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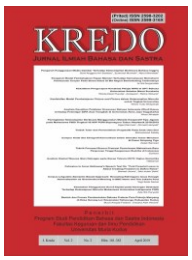

The Effect of Collaboration Inquiry Problem Based Learning Model on 4C Skills

(Pengaruh Kolaborasi Model Pembelajaran Inkuiri Berbasis Masalah pada Keterampilan 4C)

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Abstract

In the era of the Industrial Revolution, a must-have ability includes critical thinking (problem-solving), creativity (innovative skills), collaboration, and communication skills (4C) to be able to compete globally. This study aims to analyze the effectiveness of the Collaborative Inquiry PBL learning model on the 4C skills of students. The research was conducted in the Elementary School Teacher Education Study Program, Faculty of Teacher Training and Education, Muria Kudus University with a population of all first-semester students with a total of 7 classes taking Indonesian Language courses. Samples were taken by purposive sampling method consisting of 4 classes with a total of 126 students. This quantitative research method uses a one-group pretest-posttest design. The result is that the implementation of lecturer activity-based learning activities obtains a score of 0.915 in the very good category. Furthermore, critical thinking and problem-solving have an average N-Gain score of 0.587 in the medium category, creativity, and innovative skills with an average score of 0.809, collaboration skills a score of 0.816, and communication skills a very good score of 0.825. The research concludes that the PBL Collaborative Inquiry learning model is effective on students' 4C skills.

Keywords :
collaboration, effect, inquiry, problem based learning

Abstrak

Keterampilan yang harus dimiliki pada era revolusi industri diantaranya berpikir kritis dan pemecahan masalah, keterampilan kreativitas dan inovatif, keterampilan kolaborasi dan komunikasi (4C) untuk dapat bersaing secara global. Penelitian ini bertujuan untuk menganalisis efektivitas model pembelajaran PBL kolaborasi Inkuiri terhadap keterampilan 4C pada mahasiswa. Penelitian dilakukan di Prodi Pendidikan Guru Sekolah Dasar Fakultas Keguruan dan Ilmu Pendidikan Universitas Muria Kudus dengan populasi seluruh mahasiswa semester satu dengan jumlah 7 kelas yang mengambil mata kuliah Pakem Bahasa Indonesia. Pengambilan sampel menggunakan metode purposive sampling yang terdiri dari 4 kelas dengan jumlah mahasiswa 126. Penelitian ini menggunakan metode penelitian kuantitatif dengan desain one group pretest-posttest design. Hasil penelitian menunjukkan pelaksanaan kegiatan pembelajaran berdasarkan aktivitas dosen memperoleh skor sebesar 0,915 dengan kategori sangat baik. Selanjutnya keterampilan berpikir kritis dan pemecahan masalah mendapatkan skor rata-rata N-Gain 0,587 dengan kategori sedang, keterampilan kreativitas dan inovatif mendapatkan skor rata-rata 0,809, keterampilan kolaborasi skor 0,816 dan keterampilan komunikasi skor 0,825 dengan semua kategori sangat baik. Simpulan penelitian bahwa model pembelajaran PBL kolaborasi Inkuiri efektif terhadap keterampilan 4C mahasiswa.

Kata Kunci :
inkuiri, kolaborasi, pengaruh, problem based learning

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INTRODUCTION

Current challenges and issues in the 21st century require a person to have several skills that must be possessed so students need to be prepared to master these skills. The goal is for students to be able to compete in global competition. Partnership 21 (DiBenedetto, 2018) states the skills that must be possessed include critical thinking skills and problem-solving, creativity and innovation, collaboration, and communication (4C). By mastering the 4C skills, students are expected to be able to think critically to solve the problems they face. happening around students through creativity and innovation. By collaborating, work becomes more effective and efficient, and with effective communication, there are no misunderstandings with others.

The five main domains of 21st-century skills include digital literacy, critical thinking and innovation, communication and collaboration skills, high productivity, and spiritual and moral values (DiBenedetto & Myers, 2016; Egan et.al., 2017). Brown (2015) classifies 21st-century skills or attitudes as ways of thinking (knowledge, critical and creative thinking), ways of learning (literacy and soft skills), and ways of learning with others (personal, social, and citizenship, as well as responsibility). The US-based Partnership for 21st Century Skills (P21), identifies critical thinking skills (Critical Thinking Skills), Creative Thinking Skills (Creative Thinking Skills), Communication skills (Communication skills), and Collaboration skills (Collaboration skills) as skills needed in the 21st century. This competency is known as the 4C competency. Creative thinking skills (Creative Thinking Skills) are skills related to skills using a new approach to solving a problem, innovation, and discovery. This skill is an action that is completely new and original, both personally (original only for individuals) and culturally (Facione, 2018). The willingness of students to think about problems or challenges, share those thoughts with others, and listen to feedback, are some examples of creative thinking that students can show in their learning. Communication skills are skills to express new thoughts, ideas, knowledge, or information, both in writing and orally (NEA, 2010). These skills include listening, writing, and public speaking skills (Darmuki et.al., 2018; Darmuki et al., 2017; Argaw et al., 2017). Collaboration skills are skills for working together effectively and efficiently showing respect for diverse teams, practicing fluency, and willingness to make the necessary decisions to achieve common goals (Greenstein, 2012; NEA, 2012). Skills to work in groups; as well as leadership, decision-making, and cooperation (Darmuki & Hidayati, 2019).

Research related to the learning model of constructive, critical, creativity, and collaborative (4C) have been conducted. Saputra et al. (2019) have conducted a study about the integration of the scientific method and collaborative-critical thinking in the debate class which reveals that it can improve students' debate skills. A study by Persky (2019) develops collaborative critical thinking to improve students' social skills based on cooperative learning. Arifin (2017) conducted research the assessment of creative test and critical thinking in the classroom learning. Moreover, Liu et al. (2018) conduct a study on the implementation of creative and critical thinking in Singapore schools that shows there is a good mastery in its

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implementation. A study conducted by Kleinig (2018) is related to the ciritical thinking as one of attributes to be success in 21st century. Furthermore, Hohmann & Grillo (2014) conduct research on the important of collaboration learning and critical thinking skill which provide better results rather than Group Investigation and Jigsaw. Most studies are commonly not maximum and specific on the course of basic education which is focussed on 4C learning model.

Research on the Constructive Critical Creativity Collaborative learning model, hereinafter referred to as 4C, has been widely carried out, such as research Hariyadi et al., (2023) regarding the integration of scientific and collaborative methods of critical thinking in the debate class, the result is that this method is successful in improving students' debating skills. Research by Kleinig (2018) develops learning with a focus on collaborative critical thinking skills to improve students' social skills with cooperative learning. Akhan's research (2022) developed a creative test assessment and critical thinking learning in the classroom. Research Álvarez-Huerta et.al. (2022) regarding the application of creative learning and critical thinking in Singapore schools showed good results. According to Zivkovil's (2016) research, the development of critical thinking learning models is urgently needed as an attribute for achieving success in the 21st century. Research by Zubaidah et.al. (2018) the importance of collaborative learning and critical thinking skills for maximum results compared to Group Investigation (GI) and Jigsaw learning. In general, existing research is not optimal and specific in philosophy of science courses, so the results are still not focused on the 4C learning model.

Effects on Critical Thinking Abilities In this learning model, students are encouraged to think critically in solving problems. They need to collect data, analyze information, and evaluate possible solutions. Through this process, students develop strong critical thinking skills, such as the ability to analyze, evaluate, and make decisions based on existing evidence.

Learning Model, The Problem-Based Learning Model with Inquiry and Collaboration Approach is an approach that involves students in solving real problems through a process of inquiry and collaboration with fellow students (Forslund et al., 2018). Students are given problems that are relevant to everyday life and are encouraged to find solutions through research, discussion, and teamwork.

Effective learning aims to develop students' abilities in critical thinking, communicating, collaborating, and creating (4C skills). The problem-based learning model with an inquiry and collaboration approach has proven effective in developing these abilities. This paper will explore the effects of using this learning model on students' 4C abilities.

THEORITICAL REVIEW

Darmuki et al. (2023) and Santyasa (2020) argue that the Problem Based Learning model is a model that involves students in solving problems, with early learning presenting real problems for students then resolved through investigation and applied using a problem solving approach. Furthermore, Arends

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(2018) mentions the syntax of the Problem Based Learning model, namely: (1) providing problem orientation to students, (2) organizing students to research, (3) assisting in investigating independently or in groups, (4) developing and then present the results of student work, (5) analyze and evaluate the process of overcoming existing problems.

The PBL collaborated with discovery learning is problem-based learning by finding its solutions based on the curriculum needed in the future. This learning improves students' critical, constructive, collaborative, creative, and systematic thinking skills. According to Darmuki et al. (2023), teaching using problem-based learning (PBL) is a kind of learning, authentic discovery, collaboration, and producing works. So, the learning not only utilizes authentic problems which are authentic and can develop critical thinking, it also builds new knowledge. In line with Choden & Kijkuakul (2020) who says that problem-based learning is a teaching approach which utilizes real world problems as students' context to learn about critical thinking ways and ability to solve problems. It is also used to obtain knowledge and concept of the material being learned.

Ju & Choi (2018) says that the five stages of problem-based learning are: 1) students' orientation to the problems, 2) organizing students to learn, 3) guiding investigation, 4) developing and presenting attainments, 5) analysing and evaluating the process of problem solving. The use of problem-based learning is proven to explore students' potential in implementing their critical thinking skill to solve problems given by lecturers. Moreover, Sugiarti & Husain (2021) argues that discovery learning can be stated as a learning theory which is defined as a learning process that is not presented in its final form, but the students are supposed to be able to organize themselves.

The syntax of the Problem Based Learning (PBL) model directs students to think, analyze, research, and prepare research reports. The investigation phase, which is carried out independently or in groups, is the core of the PBL model. Activities undertaken by students in this phase include the process of collecting data, making hypotheses, and providing solutions so that problem-solving skills can be developed and trained. Implementation of research-based learning can improve student metacognition skills in problem-solving (Ashari et al, 2016; Dafik et al, 2019). Lecturers can act as facilitators and motivators for students in gathering information from various sources at the investigation stage.

This learning model requires students to learn each others through discussion and dialogue activities. It can potentially develop critical and creative thinking in solving problems. It also improves students' skills. These activities in PBL is potentially to minimize the gap between students who have high and low academic skills (Choden, T., & Kijkuakul, 2020). This leaning model also requires lecturer to utilize class as a learning community. The students, in the classroom, are not only active in studying facts. But they are also active to train their solving problems skill such as describing solutions, predicting alternative ways, and controlling objects and natural events. The ideal learning community supports students to learn using various learning sources such as textbooks, their surroundings (lectures), results of

communication with their peers or lecturers (Baran et al., 2018). Multidirectional interaction in this learning model has to be provided by the lecturers. The next model that is in accordance with the 2013 curriculum is the problem-solving model. According to Ngalimun (2017) states that the Problem-solving model is a student's skill in using thinking processes in solving problems through collecting facts or searching for data, analyzing information, compiling various alternative solutions or problem-solving method of finding effective patterns, rules or algorithms. Furthermore, Sahyar et al, (2017), states that the syntax of the -solving learning model is: (a) Identifying problems, (b) Representing or presenting a problem, (c) Planning for problem solving, (d) Implementing or implementing planning, (e) Judging from the planning, (f) Judging from the results.

According to Siburian et al. (2019) and Boud & Bearman (2022) said that critical thinking skills activities consist of activities of formulating problems, planning strategies or tactics and formulating conclusions. According to Triana et al. (2020) stated that critical thinking skills include the ability to understand problems, select important information to solve problems, understand assumptions, formulate and select relevant hypotheses, and draw valid conclusions by determining the validity of these conclusions. Prime et al. (2020) find analogies and types of relationships between pieces of information, determine the relevance and validity of information that can be used for problem formation and solving, and find and evaluate solutions or other ways of solving problems. Even though all the opinions of several experts differ, they are essentially the same in terms of classifying, assessing, and using information effectively. Students really need critical thinking skills so they don't make wrong decisions in their lives.

Critical thinking skills through tests can be assessed by indicators according to Persky et al. (2019), namely assumptions, making inferences, deductions, interpretations, and evaluating arguments. This opinion is reinforced by Liu et al. (2018) which states that the construct of thinking skills is as follows: 1) Formulating problems that can be measured by students' ability to formulate questions that lead to investigations. 2) Arguing can be measured by the ability of students to formulate arguments according to needs and can show differences and similarities between various aspects of the simulated task. 3) Doing deduction can be measured by the ability of students to deduce logically and interpret data correctly. 4) Doing induction can be measured by students' ability to analyze data, generalize, and draw conclusions correctly. 5) Evaluating can be measured by the ability of students to be able to evaluate based on mere facts by providing a variety of alternative problems. 6) Deciding and acting can be measured by the student's ability to determine a way out and choose alternative possibilities to be chosen.

The term creativity is defined as the application of new ideas to achieve effective teaching (Khodabakhshzadeh, et. al., 2018; Akhan et al., 2022). Creative thinking has a deep relationship with problem solving competence. People who think creatively are not only able to solve problems; he can also find a solution to a problem. Creative thinking competence is an important part of solving problems. In line with Lee (2018), positive thinking in solving problems can increase success in it.

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Creative thinking can increase a positive attitude, so that someone never gives up. Therefore, creative thinking is very important in problem solving.

Communication competence is a person's knowledge of verbal and nonverbal communication by using the media to ask questions, interact, and collaborate with others (Eggen, 2018). According to Stoner (2018), communication is an effort to provide understanding to get feedback or responses from others. Based on these opinions, it can be concluded that communication is the delivery of information, ideas, emotions, and skills in writing or orally.

Collaborative competence is the ability to participate in an activity to build relationships with other people and respect them to achieve the same goals (Le, Janssen, & Wubbels, 2017; Sari, Prasetyo, & Setiyo, 2017). Collaboration competency indicators are actively contributing; work productively; demonstrate flexibility, compromise, responsibility, and respect (Issufiah et at., 2018).

RESEARCH METHODS

This research was conducted at the Department of Indonesian Language and Literature Education at Muria Kudus University for students taking basic education study programs. The population is all semester 1 students with a total of 7 classes. The sample consists of 4 classes with a total of 126 students. Sampling using stratified random sampling. The population is all first semester students who take basic education courses in the Elementary School Teacher Education Department at Muria Kudus University from class A to class G (7 classes). The samples are first semester students of the Department of Indonesian Language and Literature Education aged 16-25 years, three lecturers who work part time for 4-12 years. Observation was carried out as a method to ensure that the learning method was carried out by three lecturers. The experimental class consisted of group IA (class A & class C) and group IIA (class B & class D). The control class consisted of group IB (class B & class D) and group IIB (class F & class H) in the Elementary School Teacher Education Department with 40-41 students per class. Students in IA and IIA belong to the experimental class with a total of 82 students. Students in class IB and IIB are included in the control class which totals 81 students. The sampling technique was stratified random sampling based on class quality in the Elementary School Teacher Education Department (high, adequate, and low levels). Determination of groups of three different levels in each class is based on pre-test data before this research was conducted.

In developing the questionnaire, the researcher used relevant literature to see PBL in collaboration with PjBL. Based on the literature review, there are several criteria used to test the effectiveness of the learning model. To get validity and unambiguous questionnaire, the questionnaire was checked by linguists and educational psychologists. The questionnaire consists of 7 questions.

Information related to lecturers' perceptions of the effectiveness of PBL in collaboration with PjBL in basic education courses was collected using interviews. In addition, it is used to obtain input on PBL in collaboration with PjBL after it is implemented. The interview guide is in the form of open-ended questions regarding evaluation, effectiveness, learning

objectives, and suggestions related to PBL in collaboration with PjBL.

The test was used by researchers to determine the effectiveness of PBL in collaboration with PjBL in basic education courses and to find out the differences before and after it was implemented. The number of instruments in a test is 15 questions that have been verified and declared valid.

This study used a mixed method with evaluative descriptive design and experimental research to evaluate learning models in basic education courses. The researchers used a cohort study design implemented by Fraenkel et al. (2012) namely 2 trial groups. From these groups, one group acts as the control class, and the other group acts as the experimental class. Both were given a pre-test. The control group was given treatment with a learning model that mostly used the lecture method in the class. The experimental class was given treatment using PBL in collaboration with the developed PjBL. Treatment in the control class was given in two meetings. At the end of the treatment, the two groups were compared to measure the level of difference. In addition, interviews and questionnaires were used to find out the responses or suggestions from lecturers and students to the learning model applied.

This experiment was carried out from August 2021 to January 2022. It involved 2 class A & class C lecturers (group IA) and 2 class B and class D lecturers (group IIA). The control group also involved 2 lecturers from class B & class D (group IB) and 2 lecturers from class F & class H (group IIB). Lecturers conducted learning experiments in basic education courses by implementing PBL in collaboration with PjBL based on the Student Learning Process Guidebook of the Department of Indonesian Language and Literature Education, Muria Kudus University. Before conducting the experiment, the experimental group and the control group were given the same pre-test and post-test. After doing so, they were given the same post-test. The results of the pretest and posttest were calculated for normality and homogeneity.

The data analysis technique uses the embedded type of triangulation mix-method design (quantitative and qualitative research methods), namely analyzing quantitative and qualitative data simultaneously (Sugiyono, 2011). Furthermore, the results of the analysis are used to understand the research problem. In this case, quantitative data provides a way to generalize qualitative data that provides information about context and place.

Quantitative test was carried out using the t-test. The researcher implemented the SPSS version 16 program to achieve accurate data calculations. Qualitative descriptive analysis was carried out on validation sheets and observation sheets on the application of PBL in collaboration with PjBL to improve student learning outcomes in basic education subjects. Furthermore, a qualitative analysis was carried out to describe student learning outcomes when PBL collaborated with PjBL was implemented in the teaching and learning process. Triangulation analysis was carried out by analyzing both data (qualitative and quantitative) and comparing the results. The next step is to interpret whether the two data support each other or not.

Data collection in this data begins with an analysis of the needs of lecturers and students by looking at curriculum

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documents, lecturer learning tools, and analysis of student achievement data in basic education courses.

RESULTS AND DISCUSSION

The PBL collaborated with Inquiry during basic education has been developed based on the needs of students and lecturers in Indonesian Language and Literature Education Department. This learning model is designed by integrate the syntax of PBL and Inquiry. This designing step aims to obtain double benefit from both learning model. Problem based learning requires a lot of collaboration and trains students to be able to solve problems, join discussion and presentation. Inquiry requires students to work scientifically and trains them to have scientific skill such as observing, doing experiments, and any other project-based activities. Each model has its own characteristics and advantages. When it is collaborated, students achieve more maximum advantages.

The syntax of problem-based learning consists of five stages, namely students' orientation to the problems, organizing students to learn, guiding experiment in groups or individually, developing and presenting work, analysing, and evaluating the problem-solving process. The syntax of project-based learning consists of six stages, namely asking questions of problem solving, designing product, making schedule, monitoring students' activeness and their project developments, testing result, evaluating learning experiences. This study is collaboration activities of both learning models. This collaboration produces new syntax of PBL collaborated with Inquiry.

The draft of PBL collaborated with Inqury has been developed. Furthermore, it is validated by the learning model expert and education expert to get their suggestions. Those suggestions are utilized to revise the draft of PBL collaborated with Inqury. Moreover, Forum Group Discussion is carried out to investigate the strength and weaknesses of it and obtain suggestions from lecturers and stakeholders. Their suggestions are used to accomplish the PBL collaborated with PjBL before being implemented. It is carried out to know its effectiveness.

To investigate its effectiveness, the experiment is carried out. It is conducted in 8 classes namely class A – class H. The experimental group I consists of group IA (class A & class C) and group IIA (class B & class D). The control group consists of group IB (class B & class D) and group IIB (class F & class H).

This experiment was carried out in August 2021 to January 2022. It involves 2 lecturers in class A & class C (group IA) and 2 lecturers in class E and class G (group IIA). The control group also involves 2 lecturers in class B & class D (group IB) and 2 lecturers in class F & class H (group IIB). The lecturers do learn experiment during basic education by implementing PBL collaborated with Inquiry based on the guidebook of Learning process for students in Elementary School Teacher Education Department of Muria Kudus University.

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Before conducting experiment, the experimental group and control group are given the same test in pre-test and. After doing it, they are given the same post-test. The results of pre-test and post-test are calculated its normality and homogeneity.

The normality test consists of eight group samples. Each group consists of 45 students. The samples in IA consist of four groups. The samples in IIA consist of four groups. In the calculation process, the value of *Asymp* Sign is higher than the value of α = 0,05. Therefore, it can be concluded that the samples come from the normally distributed population.

Based on the result of homogeneity test in table 4, it is clear that the value of sig is higher than 0,05. Therefore, it can be concluded that the variance of population is homogeneous. Furthermore, the description results of pre-test and post-test.

Based on the results of questionnaire related to lecturer's perception show that PBL collaborated with PjBL is important to be implemented during basic education. The results of pre-test show lower score in which the experimental group is 55% and the control group is 75%. The results of post-test in both groups are 100%.

The results of study show that in the teaching and learning process the score of lecture's activity is 0,915 with excellent category. Students' critical thinking and problem solving achieve average score of N-Gain is 0,587 with adequate category. Students' creativity and innovation get score of 0,809. Students' collaboration competence gets score of 0,816. Their communication competence gets score of 0,825. The average results of 4C (four competencies) can be viewed in Table 1.

No	Class	Critical Thinking	Creativity	Collaboration	Communication
1	IA	0.590	0.812	0.819	0.828
2	II A	0.587	0.809	0.816	0.825
3	IB	0.586	0.808	0.815	0.824
4	II B	0.585	0.807	0.814	0.823
Mean		0.587	0.809	0.816	0.825

Table 1 Average Results of 4C in Class IA, Class IIA, Class IB, and Class IIB

The data on the results of the basic education ability test which were analyzed by the t test had previously been tested for normality and homogeneity. Statistically, both Indonesia Standard s ability scores are different because Fcalculation was 16.5875 while Ftable was 3.91 at the significance level = 0.05. Since Fcalculation > Ftable, it can be concluded that PBL collaboration with PjBL learning gave significant influence in improving the foundation of education for students at the Elementary School Teacher Education Department.

Based on the results of this study, lecturers need to adjust student learning needs with learning strategies. Multiple models of instruction are the practice of applying several different learning models in the teaching process. The selection of a learning model to be used by a lecturer is determined by the characteristics of the

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learning material and the learning objectives to be conveyed, the ability to meet student learning needs, and the ability to increase student learning capacity to optimal limits (Arifmiboy, 2018). In line with Arend's view (2018) states that it is not possible for there to be one teaching model that is considered superior for all educational purposes. In reality, each teaching model is often only suitable for certain types of learning, although these models can also be combined to help students achieve learning goals (Suryanti et. al., 2020). No single approach is consistently better than any other.

The implementation of the PBL learning model is PBL learning, so that several previous studies related to PBL learning outcomes can be used as a reference. The results of previous research show that learning outcomes with PBL are more effective than traditional ones in increasing academic achievement (Sahin, 2010; Evcim & Ipek, 2013; Wilson et.al., 2017; Hoerunnisa et.al., 2017; Subiyantari et.al., 2019). A study on the effectiveness of learning outcomes also concluded that cooperative learning has the most positive impact on achievement variables (Darmuki, et al., 2017).

The results of the study using the PBL model were also supported by the results of PBL learning research which showed that there were significant differences between the experimental group and the control group regarding average academic achievement, learning retention scores, and student perceptions of skills in carrying out investigations, both at cognitive and affective levels (Dedonno, 2016; Indiastutik, 2016; Martaida et.al., 2017; Putri et.al., 2020; Gunawan et.al., 2020; Wardono et.al., 2020; Suryanti et.al. , 2020). This result was also confirmed by another research study, namely the discovery learning method is better than traditional teaching methods from the point of view of academic achievement (Nuryakin & Riandi, 2017). The results of other studies show that students achieve better in understanding the content (content) of learning through PjBL compared to the lecture method (Rahmadani et.al., 2017; Rambe et.al. 2018).

This PBL learning model has the potential to increase student social interaction in learning the foundation of education. Social interaction is important considering the different characteristics of students in class (Darmuki & Hariyadi, 2019). The practice of using the PBL model is to carry out scientific work in cooperative groups, so that this model is able to bring the gap between upper and lower academic students closer, strains caused by differences in student backgrounds, and is able to reduce the negative impact of competitive learning which creates unhealthy competition (Sahin, 2010; Gunawan, et.al., 2020). Interaction of students in PBL groups related to activities to find concepts or facts through stages of scientific work, whereas in the PBL group social interaction was encouraged in intense presentations and discussions to build a complete conceptual understanding

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of the foundation of education.

A review of the study literature on classroom learning reveals that the application of the learning model using the Inquiry collaboration PBL method is more effective (Leyva & Riu, 2016; Yemi et. al., 2018; Subiyantari et. al., 2019 (Jigsaw); Rambe et. al., 2018; Wardono et.al., 2020; Winarni et.al., 2020; Gunawan & Lestari, 2020 (Discovery Learning)). The results of Leung et.al's research. (2018) have collaborated the discovery learning model with the Geogebra model assistant showing that learning activities are effective and fun. Suryanti et.al's research. (2020) shows that the discovery learning learning model that is collaborated with the problem polsing learning model shows an increase in students' abilities and understanding in mastering material concepts properly and optimally. The previous scientific study conducted by Darmuki & Hariyadi (2019) in class learning using the PBL learning model can maximize student learning outcomes. Learning strategies which include learning models applied by lecturers in teaching and learning activities will affect the success of learning objectives. The ability of lecturers to apply learning models will make it easier for students to receive learning (Darmuki, et al., 2018).

The problem-solving abilities of students learned using problem-based learning are better than conventional learning which consists of lectures, discussions, and assignments of inquiry through literature (Sahyar, et al, 2017).

The findings of this research weakness when the learning process in the classroom lies in the commitment of the lecturer when implementing the PBL learning model where the combination of the Jigsaw learning model is more dominant than the PBL learning model. Apart from that, other weaknesses when the learning process takes place students lack a competitive atmosphere so that there are some students who dominate learning in class even though in the end all students are active in learning. The strength of this research lies in the social interaction in learning and the needs of students in learning so that it can build a complete understanding of students' concepts regarding the foundation of education. The application of the PBL learning model in this study is proven by the PBL learning model applied by lecturers in learning the Indonesia Standard, it turns out that students find it easier to understand the Indonesia Standard so that student competence regarding the Indonesia Standard is even better.

CONCLUSION

Based on the results of the study, the lecturers have to adjust students' learning needs with the learning strategy. Multiple models of instruction are a practice in implementing several different learning models in a learning process. There is no approach which is consistently better than others. The implementation of PBL collaborated with inquiry is a combination of problem-based learning and project-based learning. The results of study in

implementing PBL collaborated with inquiry are also supported by the research related to inquiry which reveals the significant difference between experimental group and control group related to the average score of academic achievement, learning retention value, and students' perception about skill in. PBL collaborated with inquiry can potentially improve students' social interaction in basic education courses. Students' interactions in problem-based learning are related to project-based learning activity to find concepts or facts using scientific stages. In problem-based learning, social interaction is maximized in presentation and discussion activities to build concepts of basic education courses. The weakness of this study is the lecturer's commitment to.

REFERENCES

Affandi, Y., Darmuki, A., & Hariyadi, A. (2022). The Evaluation of JIDI (Jigsaw Discovery) Learning Model in the Course of Qur'an Tafsir. *International Journal of Instruction, 15(1), 799-820*. https://doi.org/10.29333/iji.2022.15146a

Afriana, J., Permanasari, A., & Fitriani, A. (2016). Project Based Learning Integrated to STEM to Enhance Elementary School's Students Scientific Literacy. *Jurnal Pendidikan IPA Indonesia*, *5(2), 261-267*. https://doi.org/10.15294/jpii.v5i2.5493

Arends. (2018). *Learning to Teach-Belajar untuk Mengajar*. Yogyakarta: Pustaka Belajar.

Argaw, Aweke Shishigu., Haile, Beyene Bashu., Ayalew, Beyene Tesfaw., & Kuma, Shiferaw Gadisa. (2017). The Effect of Problem Based Learning (PBL) Instruction on Students' Motivation and Problem-Solving Skills of Physics. *Eurasia: Journal of Mathematics Science and Technology Education*, *13(3), 857-871.* https://doi.org/10.12973/eurasia.2017.00647a

Arifin, Z. (2017). Mengembangkan Instrumen Pengukur Critical Thinking Skills Siswa pada Pembelajaran Matematika Abad 21. *Jurnal the Original Research of Mathematics*, *1(2), 92-100.* http://dx.doi.org/10.31949/th.v1i2.383

Afifah, E. P., Wahyudi, W., & Setiawan, Y. (2019). Efektivitas Problem Based Learning dan Problem Solving terhadap Kemampuan Berpikir Kritis Siswa Kelas V dalam Pembelajaran Matematika. *Must*: *Journal of Mathematics Education, Science and Technology*, *4(1), 95-107.* https://doi.org/10.30651/must.v4i1.2822

Astuti, W. P. (2018). Efektivitas Model Pembelajaran Problem Based Learning dan Problem Solving terhadap Kemampuan Berpikir Kreatif Matematika Siswa Kelas 4. *Jurnal*

Imiah Pendidikan dan Pembelajaran, *2(2),159-166*. https://doi.org/10.23887/jipp.v2i2.15349

Azizah, L. I. R., Sugiyanti, S., & Happy, N. (2019). Efektivitas Model Pembelajaran Problem-Based Learning (PBL) dan Guided Inquiry terhadap Kemampuan Berpikir Kritis Matematis Siswa. *Imajiner: Jurnal Matematika dan Pendidikan Matematika*, *1(4), 30-36.* https://doi.org/10.26877/imajiner.v1i4.3853

Akhan, N. E., Cicek, S., & Kocaaga, G. (2022). Critical and Creative Perspectives of Gifted Students on Global Problems: *Global climate change. Thinking Skill and Creativity*, *4(101131)*. https://doi.org/10.1016/j.tsc.2022.101131

Álvarez-Huerta, P., Muela, A., & Larrea, I. (2022). Disposition Toward Critical Thinking and Creative Confidence Beliefs in Higher Education Students. *The Mediating Role of Openness to Diversity and Challenge. Thinking Skills and Creativity*, *43, (101003)*. https://doi.org/10.1016/j.tsc.2022.101003

Alrahlah, A. (2016). How Effective the Problem Based Learning (PBL) in Dental Education. A Critical Review. *The Saudi Dental Journal*, *28, 155-161.* https://doi.org/10.1016/j.sdentj.2016.08.003

Asyari, M., Al Muhdhar, M. H. I., Susilo, H., & Ibrohim. (2016). Improving Critical Thinking Skills Through the Integration of Problem Based Learning and Group Investigation. *International Journal for Lesson and Learning Studies*, *5(1), 36-44*. https://doi.org/10.1108/IJLLS-10-2014-0042

Balim, A. G., Turkoguz, S., Ormanci, U., Kacar, S., Evrekli, E., & Ozcan, E. (2014). Teachers' Views about Problem Based Learning Through Concept Cartoons. *Journal of Baltic Science Education*, *13(4), 458-468.*

Baran, M., Maskan, A., & Yaşar, S. (2018). Learning Physics Through Project-Based Learning Game Techniques. *International Journal of Instruction*, *11(2), 221-234*.

Bell, S. (2010). Project-Based Learning for the 21st Century, Skills for the Future. *Journal of Educational Strategies, Issues and Ideas*, *83 (2), 39-43*. https://doi.org/10.1080/00098650903505415

Boud, D., & Bearman, M. (2022). The Assessment Challenge of Social and Collaborative Learning in Higher Education. *Educational Philosophy and Theory*, *1-10.* https://doi.org/10.1080/00131857.2022.2114346

Choden, T., & Kijkuakul, S. (2020). Blending Problem Based Learning with Scientific Argumentation to Enhance Students' Understanding of Basic Genetics. *International Journal of Instruction*, *13(1), 445-462.*

Darmuki, A. & Ahmad Hariyadi. (2019). Eksperimentasi Model Pembelajaran Jucama Ditinjau dari Gaya Belajar terhadap Prestasi Belajar Mahasiswa Mata Kuliah Berbicara di Prodi PBSI IKIP PGRI Bojonegoro. *Kredo: Jurnal Ilmiah Bahasa dan Sastra, 3(1), 62-72.* https://doi.org/10.24176/kredo.v3i1.4021

Darmuki, A. & Hidayati N.A. (2019). An Investigation of the Cooperative Learning Using Audio Visual Media in Speaking Skill Subject. *Icsti*, *121-126*.

Darmuki, A. & Hidayati, N.A. (2019). Peningkatan Kemampuan Berbicara Menggunakan Model Kooperatif Tipe NHT pada Mahahasiswa Tingkat I-A Prodi PBSI IKIP PGRI Bojonegoro Tahun Akademik 2018/2019. *Jurnal Pendidikan Edutama, 6(2), 9-18*.

Darmuki, A., Ahmad Hariyadi, Nur Alfin Hidayati. (2019). Developing Beach Ball Group Investigations Cooperative Learning Model to Improve Social Skill in Speaking Course. *Eudl*, *120-128*. http://dx.doi.org/10.4108/eai.27-4-2019.2286784

Darmuki, A., Ahmad Hariyadi. (2019). Peningkatan Keterampilan Berbicara Menggunakan Model Kooperatif Tipe Jigsaw pada Mahasiswa PBSI Tingkat IB IKIP PGRI Bojonegoro Tahun Akademik 2018/2019. *Kredo: Jurnal Ilmiah Bahasa dan Sastra, 2(2), 256-267*. https://doi.org/10.24176/kredo.v2i2.3343

Darmuki, A., Andayani, Nurkamto, Joko., Saddhono, Kundharu. (2017). Evaluating Information-Processing-Based Learning Cooperative Model on Speaking Skill Course. *Journal of Language Teaching and Reasearch*, *8(1), 44-51*.

Darmuki, A., Andayani, Nurkamto, Joko., Saddhono, Kundharu. (2018). The Development and Evaluation of Speaking Learning Model by Cooperative Approach. *International Journal of Instruction*, *11(2), 115-128*. http://www.academypublication.com/jltr/

Darmuki, A., Ahmad Hariyadi, & Nur Alfin Hidayati (2022). Pembelajaran PBL Kolaborasi PjBL untuk Meningkatkan Keterampilan 4C pada Mata Kuliah Pragmatik. *Media Penelitian Pendidikan*, *16(1), 21-27*. https://doi.org/10.26877/mpp.v16i1.12050

Darmuki, A., Nugraheni, F., Fathurohman, I., Kanzunnudin, M., & Hidayati, N. A. (2023). The impact of inquiry Collaboration Project Based Learning Model of Indonesian Language Course Achievement. *International Journal of Instruction*. *16(2), 247-266.* https://doi.org/10.29333/iji.2023.16215a

DiBenedetto, C.A. (2018). Twenty-First Century Skills. In: McGrath, S., Mulder, M., Papier, J., Suart, R. (eds) Handbook of Vocational Education and Training. *Springer*, *Cham.* https://doi.org/10.1007/978-3-319-49789-1_72-1.

DiBenedetto C, Myers, B. (2016). A Conceptual Model for the Study of Student Readiness in The 21st Century. *Nacta J, 60, 28-35.*

Fatmawati, E. T., & Sujatmika, S. (2018). Efektivitas Pembelajaran Problem Based Learning terhadap Hasil Belajar IPA Ditinjau dari Kemampuan Berpikir Kritis. *Wacana Akademika: Majalah Ilmiah Kependidikan*, *2(2), 163-171.* https://doi.org/10.30738/wa.v2i2.2786

Forslund, Frykedal K., Hammar, Chiriac, E. (2018). Student Collaboration in Group Work: Inclusion as Participation. *International Journal of Disability, Development and Education*, *65(2), 183-198*. https://doi.org/10.1080/1034912X.2017.1363381

Fraenkel, J. L., Wallen, N. E., Hyun, H. H.. (2012). *How to Design and Evaluate Research in Education Eighth Edition*. New York: Mc Graw Hill.

Gunawan, G., Harjono, A., Kusdiastuti, M., Nisyah M., & Herayanti, L. (2019). Increasing Students' Critical Thinking Skills in Physics Using a Guided Inquiry Model Combined with an Advanced Organizer. *J of Adv Res in Dyn & Cont Sys*, *11(7), 313-320.*

Greenstein, L. (2012). *Assessing 21st Century Skills: A Guide to Evaluating Mastery and Authentic Learning*. California: Corwin.

Hohmann, J. W., & Grillo, M. C. (2014). Using Critical Thinking Rubrics to Increase Academic Performance. *Journal of College Reading and Learning*, *45(1), 35-51.* https://doi.org/10.1080/10790195.2014.949551

Issufiah, D. N., Sunardi., Sri, A. W., & Gunarhadi. (2018). The Implementatyion of Problem Based Learning Model (PBL) on Teachers and Students Grade Five Elementary Schools in Surakarta City. *International Journal of Active Learning*, *3(2), 116-123.* https://dx.doi.org/10.5897/ERR2016.3045

Irdalisa, Paidi, & Djukri. (2020). Implementation of Technology Based Guided Inquiry to Improve TPACK among Prospective Biology Teachers. *International Journal of Instruction*, *13(2), 33-44*. https://doi.org/10.29333/iji.2020.1323a

Ju, H., & Choi, I. (2018). The Role of Argumentation in Hypothetico-Deductive Reasoning during Problem Based Learning in Medical Education: A Conceptual Framework.

Interdisciplinary J. of Problem-based Learning, *12(1), 1-18*. https://doi.org/10.7771/1541-5015.1638

Kleinig, J. (2018). Trust and Critical Thinking. *Educational Philosophy and Theory*, *50(2), 133-143,* DOI: 10.1080/00131857.2016.1144167

Khodabakhshzadeh, H., Hosseinnia, M., Moghadam, H. A., Ahmadi, F. (2018). EFL Teachers' Creativity and Their Teaching's Effectiveness: A Structural Equation Modelling Approach. *International Journal of Instruction*, *11(1), 227-238.* https://doi.org/10.12973/iji.2018.11116a

Le, H., Jeroen, J., Theo, W. (2017). Collaborative Learning Practices: Teacher and Student Perceived Obstacles to Effective Student Collaboration. *Cambridge Journal of Education*, *48(1). 110* https://doi.org/10.1080/0305764X.2016.1259389

Lee, Kyung-Hwa. (2018). The Relationship between Creative Thinking Ability and Creative Personality of Prescholers. *International Education Journal, 6(2), 194-199.*

Liu, O. L., Shaw, A., Gu, L., Li, G., Hu, S., Yu, N., Ma, L., Xu, C., Guo, F., Su, Q., Kardanovaj, E., Chirikov, I., Shi, J., Shi, Z., Wang, H., Loyalka, P. (2018). Assessing College Critical Thinking: Preliminary Results from the CHINESE HEIghten® Critical Thinking Assessment. *Higher Education Research & Development, 37(5), 999-1014.* https://doi.org/10.1080/07294360.2018.1467381

Muskita, M., Subali, B., Djukri. (2020). Effects of Worksheets based the Levels of Inquiry in Improving Critical and Creative Thinking. *International Journal of Instruction*, *13(2). 519-532*. https://doi.org/10.29333/iji.2020.13236a

Ojaleye, O., Awofala, A.O.A. (2018). Blended Learning and Problem-Based Learning Instructional Strategies as Determinants of Senior Secondary School Students' Achievement in Algebra. *International Journal of Research in Education and Science*, *4(2), 486-501*. https://doi.org/10.21890/ijres. 428286

Palupi, B. S., Subiyantoro, S., Rukayah, Triyanto. (2020). The Effectiveness of Guided Inquiry Learning (GIL) and Problem-Based Learning (PBL) for Explanatory Writing Skill. *International Journal of Instruction, 13(1), 713-730.* https://doi.org/10.29333/iji.2020.13146a

Perdana, R., Rudibyani, R. B., Budiyono, Sajidan, Sukarmin. (2020). The Effectiveness of Inquiry Social Complexity to Improving Critical and Creative Thinking Skills of Senior High School Students. *International Journal of Instruction*, *13(4), 477-490.*

https://doi.org/10.29333/iji.2020.13430a

Persky, A. M., Medina, M. S., Castleberry, A. N. (2019). Developing Critical Thinking Skills in Pharmacy Students. *American Journal of Pharmaceutical Education*, *83(2),* 7033. https://doi.org/10.5688/ajpe7033

Prasasti, D. E., Koeswanti, H. D., Giarti, S. (2019). Peningkatan Keterampilan Berpikir Kritis dan Hasil Belajar Matematika melalui Model *Discovery Learning* di Kelas IV SD. *Jurnal Basicedu*, *3(1), 174-179*. https://doi.org/10.31004/basicedu.v3i1.113

Prayoga, A., Setyaningtyas, E. W. (2021). Keefektifan Model Pembelajaran *Problem Based Learning* dan *Problem Solving* terhadap Kemampuan Berpikir Kritis Matematika Siswa Kelas V. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, *5(3), 2652-2665*. https://doi.org/10.31004/cendekia.v5i3.938.

Santyasa, I. W., Rapi, N. K., Sara, I. W. W. (2020). PBL and Academic Procrastination of Students in Learning Physics. *International Journal of Instruction, 13(1), 489-508.* https://doi.org/10.29333/iji.2020.13132a

Saputra, M. D., Joyoatmojo, S., Wardani, D. K., Sangka, K. B. (2019). Developing Critical-Thinking Skills through the Collaboration of Jigsaw Model with Problem-Based Learning Model. *International Journal of Instruction*, *12(1), 1077-1094.*

Saputra, M. D., Joyoatmojo, S., Wardani, D. K., Sangka, K. B. (2019). Developing Critical-Thinking Skills through the Collaboration of Jigsaw Model with Problem-Based Learning Model. *International Journal of Instruction*, *12(1), 1077-1094.*

Sari, S. P., Koeswanti, H. D., Giarti, S. (2019). Penerapan Model Pembelajaran *Problem Based Learning* untuk Meningkatkan Keterampilan Berpikir Kritis pada Muatan Matematika Kelas 4. *Jurnal Basicedu*, *3(2), 378-386.*

Sari, K. Arum., Zuhdan, Prasetyo, H., Setiyo. (2017). Pengembangan Lembar Kerja Peserta Didik IPA Berbasis Model *Project Based Learning* untuk Meningkatkan Keterampilan Kolaborasi dan Komunikasi Peserta Didik Kelas VII. *Jurnal pendidikan dan Sains*, *6(8), 1-7.*

Styers, M. L., Van Zandt, P. A., Hayden, K. L. (2018). Active Learning in Flipped Life Science Courses Promotes Development of Critical Thinking Skills. *CBE Life Sciences Education*, *17(3), 39*. https://doi.org/10.1187/cbe.16-11-0332

Siburian, J., Corebima, A. D., Ibrohim, I., Saptasari, M. (2019). The Correlation between Critical and Creative Thinking Skills on Cognitive Learning Results. *Eurasian Journal*

of Educational Research, *(81), 99-114*.

Sugiyono. (2011). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta.

Supena, I., Darmuki, A., Hariyadi A. (2021). The Influence of 4C (Constructive, Critical, Creativity, Collaborative) Learning Model on Students' Learning Outcomes. *International Journal of Instruction*, *14(4), 1-21.* https://doi.org/10.29333/iji.2021.14351a

Sahyar., Sani, Ridwan A., Malau, Tionar. (2017). The Effect of Problem Based Learning (PBL) Model and Self-Regulated Learning (SRL) Toward Physics Problem Solving Ability (PSA) of Students at Senior High School. *American Journal of Educational Research*, *5(3), 279-283.*

Tapung, M., Maryani, E., Supriatna, N. (2018). Improving Students' Critical Thinking Skills in Controlling Social Problems Through the Development of the Emancipatory Learning Model for Junior High School Social Studies in Manggarai. *Journal of Social Studies Education Research*, *9(3), 162-176*. https://doi.org/10.17499/jsser.23826.

The Partnership for 21st Century Learning. (2015). P21 Framework Definitions. Retrieved from http://www.p21.org/about-us/p21-framework#

Thunkam, P., Donpudsa, S., Dornbundit, P. (2016). Development of STEM Activities in Chemistry on *Protein* to Enhance 21st Century Learning Skills for Senior High School Students. *Silpakorn University Journal of Social Sciences*, Humanities, and Arts, *16(3), 217-234*. https://doi.org/10.14456/sujsha.2016.17

Triana, D., Anggraito, Y. U., Ridlo, S. (2020). Effectiveness of Environmental Change Learning Tools based on STEM-PjBL towards 4C Skills of Students. *Journal of Innovative Science Education*, *9(2), 181-187*. https://doi.org/10.15294/JISE.V8I3.34048.

Utami, R. A., Giarti, S. (2020). Efektivitas Model Pembelajaran *Problem Based Learning* (PBL) dan *Discovery Learning* Ditinjau dari Keterampilan Berpikir Kritis Siswa Kelas 5 SD. *PeTeKa*, *3(1), 1-8*. https://doi.org/10.31604/ptk.v3i1.1-8.

Wedekaningsih, A., Koeswanti, H. D., Giarti, S. (2019). Penerapan Model Pembelajaran Discovery Learning untuk Meningkatkan Keterampilan Berpikir Kritis dan Hasil Belajar Matematika Peserta Didik. *Jurnal Basicedu*, *3(1), 21-26.* https://doi.org/10.31004/basicedu.v3i1.73.

Widiawati L., Joyoatmojo S., Sudiyanto. (2018). Higher Order Thinking Skills as Effect of Problem-Based Learning in the 21st Century Learning. *International Journal of Multicultural and Multireligious Understanding, 5(3), 96-105.*