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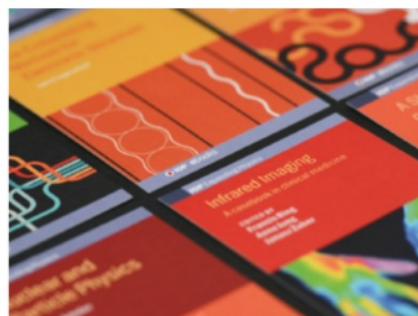
Review of learning strategies to improve creative thinking skills

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Abstract. Creative thinking skills are one of the 21st century skills pursued in science learning. This study aims to analyze learning strategies that have been studied to improve students' creative thinking skills. To achieve this goal, a meta-analysis was conducted on the results of research on students' creative thinking skills that had been published in scientific journals from 2012 to 2018. A total of 30 relevant articles were obtained. All articles were analyzed using a qualitative approach, by identifying and classifying the objectives and research subjects used as well as learning strategies that had been studied to improve creative thinking skills. The results of the analysis can be concluded that problem-based learning is the most studied model to improve creative thinking skills, especially in senior high school students.

1. Introduction

Education in the 21st century should be able to produce human resources who have the ability to face the challenges of life, because in this century the development and application of science and technology in various fields of life is very rapid and dynamic. Therefore, there are several main competencies that must be possessed by students, including learning and innovating skills, mastering the media and information, and life and career skills[1].

Skills play an important role, so that the Organization of Economic Cooperation and Development stated that skills have become the currency of the 21st century [2]. The term 21st century skill represents an operationalization of important skills needed in the future. These 21st century skills include critical thinking, decision making, problem solving, communicating, collaborating, creative thinking, which are appropriate for producing effective graduates and workers, as well as citizens who can participate in society in the future.

Creative thinking skills are one of the 21st century skills that are important and widely used in life, so the 2013 Indonesia Curriculum also mandates developing those skills. The ability to think creatively is a thought process that creates new ideas widely and in a variety of ways[3]. Quality education involves the activeness of students in learning and training students' creative thinking skills [4]. Therefore, students need to be involved in learning with the aim that they have the opportunity to develop creative thinking skills[5].

Students' thinking skills, however, are still low[6]. There are several factors that cause students' creativity to be low, including: (1) teachers use teaching methods that ignore creative information processing so that students are not confident in exploring their creativity[7]; (2) students often only memorize concepts without knowing the process of finding them; (3) teachers still use conventional learning method so that it causes less interest in students' learning[8]; (4) teachers have difficulties in knowing students' creative thinking skills, because many students are still afraid to try new things [9];

(5) teachers are still not motivated to develop students' creative thinking skills during the learning process[10]; and (6) students often only listen to what is conveyed by the teacher without wanting to issue their ideas[11].

The development of creative thinking skills of students requires an appropriate and effective method, so that the learning process can be more meaningful[12]. The problem is how do learning strategies develop students' creative thinking skills? For this reason, a meta-research approach was carried out with the aim to analyze the results of previous researches on learning strategies that can enhance creative thinking skills.

2. Methods

This study was conducted using the meta-research approach or meta-analysis, which was a search to gather various kinds of information by reviewing several research articles in international and national journals that were relevant to the topic of learning strategies for creative thinking skills. The articles used must met the following criteria: (1) published from 2012 to 2018 and (2) discussing students' creative thinking skills.

Based on the sampling criteria, the samples obtained were 30 research articles on creative thinking skills which were published in scientific journals in the period of 2012 to 2018. These articles were consisted of 12 articles from quasi-experimental research, 2 articles from pure experimental research, 3 articles from pre-experiment research, 2 articles from classroom action research (CAR), 1 article from qualitative research, 2 articles from mixed research using embedded experimental models, 3 articles from research and development, 3 articles from descriptive research, 1 article from literature study, and 1 article is a pilot study.

All articles were identified, analyzed, and classified as types: (1) the purpose of the study, (2) the subject of the study, and (3) the learning strategies used to develop creative thinking skills. The results of the analysis were then classified and sorted according to the type of objectives, subjects, and learning strategies of the categories most widely applied.

3. Results and Discussion

3.1. Classification based on research objectives

Based on an analysis of 30 articles from research on creative thinking skills, the research objectives revolved around comparing descriptively the influence of two or more learning models on improving creative thinking skills, developing or improving creative thinking skills, and describing teaching styles as a learning method for improving skills creative thinking. The research objective classification of the 30 research articles analyzed is shown in Table 1.

Table 1. Classification of research objective

No	Research objective	Number of articles	Percentage (%)
1	Testing the influence of learning models on creative thinking skills	4	13,3
2	Describing the teaching style for creative thinking skills	5	26,7
3	Improving creative thinking skills	21	70
	Total	30	100

Research related to testing the effect or impact, among others, was shown in the previous research[8], which aimed to compare between students' creative thinking skills taught by using the scientific inquiry model and those taught using conventional methods. Other research was related to the influence or impact aimed to determine the differences in creative thinking skills of students who were given three different learning models[13].

Research related to describing among other things was research conducted by Aizikovitsh-Udi which aimed to explore teaching styles that can improve students' creative thinking skills[14]. Another previous research aimed to discuss the creativity and student learning outcomes[15].

The data in Table 1 shows that studies of creative thinking skills were more focused on improving students' creative thinking skills using a learning model. This was shown in the research conducted by Fatimah[6], which aimed to improve students' creative thinking skills through problem-based learning models with the Approach to Explore the Environment. Another study aimed to develop a material guide using the Purdue model and find out its influence in improving students' creative thinking skills[16].

3.2. Classification based on research subjects
Researches on the topic of creative thinking skills used quite diverse research subjects. Based on a study of 30 research articles, the classification of research subjects used is shown in Table 2.

Table 2. Classification of research subjects

No	Research subjects	Number of articles	Percentage (%)
1	Primary school students	2	6,7
2	Junior high school students	7	23,4
3	Senior high school students	10	33,3
4	Undergraduate students	9	30
5	Teachers	1	3,3
6	No information	1	3,3
	Total	30	100

The data in Table 2 shows that for research related to creative thinking skills, the most used research subject was the senior high school students, then followed by undergraduate and junior high school students. This is shown in the research was conducted by Wibowo which used a population of all students of class X, as many as 34 students, in one of the senior high schools in Kudus Regency[17]. Another study used a population of all students in class X in one of the senior high schools in Bandung Regency, which amounted to 58 students[18].

The use of students as research subject in research on creative thinking was shown in the research was conducted by Supriyanti[19]. Their research used fourth semester students from a university in Bandung with a total sample of 40 students. Another study used sixth semester students of a university with a total sample of 55 students[20].

Previous research used VIII grade students of a junior high school in Banda Aceh[21]. Other studies using the junior high school students which used VII grade MTs students as many as 90 students[22]. The same thing was done by Alamsyah which they used class VIII MTs students totaling 66 students[23].

In Table 2, it is also shown that there were studies of thinking skills that used teachers as the subject. Other research interviewed 20 secondary school teachers from various backgrounds[24]. In addition, there was also literature study which identified the differences between critical and creative thinking skills and PBL strengthening. This literature study, in Table 2, is classified as research with subjects without information[25].

3.3. Classification based on learning strategies
Based on a study of 30 articles from research on creative thinking skills, the learning strategies that had been used to improve these skills were quite diverse. Data from the study of this learning strategy are shown in Table 3.

Table 3. Classification of learning strategies

No.	Learning strategies	Number of articles	Percentage (%)

1	Problem Based Learning (PBL)	8	26,7
2	Inquiry approach	5	16,7
3	Project Based Learning (PjBL)	2	6,7
4	Creative Problem Solving (CPS)	2	6,7
5	Thinking strategy	2	6,7
6	Web/computer	2	6,7
7	Self esteem	2	6,7
8	Search, solve, create and share (SSCS) + Metacognitive strategy (MS)	1	3,3
9	Open ended	1	3,3
10	Guided discovery	1	3,3
11	Mind mapping	1	3,3
12	Guidance with game techniques	1	3,3
13	Learning Module with Purdue Model	1	3,3
14	Enrichment test	1	3,3
	Total	30	100

The data in Table 3 shows that so far efforts to improve creative thinking skills had been carried out with various learning strategies. Based on the 30 research articles reviewed, the most widely used learning strategy was the problem based learning (PBL) model. PBL was the most innovative teaching method in the history of education, where structured problems were presented to students in the learning process, then students were facilitated to build their own knowledge in the problem solving process. Through PBL, learning is student-centered, so students can reflect on their experiences to solve problems in new ways[26].

Research on creative thinking skills related to PBL was carried out by Nuswowati[27]. They developed thinking skills and creative attitudes through the application of PBL models with the vision of Green Chemistry, the results of which showed that PBL with the vision of Green Chemistry was able to significantly improve students' creative thinking skills. Another study on the effect of creative thinking in PBL on physics learning achievement. The results of their study showed that the use of the PBL model by giving open ended tests was suitable to be applied in the learning process, because that method could attract students to be more creative in thinking and solving problems[28].

Research on the effect of using the PBL method on students' creative thinking skills was also carried out by Ersoy[29]. The results of their research showed that students could identify and solve problems with their own ideas and abilities. Efforts to improve creative thinking skills were also carried out using inquiry learning models[30]. These were indicated by, among others, the results of Sofiatun's study, that the application of inquiry learning models was also reported to be able to develop students' thinking skills, so students do not just stick to one answer or problem solving method[31]. In addition, the use of project based learning (PjBL) was also reported to encourage students to explore their creativity[32].

In addition to using the PBL model, inquiry learning, and PjBL, the results of other studies also reported that learning using an open-ended approach was better than conventional learning in an effort to improve students' creative thinking skills. Other research also stated that the application of the Search Solve Create and Share (SSCS) learning model integrated with Metacognitive Strategy (MS) had the potential to improve creative thinking skills in students who have low academic ability[33].

4. Conclusion

Based on a review of 30 research articles on creative thinking skills, information was obtained: (1) the most objective of the research on creative thinking skills was to improve these skills, (2) the most subjects of research on creative thinking skills were the senior high school students, and (3) the most widely used learning strategy to improve creative thinking skills was Problem Based Learning (PBL).

Thus, based on these three information, it was concluded that PBL is the most recommended model for improving creative thinking skills, especially for the senior high school students.

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