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Improving Collaboration Skills and Student Learning Outcomes in Cross-Interest Subjects (Biology) through the Problem Based Learning Model

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ABSTRACT

This study aims to improve collaboration skills and learning outcomes of students majoring in Social Sciences (IIS) in Biology cross-interest subjects through the Problem-Based Learning learning model. This type of research is classroom action research (CAR), which consists of 2 cycles, where each cycle consists of planning, action, observation, and reflection stages. The research subjects were 32 class XI IIS 3 students at SMAN 6 Madiun. The instruments used in this study were observation sheets and test sheets. The results obtained were an increase in collaboration with an average score of 74% in cycle 1 and 83% in cycle 2 with a good value category. From these results, it is known that the percentage increase from cycle 1 to cycle 2 is 9%. The results obtained showed an increase in learning outcomes, with the average pretest score in cycle 1 being 48 increasing to 62 in cycle 2 so the percentage increase from cycle 1 to cycle 2 was 29%. While the average post-test score in cycle 1 was 75, it increased to 81 in cycle 2 so that the increase in posttest learning outcomes from cycle 1 to cycle 2 was 8%. The conclusion from this study is that the Problem-Based Learning learning model can improve collaboration skills and learning outcomes of class XI IIS 3 students of SMAN 6 Madiun in cross-biology subjects.

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INTRODUCTION

Cross-interest subjects are one of the government programs that provide opportunities for students to study other subjects outside of their specialization majors. Based on Permendikbud nomor 64 (2014) states that cross-interest subjects are curricular programs that are provided to accommodate the expansion of the choice of interests, talents and or academic abilities of students with an orientation to mastery of groups of scientific

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subjects outside of interest choices. This provides an opportunity for students to study subjects that are of interest but are not found in the subject group of their specialization. The selection of cross-interest subjects is optional and can be chosen according to school policies and directions from Counseling Guidance teachers (Kemdikbud, 2013).

Biology is a choice of cross-interest subjects for high school social sciences (IIS) students who are in great demand. Panjaitan (2014) explained that the indicator of interest among class X IIS students at SMA N 5 Jambi City in taking biology lessons was 77.76% and the indicator of interest was 75.54%, so it was included in the high category. Students' interest in cross-interest subjects (Biology) is quite high, but that does not mean that all students' learning outcomes and collaboration skills have high scores. Meliawati, *et al*. (2016) found 3 out of 9 public high schools in Malang city that implemented cross-interest programs (Biology) faced obstacles such as laziness, lack of enthusiasm and lack of motivation in learning. In addition to this, observations made at SMAN 6 Madiun in class XI IIS 3, obtained data that 75% of students lack literacy in biology material, so that when lessons begin students take a long time to adapt, 18% of students find biology material difficult, 12% felt biology material was less interesting, and the rest for other reasons.

One of the reasons behind this condition is the lack of collaboration skills of students when working in groups, which can lead to low learning outcomes, especially in terms of daily test scores. So to overcome these problems teachers need to innovate using learning models that are able to improve collaboration skills and student learning outcomes. Ibrahim & Nur (2010), in constructing knowledge, students need social interaction with the environment and other students. The social interaction is one aspect of students' collaboration skills. Where when collaboration skills increase, it will also affect the improvement of learning outcomes, because collaboration activities allow students to be actively involved in the learning process, especially in problem solving (Shofiyah, *et al*., 2023).

One learning model that can improve collaboration skills and learning outcomes is the Problem Based Learning (PBL) learning model. Based on research conducted by Ilhamdi, *et al*. (2020) the application of the PBL method can improve the learning outcomes of class X IIS MAN 2 Mataram in cross-interest subjects in Biology with a cognitive score of 86%. Meanwhile, Oktaviani (2022) in his research stated that the implementation of the PBL learning model could improve collaboration skills in aspects of active contribution by 4%, productive work by 16%, flexibility/compromise by 4%, responsibility by 7%, and respect by 4%. Based on the results of the research above, the PBL learning model not only improves learning outcomes, but can also improve collaboration skills. Mainly the skills of students in solving problems through discussion. Therefore the process of learning using the PBL model becomes more meaningful for students because it relates to real problems in everyday life (Wahyuni, *et al*., 2015).

Through the description of the background above, a class action research (PTK) was compiled with the title: "Improving Collaborative Skills and Student Learning Outcomes in Cross-Interest Subjects (Biology) Through the Problem Based Learning Model." The title is arranged based on the problems that exist in the class during the learning process. The PTK is expected to provide an explanation regarding the implementation of the PBL model in improving collaboration skills and learning outcomes in cross-interest subjects (Biology).

METHOD

Types of research

This type of research is class action research (classroam action research). According to Wardani (2007), Classroom Action Research (CAR) is an examination of learning activities in the form of actions that are deliberately raised and occur in the classroom together with the aim of improving the teaching and learning process.

Subject

The subjects of this study were students of class XI IIS 3 SMAN 6 Madiun, totaling 32 students, consisting of 16 male and female students. This research was conducted in two cycles, where each cycle consisted of planning, action, observation, and reflection stages.

Data collection technique

Data collection techniques with observation and tests. Student collaboration data was obtained based on the results of observations during the group discussion and presentation stages in class. The collaboration assessment is shown in Table 1.

Table 1. Aspects of Collaboration Skills

No	Aspects of Collaboration	Indicator
1.	Cooperation	Students are able to work with diverse team members in solving existing problems.
2.	flexibility	Students are able to adapt to each group in solving existing problems.
3.	Responsibility	Students have the initiative in self-regulating in groups in doing joint tasks to solve existing problems.
4.	Compromise	Group members carry out discussions and make joint decisions in solving existing problems.
5.	Communication	All group members are connected (communicated) well in the group in solving existing problems.

(Noor, *et al*., 2021)

Based on Table 1, the research is said to be successful if there is an increase in the percentage of scores in each aspect from cycle 1 to cycle 2. The data on the percentage of collaboration skills uses the following formula:

$$\% = n/N \times 100$$

Information:
n: score obtained
N: sum of all scores
%: percentage of collaboration capability
(Dewi, *et al*., 2020)

With the provisions of the values listed in Table 2 as follows:

Table 2. Collaboration Skills scores & criteria

Score	Criteria
86% ≤ N < 100 %	Very good
2 72% ≤ N < 85 %	Good
3 58% ≤ N < 71 %	Pretty good
4 43% ≤ N < 57 %	Not good

(Oktaviani, 2022)

While the increase in student learning outcomes is measured based on the average value in cycles 1 and 2, using the results of the pretest, posttest, and students' daily tests. The research is said to be successful if there is an

increase in value from cycle 1 to 2. The criteria for learning outcomes can be seen in Table 3.

Table 3. Learning Outcome Score

No.	Score Range	Learning Outcomes Category
1.	80-100	Very good
2.	70-80	Good
3.	60-70	Pretty good
4.	50-60	Not good
5.	0-50	Very Less Good

(Masyhud, 2012)

Before carrying out the research, there are pre-cycle activities to compare the results in cycles 1 and 2 in Figure 1.

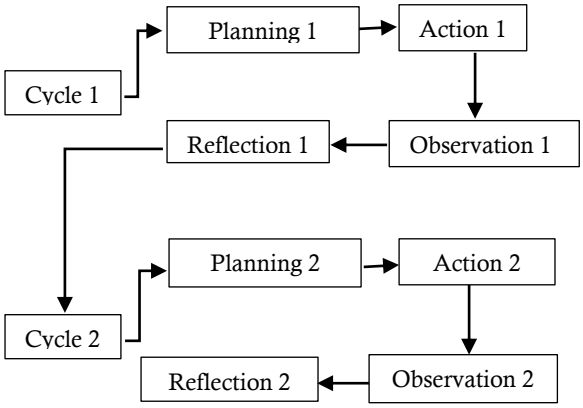

Figure 1. Kurt Lewin Model PTK flow (Asrori & Rusman, 2020)

RESULTS AND DISCUSSION

Classroom action research was carried out for 2 cycles (Asrori & Rusman, 2020). The material used during pre-cycle learning is the human reproductive system in the sub-material of organs and hormones of the human reproductive system. At the pre-cycle meeting, a non-cognitive diagnostic assessment was also carried out to find out the characteristics of students, so that the teacher could develop worksheets for subjects of cross-interest in Biology that matched the characteristics of class XI IPS 3.

Cycle 1 Actions

After the teacher carries out pre-cycle learning, the teacher analyzes the low learning outcomes of students, especially in the pre-test results, then the low ability of students' collaboration in solving problems in LKPD. Based on these problems, the actions taken by the teacher are compiling teaching modules which are assumed to be able to improve collaboration and student learning outcomes using the Problem Based Learning model. The material used in cycle 1 learning is the sub-material of the process of fertilization, pregnancy and childbirth. The LKPD prepared by the teacher contains problem solving in case studies of ectopic pregnancies, and case studies of abortion news.

The developed LKPD is a case study based LKPD. In accordance with research conducted by Nauli, *et al*. (2018) revealed that reading literacy can affect the improvement of completeness and learning outcomes, due to an increase in teacher and student activity during the learning process. Apart from reading literacy can support learning outcomes, this is done based on observations in pre-cycle learning, that 60% of students majoring in Social Sciences have a tendency to be lazy to read abstract material or material that has a lot of Latin terms . Therefore the teacher must provide an introduction such as an apperception video that triggers high student curiosity about the material to be studied.

Cycle 2 Actions

The teacher arranges the actions in cycle 2, namely by reflecting on the LKPD that students worked on in cycle 1. The results of the reflection provide a change in the concept

of LKPD, where previously the LKPD cycle 1 only focused on case studies, so in cycle 2 there is a revision of LKPD, namely the preparation of LKPD consisting of There are 2 types of questions, namely case study questions and concept reinforcement questions. This is done so that students are able to improve learning outcomes with a deep understanding of concepts before conducting analysis on case study questions.

The material in cycle 2 is contraceptives and disorders of the human reproductive system. The teacher presents a matter of strengthening the concept in the form of types of means of conception, a matter of case analysis in disorders of the reproductive system and sexually transmitted diseases. The teacher also presents pictures visually on the questions, this is related to the characteristics of students majoring in Social Sciences who tend to like visual learning.

Improved Collaboration Skills

The first variable is collaboration skills during the group discussion stage, the results of increased collaboration can be seen in Table 4.

Table 4. Collaboration Skills Value Percentage

No.	Indicator	Collaboration Skills Score Percentage					
		Pre Cycle	Category	Cycle 1	Category	Cycle 2	Category
1.	Cooperation	67 %	Pretty good	76 %	Good	84 %	Good
2.	flexibility	70 %	Pretty good	76 %	Good	83 %	Good
3.	Not quite enough Answer	69 %	Pretty good	73 %	Good	86 %	Very good
4.	Compromise	70 %	Pretty good	77 %	Good	83 %	Good
5.	Communication	64 %	Pretty good	70 %	Good	80%	Good
Average per cycle		68 %	Pretty good	74 %	Good	83 %	Good
Percentage Increase			5 %			9 %	

Based on the results in Table 4, there was an increase in collaboration skills from the pre-cycle phase to the first cycle phase by 5%, with the lowest percentage being 70%, and the highest being 76%, in cycle 2 increasing by 9% with the lowest percentage being 80% and the highest by 86%. The aspects of cooperation, flexibility, communication and compromise in cycles 1 and 2 are included in the good category and the responsibility aspect in cycle 2 is included in the very good category. The aspect of responsibility occupies the highest presentation because it relates to the ability of each member to manage the division of tasks, so that LKPD is collected in a timely manner.

Collaboration skills are social traits that are part of people's lives that cannot be avoided by humans in everyday life (Wulandari, 2015). PTK research contains 5 aspects of assessing collaboration skills, the results of the recap of data obtained during pre-cycle learning, cycles 1 and 2 which can be seen in Figure 2.

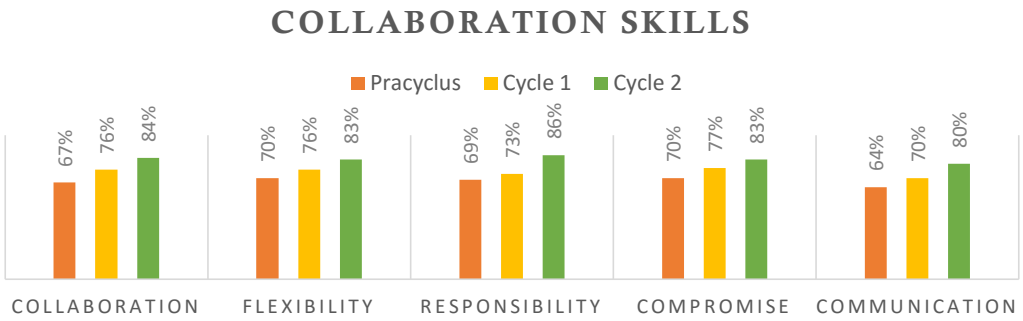

Figure 2. Improved Collaboration Skills

Based on Figure 2, at the pre-cycle stage the teacher does not provide treatment with the Problem Based Learning (PBL) learning model, the LKPD used is more on strengthening material concepts. At the pre-cycle stage, students have a percentage of scores that fall into the pretty good category, which ranges from at least 64% to a maximum of 70%. It is known that the flexibility and compromise aspects have the highest percentage, where the flexibility aspect has an indicator of the ability of students to adapt to each group in solving problems, in line with the observations made by the teacher, that during group formation, no students complained about their friends. one group. In the aspect of compromise, each student makes decisions together without conflict.

The aspect of communication is the aspect that has the lowest percentage, observations made by the teacher get the result that the majority of students after dividing the tasks will be busy with the questions that are distributed, besides this, the existence of mobile media also reduces communication between students, because they have a tendency to open cellphones when discussion starts. Even though the communication factor is a supporting factor in the success of working as a team (Sufajar and Qosyim, 2022). Therefore the teacher has an important role in conditioning the class and providing examples of the flow of communication between groups, because if the communication between group members is good, then collaboration is also possible to do better.

One of the reasons for the increase in collaboration skills in cycles 1 and 2 is the type of LKPD which has 2 types of questions, namely the deepening of concepts that help students understand the basic material and analytical questions through case studies, news videos and articles. The existence of these two types of questions makes students feel difficult and requires a lot of collaboration with group members. This causes each member to want to contribute to find sources, argue or argue together to solve problems. In accordance with Khanafiyah's statement (2012) that problem-based learning (PBL) emphasizes student involvement in the entire learning process such as question and answer, finding learning resources, discussions, and designing solutions.

All aspects of collaboration skills increase in each cycle, this happens because each indicator is related. In accordance with research conducted by According to Khanafiyah (2012) problem-based learning emphasizes student involvement in the entire learning process such as question and answer, finding learning resources, discussions, and designing solutions. In accordance with research conducted by the use of PBL-based teaching materials in the learning process can increase collaboration skills by 78.52% and are in the high criteria.

Improved Learning Outcomes

The second variable is student learning outcomes in the form of cognitive assessment during the pretest, posttest and daily tests in Table 5.

Table 5. Improved Learning Outcomes

No.	Criteria	Assessment of Learning Outcomes						
		Pre Cycle		Cycle 1		Cycle 2		Daily tests
		Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	
1.	Average	41	67	48	75	62	81	79
2.	Category	Very Less Good	Pretty good	Very Less Good	Good	Pretty good	Good	Good
3.	The highest score	80	93	67	82	78	100	92
4.	Lowest value	20	60	33	65	30	30	60

Based on Table 5, it is known that there is an increase in the value between the pretest and posttest during the pre-cycle, cycle 1 and cycle 2. At the pre-cycle meeting, the average pretest results are 41 and the posttest is 67. At the cycle 1 stage, the average pretest increases to 44, posttest 75, then in cycle 2 it increases again to 62 and posttest 79. The category of assessment for each aspect has increased, where the pretest scores in the pre-cycle and cycle 1 stages are in the very unfavorable category, then in the 2nd cycle it increases to moderate Good. This happened because in the pre-cycle activities, students did not know about pre-test activities, so that more than 70% of the 32 students had not carried out previous literacy. Meanwhile, in cycles 1 and 2, students have started to adapt, so learning outcomes have increased. At the end of the cycle there are daily repetition activities, which have an average score of 79, with the highest score of 92 and the lowest score of 60, so it is included in the good category.

Based on the pretest and posttest results in Table 5, then the percentage increase in value in each cycle is arranged in Table 6.

Tabel 6. Percentage of increased cognitive value

Average cognitive score			
	Pre cycle	**Cycle 1**	**Cycle 2**
Pretest	41	48	62
Percentage Increase		17%	29%
Postest	67	75	81
Percentage Increase		12%	8%

In the pre-test value of cycle 1 there was an increase of 17%, because at that stage the students had started to make adjustments, the teacher had also implemented literacy reading material before carrying out learning. So that learning outcomes increase again to be quite good in cycle 2 pretest with an increase percentage of 29%. The percentage increase in the posttest also increased, in cycle 1 it increased by 12% and in cycle 2 it increased again by 8%.

The difference in increasing the posttest score can be caused by internal factors and external factors from students which can affect learning outcomes during the cycle. For example, the biggest internal factor in class XI IIS is a factor from oneself, namely 75% of students feel less literate. In addition, external factors such as the school environment which

are quite influential in class XI IPS 3 are the complex factors of the sub-material, so that students find it difficult to understand certain material so that it can affect learning outcomes. As in cycle 2 before entering the theory of pregnancy, the theory of the menstrual cycle and hormones was conveyed first, so that it was observed that the material was considered difficult material and required high concentration. Zikra (2016) states that the material difficulty factor has a fairly large percentage, namely 43%, so it is quite influential if students don't concentrate enough during learning.

Based on the previous explanation, it is known that the increase in collaboration skills is directly proportional to the increase in learning outcomes. Fauzi (2018), improving the skills of collaboration (collaborating) in group work is also accompanied by an increase in student learning outcomes. This can happen because when students go through the discussion process, they will learn to clarify and evaluate the ideas and opinions of their group mates so that they can strengthen critical thinking and be effective in gaining knowledge holistically.

CONCLUSION

Based on the results and discussion, it can be concluded that the Problem Based Learning learning model can improve collaboration skills and learning outcomes of class XI IIS 3 students of SMAN 6 Madiun in cross-biology subjects. The percentage increase in collaboration skills from pre-cycle to cycle 1 was 17% and from cycle 1 to cycle 2 was 29%. While the percentage increase in learning outcomes from pre-cycle to cycle 1 is 12% and from cycle 1 to cycle 2 is 8%.

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