

Increasing Students Creative Thinking Skills and Writing a Quality Research Proposal Using PjBL_LC

Yusuf Suharto¹, Sumarmi^{2*}, Sugeng Utaya³, I Komang Astina⁴, Rima Meilita Sari⁵

^{1, 2, 3, 4} Departement of Geography, Universitas Negeri Malang, Indonesia

⁵ Departement of Geography, Universitas Samudera, Langsa, Indonesia

*sumarmi.fis@um.ac.id

ABSTRACT

Students must be able to write research proposals as part of the graduation requirements. Therefore, the research proposal required a novelty to think creatively. However, many students have difficulty completing research proposals due to a lack of creative thinking skills. The study aimed to increase creative thinking and write quality of geography research proposals using Project-Based Learning_Learning Community (PjBL_LC). The study used a quasi-experimental study involving three groups: the experimental group 1 using PjBL, the experimental group 2 using PjBL_LC, and the control group using conventional learning. The research was conducted for 4 months, with 80 students. Creative thinking data was taken from the Torrance instrument, while the quality of research proposal data was taken from the research proposal's assessment result. Data were analyzed using independent sample t-test analysis. The research findings showed a significant difference between creative thinking and quality of research proposal for Geography students using PjBL, PjBL_LC, and conventional learning. Further research is suggested to support Project-Based Learning integrated with Learning Community (PjBL_LC) to improve creative thinking skills and quality in writing research proposals.

Keywords

Project-Based Learning; Learning Community; Creative Thinking Skill; Ability in Writing Research Proposals

Introduction

Creative thinking is an essential ability for students to compete as a requirement for graduation. Creative thinking ability is closely related to critical thinking and problem-solving abilities [1], [2]. The development of 21st-century education depends on certain abilities [3]. There are similarities between creative thinking, critical thinking and problem-solving in synthesizing, constructing knowledge and experience, and thinking imaginatively and reliably. However, creative thinking has a general character that differs from the two other abilities, especially in thinking flexible, different, original, double thinking, curiosity, and producing different solutions [4]–[6].

Creative thinking allows students to develop innovative ideas to solve problems [4], [7]. Students develop cognitive activities to analyze objects, conditions, and problems through creative thinking. Creative students try to design a quality project [8]–[10]. Additionally, various positive outcomes are accessible in daily life, associated with creativity [11].

There are many advantages to having a creative thinking ability. However, the ability is still low in practice; the creative thinking ability of Chemistry students at universities in Indonesia is still low [12]; the creativity of Communication Design students in Ghana is still low [13]. The students' responses in recognizing problems and providing solutions demonstrate a lack of flexibility and rigidity.

Many universities provide certain lesson plans and learning models to improve students' critical thinking skills. Critical thinking skills are essential for students to compete in real life [14]–[16]. The creative thinking ability can be developed through training [17], the development of lecture teaching materials [18], increasing the lecturers and teachers capacity to teach creative thinking skills through the learning objectives [19], and increasing the capacity of students in creative thinking through learning activities [18], [20]. The creative thinking practice can be done through writing research proposals.

A research proposal determines a series of backgrounds, objectives, supporting theories, methodology, data analysis, and research activities

[21]. Writing a research proposal involves many disciplines and can train students to communicate with the research [22]. Therefore, a holistic and comprehensive thinking process is needed [21]. Writing a good Geography research proposal requires reading a lot of scientific articles and research results. Reading research articles puts more emphasis on rhetorical activities. Each research article has rhetorical moves based on the researcher's argument in writing the research article [23]. Writing proposals can provide students with the experience to understand the researcher's thinking process [24]. Students' abilities can be seen in writing novelty using creative thinking [25].

A research proposal is an effective way to express thoughts about situations and conditions systematically and comprehensively. Students are trained to think critically, solve problems, formulate projects, plan, make it easier to monitor activities, and think innovatively [17], [26]. It seems that writing a research proposal allows students to develop creativity. The ability to write research proposals is needed for students [27]. As a graduation requirement, students are expected to research scientific papers, theses, and dissertations [27], [28]. Before completing a scientific paper, students are asked to write a research proposal. Some students still find it challenging to complete a quality research proposal [28]–[30].

Several related studies have mentioned the lack of creative thinking skills and writing proposals, encouraging learning innovation research development. Innovations develop a learning model that can accommodate creatively thinking ability [18], [31] and write quality research proposals [32], [33].

The PjBL learning model is one of the learning models applied in 21st-century learning [34], [35]. The PjBL has received much interest from previous researchers and has succeeded in improving creative thinking skills [34], [36], [37]. Learning through the project allows students to learn independently and construct knowledge [38]. Furthermore, students are trained in thinking scientifically [39], [40]. Also, implementing PjBL

learning can improve writing scientific proposals [41], [42]. The ability to write research proposals can be improved through writing projects as a learning activity.

Support is needed to increase PjBL learning for creative thinking skills and writing a quality research proposal, such as forming a learning community. Learning communities allow students to learn by sharing with fellow students [43]. Also, students get many ideas from the discussion process with their peers, seniors, and even experts [44]. Research by Putri, [45] stated that the learning community could increase students' creative thinking ability. Furthermore, the learning community can increase learning motivation [46], [47]. It is because students feel motivated to share and provide solutions to others. It makes students feel comfortable to learn and achieve learning objectives [48].

This research aimed to determine the impact of PjBL on creative thinking and writing a quality research proposal, but the research in the integration between PjBL and the Learning Community on creative thinking skills and research proposal writing is still limited [49], [50]. Therefore, learning innovation is carried out to support the learning outcomes, especially in the creative thinking ability and writing a quality research proposal.

Literature Review

1. Creative Thinking Skill

Different thinking ideas that emerged in the 19th century raised the concept of creative thinking [5]. Creative thinking, along with problem-solving and critical thinking skills, is a higher-order thinking skill needed for students to face the challenges of the 21st century [3], [51]. Students used the ability to generate new ideas and innovate against old ideas [4]. It showed the originality in the innovation of problem-solving products [52].

Creative thinking skills are formed by giving students the option to think flexibly. Students need to look at the originality and quality of a

product to think creatively. Giving students practice in learning can help to think creatively. [53]. It can be done by providing problems in a context included in the learning material [20], [37], [40], [50], [52], [54].

The advantages of creative thinking are very interesting to study. Through the increasingly rapid development of the 21st century, the interest in creative thinking study is increasing. Several methods are used to increase creative thinking ability. Several previous studies have explained that creative thinking skills can be improved through learning innovation by developing models [20] and providing teaching materials [18].

2. Writing a Quality Research Proposal

Preparing good research proposals shows student's scientific performance abilities [55]. It involves multidisciplinary learning both inside and outside the classroom [27], [56] and cognitive activities [57]. Preparing a research proposal requires an environment for independent learning and motivation in learning. Students can gain experience by working on projects in preparing research proposals [58]. It aims to observe and solve problems in the real world before deciding on a research topic.

Preparing quality research proposals can be assessed after students have completed the assignment [59]. It set through determine research titles, formulate problems, formulate research objectives, formulate hypotheses, write research implications, compiling literature reviews, determine research methods and procedures, select samples, collect instruments, analyze data, and write references [21]–[24]. Writing a proposal involves rhetorical ability consisting of motive, objective, main conclusion, implication, support, counterargument, and refutation, adapted with novelty [24].

Several researchers explained that writing skills are very important. Various experimental studies have shown that increasing writing ability can be improved by using chasing models, portfolios, and evaluation tests [41], [42]. Therefore, innovation

is needed to improve writing skills, especially in writing geography research proposals.

3. Project-Based Learning Learning Community (PjBL_LC)

The project-based learning_learning community project is integrated project-based learning and learning community to complement learning development. There are several advantages of project-based learning and learning communities that can be implemented in learning.

Project-based learning is needed to achieve the goal of 21st-century learning. The learning refers to the constructivist learning theory popularized by John Dewey [34], [36], [39], [40], [60], [61]. The teaching steps in project-based learning prioritize the interaction of fellow students and provide direct experience in learning. The project-based learning model has six stages of learning: (1) determining basic questions, (2) designing a project, (3) scheduling, (4) monitoring project progress, (5) evaluating results, and (6) evaluating experiences [60], [61]. Writing a geography research proposal requires direct experience from students to formulate problems, propose research hypotheses, and determine research methods to answer research questions. The development of a geography research proposal involves direct experience to obtain a real picture of the research. Therefore, it is necessary to have a learning community while learning.

Learning communities is a learning culture that involves each student collaborating to improve understanding. Learning communities highlight connectedness and creativity [62]. In the learning community, learning outcomes can be obtained from the cooperation between fellow students, between groups, or students themselves. In learning activities, students could teach other fellow friends. Multidirectional communication will create a learning community [63]. Group members can learn from each other. Students could ask and provide the information needed by friends and surroundings [64].

Preparing research proposals requires a learning community for students to learn independently. In the learning community, experts can be invited or collaborated with other classes at the same level or with their seniors [64]. Learning communities can help students communicate ideas and experiences to help other students solve problems [63]. Learning Community can also increase cooperation and responsibility among students. It

also can increase student motivation, especially students with low academic abilities [46], [47]. Therefore, it is necessary to include the learning community's content in project-based learning in preparing research proposals. The theoretical framework for learning PjBL_LC is shown in figure 1.

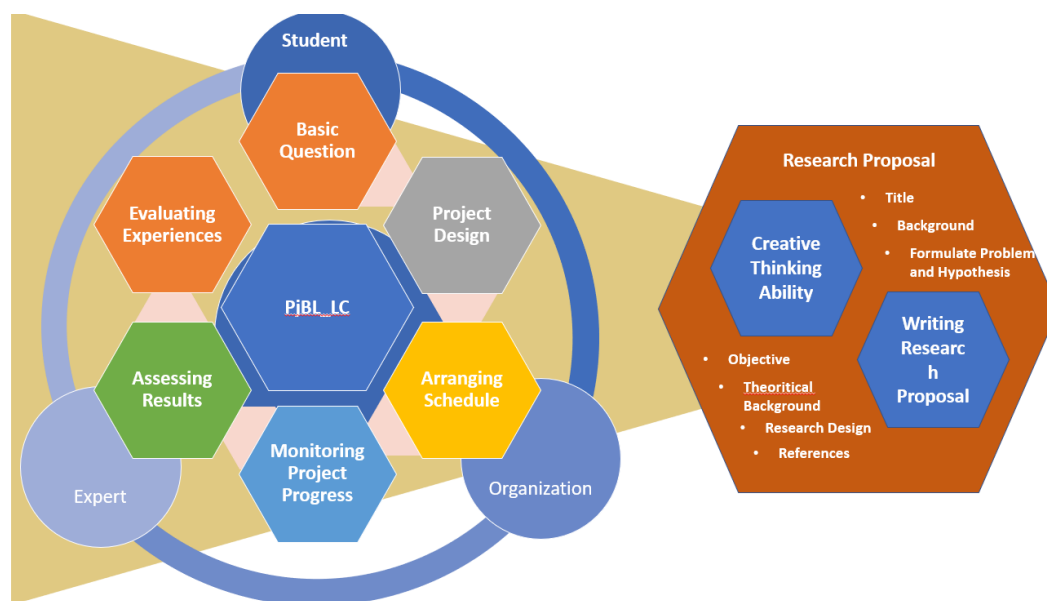


Figure 1. Theoretical Framework in PjBL_LC [60]

4. Research Problem

In Indonesia, creative thinking ability and write quality research proposals are essential. The ability is needed by students in Indonesia as the main requirement for graduation in the undergraduate program. Students must be able to think critically and write effectively. However, the ability to think creatively and to write proposals is still very low for students. Previous research has been mentioned that improving creative thinking ability in writing research proposals is very important for students [1]–[4], [7]–[11], [14]–[16]. However, the research on increasing the creative thinking ability in writing proposals that focus on the research proposal's novelty value is still limited. Another problem is the activity to

increase the quality of research proposals. PjBL_LC learning can be used as a learning model, but the research that tests PjBL_LC learning towards creative thinking ability in writing quality research proposals is still limited. Therefore, this research aimed to find out the effect of PjBL_LC learning on students creative thinking skills and writing a quality research proposal. Research is expected to contribute to improving the creative thinking ability in writing research proposals using innovative models. Also, it is expected to provide innovative learning models to promote student learning communities to build creative thinking skills and writing quality research proposals, especially in Geography research.

Methods

1. Research Design

The research design was a quasi-experimental study using a non-equivalent pretest – post-test control group. The variables were divided into experimental group and control group. The experimental group used the PjBL_LC learning model, and the control class used conventional learning such as discussions, lectures, and questions and answers. The independent variable is PjBL_LC learning, while the dependent variable is creative thinking in writing a quality geography research proposal. The research framework is shown in table 1.

Table 1. Experimental Research Design

Groups	Pretest	Treatment	Posttest
Experimental	O1	X1	O2
Control	O1	-	O2

Description:

- O1 : Pretest of creative thinking and writing a quality research proposal
- O2 : Posttest of creative thinking and writing a quality research proposal
- X1 : treatment using PjBL-LC learning

Two groups were selected as research subjects. The experiment group and control group were determined from the initial test (pre-proposal). Furthermore, it was given treatment using PjBL integrated with Learning Community to the experimental group and conventional learning to the control group. The results were then tested using a posttest to determine creative thinking and writing a quality research proposal.

2. Participants

The population is undergraduate students of the Geography Education study program in State University of Malang academic year of 2019/2020. Two classes were selected as research samples, with a total of 80 students. The sample is

students in the Geography Research Methodology classes. The research subjects were divided into two groups: class K (experimental group) for 40 students and class A (control group) for 40 students. The group was selected based on the initial test scores and initial results to write pre-proposals. The research participants were chosen because the students took the Geography Research Methodology classes and had similar scores. The selected classes have a similar gain score value as the research subject [65].

3. Research Setting

The research was conducted for 14 meetings (4 months) with 150 minutes at each meeting. The research was started from January to April 2020. The study was conducted in the Geography Research Methodology class held in the second year (the 4th semester) with the main topic of designing a geography research proposal.

4. Research Implementation

The learning innovation used in this research is PjBL_LC learning. It allows students to form a learning community to understand the concepts and implementation in writing research proposals. The learning stages using PjBL_LC are originated from the PjBL model in the following order: 1) determining basic questions, 2) making project designs, 3) arranging schedules, 4) monitoring project progress, 5) evaluating results, and 6) evaluating experiences.

The experimental group is implemented PjBL_LC learning to improve creative thinking skills in writing quality research proposals. The lecturer provided a classroom agreement, course lesson plan, and semester lesson plan to the experimental group at the beginning of the meeting. In this stage, the lecturer explained the learning process and the assessment in writing a research proposal. This research involved the learning community in improving creative thinking skills in writing a quality research proposal. Students formed study groups and work together between student groups and cooperate with students outside of other classes, even experts. In PjBL_LC learning,

students also shared information and established multi-way communication. The implementation also involved seniors that have passed the courses and research experts, especially in geography. Proposals were then submitted at the end of the meeting.

The control group has the same duration, lecture material, and final project writing a geography research proposal but given different treatment. The lecturer still provided learning tools and explained the classroom contract at the beginning of the lecture, but the treatment given is using conventional learning. The learning methods used in the control group were lectures, questions and answers, and discussions.

5. Instrument

The instrument was developed before the treatment. Lecturer designed learning tools and research instruments that support research achievement, especially creative thinking skills in writing research proposals. The pretest was used to determine students' initial abilities, and the posttest was used to assess the achievement of learning outcomes. The research instrument consisted of research tools and research proposal assessment. The research tools as guidelines consist: 1) guidelines for writing and assessing scientific papers at the State University of Malang in 2018, 2) syllabus, and 3) curriculum. The research proposal assessment instrument consists of an assessment instrument for the creative thinking ability in writing the research proposal.

The writing research proposals used indicators from Davies [21], and students' creative thinking abilities refer to Torrance's indicators of creative thinking abilities, which consist of fluency (ideas), flexibility, originality, and elaboration [66]. The indicator was also implemented in the guidelines for writing and assessing scientific papers at the State University of Malang. The researcher then developed the instrument based on the students' condition, facilities, and infrastructure to support the lectures. Then, the instrument is validated. The validation process involved experts in geography

research methodology so that the instrument is valid to use.

6. Data Analysis

Quantitative data were obtained through tests to measure creative thinking and writing a quality research proposal. Data were collected in two groups using PjBL_LC and conventional. The data were then analyzed using a t-test instrument to test each indicator's gain score in SPSS 21 for windows. Before analyzing the data, the initial analysis tests were carried out, including the normality and homogeneity tests. The t-test used a significant level of 0.05. If the data does not meet the requirements, then replaced with a non-parametric statistical test.

Results

1. Comparison test of Mean value in pretest and posttest

The test was conducted using the paired t-test. Normality test was used the Kolmogorov Smirnov with $p\text{-value} > \alpha$ ($\alpha = 0.05$) for data can be defined as normal. Homogeneity test used Levene test with $p\text{-value} > \alpha$ ($\alpha = 0.05$). The Wilcoxon test if the result did not meet the assumption.

1.1. Normality test

The normality test was used to determine the variable distribution before processed to the next test. The hypothesis of normality is shown as follows.

H0 : Data is normally distributed

H1 : Data is not normally distributed

Kolmogorov Smirnov test was used to test the assumption. H0 will be accepted with a significant > 0.05 or declined with a significant < 0.05 . The result is shown in the following table 2.

Table 2. Normality test result

Variables	Statistic	sig.
Creative thinking skill pretest of the experimental group	0.252	0.000
Creative thinking skill posttest of the experimental group	0.263	0.000
Writing quality research proposal pretest of the experimental group	0.288	0.000
Writing quality research proposal posttest of the experimental group	0.222	0.000
Creative thinking skill pretest of the control group	0.270	0.000
Creative thinking skill posttest of the control group	0.233	0.000
Writing quality research proposal pretest of the control group	0.259	0.000
Writing quality research proposal posttest of the control group	0.220	0.000

The normality test on each variable showed a value of $0.00 < \alpha$, which gain scores the data was not normally distributed. Furthermore, the data variance homogeneity test was conducted between pretest and posttest on each variable.

H0 : Variance data is homogeneous

H1 : Variance data is not homogeneous

Levene test was used to test the assumption. H0 will be accepted with a significant > 0.05 or declined with a significant < 0.05 . The result is shown in the following table 3.

1.2. Homogeneity of variance test

The homogeneity test was used to find out the homogeneity of variance between data groups. The hypothesis test is shown as follows.

Table 3. Homogeneity test result

Variables	Statistic	sig.
Creative thinking skill of the experimental group	0.053	0.819*
Writing quality research proposal of the experimental group	4.914	0.030
Creative thinking skill of the control group	0.009	0.924*
Writing quality research proposal of the control group	0.140	0.709*

The test has found 1 data in the normality test did not pass the test. Therefore, the Wilcoxon test was used to determine the difference between pretest and posttest in creative thinking and writing a quality research proposal.

H0 :There is no significant difference between pretest and posttest on the measured variables

H1 : There is a significant difference between pretest and posttest on the measured variables

1.3. Wilcoxon Hypothesis test

The hypothesis test used is shown as follows.

The measurement criteria are shown as follows.

Zcount < Ztable, and p-value < 0.05, the H0 is declined;

Zcount < Ztable, and p-value > 0.05, the H0 is accepted.

1.3.1. Creative Thinking in the experimental group

Table 4. The gain score result of the experimental group

	Gain Score	St dev.
Pretest	71.3500	2.93126
Posttest	85.9750	3.43800
Zcount	= -5.519	
Ztable	= 1.960	
p-value t	= 0.000	

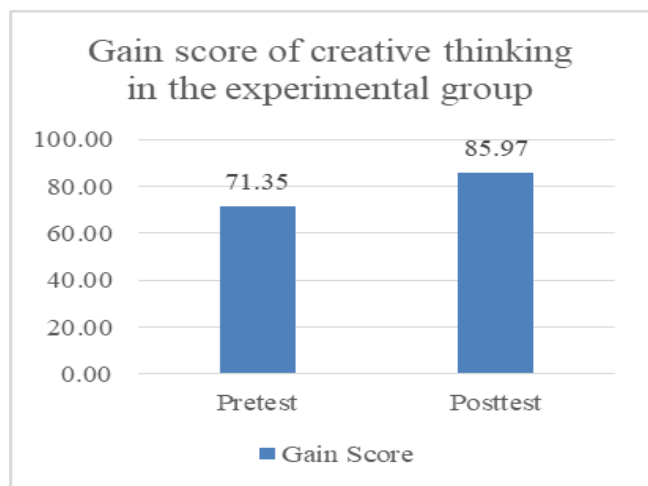


Figure 2. The gain score result

Table 4 showed the gain score of creative thinking in the pretest was 71.35±2.93 below the posttest score of 85.98±3.44. The Wilcoxon was used to determine the significance of gain score in pretest and posttest of creative thinking.

The Wilcoxon test found the Zcount < Ztable (-5.519 < -1.960), and p-value > α (0.000 < 0.050), then H0 is declined and has significant difference in gain score of pretest and posttest. Table 4 showed significant improvement in the creative thinking of the experimental group in pretest and posttest.

1.3.2. Quality of research proposal in the experimental group

Table 5. The gain score result of the experimental group

	Gain Score	St dev.
Pretest	70.2500	2.63847
Posttest	84.0750	3.54015
Zcount	= -5.517	
Ztable	= 1.960	
p-value t	= 0.000	

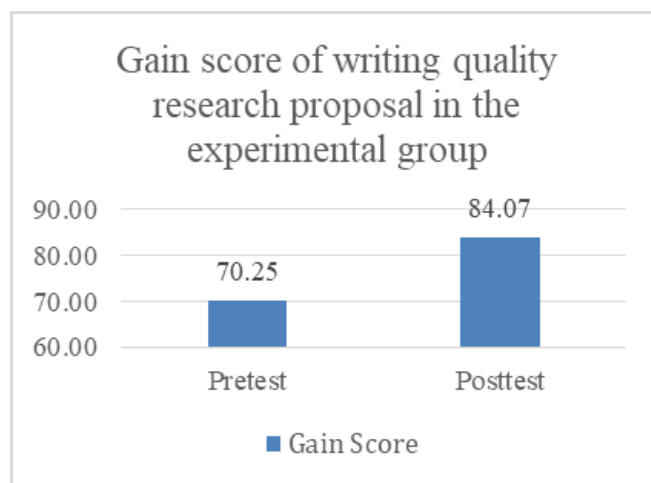


Figure 3. The gain score result

Table 5 showed the gain score of writing a quality research proposal in the pretest was 70.25±2.64 below the posttest score of 84.08±3.54. The Wilcoxon was used to determine the significance of gain score in pretest and posttest of writing a quality research proposal.

The Wilcoxon test found the Zcount < Ztable (-5.519 < -1.960), and p-value > α (0.000 < 0.050), then H0 is declined and has significant difference in gain score of pretest and posttest. Table 5 showed significant improvement in writing a quality research proposal of the experimental group in pretest and posttest.

1.3.3. Creative Thinking in the control group

Table 6. The gain score result of the control group

	Gain Score	St dev.
Pretest	72.0000	3.43437
Posttest	78.5500	3.56586
Zcount	= -5.174	
Ztable	= 1.960	
p-value t	= 0.000	

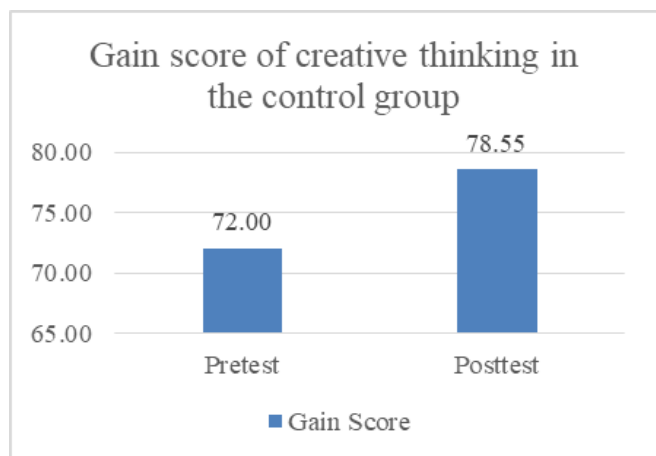


Figure 4. The gain score result

Table 6 showed that the gain score of creative thinking in the pretest was 72.00 ± 3.43 below the posttest score of 78.55 ± 3.57 . The Wilcoxon was used to determine the significance of gain score in pretest and post-test of creative thinking.

The Wilcoxon test found the $Z_{count} < Z_{table}$ ($-5.519 < -1.960$), and $p\text{-value} > \alpha$ ($0.000 < 0.050$), then H_0 is declined and has significant difference in gain score of pretest and post-test. Table 6 showed significant improvement in the creative thinking of the control group in pretest and post-test.

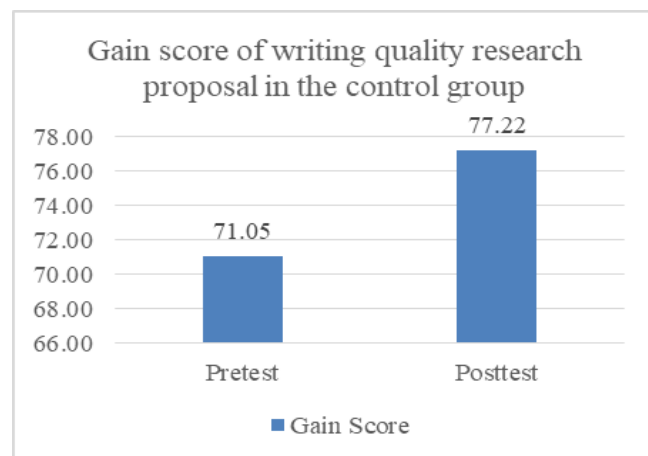


Figure 5. The gain score result

Table 7 showed that the gain score of writing a quality research proposal in the pretest was 72.00 ± 3.43 below the posttest score of 78.55 ± 3.57 . The Wilcoxon was used to determine the significance of gain score in pretest and posttest of writing a quality research proposal.

The Wilcoxon test found the $Z_{count} < Z_{table}$ ($-5.519 < -1.960$), and $p\text{-value} > \alpha$ ($0.000 < 0.050$), then H_0 is declined and has significant difference in gain score of pretest and post-test. Table 7 showed significant improvement in writing a quality research proposal of the control group in pretest and post-test.

1.3.4. Quality of research proposal in the control group

Table 7. The gain score result of the control group

	Gain Score	St dev.
Pretest	71.0750	3.14918
Posttest	77.2250	2.70316
Zcount	= -5.174	
Ztable	= 1.960	
p-value t	= 0.000	

2. Comparison test of gain score between groups

The test was conducted using the paired t-test. Normality test was used the Kolmogorov Smirnov with $p\text{-value} > \alpha$ ($\alpha = 0.05$) for data can be defined as normal. Homogeneity test used Levene test with $p\text{-value} > \alpha$ ($\alpha = 0.05$). The Mann Whitney test if the result did not meet the assumption.

2.1. Normality test

The normality test was used to determine the variable distribution before processed to the next test. The hypothesis of normality is shown as follows.

- H_0 : Data is normally distributed
- H_1 : Data is not normally distributed

Kolmogorov Smirnov test was used to test the assumption. H0 will be accepted with a significant

> 0.05 or declined with a significant < 0.05. The result is shown in the following table 8.

Table 8. Normality test result

Variables	Statistic	sig.
Creative thinking skill of the experimental group	0.184	0.002
Creative thinking skill of the control group	0.239	0.000
Writing quality research proposal of the experimental group	0.114	0.200*
Writing quality research proposal of the control group	0.155	0.017

Table 8 showed that the gain score of writing a quality research proposal in the experimental group was normally distributed with a significance > 0.05. However, the gain score for the creative thinking in the experimental and control group, as well as writing a quality research proposal in the control group, were not normally distributed with a significance < 0.05. Furthermore, the homogeneity of variance between groups was tested on each variable.

2.2. Homogeneity of variance test

The homogeneity test was used to find out the homogeneity of variance between data groups. The hypothesis test is shown as follows.

- H0 : Variance data is homogeneous
- H1 : Variance data is not homogeneous

Levene test was used to test the assumption. H0 will be accepted with a significant > 0.05 or declined with a significant < 0.05. The result is shown in the following table 9.

Table 9. Homogeneity test result

Variables	Statistic	sig.
Creative thinking skill	3.524	0.064*
Writing a quality research proposal	1.799	0.184*

Table 9 showed the homogeneity of variance test result in the creative thinking and writing a quality research proposal with a significance value > 0.05.

The data did not meet the assumption of normality and homogeneity test. Mann Whitney test was used to measure the gain score of creative thinking and writing a quality research proposal in the experimental and control group.

2.3. Mann Whitney Hypothesis test

The hypothesis test used is shown as follows.

- H0 : There is no significant difference between pretest and posttest on the measured variables
- H1 : There is a significant difference between pretest and posttest on the measured variables

The measurement criteria are shown as follows.

- Zcount <- Ztable, and p-value < 0.05, the H0 is declined;
- Zcount <- Ztable, and p-value > 0.05, the H0 is accepted.

2.3.1. Variable of Creative Thinking

Table 10. The gain score result of creative thinking

	Gain Score	St dev.
Experimental	71.3500	2.93126
Control	85.9750	3.43800
Zcount	= -6.339	
Ztable	= 1.960	
p-value t	= 0.000	

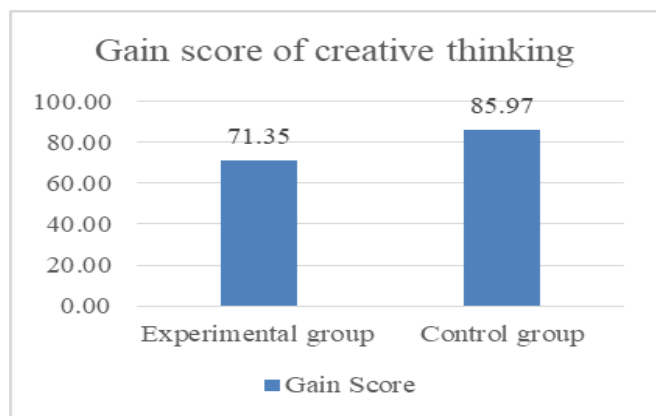


Figure 6. The gain score of creative thinking

Table 10 showed that the gain score of creative thinking in the experimental group was 14.63 ± 4.37 higher than the control group of $.55 \pm 3.14$. The Mann Whitney test was used to determine the gain score of creative thinking in the experimental and control group.

The Mann Whitney test found the $Z_{count} < Z_{table}$ ($-6.469 < -1.960$), and $p\text{-value} > \alpha$ ($0.000 < 0.050$), then H_0 is declined and has a significant difference in gain score of experimental and control groups. Table 10 showed significant improvement in the gain score of creative thinking in the experimental and control group.

2.3.2. Variable of writing a quality research proposal

Table 11. The gain score result of writing a quality research proposal

	Gain Score	St dev.
Experimental	13.8250	4.31983
Control	6.1500	3.64129
Zcount	= -6.339	
Ztable	= 1.960	
p-value t	= 0.000	

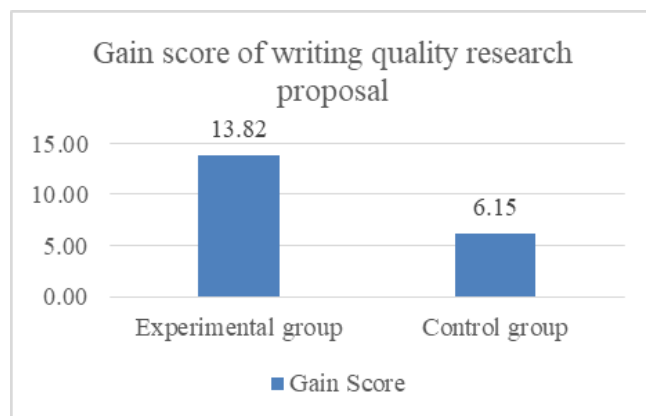


Figure 7. The gain score result

Table 11 showed the gain score of writing a quality research proposal in the experimental group was 13.83 ± 4.32 higher than the control group of 6.15 ± 3.64 . The Mann Whitney test was used to determine the gain score of writing a quality research proposal in the experimental and control group.

The Mann Whitney test found the $Z_{count} < Z_{table}$ ($-6.469 < -1.960$), and $p\text{-value} > \alpha$ ($0.000 < 0.050$), then H_0 is declined and has a significant difference in gain score of experimental and control groups. Table 11 showed significant improvement in the gain score of writing a quality research proposal in the experimental and control group.

Discussions

The research was conducted at the PjBL_LC with project learning and learning communities to improve creative thinking and writing quality research proposals. The effectiveness of research results showed that creative thinking and the quality in writing research proposals have increased through the implementation of PjBL_LC. It is indicated by the average score of PjBL_LC learning that showed the highest value compared to groups studying with conventional learning. It is supported by previous research that showed that PjBL integrated with the learning community can help students to share knowledge and improve learning outcomes [48], [67].

Writing a research proposal is needed to learn, along with project learning. Through projects,

students are challenged to provide something innovative. Projects are assessed with instruments that supported creative thinking development. It is supported by Isabekov & Sadyrova, [37] stated that project learning could improve innovative thinking skills. Furthermore, research by Amin et al. [2] and Gencer & Gonen [50] also stated that project learning could develop critical and creative thinking skills. It means that students learn to think constructively while completing a project [38], [60], [68]. Students also get instructions in the syllabus and curriculum to understand the assignment and learning process. Students have studied a research proposal from the basics to provide an in-depth understanding and lead to a good understanding and creative thinking skills.

Writing a research proposal assisted by the learning community positively impacts students to improve creative thinking skills. It can be seen from the many creative ideas that students produce through research proposals. Also, it is supported by Van-Ekenlenburg [69], and Alsaleh [55] stated that students learn a lot outside the classroom when writing research proposals. In this case, students learn to observe environmental conditions, thus giving students more sensitivity and the emergence of new ideas to solve problems [51], [70], [71]. The findings have a significant impact on educators by giving students' choices and encouraging students to get out of their comfort zone to generate new ideas. It can make students ready and more confident in facing their final project of writing a thesis as the graduation requirement through creative thinking.

The creative thinking ability is increased by finding innovative ideas and solutions in writing research proposals. Students working on projects through the learning community can also develop communication and collaboration skills. The ability is important in 21st-century learning [51], [54], [72]. Completing the learning community project allows students to respect each other's opinions [73]. It supports students' success in achieving their goals and can increase students' persistence in completing projects [62]. The findings of this study are also supported by

Stefanou [47] stated that learning through the learning community makes students have good academic and social attitudes. Also, stated by Hwang [74] that creative thinking could develop by increasing students' ability to elaborate on several opinions. Learning communities allowed students to think more flexibly, thus supporting creative thinking skills [75].

In completing a research proposal, the learning community provided students with the opportunity to consult fellow students or seniors at university. Most of the students showed the efficiency of asking questions and sharing knowledge [45], [70]. Students do not hesitate to ask for help from friends and seniors to solve problems in writing a research proposal [2]. In this case, fellow students are the most appropriate option to learn from each other and share their knowledge and experience.

Students must be actively involved in every learning activity in writing research proposals. It is aligned with previous research expressed by Kemp [76] and Thoonen et al. [77], stated that Learning Community could increase student activity in the learning process, increase student involvement, and increase student enthusiasm. Student involvement in learning activities gives students the freedom to determine their learning conditions. Independence in learning can provide students with confidentiality and high motivation to participate in learning activities [67], [71]. Freedom in learning together with peers can support learning success [52].

Learning communities could improve learning outcomes. In this study, the intended learning outcome was writing a research proposal as the final result of the geography research methodology lecture. It is supported by Watkins [46] and Chang [63] stated that the learning community supports the achievement of student learning outcomes. The learning process has two important elements to achieve success when learning through groups: focus and collaboration [67]. Learning through the learning community ensured that students focus on the learning objectives mutually agreed upon by the lecturers and students.

Projects taken by students and learning communities demonstrated that the creative thinking and ability in writing quality research proposals are better than groups that are just implemented with project learning without the support of a learning community or conventional learning classes. Creating a research proposal writing project requires students to seek experience and knowledge as much as possible [47], [55]. In the learning community, lecturers must create learning by appreciating each student's contribution, relationship, and implications for learning objectives [62]. Students who learn in a learning community showed various qualities, as demonstrated by the environment, age, culture, preferred learning method, and abilities. Research Kemp [76] supports the findings of this study by stating that in community learning, students can collaborate on knowledge based on different backgrounds to increase learning confidence and shorten learning time by allowing students to accept each other's diversity. Based on the research results, it can be concluded that PjBL_LC can improve creative thinking skills and writing quality research proposals.

Although the results showed a positive relationship between the model, including the syntax that supports the improvement of creative thinking skills and writing research proposals, there are still some gaps in the relationship. Students' comfort levels in conversations continue to be an issue in implementing learning in the learning community. Lecturers must pay attention to the details of the discussion process between students, especially for heterogeneous students. The lecturers' attention to students also affects the project's running well [51].

Conclusion

The results showed a significant difference between the creative thinking skills and writing a quality research proposal of students using PjBL_LC and conventional learning. The results also showed that using Project-Based Learning_Learning Community (PjBL_LC) could

improve creative thinking and quality of research proposals compared to conventional learning. It can be seen in the average score of students learning using PjBL_LC, which is higher than using conventional learning. Based on the research, it can be concluded that PjBL_LC is one of the right choices for developing creative thinking and ability in proposal writing. PjBL_LC can be applied at the higher education level, but it does not rule out the possibility that other researchers can develop it at other educational levels.

Limitations and Future Studies

Further development is needed regarding the implementation of PjBL_LC for different educational levels related to treatment. Researchers suggest that PjBL be implemented in students with various backgrounds and groups is divided into heterogeneous conditions. Thus, the university must implement it practically and integrate it into the learning curriculum. The research is limited to two variables studied: creative thinking and writing a quality research proposal. Therefore further research is needed to analyze other factors that can influence PjBL_LC learning.

Acknowledgement

The authors thank the Department of Geography, Faculty of Social Sciences, Malang State University for the opportunity given to researchers to conduct research. The author affirms that there is no conflict of interest in writing articles.

References

- [1] I. Madyani, S. Yamtinah, S. B. Utomo, S. Saputro, and L. Mahardiani, (Feb. 2020). "Profile of Students' Creative Thinking Skills in Science Learning," pp. 957–964. doi: 10.2991/assehr.k.200129.119.
- [2] S. Amin, S. Sumarmi, S. Bachri, S. Susilo, and A. Bashith, (Oct. 2020). "The Effect of Problem-Based Hybrid Learning (PBHL) Models on Spatial Thinking Ability and Geography Learning Outcomes," *International Journal of Emerging Technologies in Learning (iJET)*, vol. 15, no. 19, Art. no. 19.
- [3] R. Sari, S. Sumarmi, I. Astina, D. Utomo, and R. Ridhwan, (2019). "Measuring students scientific learning perception and critical thinking skill using

- paper-based testing: school and gender differences,” *International Journal of Emerging Technologies in Learning (IJET)*, vol. 14, no. 19, Art. no. 19, doi: 10.3991/ijet.v14i19.10968.
- [4] B. B. Yazar Soyadı, (Dec. 2015). “Creative and Critical Thinking Skills in Problem-based Learning Environments,” *JGEDC*, vol. 2, no. 2, pp. 71–71, doi: 10.18200/JGEDC.2015214253.
- [5] M. A. Runco and S. Acar, (2012) “Divergent thinking as an indicator of creative potential,” *Creativity research journal*, vol. 24, no. 1, Art. no. 1, doi: 10.1080/10400419.2012.652929.
- [6] S. Marni, M. Aliman, Suyono, Roekhan, and T. Harsiati, (Dec. 2020). “Students’ Critical Thinking Skills Based on Gender and Knowledge Group,” *Journal of Turkish Science Education*, vol. 17, no. 4, Art. no. 4.
- [7] S. Wechsler, (2006). “Validity of the Torrance Tests of Creative Thinking to the Brazilian culture,” *Creativity research journal*, vol. 18, no. 1, Art. no. 1, doi: 10.1207/s15326934crj1801_3.
- [8] R. J. Sternberg, (2003). “Creative thinking in the classroom,” *Scandinavian Journal of Educational Research*, vol. 47, no. 3, Art. no. 3, doi: 10.1080/00313830308595.
- [9] T. Y. E. Siswono, (2011). “Level of student’s creative thinking in classroom mathematics,” *Educational Research and Review*, vol. 6, no. 7, pp. 548–553.
- [10] R. Lince, (2016). “Creative Thinking Ability to Increase Student Mathematical of Junior High School by Applying Models Numbered Heads Together,” *Journal of Education and Practice*, vol. 7, no. 6, pp. 206–212.
- [11] A. Alghafri and H. Ismail, (2014). “The Effects of Integrating Creative and Critical Thinking on Schools Students’ Thinking,” *International Journal of Social Science and Humanity*, vol. 4, no. 6, pp. 518–525, doi: 10.7763/IJSSH.2014.V4.410.
- [12] D. K. Sari, A. Permasari, and F. M. T. Supriyanti, (2017). “Profile of Students’ Creative Thinking Skills on Quantitative Project-Based Protein Testing using Local Materials,” *Jurnal Pendidikan IPA Indonesia*, vol. 6, no. 1, Art. no. 1, doi: 10.15294/jpii.v6i1.9516.
- [13] E. F. Eshun and K. Amoako-Agyeman, (2016). “Measuring Creativity with Divergent Thinking Tasks: Communication Design Students’ Experience,” *International Journal of Innovation*, vol. 2, no. 4, p. 23.
- [14] E. Papaleontiou-Louca, D. Varnava-Marouchou, S. Mihai, and E. Konis, (2014). “Teaching for Creativity in Universities,” *JEHD*, vol. 3, no. 4, doi: 10.15640/jehd.v3n4a13.
- [15] R. K. Sawyer, (2006). “Educating for innovation,” *Thinking skills and creativity*, vol. 1, no. 1, Art. no. 1, doi: 10.1016/j.tsc.2005.08.001.
- [16] A. S. Hosseini, (Jan. 2011) “University student’s evaluation of creative education in universities and their impact on their learning,” *Procedia - Social and Behavioral Sciences*, vol. 15, pp. 1806–1812, doi: 10.1016/j.sbspro.2011.04.007.
- [17] S. M. Ritter, X. Gu, M. Crijns, and P. Biekens, (2020). “Fostering students’ creative thinking skills by means of a one-year creativity training program,” *PloS one*, vol. 15, no. 3, Art. no. 3, doi: 10.1371/journal.pone.0229773.
- [18] L. Nurlaela, (Feb. 2015). “Developing Creative Thinking Skills in Learning at Higher-Educational Institution of Teacher,” pp. 114–119. doi: 10.2991/ictvet-14.2015.26.
- [19] Y. Wu, (2018). “A hybrid deep learning based traffic flow prediction method and its understanding,” *Transportation Research Part C: Emerging Technologies*, vol. 90, no. Query date: 2020-06-14 16:26:32, pp. 166–180, doi: 10.1016/j.trc.2018.03.001.
- [20] T. Seechaliao, (2017). “Instructional strategies to support creativity and innovation in education.” *Journal of Education and Learning*, vol. 6, no. 4, Art. no. 4, doi: 10.5539/jel.v6n4p201.
- [21] M. Davies, (2011). *Study Skills for International Postgraduates*, 2011th edition. Houndmills, Basingstoke, Hampshire ; New York: Red Globe Press.
- [22] S. Sujito, (2017). “Peningkatan Kemampuan Menulis Proposal Melalui Penggunaan Strategi Jigsaw Pada Siswa Kelas Xi Ipa Sma Negeri 1 Bancar Semester Gasal Tahun Pelajaran 2017-2018 (Improvement of Proposal Writing Ability Using the Jigsaw Strategy for Class XI IPA Students of SMA Negeri 1 Bancar for 2017-2018 Academic Year),” *PENTAS: Pendidikan Bahasa dan Sastra Indonesia*, vol. 3, no. 1, Art. no. 1.
- [23] S. Ahmed, (Nov. 2015). “Rhetorical Organization of Tourism Research Article Abstracts,” *Procedia - Social and Behavioral Sciences*, vol. 208, pp. 269–281, doi: 10.1016/j.sbspro.2015.11.203.
- [24] E. B. V. Lacum, M. A. Ossevoort, and M. J. Goedhart, “A Teaching Strategy with a Focus on Argumentation to Improve Undergraduate Students’ Ability to Read Research Articles,” *CBE Life Sci Educ*, vol. 13, no. 2, pp. 253–264, 2014, doi: 10.1187/cbe.13-06-0110.
- [25] L. M. Rababah, A. H. Mohamed, M. T. Jdaitaw, and N. Z. B. Melhem, (2013). “The level of creativity in English writing among Jordanian secondary school students,” *Arts and Design Studies*, vol. 10, pp. 25–29.
- [26] S. M. Sidik, (2005). *How to Write a Research Proposal*, 3rd ed., vol. 13. The Family Physician.
- [27] R. T. Abdulai and A. Owusu-Ansah, (Jul. 2014). “Essential Ingredients of a Good Research Proposal for Undergraduate and Postgraduate Students in the Social Sciences,” *SAGE Open*, vol. 4, no. 3, p. 2158244014548178, doi: 10.1177/2158244014548178.
- [28] X. Wang and L. Yang, (2012). “Problems and strategies in learning to write a thesis proposal: A study of six MA students in a TEFL program,” *Chinese Journal of Applied Linguistics*, vol. 35, no. 3, Art. no. 3.
- [29] A. Asmawan, (Feb. 2017). “Analisis Kesulitan Mahasiswa Menyelesaikan Skripsi. Jurnal Pendidikan Ilmu Sosial (Analysis of Students’ Difficulties in Completing Thesis),” *Jurnal Pendidikan Ilmu Sosial*, vol. 26, no. 2, Art. no. 2, doi: 10.23177/jpis.v26i2.3331.

- [30] S. H. Stapa, T. N. R. T. M. Maasum, and M. S. A. Aziz, (Feb. 2014). "Identifying Problems in Writing Thesis Introductions in Research Methodology Class," *Procedia - Social and Behavioral Sciences*, vol. 112, pp. 497–502, doi: 10.1016/j.sbspro.2014.01.1194.
- [31] S. Zubaidah, N. M. Fuad, S. Mahanal, and E. Suarsini, (Dec. 2017). "Improving Creative Thinking Skills of Students through Differentiated Science Inquiry Integrated with Mind Map," *Journal of Turkish Science Education*, vol. 14, no. 4, Art. no. 4.
- [32] A. Fatchan, H. Soekamto, Sumarmi, and S. Utaya, (May 2016). "Effect of Learning 'Outdoor Study' Ability to Communicate in Writing and Social-Geography Student Learning Outcomes at 'Mataraman' East Java-The Republic of Indonesia*," *Mediterranean Journal of Social Sciences*, vol. 7, no. 3, Art. no. 3, doi: 10.5901/mjss.2016.v7n3p429.
- [33] R. C. I. Prahmana, (Sep. 2017). "The Role of Research-Based Learning to Enhance Students' Research and Academic Writing Skills," *Journal of Education and Learning*, pp. 351–366, doi: 10.11591/edulearn.v11i3.5871.
- [34] M. Inthachot, S. Sopeerak, and N. Rapai, (Nov. 2013). "The Development of a U-learning Instructional Model Using Project based Learning Approach to Enhance Students' Creating-innovation Skills," *Procedia - Social and Behavioral Sciences*, vol. 103, pp. 1011–1015, doi: 10.1016/j.sbspro.2013.10.426.
- [35] R. M. Sari, S. Sumarmi, D. H. Utomo, and I. K. Astina, (2019). "Geography Teachers Perception on the Implementation of Mind Map on Scientific Approach," in *1st International Conference on Social Knowledge Sciences and Education (ICSKSE 2018)*, pp. 125–131. doi: 10.2991/icskse-18.2019.24.
- [36] A. Baidowi, S. Sumarmi, and A. Amirudin, (Jan. 2015). "Pengaruh Model Pembelajaran Berbasis Proyek terhadap Kemampuan Menulis Karya Ilmiah Geografi Siswa SMA," *JPG*, vol. 20, no. 1, pp. 48–58, doi: 10.17977/um017v20i12015p048.
- [37] A. Isabekov and G. Sadyrova, (2018). "Project-Based Learning to Develop Creative Abilities in Students," in *Vocational Teacher Education in Central Asia: Developing Skills and Facilitating Success*, J. Drummer, G. Hakimov, M. Joldoshev, T. Köhler, and S. Udartseva, Eds. Cham: Springer International Publishing, pp. 43–49. doi: 10.1007/978-3-319-73093-6_4.
- [38] W. Y. Silviariza and B. Handoyo, (Jan. 2020). "Spatial-Problem Based Learning (SPBL) Development (Preliminary Studies for Geography Learning)," *Jurnal Pendidikan Geografi: Kajian, Teori, dan Praktek dalam Bidang Pendidikan dan Ilmu Geografi*, vol. 25, no. 1, pp. 69–79.
- [39] Dhundi Raj Giri, (Aug. 2016). "Project-Based Learning as 21st Century Teaching Approach: A Study in Nepalese Private Schools," *UCER-A*, vol. 6, no. 8, pp. 487–497, doi: 10.17265/2161-623X/2016.08.004.
- [40] S. P. Devkota, D. R. Giri, and S. Bagale, (2017). "Developing 21st Century Skills Through Project-Based Learning in EFL Context: Challenges and Opportunities," *The Online Journal of New Horizons in Education*, vol. 7, no. 1, p. 6.
- [41] J. Ravitz, (2010). "Beyond changing culture in small high schools: Reform models and changing instruction with project-based learning," *Peabody Journal of Education*, vol. 85, no. 3, Art. no. 3, doi: 10.1080/0161956x.2010.491432.
- [42] D. T. Widayati *et al.*, (2010). *Pedoman Umum Pembelajaran Berbasis Riset (General Guidelines for Research-Based Learning)*. Yogyakarta: UGM Press.
- [43] F. Dingyoudi, J.-W. Strijbos, and M. F. de Laat, (Sep. 2019). "Value creation: What matters most in Communities of Learning Practice in higher education," *Studies in Educational Evaluation*, vol. 62, pp. 209–223, doi: 10.1016/j.stueduc.2019.05.006.
- [44] L. Xu and L. J. Zhang, (2019). "L2 doctoral students' experiences in thesis writing in an English-medium university in New Zealand," *Journal of English for Academic Purposes*, vol. 41, p. 100779, doi: 10.12973/tused.10214a.
- [45] I. W. S. Putri, D. Trapsilasiwi, H. Hobri, E. Oktavianingtyas, L. N. Safrida, and N. Aini, (Apr. 2019). "Creative thinking skill with adversity quotient based on lesson study for learning community," *J. Phys.: Conf. Ser.*, vol. 1211, p. 012110, doi: 10.1088/1742-6596/1211/1/012110.
- [46] C. Watkins, (2005). "Classrooms as learning communities: A review of research," *London Review of Education*, vol. 3, no. 1, Art. no. 1, doi: 10.1080/14748460500036276.
- [47] C. R. Stefanou and J. D. Salisbury-Glennon, (2002). "Developing motivation and cognitive learning strategies through an undergraduate learning community," *Learning Environments Research*, vol. 5, no. 1, Art. no. 1, doi: 10.1023/A:1015610606945.
- [48] K. E. Freeman, S. T. Alston, and D. G. Winborne, (2008). "Do Learning Communities Enhance the Quality of Students' Learning and Motivation in STEM?," *The Journal of Negro Education*, vol. 77, no. 3, pp. 227–240.
- [49] R. I. Segundo Marcos, V. López Fernández, M. T. Daza González, and J. Phillips-Silver, (Jun. 2020). "Promoting children's creative thinking through reading and writing in a cooperative learning classroom," *Thinking Skills and Creativity*, vol. 36, p. 100663, doi: 10.1016/j.tsc.2020.100663.
- [50] A. A. Gencer and M. Gonen, (May 2015). "Examination of The Effects of Reggio Emilia Based Projects on Preschool Children's Creative Thinking Skills," *Procedia - Social and Behavioral Sciences*, vol. 186, pp. 456–460, doi: 10.1016/j.sbspro.2015.04.120.
- [51] R. Ridhwan, S. Sumarmi, I. N. Ruja, D. H. Utomo, and R. M. Sari, (Jul. 2020). "Measuring Students Environmental Problem Solving Ability Across Gender and School Differences Using Paper Based Testing," *International Journal of Emerging Technologies in Learning (iJET)*, vol. 15, no. 13, Art. no. 13.

- [52] A. Rahardjanto, (2019). "Hybrid-PjBL: Learning Outcomes, Creative Thinking Skills, and Learning Motivation of Preservice Teacher.," *International Journal of Instruction*, vol. 12, no. 2, Art. no. 2, doi: 10.29333/iji.2019.12212a.
- [53] C.-S. Lin and R. Y.-W. Wu, (Jul. 2016). "Effects of Web-Based Creative Thinking Teaching On Students' Creativity and Learning Outcome.," *EURASIA J Math Sci Tech Ed*, vol. 12, no. 6, pp. 1675–1684, doi: 10.12973/eurasia.2016.1558a.
- [54] R. M. Sari, S. Sumarmi, I. K. Astina, D. H. Utomo, and R. Ridhwan, (Oct. 2019). "Measuring Students Scientific Learning Perception and Critical Thinking Skill Using Paper-Based Testing: School and Gender Differences.," *International Journal of Emerging Technologies in Learning (iJET)*, vol. 14, no. 19, pp. 132–149, doi: <https://doi.org/10.3991/ijet.v14i19.10968>.
- [55] N. J. Alsaleh, (Jul. 2020). "Flipped classrooms to enhance postgraduate students' research skills in preparing a research proposal.," *Innovations in Education and Teaching International*, vol. 57, no. 4, pp. 392–402, doi: 10.1080/14703297.2019.1647269.
- [56] S. Bailey, (2011). *Academic Writing: A Handbook for International Students*, 3rd edition. London; New York: Routledge.
- [57] J. Defazio, J. Jones, F. Tennant, and S. A. Hook, (Jun. 2010). "Academic Literacy: The Importance and Impact of Writing across the Curriculum--A Case Study.," *Journal of the Scholarship of Teaching and Learning*, vol. 10, no. 2, pp. 34–47.
- [58] N. L. P. N. S. P. Astawa, L. Artini, and P. K. Nitiasih, (2017). "Project-based Learning Activities and EFL Students' Productive Skills in English.," *Journal of Language Teaching and Research*, vol. 8, no. 6, pp. 1147–1155, doi: 10.17507/JLTR.0806.16.
- [59] M. A. Saeed, A. A. M. H. Al-Ahdal, and H. S. A. Qunayeer, (May 2021). "Integrating research proposal writing into a postgraduate research method course: what does it tell us?," *International Journal of Research & Method in Education*, vol. 44, no. 3, pp. 303–318, doi: 10.1080/1743727X.2020.1777963.
- [60] S. Sumarmi, M. Aliman, and T. Mutia, (Jun. 2021). "The effect of digital eco-learning in student worksheet flipbook to environmental project literacy and pedagogic competency.," *Journal of Technology and Science Education*, vol. 11, no. 2, Art. no. 2, doi: 10.3926/jotse.1175.
- [61] A. Habók and J. Nagy, (Jan. 2016). "In-service teachers' perceptions of project-based learning.," *SpringerPlus*, vol. 5, no. 1, p. 83, doi: 10.1186/s40064-016-1725-4.
- [62] R. S. Prawat, (Jan. 1996). "Learning community, commitment and school reform.," *Journal of Curriculum Studies*, vol. 28, no. 1, pp. 91–110, doi: 10.1080/0022027980280105.
- [63] H. Chang, (Nov. 2012). "The development of a learning community in an e-learning environment.," *International Journal of Pedagogies and Learning*, vol. 7, no. 2, pp. 154–161, doi: 10.5172/ijpl.2012.7.2.154.
- [64] Y. B. Nurhadi and A. G. Senduk, (2021). *Pembelajaran Kontekstual dan Penerapannya dalam KBK (Contextual Learning and Its Application in the curriculum)*. Malang: UM Press, 2004. Accessed: Jul. 06, [Online]. Available: https://nanopdf.com/download/pembelajaran-kontekstual_pdf
- [65] M. D. Gall, J. P. Gall, and W. R. Borg, (2006). *Educational Research: An Introduction*, 8 edition. Boston: Pearson.
- [66] E. P. Torrance, (1972). "Predictive validity of the torrance tests of creative thinking.," *The Journal of creative behavior*.
- [67] S. Sumarmi, S. Bachri, L. Y. Irawan, D. B. P. Putra, R. Risnani, and M. Aliman, (Mar. 2020). "The Effect of Experiential Learning Models on High School Students Learning Scores and Disaster Countermeasures Education Abilities.," *Journal for the Education of Gifted Young Scientists*, vol. 8, no. 1, Art. no. 1, doi: 10.17478/jegys.635632.
- [68] M. L. Nation, (Nov. 2008). "Project-Based Learning for Sustainable Development.," *Journal of Geography*, vol. 107, no. 3, pp. 102–111, doi: 10.1080/00221340802470685.
- [69] H. Van Ekelenburg, (Nov. 2010). "The Art of Writing Good Research Proposals.," *Science Progress*, vol. 93, no. 4, pp. 429–442, doi: 10.3184/003685010X12798150447676.
- [70] R. Ridhwan, S. Sumarmi, I. N. Ruja, D. H. Utomo, and R. Sari, (Dec. 2019). "Student Perception on Teaching Materials Development to Increase Students' Knowledge of Aceh's Maritime Potential.," *Journal for the Education of Gifted Young Scientists*, pp. 1295–1309, doi: 10.17478/jegys.618245.
- [71] M. Aliman, Budijanto, Sumarmi, I. K. Astina, R. E. Putri, and M. Arif, (Jun. 2019). "The Effect of Earthcomm Learning Model and Spatial Thinking Ability on Geography Learning Outcomes.," *JBSE*, vol. 18, no. 3, pp. 323–334, doi: 10.33225/jbse/19.18.323.
- [72] S. Amin, S. Utaya, S. Bachri, S. Sumarmi, and S. Susilo, (Jun. 2020). "Effect of Problem Based Learning on Critical Thinking Skill and Enviromental Attitude.," *Journal for the Education of Gifted Young Scientists*, vol. 8, no. 2, Art. no. 2, doi: 10.17478/jegys.650344.
- [73] R. Sari, S. Sumarmi, I. Astina, D. Utomo, and R. Ridhwan, (2021). "Increasing Students Critical Thinking Skills and Learning Motivation Using Inquiry Mind Map.," *International Journal of Emerging Technologies in Learning (iJET)*, vol. 16, no. 3, Art. no. 3, doi: 10.3991/ijet.v16i03.16515.
- [74] S. Y. Hwang, (Feb. 2017). "Rethinking creativity: Present in expression in creative learning communities.," *Educational Philosophy and Theory*, vol. 49, no. 3, pp. 220–230, doi: 10.1080/00131857.2016.1225559.
- [75] B. F. Nabilah, I. N. S. Degeng, W. Kamdi, and Sulton, (Jan. 2021). "The effect of mixed gamification and achievement motivation on concept comprehension and creative thinking skills in learning science.," *Psychology*

and *Education Journal*, vol. 58, no. 1, Art. no. 1, doi: 10.17762/pae.v58i1.1735.

[76] L. Kemp, (2010). "Teaching & Learning for International Students in a 'Learning Community': Creating, Sharing and Building Knowledge," *InSight: A Journal of Scholarly Teaching*, vol. 5, pp. 63–74.

[77] E. E. Thoonen, P. J. Slegers, T. T. Peetsma, and F. J. Oort, (2011). "Can teachers motivate students to

learn?," *Educational studies*, vol. 37, no. 3, Art. no. 3, doi: 10.1080/03055698.2010.507008.