Hybrid-PjBL: Creative thinking skills and self-regulated learning of pre-service teachers

N E Zakiah¹ and D Fajriadi²,³

¹Program Studi Pendidikan Matematika, Universitas Galuh, Jl. R. E Martadinata No. 150, Ciamis 46274, Indonesia
²Magister Pendidikan Matematika, Universitas Siliwangi, Jl. Siliwangi No. 24, Tasikmalaya 46115, Indonesia
³SMK Negeri 2 Ciamis, Jl. Sadananya No. 21, Ciamis, 46214, Indonesia

*Corresponding author’s email: nureva.math@gmail.com

Abstract. This study aims to describe creative thinking skills and self-regulated learning of pre-service teachers who participated in Hybrid-PjBL learning activities. The research design used a single-case study (one-shot case study). This study used quantitative descriptive with data in the form of a creative thinking scale, creative thinking ability tests, and self-regulated learning questionnaires. Data analysis used descriptive statistics. The results showed that the application of Hybrid-PjBL to students’ creativity had a very high category; students’ creative thinking abilities had a high category, with the construct of students’ creative thinking abilities comes from innovative factors; and self-regulated learning students had a positive attitude. This indicates that the Hybrid-PjBL learning model can develop students’ creative thinking skills and self-regulated learning with satisfactory results. This study contributes to the study of literature as an alternative learning model relevant to the demands of the twenty-first-century scheme.

1. Introduction

Individuals who have various life skills and thinking skills will be able to compete in life [1, 2]. Efforts can be made to develop these skills through higher education. The functions of higher education include innovative, responsive, creative, skilled, competitive, and cooperative skills.

Students who have attended higher education are expected to have competencies including attitudes, knowledge, and skills following the Indonesian National Qualification framework. Such competencies can make decisions based on the analysis of information and data, able to choose a variety of alternative solutions, able to utilize IPTEKS in the field of expertise, and able to adapt to the situation faced [3, 4]. This suggests that the ability of creative thinking, a good attitude in resolving problems, as well as information and communication technologies should be integrated into learning.

Students who have creative thinking skills will be able to be flexible, be able to see opportunities, be able to face challenges in a rapidly growing world, and be able to digest the information they get from different perspectives [5, 6]. Students with creative thinking skills can be identified, including fluency, flexibility, originality, and elaboration [7]. One aspect that can develop students’ creative thinking is self-regulated learning. Individuals who can organize and manage their thoughts, emotions, behaviors, and environment will have academic achievement [8, 9].

The learning process is expected to improve creative thinking and students’ self-regulated learning. Thus, in designing learning it is necessary to choose and use a learning model with attention to material
characteristics, availability of learning media, the mental and physical development of students [10]. Potential learning models develop students’ ability to produce creative and contextual work, both individual and group using project-based learning (PjBL) [4]. PjBL has a positive impact on learning outcomes and creative thinking skills [11, 12]. Besides, project-based learning models are suitable for 21st-century competencies [13].

Internet use should be integrated into higher education systems [14]. The use of information and communication technology in learning activities impacts the student’s learning process and outcomes. Computer-assisted learning can improve interactive and communicative aspects [15]. A learning model that leverages the use of technology is hybrid learning. Hybrid Learning combines the process of delivering learning content through online, offline, mobile, with regular, effective, face-to-face learning [16]. A range of studies that have successfully implemented hybrid learning and PjBL demonstrate that PjBL can develop students’ metacognitive awareness effectively, and has a positive impact on the development of student thinking skills [17, 18]. Subsequent research shows that Hybrid-PjBL has a significant influence on achieving learning outcomes and creative thinking skills. Hybrid-PjBL is a learning alternative, according to the demands of the twenty-first century [11].

Hybrid-PjBL is a modification of learning using electronic facilities that will make students engage actively and independently in the learning process, and students will be accustomed to collaborating and communicating. Research on the application of Hybrid-PjBL is still rarely used by some researchers in Indonesia and studies are still limited to the effects of this model on student’s thinking skills and metacognitive awareness. Thus, the study aims to examine the effectiveness of the Hybrid-PjBL implementation of creative thinking and student learning independence.

2. Methods
The research method used a pre-experimental method with single-case study design (one-shot case study). The subject of the research is a group of preservice teacher students of Mathematics Education Department of the fourth semester in the academic year of 2018-2019. The sample of the research was selected by using purposive sampling. The samples of the research were students of A class consisting of 16 students, who took the course on teaching and learning strategies.

Data collection was obtained from a creative thinking scale, creative thinking skills tests, and self-regulated learning questionnaires. The measurement of creativity was adapted from Sari [19], consisted of planning, implementation, and reporting activities. Measurement of creative thinking skills used a model adapted from Krumm [20]. In this model, the innovative factors were composed of the fluency and originality abilities. The adaptive factors were composed of the elaboration, abstractness of titles, and resistance to premature closure abilities.

The criteria for evaluating creativity are presented in Table 1.

| %     | Criteria  |
|-------|-----------|
| 81 – 100 | Very high |
| 61 – 80  | High      |
| 41 – 60  | Medium    |
| 21 – 40  | Low       |
| 1 – 20   | Very low  |

The measure of the self-regulated learning questionnaire consisted of used 30 items adapted from De Beni [21]. The aspects of self-regulated learning that were measured, namely organization, elaboration, self-evaluation, strategies for learning for exams, and metacognition. For each aspect, it consists of six statements, three positive statements, and three other negative statements.

The scale used in this study is a Likert scale consisted of items with degrees (1) strongly disagree; (2) disagree; (3) agree; and (4) strongly agree. Furthermore, the way to determine the student attitude classification is if the average student score is greater or equal to the average neutral score, the attitude
of students is included in the positive category. Whereas if the average student score is less than the average neutral score, then student attitudes included negative categories [22].

The implementation of the Hybrid-PjBL learning activities in this study using the modified models from Putra [23], namely asynchronous virtual collaboration. This learning is collaborative involving the interaction between lecturers and students who are delivered at different times. The facilities used in this learning activity were online discussion boards. Internet facilities were used in learning activities, but there were still more face-to-face activities between students and teachers. The internet in this model was used as a support during learning, for example during project assignments, the teacher recommends that students look for project material with the internet and then present it.

Students who learn under Hybrid-PjBL carry out project activities with the theme “Making Teaching Materials Using Technology”. Students are divided into two groups to carry out their project activities. The project undertaken by students is to make teaching materials using local wisdom problems in Ciamis Regency. Students make learning videos and student worksheets. Then the results of the project are presented as part of the learning simulation activities.

3. Result and Discussion
3.1. Creativity
The data obtained in this study is creativity, creative thinking skills, and self-regulated learning of preservice teachers who participated in Hybrid-PjBL learning activities. Creative thinking scales are used to know information about student creativity based on the product results that have been presented in class. The average student's creativity can be seen in Table 2.

| No. | Aspects observed | Average | Category |
|-----|------------------|---------|----------|
| 1   | Planning         | 86      | Very high|
| 2   | Implementation   | 88      | Very high|
| 3   | Reporting        | 78      | High     |
|     | The average percentage of students creativity | 84 | Very high |

In Table 2, an overview of student's creativity is provided in making teaching materials using technology. The indicators assessed in the planning aspect are material preparation, material resources and design of the framework. Assessment of planning aspects obtained an average of 86 with a very high category. Indicators assessed on aspects of implementation are work attitudes, ICT use, workmanship, assembly, and finishing. Assessment of implementation aspects obtained an average of 88 with very high categories. Indicators that are assessed on the reporting aspects are the performance and suitability of the products produced. Assessment of reporting aspects obtained an average of 78 with a high category. From the results of observations of products with a scale of creative thinking scale, it is known that student creativity through Hybrid-PjBL learning is in a very high category with an average of 84. Creativity is defined as a high-level human ability or skill to think of something new [24]. This indicates that the Hybrid-PjBL learning model can develop student creativity with satisfactory results.

3.2. Creative Thinking Skills
Creative thinking skills in this study are reviewed from two factors, namely innovative and adaptive. Innovative factors consist of fluency and original. Adaptive factors consist of elaboration, abstractness, and resistance to premature closure abilities [25, 26]. Flexibility and adding abstractness of titles, and resistance to premature closures as an initial step an individual can remain open, acknowledge ambiguity and thus produce creative responses [27]. The high score on the creative thinking test is likely that individuals will behave in creative ways, even though creative behavior is not evidenced by its creative ability [28]. Therefore, the creativity information of the students above was followed up by measuring creative thinking by using tests. Data analysis using descriptive statistics. Description of creative thinking skills can be seen in Table 3.
### Tabel 3. Description of creative thinking skills

| Factor | Abilities                  | Average  | Category |
|--------|----------------------------|----------|----------|
| Innovative | Fluency                  | 92.25    | Very high |
|         | Originality               | 86       | Very high |
| Adaptive | Elaboration               | 78.25    | High     |
|         | Abstractness of titles    | 73.5     | High     |
|         | Resistance to premature closure | 68.75 | High     |

The average percentage of students’ creative thinking abilities is 79.75. Then the average creative thinking skills based on innovative factors are greater than adaptive. This suggests that establishing a student’s creative thinking skills come from innovative factors. Individuals with more innovative styles are present to respond quickly [25, 29].

#### 3.3 Self-Regulated Learning

The results of research on self-regulated learning were obtained from a self-regulated learning questionnaire. The self-regulated learning indicators used in this study were organization, elaboration, self-evaluation, strategies for learning for exams, and metacognition. Data were analyzed using descriptive statistics. The description of the self-regulated learning presented in Table 4.

| Table 4. Description of the self-regulated learning scale |
|-------------|---------------|----------|
| Indicator   | Average       | SD       |
| Organization| 3.44          | 0.51     |
| Elaboration | 3.38          | 0.72     |
| Self-evaluation | 3.25   | 0.58     |
| Strategies for studying for an exam | 3.31 | 0.70 |
| Metacognition | 3.13         | 0.81     |

Based on Table 4, it is known that on average each self-regulated learning indicator is not much different. The results of this study are in line with research that states that independent students see learning as a process of control. They constantly plan, organize, monitor, and evaluate their learning during this process. They set standards or goals to struggle in their learning, monitor their progress towards that goal, and then adjust and regulate cognition, motivation, and behavior to achieve their goals [30]. Further based on the study has investigated the role of emotions, self-regulated learning, and motivation together as a predictor of academic achievement [9].

Scoring on self-regulated learning scale answer options is 1, 2, 3, and 4. Further description of the process of determination of the neutral score adapted from Zakiah and Sunaryo [31], and the classification of students’ attitudes adapted from Suherman and Kusumah [22].

Having done learning using Hybrid-PjBL acquired the results that self-regulated learning students have positive criteria, characterized by: (a) students are able to make academic time management; (b) students are able to summarize study materials; (c) students are able to involve a high level of self-awareness and ability to monitor self-study; (d) students are able to involve behaviors such as monitoring college understanding; and (e) students are able to identify, monitor, evaluate their thoughts.

Attitudes have a dynamic nature, meaning it does not escape the change. Some aspects that can last for a certain period of time, but some can change according to the situation for a moment [31]. Furthermore, to obtain more satisfactory results need to be performed in a relatively long period of time.
In Hybrid-PjBL learning students build knowledge based on their learning experience. Learning by doing has great benefits in shaping the habit of learning. So that students have a high-quality experience. In addition, providing contextual problems in everyday life can help students understand the material [32]. Hybrid-PjBL is an effective and compliant approach to Dewey’s philosophy, which many educators have learned. It is in line according to Rahardjanto showed that the application of Hybrid-PjBL had a significant influence on the achievement of learning outcomes and creative thinking skills [11].

The learning theory underlying Hybrid-PjBL learning is constructivism, from Piaget. Knowledge is human thought. Humans build their knowledge through interactions with objects, phenomena, experiences and their environment. Knowledge cannot be transferred from someone to others without understanding the context [33]. Knowledge is built in the minds of students, not obtained passively by someone [34]. The cognitive theory of Bruner and Gagne sharpen individual students in the aspect of cognitive ability, when studying independently through the website, as well as during classical learning, and the social constructivist (collaborative learning) of Vygotsky. Developing hybrid learning allows researchers to create learning media based on students’ character, learning ability and learning style.

4. Conclusion
The results of this study show that the creativity of students participating in Hybrid-PjBL learning activities had a very high category, students’ creative thinking skills include a high category, and students’ self-regulated learning has a positive attitude. The students’ creative thinking skills in this research are derived from innovative factors, namely aspects of fluency and originality. Individuals with innovative styles will respond quickly. Project implementation encourages students to engage in innovation in creating teaching materials using technology. This provides students with opportunities for collaboration and mutual communication. So it will improve students’ creative thinking skills and self-regulated learning.

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