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**Application of the Li-Pro-GP learning model to improve students' conceptual understanding and creativity of environmental pollution**

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ARTICLE INFO	ABSTRACT
<p><b>Article history</b> Received: 26 January 2022 Revised: 05 April 2022 Accepted: 07 April 2022</p> <p><b>Keywords:</b> Biology Creativity Environment Pollution Poster</p> 	<p>Concept understanding and product creativity of SMP class VII A students are less than optimal. This problem is caused because learning activities do not invite students to improve their literacy. This research aims to apply Li-Pro-GP (Project-Based Science Literacy) learning in the integrated science literacy movement strengthening character education to improve conceptual understanding and creativity of learning poster products. The type of research used is quasi-experimental research using a one-group pretest-posttest design. The population of this research is the seventh-grade students of SMP. At the same time, the sampling used purposive sampling. The sample of this study was all students of class VII A. Data collection techniques used tests and documentation with research instruments, namely written test questions in the form of essays used for pretest and posttest. The measurement of the creativity of the learning poster product uses the product creativity rubric. Data analysis used paired t-test with the help of data processing applications IBM SPSS 26 and Ms. Excel. The results showed that: 1) there was an effect of using the Li-Pro-GP learning model on the ability to understand concepts; 2) there is an effect of using the Li-Pro-GP learning model on creativity of the learning poster product. Based on the research results, this learning model can be applied to other materials to improve students' conceptual understanding and creativity.</p>

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## INTRODUCTION

In the 21st century, science and technology are developing quite rapidly. Almost all activities in life are arranged in such a way using technology (U. D. Pertiwi et al., 2018). The existence of changes requires humans to have the skill to survive during the development of science and technology in the 21st century. Therefore, national Education in the 21st century aims to realize the ideals of the nation, namely the formation of a society consisting of quality human resources, independent, willing, and able individuals. Capable of learning the purposes of the country (Pratiwi et al., 2019).

One of the skills that must be possessed in the 21st century is literacy skills (Pratiwi et al., 2019). Scientific literacy is directly correlated with building a new generation of more vital scientists that can effectively communicate research science to the general public. The results of research conducted by (Treacy & Kosinski-Collins, 2011) show that increasing communication skills in reading and writing scientific papers should help improve students understanding in the field being studied. Those who have literacy skills will use scientific concepts and science process skills to make everyday decisions (Arohman et al., 2016).

By applying science concepts in science education, it is hoped that students in Indonesia will be able to solve real-life problems in this 21st-century era (Pratiwi et al., 2019). In addition, scientific literacy can be used to indicate a country's quality of education and human resources (Winata et al., 2016). However, according to the 2018 PISA (Program for International Student Assessment) survey, in the reading category, Indonesia was ranked 74th, and the science category was rated 71st out of a total of 79 countries (Tohir, 2019).

As a big nation, Indonesia must develop a literacy culture as a prerequisite for 21st-century life skills through integrated education, starting from family, school to the community (Kemendikbud, 2017). However, surveys from some research on Indonesian students' literacy skills showed irregularity with Indonesia's literacy rate. According to (Sriharyu et al., 2021), reading skill problems are related to low reading experience and practice. Talking about solutions for reading skills, the government designed the School Literacy Movement (SLM) program to improve student literacy.

The results of Dayang et al., (2013) SLM is one of the government's efforts to overcome this problem lack of interest in students' reading, which involves all school members from teachers, students, parents or guardians of students and the community as part of the educational ecosystem (Kemendikbud, 2019). The hope is that the school becomes a lifelong literate organization (Kemendikbud, 2016). Therefore, the purpose of the GLS is to develop the character of students through cultivating the school literacy ecosystem, which is manifested in the School Literacy Movement so that they become lifelong learners (Kemendikbud, 2016).

Currently, the Indonesian people have big enemies, namely poverty, ignorance, rampant corruption, lack of law enforcement, student brawls, pragmatism, and an instant culture that is getting stronger. These deviations appear due to the erosion of the values of the nation's character (Hendriana & Jacobus, 2016). National education functions to develop the ability to create the potential of students to become human beings who are faithful and pious, have a noble character, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens. The application of character education can be integrated into learning activities (Khusniati, 2012). So, all subject teachers can be role models for the integration of character education in learning (Omeri, 2015).

The Li-Pro-GP learning model is a learning model that adopts project learning syntax (Pantiwati et al., 2020). Therefore, the Li-Pro-GP learning model assumes the PjBL learning syntax in its implementation. Students will go through a broader inquiry process in project learning to respond to complex questions, problems, or challenges (Wahyuni, 2021). In addition, project learning will focus on creative thinking, problem-solving, and interaction between students and their peers to create and use new knowledge (Jagantara et al., 2014).

Project-based learning has the characteristics that students make decisions and create frameworks, design processes to achieve results and final results in the form of products, and evaluate their quality (Suciani et al., 2018). Therefore, the project-based learning model has the advantage of its characteristics, namely helping students design a process to determine an outcome, train students to be responsible for managing information carried out on a project, and finally, students who produce an authentic product the student's results are then presented in class (Kristanti et al., 2016).

Unaenah & Sumantri (2019) stated that concept understanding is defined as the ability of students to explain concepts, and it can be interpreted that students can re-express what has been communicated to them. For example, understanding the concept of science is a process of explaining a fact in detail through observation and experiment (Ningsih, 2019). Understanding the correct concept is the basis for forming a correct understanding of other, more complex concepts. Students who do not understand the concept correctly will form a difficult concept, so that understanding the concept becomes the basis for learning (Alighiri et al., 2018).

The importance of understanding concepts is not in line with the quality of students' conceptual understanding abilities. The results of the PISA and TIMSS surveys show that the concept understanding ability of students in Indonesia is still relatively low (Diana et al., 2020). There are still many students who have difficulty understanding concepts. If the ability to understand a concept is lacking, the usefulness of ideas, knowledge and skills is very limited (Unaenah & Sumantri, 2019). Lack of ability to understand concepts can be caused by several things, one of which is the learning model used. According to Pranata (2016) using a direct learning model that is

centered on the teacher where this of course hinders the development of students in expressing their ideas.

The understanding learning process is a prerequisite for achieving cognitive abilities or skills at a higher level, both in the same context and in different contexts (Rusminiati et al., 2015). Concept understanding is obtained by students from the learning outcomes experienced during the learning process (Alighiri et al., 2018). Understanding learning concepts in the classroom can be done in various ways, one of which is applying appropriate learning models. According to various previous studies, the learning model that can be used to increase students' understanding is the project-based learning model (Anggriani et al., 2019).

21st-century learning demands that schools no longer just an institution that emphasizes hard skills and soft skills. One of the skills that must be possessed is creativity or creativity (Wibowo et al., 2020). In learning activities at school, students' creativity can be seen from work (product). An idea that is made with a design of its own will provide an identity that will distinguish the results of one's thoughts from one another (Afghani & Sutama, 2020). One product that requires its ideas or thoughts is poster making. Posters are said to be good if they meet specific criteria, including readability, visibility, legibility, and good composition (Sulistiyono, 2016).

The results of the PISA and TIMSS surveys show that the creative thinking skills of Indonesian students are still low. Students do not yet have the skills to become creative thinkers. Students in class tend to be passive in conveying their creative ideas. The development of student creativity depends on the way the teacher designs learning. Generally, teachers still use conventional learning. In this case, a learning model is needed that is able to train students' creative thinking skills (R. S. Pertiwi &, Abdurrahman, 2017; Setiawati, 2017). Through the ability to think creatively allows humans to improve the quality of their lives. This is because through the ability to think creatively students are able to see various possible answers or solutions to a problem (Setiawati, 2017)

The Li-Pro-GP learning model is a learning model that will develop student literacy based on project learning and integrated with GLS and KDP (Pantiwati et al., 2020). This learning model adapted using project-based learning syntax can also improve students' conceptual understanding and scientific ability (Anggriani et al., 2019). This project learning can also increase students' creativity. This creativity will determine how the results of student products will be, one of which is in making posters that do require creativity. Based on the description that has been submitted, it is necessary to research the application of Li-Pro-GP learning (Project-Based Science Literacy in GLS integrated KDP) to improve conceptual understanding and creativity of learning poster products (Rati et al., 2017).

## METHODS

### Research Design

The type of research used is quasi-experimental research (quasi-experimental). The research design used is a one-group pre-test post-test design. This research model provides pretest treatment before the study and posttest after being given treatment. The use of one-group pre-test post-test design because there is no control class as a comparison in this study (Rosdianto et al., 2017).

### Population and Samples

The population in this study were seventh-grade junior high school students. The research was conducted at the Ma'arif Junior High School conducted. The sampling technique used was purposive sampling. Purposive sampling technique is a sampling technique based on certain considerations. Technical considerations this purposive sampling can vary and depend on the needs of the research being conducted will be done (Maharani & Bernard, 2018). The research sample was all SMP Ma'arif class VII A students in one lesson from the entire selected population. The data measured were the students' conceptual understanding and the creativity of students' poster products data collection techniques with tests and documentation. The test is used to measure the knowledge of concepts in students. Concept understanding in students was measured using pre-test and post-test instruments. Questions are given in essay form.

### Instrument

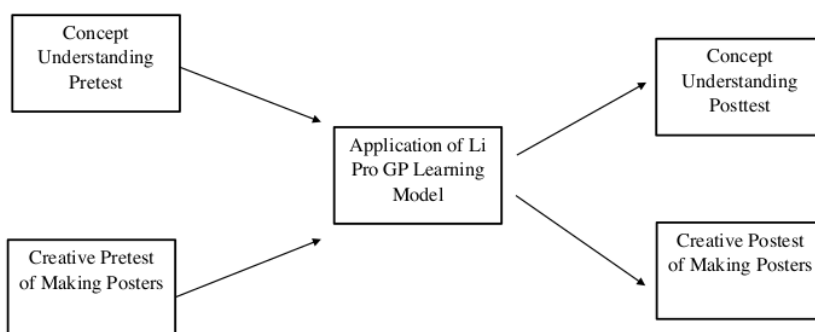
Measurement of concept understanding was carried out twice, namely pretest and posttest. A pretest was conducted to measure the knowledge of students' initial concepts before being given treatment. A posttest was conducted to measure students' understanding of the final concept after being given treatment. In this study, the supporting documents used were the collection of student posters both before the treatment and after the treatment. The research instrument used a test instrument for students' conceptual understanding, namely pretest and posttest. Pretest was given to all classes before treatment (treatment) and after treatment (treatment). The type of instrument used is in the form of an essay. It must be tested for feasibility before being used as an instrument, namely validity and reliability tests. The results of the item validity test on the concept of understanding of the 5 essay questions contained 1 invalid number, namely question number 3. The number of invalid questions was decided to be revised (Table 1). The results of the reliability test alpha Cronbach showed a value of 0.458 with a significance level of 5% or 0.05. The reliability value indicates that the instrument is reliable in the medium category. The instrument used to assess the results of student product creativity is using the poster creativity rubric, containing the criteria for making, including surprising, beauty, utility, and originality.

**Table 1.**  
Indicators for concept understanding questions

Basic competencies	Indicators for Questions	Number
3.8 Analyzing the occurrence of environmental pollution and its impact on the ecosystem	Describe ways to prevent environmental pollution starting from oneself	1
	Explain efforts to maintain the balance of the ecosystem based on the given problem	2
	Describe how to treat waste based on the problems presented	3
	Concluding the results of experiments regarding environmental pollution using animals and plants	4a
	Write suggestions for environmental pollution experiment activities using animals and plants	4b
	Write down the benefits of environmental pollution experiment activities for the future	4c
	Write down ideas for overcoming environmental pollution based on everyday problems	5

### Procedure

The research procedure includes research preparation which is a preliminary study carried out through interviewing teachers. The making of research instruments consists of making Li-Pro-GP lesson plans and attachments, making the rubric for assessing the creativity of poster products, making pre-test essay questions, and making post-test essays (Figure 1.) The research implementation (a) provides a pre-test of concept understanding. A pre-test was given to students to determine the ability to understand the concept of the sample before being given treatment (treatment). The implementation of the pre-test was carried out at the beginning of the learning activities at the first meeting. (b) Collection of student initial poster products. The initial group of student posters is carried out to find out how far creativity is in making learning products, one of which is in the creativity of making posters before giving treatment. The results of the posters are collected at the beginning of the learning activity or the first meeting. (c) Provide treatment (Treatment). The treatment is given three times in three meetings, namely 21, 28 April, and 2 June 2021. (d) Collection of student final poster products. The final poster collection of students is carried out to find out how far creativity is in making learning products, one of which is in the creativity of making posters after treatment. The results of the posters are collected at the beginning of the learning activity or the first meeting. (e) Provide a post-test understanding of the concept. Post-tests were given to students to determine the ability to understand the concept of the sample after being given treatment. The pre-test was carried out at the end of the learning activities at the last meeting.



**Figure 1** Research Steps

### Data Analysis Techniques

Data on the results of student concept understanding and student creativity were analyzed using IBM SPSS 26 software and Microsoft Excel. Data on students' conceptual understanding was tested using parametric t-test statistics. T test was used to test the significance and relevance of one or two groups. Meanwhile, poster creativity uses non-parametric statistics, namely the Wilcoxon test. In addition to statistical analysis, the results of the ability to understand concepts are categorized into high, low and moderate. This is based on the scores obtained by students. The high group is students who get a score of 75, the middle group of students who get a score of 60 score <75 and the low group of students who get a value of <60.

### RESULTS AND DISCUSSION

Based on the research data and the results of grouping students' scores in the low, medium, and high categories of students' conceptual understanding. It was found that there was an increase between the students' pretest scores before treatment and the students' post-test scores after the treatment of applying the Li-Pro-GP learning model. At the beginning of the pretest, students' understanding of the concept, students with low category

scores were three students, medium category scores were 13 students, and high category scores were three students. After being given treatment, namely the application of Li-Pro-GP learning, the results showed that students with low category scores were four students, medium category scores were seven students, and high category scores were eight students. In addition, there was an increase in students who had high grades than before being given treatment; this can be seen from the rise in the number of students in the medium grade category and an increase in the number of students with high-grade types (Figure 2).

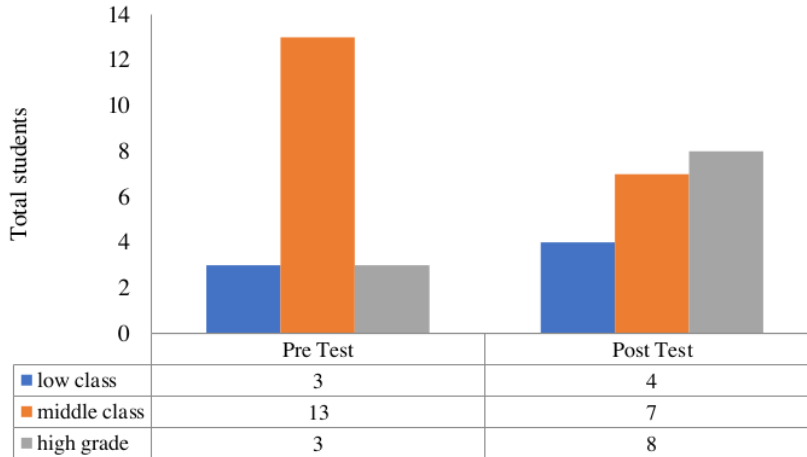


Figure 2. Comparison diagram of pre and post values concept understanding

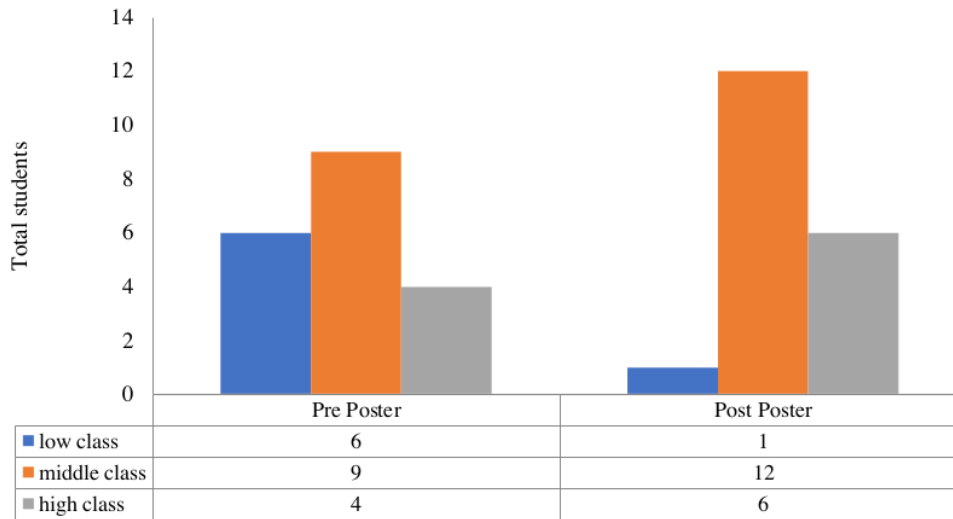
The pre and post-data of students' poster product creativity were analyzed using a paired sample t-test (Table 2). In Table 1, it can be seen that the significance (2-tailed) is 0.001 < 0.05, so it can be concluded that there are differences in the students' pre-test and post-test scores. These results show that there is an effect of applying the Li-Pro-GP learning model on students' conceptual understanding, as seen from the differences in the pre-test and post-test results (Table 2).

Table 2. Paired samples test

Pre-Test Post Test	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		T	df	Sig. (2-tailed)
				Lower	Upper			
Test	-7,31579	8,38022	1,92255	-11,35493	-3,27665	-3,805	18	,001

Based on the grouping results of low, medium, and high scores of students' pre-test and post-test creativity. It was found that there was an increase between the pre-test value of the student's poster product creativity before treatment and the post-test value of the student's poster product creativity after the application of the Li-Pro-learning model. GP. At the beginning of the poster-making students (pre), six students got scores in the low category. The middle category scores were nine students, and the high category scores were four students (Figure 1.). After being given treatment with the application of Li-Pro-GP learning, the results showed an increase for students in the medium & high-grade category. Students with low category scores decreased. Students who get low grades after treatment are one student, students with moderate category scores are 12, and students with high category scores are six students (Figure 3.).

The Wilcoxon test is part of the non-parametric test used to measure the difference between 2 groups of paired data on an ordinal or interval scale, but the data is not normally distributed. The basis for decision-making uses the Wilcoxon test. If the probability value of Asym. Sig 2 failed < 0.05, then there is an average difference. If the probability value of Asym. sig 2 fell > 0.05, and then there is no difference in average (Nuryadi et al., 2017).



**Figure 3.** Comparison diagram of pre and post product creativity poster

**Table 3.** Wilcoxon test ranks

	N	Mean Rank	Sum of Ranks
Post Test-Pre-Test	Negative Ranks	0 <sup>a</sup>	,00
	Positive Ranks	19 <sup>b</sup>	190,00
	Ties	0 <sup>c</sup>	
	Total	19	

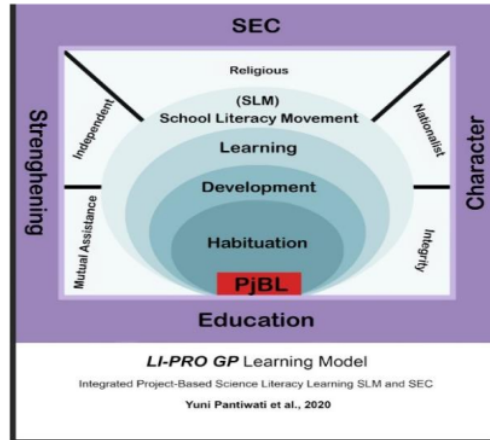
The negative difference (negative ranks) between the results of the creativity of the pre- and post-student poster products with the Wilcoxon test got 0, both the value of N, Mean Ranks and Sum Ranks (Table 3.). Through this, it can be indicated that the pre-to-post value of the student's poster product creativity did not decrease (the post-test value was more significant). The positive difference (positive ranks) of the results of poster product creativity has 19 positive data, meaning that the 19 students experienced an increase in the results of pre- to post-poster product creativity (Table 3.). The increase in question is a mean rank of 10.00 and a sum of level of 190.00. The ties value or the similarity of the pre- and post-values of student poster creativity is 0, meaning there is no equal value between pre and post-student creativity posters.

Wilcoxon statistical test results show that Asymp. Sig (2-tailed) is worth 0.000. The Asymp. sig (2-tailed) value of 0.000 is smaller than <0.05, so it can be informed that the hypothesis is accepted, namely that there are differences in the results of student poster product creativity from pre to post-test (Table 4). Through this, there is an effect of using the Li-Pro-GP learning method on students' poster products.

**Table 4.** Test statistics Wilcoxon test

Z	-3,825 <sup>b</sup>
Asymp. Sig. (2-tailed)	,000
a. Wilcoxon Signed Ranks Test	
b. Based on negative ranks.	

This study was conducted to determine the application of the Li-Pro-GP learning model to students' conceptual understanding and product creativity in posters. In implementing learning activities later, the flow used is the flow in project learning (Figure 4). Project-based learning is designed to be used on complex problems that students need to investigate and understand (Anggriani et al., 2019). At the implementation stage at the first meeting before the learning activities (treatment), students will do a pre-test (concept understanding) and an initial poster as data before treatment. To determine whether the treatment given affects the specified variable. Data will be processed with a paired t-test. Before the t-test, the data were first grouped into several categories. The categories in question are students with low, medium, and high scores.



**Figure 4.** Li-Pro-GP learning model

Data on students' initial concept understanding was obtained from three students with low scores; medium scores of 13 and three high scores. After being given treatment, namely applying Li-Pro-GP learning, the results obtained were four students with low scores, seven students with medium scores, and eight students with high scores (Figure 1). Based on the diagram in Figure 1, it can be seen that there is an increase in the number of students with high scores. That is indicated by a decrease in the number of students with average scores, and although there is an increase in students with low scores, there is only one student. The results of the data analysis showed a significance value of  $0.001 < 0.05$ . That indicates that applying the Li-Pro-GP learning model affects students' conceptual understanding, as seen from the differences in the pre-test and post-test results (Table 1).

One of the efforts to improve students' understanding of concepts is giving assignments independently in the form of project assignments. Through projects or tasks, students can discover and construct their existing knowledge and concepts. A project is a supporting tool that can support students' understanding of concepts (Puspitasari et al., 2020). Several studies have proven that project-based learning affects students' understanding of science concepts and processes (Anggriani et al., 2019; Puspitasari et al., 2020; Winarti & Nurhayati, 2014). Project learning is a learning approach that knocks students into practical problems through a stimulus in learning. In project-based learning activities, the teacher's role is very important, namely providing incentives so that students can learn independently, find their understanding, and develop their creativity collaboratively (Wajdi, 2017).

The following study is to determine whether the application of Li-Pro-GP learning increases the creativity of students' products in the form of posters. The data obtained will be categorized as student scores. Through the curve in Figure 2, there was an increase in the initial and final grades of student posters. In the initial data, students with a low score were six students, a medium score of nine students, and a high score of four students (Figure 2). After being given treatment with the application of Li-Pro-GP learning, the results showed an increase for students with medium & high scores. Conversely, students with low scores decreased. Students who get low scores after treatment amount to 1, students with medium scores are 12, and students with high scores are six students (Figure 2).

In addition to looking at the initial and final curvilinear increase rates, the student's poster product creativity data was also tested for data analysis. The test used is the Wilcoxon test because the data is not normally distributed in the normality test. The output of the Wilcoxon test consists of several outputs. One of the outputs of this test is Ranks (Table 2). The negative difference (negative ranks) between the results of the creativity of the pre and post-student poster products at the value of N, Mean Ranks, and Sum Ranks is 0 (Table 2). Through this, it can be indicated that the pre-to-post value of the student's poster product creativity did not decrease (the post-test value was greater). The positive difference (positive ranks) of the results of poster product creativity has 19 positive data, meaning that the 19 students experienced an increase in the results of pre- to post-poster product creativity (Table 2). The result of the similarity of the pre- and post-values of student poster creativity is 0. It means that there is no equal value between pre and post students' poster creativity.

One of the essential outputs in the Wilcoxon test is the Wilcoxon statistical test results showing that Asymp. Sig (2-tailed) is 0.000. The Asymp. sig (2-tailed) value of 0.000 is smaller than  $< 0.05$ , so it can be informed that the hypothesis is accepted, namely that there are differences in the results of student poster product creativity from pre to post-test (Table 3). This can be concluded that using the Li-Pro-GP learning method affects the creativity of students' poster products. Project-based learning has the potential for student creativity because innovative education that combines theory and practice brings learning problems into work life becomes a project and a work product (Hakim et al., 2016). To produce a product such as a poster with a high creativity value must meet several



requirements. Aspects, one of which is the criteria for making posters. A promising sign must meet readability, visibility, legibility, and good composition (Sulistiyono, 2016). The characteristics of a good poster include simple, presenting one idea and achieving one main goal, color, slogan, clear writing, and varied writing motifs (Sumartono & Astuti, 2018).

The Li-Pro-GP learning model affects students' conceptual understanding abilities. The characteristic of the Li-Pro-GP learning model is that this learning model develops student literacy based on independent project learning. The study results concluded that there are differences in learning outcomes between groups of students who follow the project learning model and groups of students who follow the conventional learning model. The results of this study are also supported by the opinion that project-based learning increases collaboration to construct knowledge. Project-based learning can improve students' conceptual understanding. This is because project learning in the Li-Pro-GP model provides opportunities for students to work autonomously, learn independently (student center) and produce a product.

The use of the Li-Pro-GP learning model on the creativity of learning poster products. Project-based learning can lead a person to practice and understand complex thinking and know-how to integrate it into skills that are often associated with real life. Take advantage of searching for various sources, think critically, and have good problem-solving skills. In addition, through Li-Pro-GP learning the literacy learning model is a 21st century skill and integrates character education in the application of learning. This learning model has the hope of making students with good manners and good character in addition to the realm of knowledge and skills. Research results project-based learning can improve students' creative thinking. Project-based learning has advantages, namely: (1) increasing students' learning motivation, (2) improving problem-solving abilities; (3) make students more active; (4) enhance collaboration: (5) learners to develop and practice communication skills; (6) improve managing resources.

The constraints of the research were carried out during the covid-19 pandemic, so that the movement between researchers, students and related parties was a little limited. To anticipate this, research activities are carried out in a blended manner. One of the obstacles in this research is the network. When learning activities are carried out online there are some students who experience network problems. Regarding the network, things are beyond the control of researchers and students, so to anticipate this, zoom activities are recorded so that if there are some things that are not clear, the zoom record can be played back and all materials used in learning are given to students.

## CONCLUSION

Li-Pro-GP learning model improves students' conceptual understanding before and after being given treatment. That is based on the increase in the curve, and the results of the t-test analysis showed that there were differences in the students' pre-test and post-test scores before and after the implementation of the Li-Pro-GP learning model. This study also states that the Li-Pro-GP learning model also affects the creativity of students' poster products. This statement is based on the increase in the student's product assessment curve before and after treatment. In addition, this is also based on the results of the Wilcoxon test, where there are differences in the results of the creativity of student poster products from before and after treatment. For the next activity, the Li-Pro-GP learning model can be applied offline with students at school on other biology materials, especially those related to students' creativity and understanding of students' concepts.

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