learning skills, students in terms of behavior Verbal and nonverbal have shown that the intensity of practicing skills in groups of students is quite high. The ability for verbal and nonverbal behavior is to integrate and perform collaborative and cooperative behavior in groups independently.

The social institutions built by the people of Maluku through customary law to protect natural resources hereditarily are the attitude of people who have local knowledge. Local knowledge has benefits for the defense and development of biodiversity so that it should be passed on to the next generation (Reyes-García et al., 2022). Sommers (2022) states that the inheritance of local knowledge is very important because as one of the wealth of knowledge from the ancestors who became key partners in solving problems of hunger, malnutrition, food insecurity.

The results also showed that most students in the POE (experimental) class reached a level of deep understanding of ethnobioconservation, which was seen from the features of the POE (Experiment) class, which provided opportunities for students to develop their thinking processes. Thus, the POE strategy encourages students to think deeply and independently which allows them to build knowledge (Hilario, 2015). POE also helps students develop their understanding of Ethnobiconservation even though their knowledge is still at a low level of understanding, the process with the POE strategy is very helpful for them in gaining broad knowledge.

The overall N-Gain value of experimental cooperative skills was higher than that of the control group. LSD test results also show that POE is more effective in improving student cooperative skills than conventional learning models. POE strategies can also help students develop skills in group and individual learning to solve problems. In addition, POE is more efficient in facilitating independent or collaborative student learning compared to conventional learning methods (Kala et al., 2013).

Collaboration enables students to communicate better and achieve higher levels of cognitive skills (Carter et al., 2019). POE, as a learning strategy, facilitates the development of higher order thinking skills and student problem solving. Thus, POE is different from traditional learning, which only directs students to memorize knowledge because collaboration is useful for building knowledge and solving problems in the group. Therefore, students have the opportunity to express their ideas, broadly and deeply, and negotiate their solutions in their groups. Furthermore, it will equip students with high academic abilities and complement their academic learning.

Conclusion

Research findings indicate that the POE strategy improves student cooperative skills. The N-Gain value indicates that the POE group has better performance than the conventional group. However, the two groups (POE and conventional learning) were still the same in contributing to the ability of cooperative skills in different concepts. Apart from that, the results also showed that the mean POE group score was higher than the conventional group. POE is more effective in improving student cooperative skills compared to conventional learning. This study suggests that students' understanding of the concept of conservation biology should be improved. POE strategies can have an impact on reducing student misconceptions because the POE strategy facilitates investigating scientific phenomena in small groups, then they make predictions about these phenomena based on what they observe. Comparing predictions and explanations made based on observations made by students eliminates cognitive conflicts that occur between predictions and observations by explaining so that the POE strategy provides students with conceptual understanding and deep learning. Therefore, it is suggested that POE is very important and useful for use in biology learning because the POE strategy facilitates changes in student concepts.

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