INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN PROGRESSIVE EDUCATION & DEVELOPMENT

OPEN ACCESS JOURNAL

Vol 13, Issue 3, (2024) E-ISSN: 2226-6348

Impact of Project-Based Learning (PBL) in Teaching and Learning Facilitation in Primary Schools

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To Link this Article: http://dx.doi.org/10.6007/IJARPED/v13-i3/22624 DOI:10.6007/IJARPED/v13-i3/22624

Published Online: 12 September 2024

Abstract

Project-based learning is a learning method that allows students to study a given topic to produce a product at the end of learning. This learning activity is also able to encourage students to think critically, creatively, systematically and logically. This study will discuss the literature review related to the effects of project-based learning (PBL) in teaching and facilitation in primary schools in previous studies. Data was obtained through a qualitative method that applied a document analysis design based on a systematic literature review (SLR) as a foundation. The databases used are leading databases namely Scopus and Web of Science (WOS). The articles that have been collected are then examined to ensure that the selected articles meet the focus of the study. A total of 17 out of 215 articles were selected to be discussed in this study. Each topic has been discussed in detail to get a comprehensive picture of the impact of project-based learning (PBP) at the primary school level. The results of the study show that there are five effects of project-based learning (PBP) at the primary school level, namely in terms of skills, creativity, social interaction, knowledge and academic achievement. These five effects are positive effects in the implementation of PBP at the primary school level and the effects that have a great impact in the PBL teaching method are in terms of skills and the effect on academic achievement is less impressive.

Keywords: Project-Based Learning, Skills, Creativity, Social Interaction, Knowledge, Academic Achievement.

Introduction

Project-based learning (PBL) is a teaching and learning technique that has just been introduced in Malaysia. This technique is a very comprehensive 21st century learning technique because it supports all skills in the 4C components (Communication, Collaboration, Critical Thinking, Creativity). Some educational researchers consider John Dewey to be the founder of PBL because the approach he used is learning by doing. Dewey's learning theory emphasizes a lifelong learning approach where learning occurs when students interact with real life or the environment while doing a task.

According to Bennette et al., 2022, the project-based learning method (PBL) is able to build critical, creative, systematic and logical thinking. Thus, PBL is defined as a systematic method that is student-centered in learning knowledge and skills through the process of further investigation and carefully constructed product results (Han et al., 2016). Hakim et al. (2019) suggested that in facing all the global challenges and learning changes of the 21st century, the implementation of PBL at the school level needs to be practiced.

One of the approaches and recommendations recommended in the Implementation of School Transformation 2025 (TS25) is the PBL learning approach in primary schools. The method of approach at the level of entry has been practiced for a long time. However, PBL at the primary school level is still new and primary school teachers need to master the knowledge of this PBL approach so that it can be applied to primary school students. According to Krajcik J et al., (2023), the implementation of PBL can improve the academic performance of primary school students. Besides. Therefore, this PBL PBL method is better for improving students' academic performance compared to traditional learning methods (Demir & Onal, 2020). Apart from academic performance, students, other aspects that are able to achieve the KPM's wishes in student development can be nurtured in this PBL method. Among them is improving knowledge, skills, creativity and positive social interaction among students. Therefore, this PBL needs to be implemented at the primary school level.

Therefore, this SLR was conducted to analyze articles related to the implementation of project-based learning (PBL) at the primary school level. The results of the analysis and research that has been conducted can be a guide to researchers and educators regarding the impact and importance of implementing the PBL method at the primary school level.

Metodologi

Systematic Literature Review (SLR) is a study that requires the formation of clear research questions by using systematic and explicit methods in identifying, selecting, evaluating, collecting and analyzing data from relevant past studies (Moher et al., 2009). . The study conducted was also guided by the Perfect Reporting Items for Systematic flow diagram

Article Search Strategy

In the process of searching for articles, leading databases namely SCOPUS and Web Of Science (WOS) were used to identify empirical studies related to the topic. The main keywords used are in English, namely "project based learning" and "primary school". The keyword is to find articles related to project-based learning methods in primary schools. By using those keywords, the articles displayed on the database are related to project-based learning at the primary school level. Words synonymous with variables have been identified and Boolean operators have been constructed to construct a "search string" as follows.

Table 1
Keywords and Databases used in Article SearchKriteria Pemilihan
Artikel

DATABASE	KEYWORDS
SCOPUS	TITTLE-ABS-KEY [("effect*" OR "impact" OR "impression" OR "overview" OR "meaning" OR "influence" OR "consequence") AND ("project base* learning") AND ("primary school" OR "elementary school")]
Web Of Science (WOS)	TITTLE-ABS-KEY [("effect*" OR "impact" OR "impression" OR "overview" OR "meaning" OR "influence" OR "consequence") AND ("project base* learning") AND ("primary school" OR "elementary school")]

In this article selection criteria, several article filters have been set to obtain articles that meet the study criteria. Among them are in terms of the year of publication, language, type of reference material and field of study of the journal. In terms of the year of publication, the selection of articles is limited to the most recent five years, from 2020 to 2024 only to ensure that the relevance of the article is up-to-date with topics that include the latest issues. Next, the selection of articles in terms of the chosen language is English only. This is also because the database only publishes articles in English. Meanwhile, the research conducted only uses journal articles that have open access and excludes conferences, proceedings, theses and books in the selection of reference materials. This is because according to Moher et al (2009) journal articles are reference materials that have detailed material. The following are the acceptance and rejection criteria for article selection.

Table 2
Article acceptance and rejection criteria

Criteria	Article Acceptance	Article Rejection
Year of Publication	Publication from 2020 to 2024	Publication before 2020
Language	English	Malay, Indonesian and other languages
Types of Reference Materials	Journal Articles	Proceedings, conferences, theses and books

Proses Pemilihan Artikel
The literature review for this article selection process was conducted on April 24, 2024. Figure 1 shows a flowchart of the article selection process modified and adapted from the PRISMA 2020 flowchart (MJ et. al., 2020). This SLR study uses articles identified from two types of databases used which are 215 articles. Then, the articles are screened using pre-established criteria before being included in the qualifying stage for more thorough and detailed screening.

Based on the attached article selection process flow diagram, there are some additional criteria for the article exclusion process before being included in the SLR study that will be implemented. Among them are article titles that do not fit the context of the study, articles that do not meet the study acceptance criteria such as articles that do not have

empirical data and are in the form of reviews, articles that do not have full text and the same article from two databases. In addition, research articles that are not implemented in primary schools will also be excluded. After undergoing screening and some research on the articles obtained, the articles that will be included in the SLR study that have met all the selection criteria set are only 19 articles.

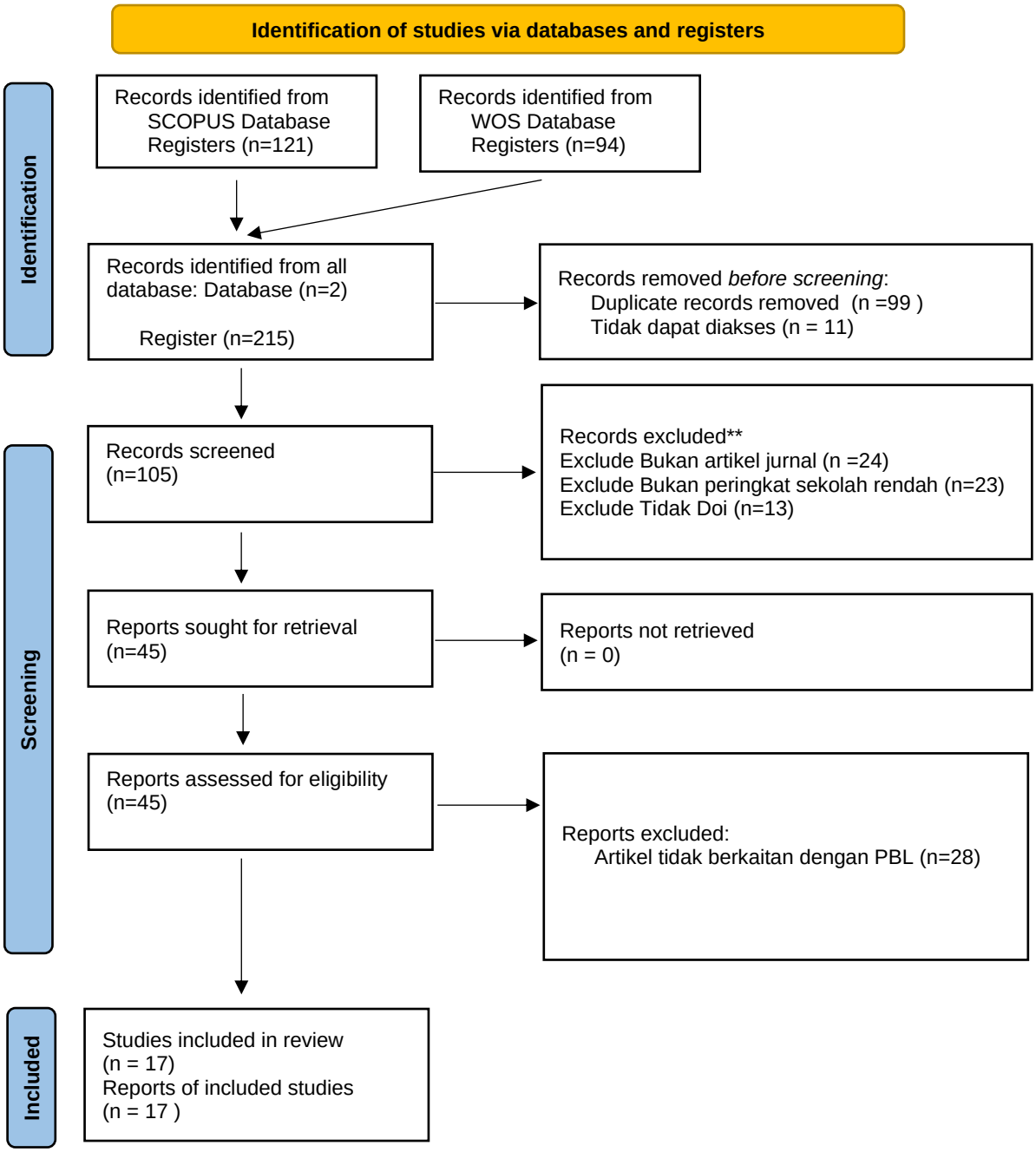


Figure 1: Flow Chart of the Article Selection Process (PRISMA 2020)

Data Collection and Data Analysis

Data collection was carried out using 17 articles obtained from two databases namely SCOPUS and Web Of Science (WOS). Data was collected by extracting the author's name, title, project-based learning (PBL) effects for each past study into a table built using Microsoft Excel 365 software. used by each research article. Then, the results of the data analysis carried out will be presented in the form of tables and bar graphs. Table 3 shows a list of past research articles and those that have been selected along with the author's name. The articles selected are based on the acceptance and rejection criteria that have been set.

Table 3
List of Past Research Articles

NO	Author's Name	Title of Research
1	Syawaludin et al., 2022	The Effect of Project-based Learning Model and Online Learning Settings on Analytical Skills of Discovery Learning, Interactive Demonstrations, and Inquiry Lessons
2	Krajcik et al., 2023	Assessing the Effect of Project-Based Learning on Science Learning in Elementary Schools
3	Hu et al., 2023	Integrating educational robot and low-cost self-made toys to enhance STEM learning performance for primary school students
4	Arana-Cuenca et al., 2023	Emotions and the Acquisition of Light and Colours through Project-based Learning in Primary Education;
5	Feng et al., 2022	Effectiveness of project based on learning of COVID¯19 prevention and protection among primary school students
6	Coufal, 2022	Project-Based STEM Learning Using Educational Robotics as the Development of Student Problem-Solving Competence
7	Cheng et al., 2022	Design My Music Instrument: A Project-Based Science, Technology, Engineering, Arts, and Mathematics Program on The Development of Creativity
8	Gonzalez et al., 2021	Descriptive and experimental studies about moral emotions, online empathy, anger management, and their relations with key competencies in primary education
9	Xie & Zhang, 2023	Research on the design and implementation of primary school STEM project based on VR coursewares
10	Halimah et al., 2020	Fostering students' creativity through lapbooking: A case study in an indonesian primary school context
11	Divac et al., 2022	INQUIRY AND PROJECT-BASED LEARNING AS AN APPROACH FOR DEVELOPING ENTREPRENEURSHIP COMPETENCIES IN PRIMARY SCHOOL HIGH-ACHIEVING STUDENTS
12	Husna et al., 2024	The influence of project-based learning and problem-based learning models on science learning ability from the perspectives of learning interest
13	Liorent et al., 2022	Improving Literacy Competence and Social and Emotional Competencies in Primary Education Through Cooperative Project-Based Learning
14	Sumarno et al., 2024	Effectiveness of Bilingual Project-B ased Materials to Facilitate Literacy and Numeracy Teaching

15	Lu et al., 2022	Evaluation of Disabled STEAM -Students' Education Learning Outcomes and Creativity under the UN Sustainable Development Goal: Project-Based Learning Oriented STEAM Curriculum with Micro:bit
16	Rehman et al., 2023	Fostering twenty-first century skills among primary school students through math project-based learning
17	Ostroyska et al., 2023	The Use of Creative Projects for the Enhancement of Primary School Students' Learning Motivation

Findings

The main objective of the SLR study conducted is to identify the effects of PBL implementation at the primary school level. In addition, the study was conducted to build a conceptual framework that is often used by researchers in previous studies based on the implementation of PBL. Findings from previous research. There are 17 articles that meet all the criteria that have been determined. Table 4 shows the table of data analysis results for past research articles that have been extracted according to the title, author name, country name and aspects that have been set.

Table 4

List of Articles According to the Effects of PBL at the Primary School Level

NO	AUTHOR'S NAME	YEAR	COUNTRY	RESEARCH DESIGN		ACADEMIC ACHIEVEMENT	KNOWLEDGEY	SKILLS	CREATIVITY	POSITIVE SOCIAL INTERACTION
				QUANTITATIVE	QUALITATIVE					
1	Syawaludin A et al.	2022	Turkey	/				/		
2	Krajcik J et al.	2023	United Stated	/		/				/
3	Hu et al.	2023	Taiwan		/		/	/		/
4	Arana-Cuenca A et al.	2023	United Stated	/			/		/	
5	Feng L et al.	2022	China	/				/		
6	Coufal	2022	Czech Republic	/				/		
7	Cheng L et al.	2022	China		/				/	
8	Gonzalez et al.	2021	Switzerland		/					/
9	Xie & Zhang.	2023	China	/			/	/		
10	Halimah et al.	2020	Indonesia		/				/	
11	Divac et al.	2022	Serbia		/			/		
12	Husna M et al.	2024	Indonesia	/			/			
13	Liorent et al.	2022	Spain	/	/	/				/
14	Sumarno et al.	2024	Indonesia		/			/		

15	Lu et al.	2022	Taiwan		/				/	
16	Rehman et al.	2023	China	/				/	/	/
17	Ostroyska et al.	2023	Venezuela	/		/		/	/	
			JUMLAH	**8**	**9**	**3**	**4**	**9**	**6**	**5**

As a result of the article analysis, it was found that 17 selected articles had researchers from 9 countries. Among them are from Turkey (Syawaludin A et al. 2022), the United States (Krajcik J et al., 2023; Arana-Cuenca A et al., 2023), Taiwan (Hu et al., 2023; Lu et al. ., 2022), China (Feng L et al., 2022; Cheng L et al., 2022; Xie & Zhang, 2023; Rehman et al., 2023), the Czech Republic (Coufal, 2022) Switzerland (Gonzalez et al., 2021), Serbia (Divac et al., 2022), Spain (Liorent et al., 2022), Venezuela (Ostroyska et al., 2023) and Indonesia (Halimah et al., 2020; Husna M et al., 2024; Sumarno et al., 2024). Of the 17 selected articles, the country of Malaysia was not listed in the article selection criteria.

The study design is also different. Among the approaches used are quantitative, qualitative and both (Mix-method). The quantitative approach is the most widely used approach compared to the qualitative approach and the combination (Mix-method). A total of 9 articles that use a qualitative approach namely (Syawaludin A et al., 2022; Krajcik J et al., 2023; Arana-Cuenca A et al., 2023; Feng L et al., 2022; Coufal, 2022; Husna M et al., 2024; Rehman et al., 2023; Ostroyska et al., 2023). Meanwhile, 7 articles use a qualitative approach namely (Hu et al., 2023; Cheng et al., 2022; Gonzalez et al., 2021; Halimah et al., 2020; Divac et al., 2022; Sumarno et al. , 2024; Lu et al., 2022). and only 1 article uses a mixed approach (mix-method) which is (Liorent et al., 2022).

Theme Analysis

Based on the articles that have been analyzed, it was found that all the articles have a positive impact on the implementation of PBL at the primary school level. There are five main aspects discussed in the article regarding the impact of PBL at the primary school level. Among them are academic achievement, knowledge, skills, creativity and positive social interaction.

a) Academic Achievement

According to (Krajcik J et al., 2023; Liorent et al., 2022; Ostroyska et al., 2023), studies show that PBL has a positive effect on student academic achievement. This PBL method is able to encourage students to manage their own learning through collaboration between friends. This is because students at the primary school level will have an easier time understanding learning with the guidance of their peers.

b) Knowledge

This PBL learning method will further improve students' knowledge to learn, especially at the primary school level. This is proven by several studies namely (Hu et al., 2023; Arana-Cuenca A et al., 2023; Xie & Zhang., 2023; Husna M et al., 2024). Throughout PBL learning, students easily gain new knowledge and understanding more than traditional learning methods

c) Skills

One of the main objectives of the PBL learning method is to improve the skills to learn a principle (Barrow & Tamblyn, 1980). Thus, studies (Syawaludin A et al., 2022; Hu et al., 2023; Feng L et al., 2022; Coufal, 2022; Xie & Zhang., 2023; Divac et al., 2022; Sumarno et al., 2024;

Rehman et al., 2023; Ostroyska et al., 2023) have proven that this PBL method can improve students' skills. This can prepare students for lifelong learning concepts that can be applied outside the classroom.

d) Creativity

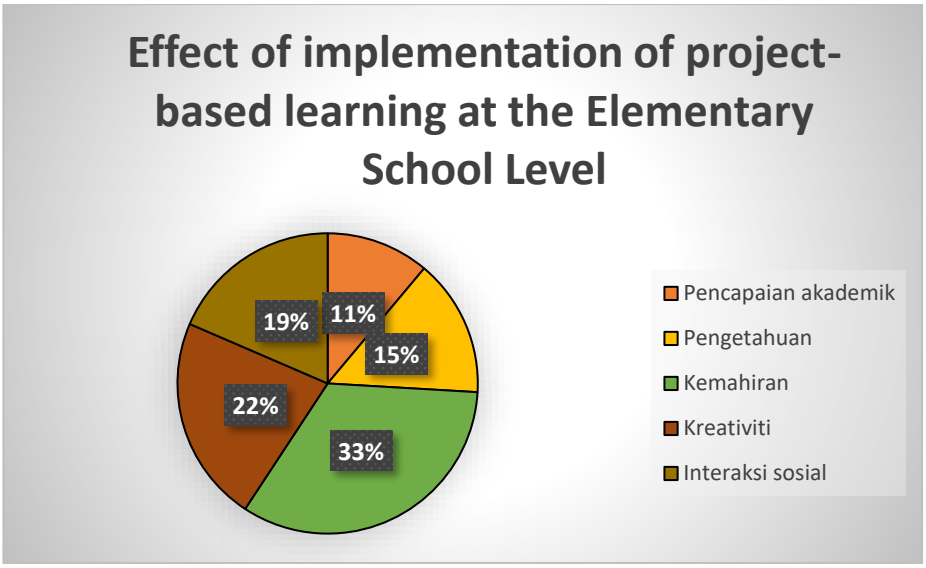
According to the fourth edition of Kamus Dewan, kreativity means the ability or ability to create and the creative power possessed by an individual. Creativity must be instilled in every student to produce students who can face the challenges of the future. According to (Arana-Cuenca A et al., 2023; Cheng L et al., 2022; Halimah et al., 2020; Lu et al., 2022; Rehman et al., 2023; Ostroyska et al., 2023) the approach method This PBL is able to increase creativity for primary school students. This PBL method approach is proven to be able to foster creativity in each student involved.

Social Interaction

In the context of the classroom, the social interaction approach emphasizes group activities that aim to create unity and cooperation between students. This PBL method is able to foster teamwork and positive social interaction among students. Pupils can discuss in groups in carrying out activities and further foster positive social attitudes with friends as in the study (Krajcik J et al. 2023; Hu et al., 2023; Gonzalez et al., 2021; Liorent et al., 2022; Rehman et al., 2023) which proves that this PBL approach can foster positive interaction among students.

Conceptual Framework

Based on previous research articles, it was found that there are several effects of PBL implementation at the primary school level. Among them are in terms of academic achievement, knowledge, skills. Student creativity and social interaction. From the 17 articles that have been selected, the most frequently studied effect of PBL learning methods at the primary school level is student skills, which is 9 articles that are equivalent to 33%. Meanwhile, the second effect of PBL is the aspect of student creativity which is as many as 6 articles which is equivalent to 22%. Next is the aspect of students' social interaction in implementing PBL, which is as many as 5 articles that correspond to 19%. Then there is the effect on student knowledge which is as many as 4 articles or 15% and a minority of researchers found that the effect of implementing PBL at the school level is the effect on student achievement which is only as many as 3 articles equal to 11%. These five findings of PBL effects are the most discussed by past researchers on primary school students. Thus, this discussion to some extent can contribute to the researchers in the future in the literature section of the study.



Rajah 2: The number of articles and percentages according to the effect of PBL implementation at the primary school level

A conceptual framework has also been developed in this SLR study based on the effects of PBL coercion at the primary school level that were most frequently used by previous study articles. The majority of recent researchers found that the highest impact of early implementation of PBL methods at the primary school level was on the ability of students to know the principles of some PBL teaching topic. Then followed by creativity, social interaction, knowledge and student achievement. Figure 3 shows the conceptual framework for the impact of PBL implementation at the elementary school level.

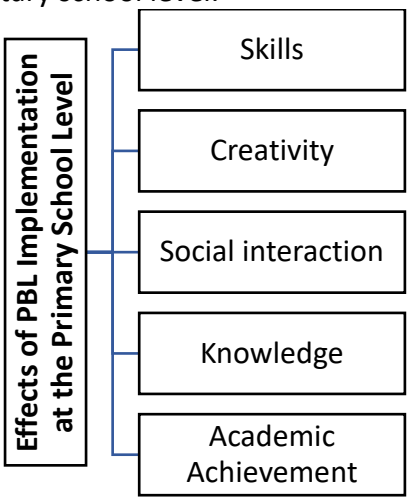


Figure 3: Conceptual framework of the effect of PBL implementation at the primary school level

Discussion of the Study

Based on the results of the SLR study, the implementation of project-based learning for primary school students has a greater impact on student skills. In fact, the study of the effect of PBL on students' skills is often discussed at the primary school level. This is in line with some previous studies such as Syawaluddin el at (2022), Hu et al (2023), Feng L et al (2022), Coufal (2022), Xie & Zhang (2023), Divac et al (2022), Sumarno et al (2024), Rehman et al (2023) and Ostroyska et al (2023). For the primary school level, this PBL activity has a great impact on

students in terms of skills. This is how this PBL learning method will help students improve their skills in facing a problem in the future. The personality characteristics of an entrepreneur are closely related to the characteristics of talented students, their development is important in the modern education system (Divac et al., 2022). So, indirectly, project-based learning is able to foster entrepreneurial values in students with the skills developed during this learning.

In addition, research has found that the Project-Based Learning (PBL) approach has a positive impact on primary school students' creativity. This is evidenced by studies such as those by Arana-Cuenca et al. (2023), Cheng L et al (2022), Halimah et al (2020), Lu et al. (2022), Rehman et al (2023), and Ostroyska et al (2023). Enhancing student creativity has garnered significant attention in education (Cheng L et al., 2022). Therefore, one activity that can foster students' creativity is through PBL activities in primary schools (Halimah et al., 2020). This is because creativity is crucial in the classroom to prepare students for future challenges. PBL can enhance students' critical thinking and creativity skills by providing opportunities to generate new ideas and apply their knowledge in various situations. It also offers opportunities to strengthen social and collaborative skills, which are important aspects in today's job market.

The PBL method has been shown to enhance social interaction and learning performance among primary school students (Krajcik J et al., 2023; Hu et al., 2023; Gonzalez et al., 2021; Liorent et al., 2022; Rehman et al., 2023). PBL activities are typically carried out in groups, fostering positive social interactions among group members. According to Rehman et al. (2023), this approach allows students to improve their collaboration skills, including promoting each other's viewpoints, speaking when necessary, listening to one another, and participating in meaningful discussions. Through PBL, students can also tackle real-world problems, develop social and collaborative skills, and manage emotions—essential for their success in today’s job market (Liorent et al., 2022).

Referring to the conceptual framework outlined in Figure 3, the implementation of PBL has a clear impact on primary school students. While in secondary education, the impact of PBL is often discussed in terms of academic achievement, at the primary level, the focus is on students' skills and creativity. Students' understanding of PBL activities can enhance their critical thinking skills, thereby boosting their creativity. However, aside from the five effects listed, there are also some impacts that have been less studied by previous researchers. Therefore, further review and investigation are needed on the conceptual aspects developed for future studies.

Conclusion

The SLR study conducted involved two prominent databases: SCOPUS and Web Of Science (WOS). Only 17 articles met the selection criteria, and none of these articles were from Malaysia. This indicates that Malaysia's involvement in the use of the Problem-Based Learning (PBL) method at the primary school level is still limited. Therefore, this 21st-century learning approach needs to align with global demands so that Malaysia can also produce students with skills and creativity starting from the primary school level.

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