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GLOBAL PUBLICATION TRENDS IN PBL (PROBLEM-BASED LEARNING) AND PJBL (PROJECT-BASED LEARNING) FOR LEARNING: THE LAST TEN YEARS

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Abstrak: Artikel ini mengeksplorasi peran penting pendidikan dalam kemajuan masyarakat, mengkritik metode tradisional yang berpusat pada guru karena keterbatasan pengembangan keterampilan. Pembelajaran Berbasis Masalah (PBL) dan Pembelajaran Berbasis Proyek (PjBL) disorot sebagai pembelajaran yang transformatif dan melibatkan siswa dalam pemecahan masalah di dunia nyata. Tinjauan sistematis menegaskan kemanjuran PBL dalam meningkatkan keterlibatan kognitif, keterampilan, dan motivasi, khususnya dalam teknologi dan kolaborasi. Dengan menganalisis literatur selama satu dekade, penelitian ini membahas tren publikasi, artikel yang banyak dikutip, keselarasan PBL/PjBL dengan Tujuan Pembangunan Berkelanjutan, dan perbedaan di antara keduanya. Tinjauan literatur menggarisbawahi pentingnya hal ini dalam mempersiapkan siswa menghadapi ekonomi berbasis pengetahuan. Secara metodologis, pendekatan kuantitatif menggunakan Scopus dan VIOSViewer mencakup kriteria pengumpulan dan analisis data, yang mencakup empat tahap: identifikasi, penyaringan, analisis, dan ringkasan konklusif.

Kata Kunci: PjBL, PBL, Analisis Bibliometrik, Tujuan Pembangunan Berkelanjutan, Pendidikan, Pembelajaran.

Abstract: *This research aims to evaluate the fiqh curriculum on materials welcoming the 4th grade puberty at Al-Basyariyah Elementary School Bandung. The benefit of this research is to expand academic insight for researchers and readers, so that it can become a reference or source of knowledge that is useful in increasing understanding and enriching references for future researchers regarding hadith curriculum analysis. The research method applied is a case study using a qualitative approach, where this research is focused on a particular place or institution which discusses curriculum analysis of the fiqh curriculum on material welcoming the 4th grade puberty at Al-Basyariyah Elementary School Bandung. The results of the research show that the analysis of the fiqh curriculum on material welcoming the 4th grade puberty at Al-Basyariyah Elementary School in Bandung overall went well, involving appropriate planning and implementation stages.*

Keywords: *PjBL, PBL, Bibliometric Analysis, Sustainable Development Goals, Education, Learning.*

PENDAHULUAN

Education plays an important role in the progress and development of society (adib, 2022). "Education", which relates to the idea of learning and teaching, is generally defined as the process of raising individuals for a specific purpose (Tascı, 2015). Education in many countries is still dominated by traditional teacher-centered learning approaches. Students tend to be passive and less actively involved in the learning process (Prasetyo, 2021). As a result, students cannot develop contemporary skills such as problem solving, teamwork, and critical thinking (Rosita & Leonard, 2015; Wulandari, 2019). In fact, these skills are very important to equip students to face the challenges that arise in the era of globalization.

Creating a learning pattern requires the role of an innovative teacher to create a learning design. In other words, teachers need to choose a suitable learning model with the aim that students are not quickly bored and excited about learning (Sunarti, 2020)). So it is necessary to choose the right learning model, so that learning does not only focus on the teacher (Kusumaningtyas et al., 2020). There are four 21st century learning models, namely discovery learning, problem-based learning, project-based learning, inquiry learning, which are four learning models that use a student center learning (SCL) approach and do not focus on the teacher alone (Wijayati et al., 2019).

PBL (Problem Based Learning) and PjBL (Project Based Learning) are innovative approaches that can answer this challenge (Suradika et al., 2023). Both approaches are designed for students to be actively involved in investigating authentic problems and working on projects relevant to the real world(Prasetyo, 2021). A comprehensive review is needed to map the current research trends related to the implementation of PBL and PjBL in various fields of education.

Project-based learning (PjBL) is a systematic approach to learning and teaching. It involves students in complex real-world tasks that result in products and two-way interaction between teachers and students (Jusita, 2019). This method allows students to acquire knowledge and skills that can improve the quality of life (Chen & Yang, 2019). PBL is a teaching model that uses problems as a starting point for the development of students' new knowledge (Moutinho et al., 2015).

Conclusions from PjBL-related research indicate that it effectively improves students' understanding, cognitive engagement, and skills. Study results from Ruslan (2021) showed 100% student success in producing working prototypes within 5 weeks (Ruslan et al., 2021).

while Hugerat (2016) emphasized higher learning satisfaction and positive teacher-student relationships through project-based strategies (Hugerat, 2016). Asan (2005) highlighted improvements in students' technological abilities, collaboration skills, self-esteem, and motivation through PBL approaches (Asan, 2005).

Additional research by Rotgans (2011), Raiyn (2010), Khoiriyah (2018), and Birgili (2015) demonstrated the effectiveness of PBL in improving students' cognitive engagement, higher-order thinking skills, creativity, and problem-solving abilities. Although there are some cases without significant results, PBL continues to be recognized as a more effective approach than traditional teaching methods in some contexts. In conclusion, PBL can be considered a valuable tool in enriching critical and creative thinking skills in education (Khoiriyah & Husamah, 2018; Raiyn & Tilchin, 2015; Rotgans & Schmidt, 2011).

From several related studies, it can be concluded that PjBl and PBL models have positive and significant benefits and influences on learning at all levels of education. This study is a systematic effort to look at the publication trends of PBL and PjBL for learning in educational journals over the past ten years. It focuses on publication patterns by year, country, field of study, research methodology used and key research findings. This review is expected to provide researchers, educational practitioners and policy makers with a better understanding of PBL and PjBL research trends around the world.

This study also aims to conduct a literature review on PPA and PBL in education in the last 10 years using bibliometric analysis. The following is a list of research questions that will be the focus to achieve the objectives of this study:

1. What is the publication trend of Project-based Learning (PjBL) and Problem-based Learning (PBL) for learning in the last 10 years?
2. What are the publication types of the 150 most cited articles in the field of PjBL and PBL for learning from 2014-2023?
3. What is the distribution of the top 150 cited papers on PjBL and PBL for learning from 2014-2023?
4. How do PjBL and PBL help achieve Sustainable Development Goals (SDGs)?
5. Who are the top 20 authors of the 150 cited papers on PjBL and PBL for learning from 2014 to 2023?
6. Which journal published the most papers on PjBL and PBL for learning between 2041 and 2023?

7. What are the differences and similarities between PjBL and PBL?
8. What are the advantages and disadvantages of PjBL and PBL?

LITERATURE REVIEW

a. The Sustainable Development Goals (SDGs)

Leaders from all across the world, including Indonesia, have come to an agreement on the Sustainable Development Goals (SDGs) as a worldwide action plan to end the environmental catastrophe. The SDGs are composed of 169 Targets and 17 Goals (see Figure 1), all of which are anticipated to be accomplished by 2030.The UN has said that in order to accomplish the SDGs in all circumstances, nations must make use of resources like money, information, creativity, and technology. Furthermore, PBL (Project-Based Learning) and PJBL (Problem-Based Learning) are important learning models to improve concept understanding, problem-solving skills, deep understanding, and mastery of material. They also help students become lifelong learners, think independently, and be ready for future challenges. In addition, PBL and PJBL can also help students prepare to work in a knowledge-based economy and face continuous change. The implementation of PBL and PJBL can also influence students' attitude towards learning, by encouraging them to take an active role in the learning process.

Figure 1. Sustainable Development Goals (SDGs)

b. Bibliometric analysis

A statistical technique for examining publications is called bibliometrics. It serves as the foundation for identifying the most well-known and important articles in a given topic. Bibliometrics is a study methodology that combines science, mathematics, and statistics to analyze knowledge quantitatively and provides comprehensive information. Bibliometrics has developed over time and is now widely used to map and analyze ideas and information that

have been published in a variety of sectors.

RESEARCH METHODS

For this study, quantitative research based on the Scopus database was chosen, and data was collected via sciencedirect. With the use of VIOSViewer software, data analysis was done utilizing bibliometric methodologies to demonstrate and identify research trends and innovation. The criteria in Table 1 were used to collect all of the data for this investigation.

Tabel 1. Data Identification

Description	PBL	PjBL
Keyword	Title (Problem Based Learning)	Title (Project Based Learning)
Publication Type	Articles	Articles
Document (All Years)	15.129	12.558
Document (2014-2023)	12.335	10.389

The metadata were then saved as RIS and CSV files. The data was then enhanced with additional analysis performed with VOSViewer and MS Excel. A recent study using the Scopus index has demonstrated the efficacy of VOSViewer, As shown in Figure 2, the research process is divided into four stages: 1) identification; 2) screening and filtering; 3) analysis and discussion; and 4) conclusion.

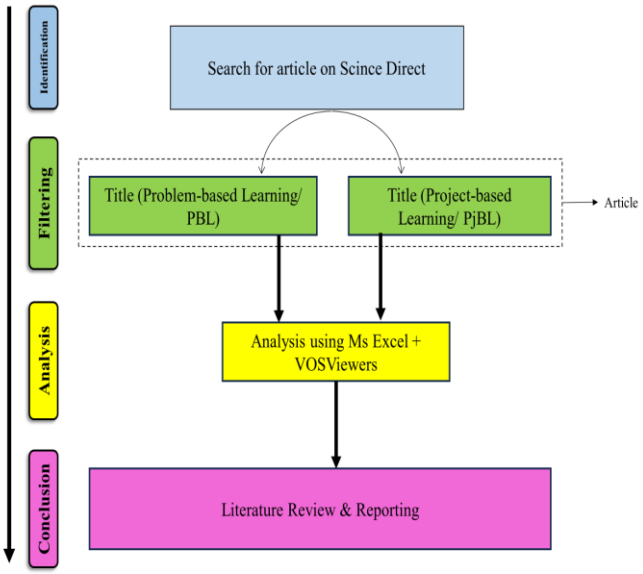

Figure 2. Research Procedure

State the research type, time, and location of the study. Procedures should be delineated according to the research type. How the research is conducted and data will be obtained needs

to be explicated in this section. For experimental research, the type of experimental design utilized should be documented in this section.

Nyatakan jenis penelitian, waktu dan tempat penelitian. Prosedur perlu dijabarkan menurut tipe penelitiannya. Bagaimana penelitian dilakukan dan data akan diperoleh, perlu diuraikan dalam bagian ini. Untuk penelitian eksperimental, jenis rancangan (experimental design) yang digunakan sebaiknya dituliskan di bagian ini.

RESULTS AND DISCUSSION

Global publication trends

Data were identified using the keyword criteria described in Table 1 and sourced from the Scopus database. The type of publications in this study limited to articles showed the results of screening 15,129 documents on PBL in education in all years. While publications that discuss PjBL in learning amounted to 12,558 (all years).

Figures 3 and 4 illustrate the growth of Scopus article publications on PBL and PjBL for learning in the last 10 years, which proved to be significant. This shows that PBL and PjBL for learning continue to grow. The data also shows the interest of researchers in this research topic. Figures 3 and 4 show 739 articles on PBL and 596 articles on PjBL in learning published in 2014. In 2023, there are 2971 Scopus articles on PBL in learning and 2552 articles on PjBL in learning

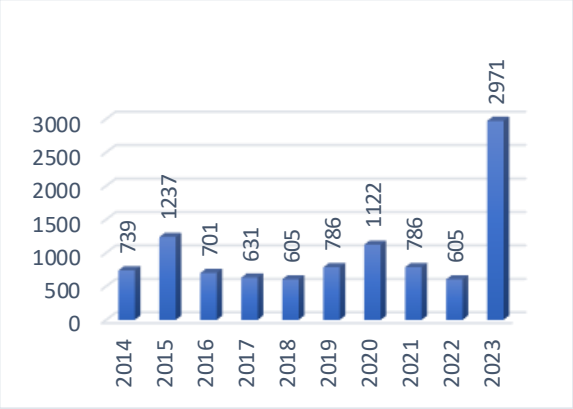

Figure 3. *Cumulative publication: Problem-based Learning (PBL)*

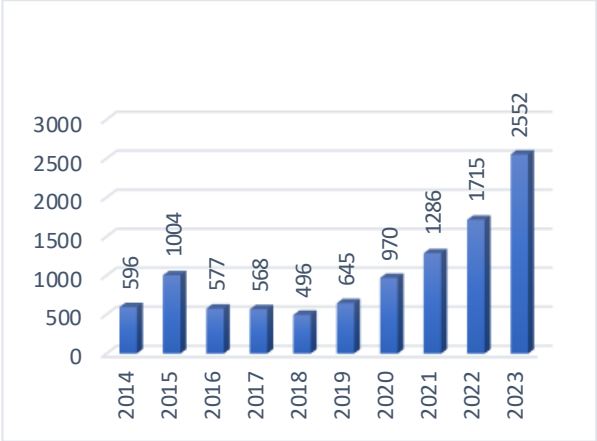

Figure 4.. *Cumulative publication: Project-based Learning (PjBL)*

Publication Type

This study examined the 150 articles that received the most awards in the last 10 years. Table 2 summarizes the top 150 publications with citations published on PBL and PjBL methods in learning.

Table 2. Types of publications with the highest number of citations

Publication Type	Frequency		Total Citation	
	PBL	PjBL	PBL	PjBL
Artikel	75	75	5944	4491

In Table 2. we can find 75 publications on PBL in education. Meanwhile, 75 publications are about PjBL in education. In addition, the number of citations for PBL reviews is 5944 citations, while for PjBL it is 4491. Which means, there are more citations in articles that discuss PBL in learning than PjBL. The following section discusses the distribution of 150 publications based on the highest number of citations.

Distribution of publications

Table 3 below shows the distribution of 150 publications on PBL and PjBL methods for learning in education with the highest number of citations (top 150) over the past 10 years. The top 75 publications on PBL had 6034 total citations, with 786.824 ACPP; 164.34 ACPPY. The highest number of citations (1433) occurred in 2016, and 2015 & 2017 were considered as years with the highest number of publications from 11 documents. However, the highest ACPP (179.13) occurred in 2016. Meanwhile, the highest ACPPY (33.1675) occurred in 2020. While

the top 75 publications on PjBL, 4376 total citations, with 606.81; 120.65 ACPPY. While with PjBL, the highest number of citations (1461) occurred in 2020. However, the highest ACPP (114.71) occurred in 2019. Meanwhile, the highest ACPPY (28.12) occurred in 2020.

Tabel 3. Distribution of publications

Problem Based Learning					Project-based Learning				
Year	**Pub.**	**Cit.**	**ACPP**	**ACPPY**	**Year**	**Pub.**	**Cit.**	**ACPP**	**ACPPY**
2014	10	614	61.40	6.216	2014	6	355	59.17	6.37
2015	**11***	825	75.00	8.33364	2015	7	707	101	11.22
2016	8	**1433***	**179.13***	22.3788	2016	4	123	30.75	3.85
2017	**11***	738	67.09	9.57091	2017	3	126	42	6
2018	6	715	119.17	19.86	2018	1	89	89	14.83
2019	8	814	101.75	20.35	2019	7	803	**114.71***	22.94
2020	4	425	106.25	**33.1675***	2020	13	**1461***	112.38	**28.12***
2021	6	154	25.67	8.94333	2021	8	226	28.25	9.42
2022	8	259	32.38	16.1875	2022	**19***	442	23.26	11.63
2023	3	57	19	19.333	2023	7	44	6.29	6.29
Total	**75**	**6034**	**786.824**	**164.341**	**Total**	**75**	**4376**	**606.81**	**120.65**

*Notes: Pub. = Number of publications; Cit. = Number of citations; ACPP = Average Citations Per article; ACPPY = Average Citations Per article Per Year; * = Highest number*

In Figure 5, it can be seen that from 2014 to 2023 there are 11 publications on PBL in 2015 and 2017 that are included in the top 75 publications with citations, and likewise as many as 19 publications on PjBL in 2014-2023, included in the category of 75 publications with top citations in 2020.

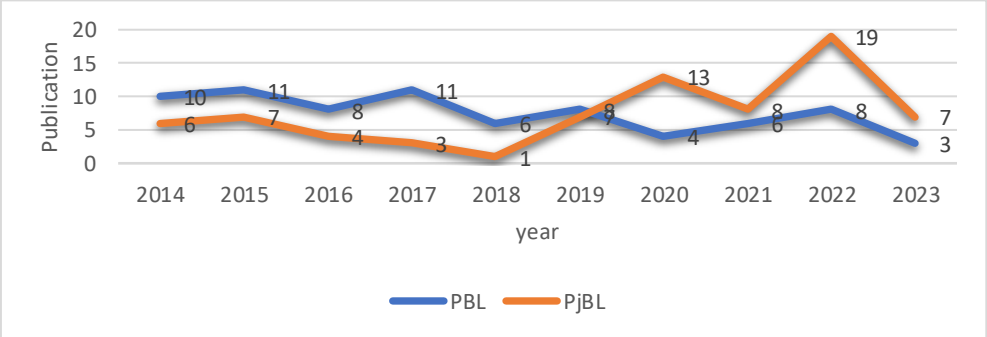

Figure 5. Distribution of the top 75 published articles

As seen in Figure 6, the average number of citations per paper per year (ACPPY) of the top 75 publications has increased significantly. The rapid increase occurred from 2017 to 2019.

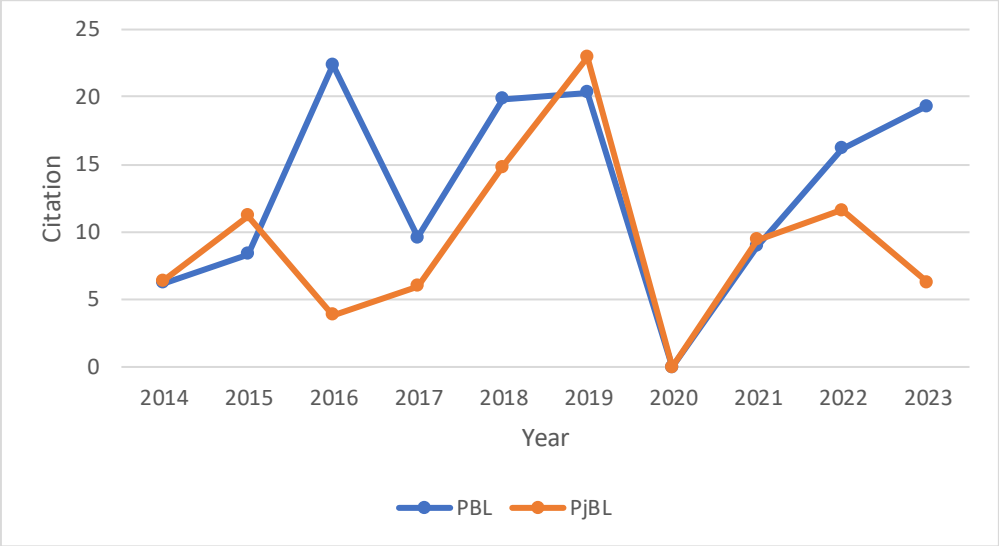

Fig. 6. Average citations per paper per year

Figure 7 shows that ACPPY PBL/PjBL increases and decreases every year. The highest number occurred in 2020 for PBL (33.1675) and PjBL (28.12). Meanwhile, the lowest ACPPY for PBL occurred in 2014 (6.216), and the lowest ACPPY for PjBL occurred in 2016 (3.85).

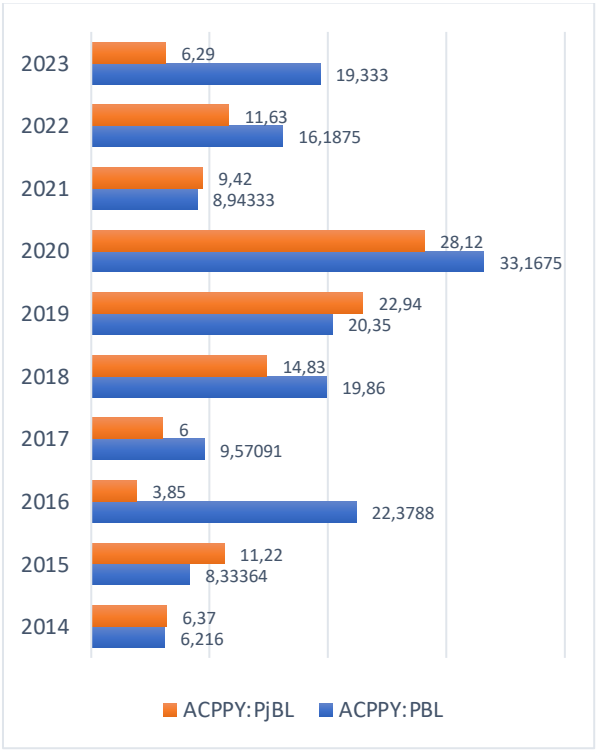

Fig 7. ACPPY: PBL & PjBL (2014-2023)

Notes: ACPP = Average Citations Per Paper; ACPPY = Average Citations Per Paper Per Year.

Categories of publications

Figure 8 illustrates the classification of publication distribution by research field. It can be seen that the fields of computer science, social and behavioral science, and CRIP dominate the publications from PBL and PjBL, followed by manufacturing and heliyon. There are 1433 publications in the computer science category and 727 publications in the social and behavioral science category. This implies that researchers are actively discussing PBL/PjBL methods in their literature studies.

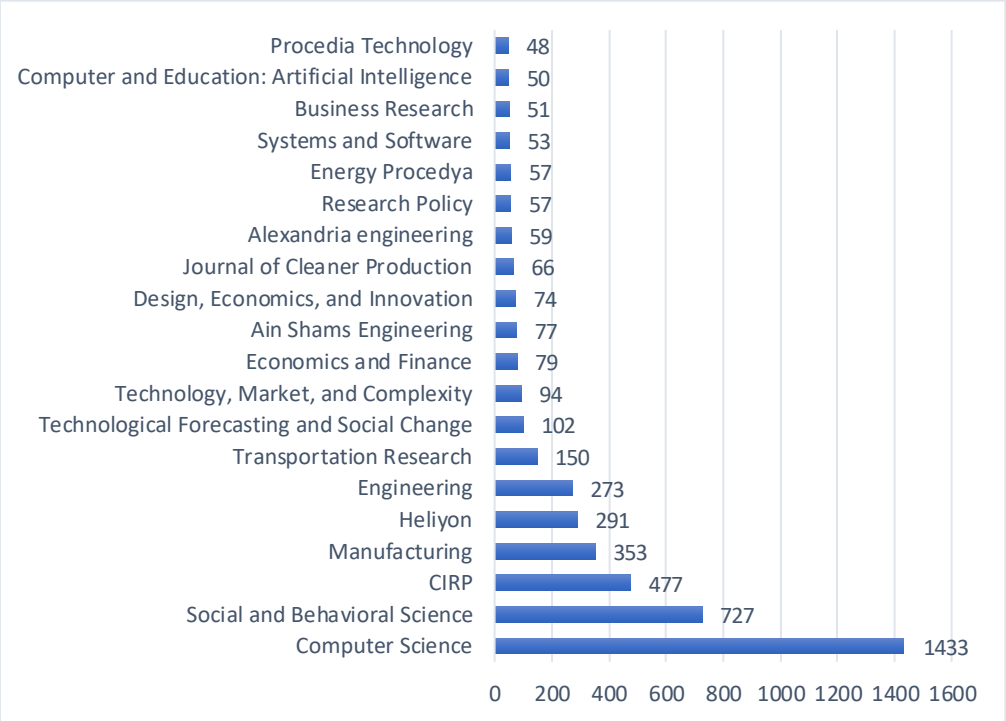

Fig 8. PBL and PjBL classification by fields of publication title

Top 20 Authors with the Most Publications

Table 4 shows the 20 authors with the highest number of citations in the last 10 years. Dominated by laine H.J Yeq Karen Goh (2016) with 889 citations (Yew & Goh, 2016), followed by Pengyue Guo (2020) with 877 citations (Guo et al., 2020), followed by Cheng-Huan, Yong-Cih Yang (2019) with 658 *citations* (Chen & Yang, 2019).

Table 4. Top 20 authors with most citations in the field of PBL/PjBL for learning

Author	Year	Journal/ Conference	No. of Cits
(Yew & Goh, 2016)	2016	Health Profession Education	889
(Guo et al., 2020)	2020	International Journal of Educational	877

Author	Year	Journal/ Conference	No. of Cits
(Chen & Yang, 2019)	2019	Educational Research Review	658
(Fidan & Tuncel, 2019)	2019	Computers and Education	432
(Seibert, 2021)	2020	Teaching and Learning in Nursing	310
(Topalli & Cagiltay, 2018)	2018	Computers and Education	303
(Phungsuk et al., 2017)	2017	Kasetsart Journal of Social Sciences	293
(Nadiyah & Faaizah, 2015)	2015	Procedia - Social and Behavioral Sciences	257
(Ersoy & Başer, 2014)	2014	Procedia - Social and Behavioral Sciences	256
(Gorghiu et al., 2015)	2015	Procedia - Social and Behavioral Sciences	211
(Alrahlah, 2016)	2016	The Saudi Dental Journal	207
(Wu & Wu, 2020)	2020	Thinking Skills and Creativity	176
(Lasauskiene & Rauduvaite, 2015)	2015	Procedia - Social and Behavioral Sciences	160
(Bartlett & Cussens, 2017)	2017	Artificial Intelligence	157
(Fernandes, 2014)	2014	Procedia - Social and Behavioral Sciences	153
(Wosinski et al., 2018)	2018	Nurse Education in Practice	150
(Tascı, 2015)	2015	Procedia - Social and Behavioral Sciences	117
(Sart, 2014)	2014	Procedia - Social and Behavioral Sciences	109
(Vila et al., 2017)	2017	Procedia Manufacturing	90
(Amamou & Cheniti-Belcadhi, 2018)	2018	Procedia Computer Science	89

The following also shows the relationship analysis based on keywords from the 150 articles that have been select

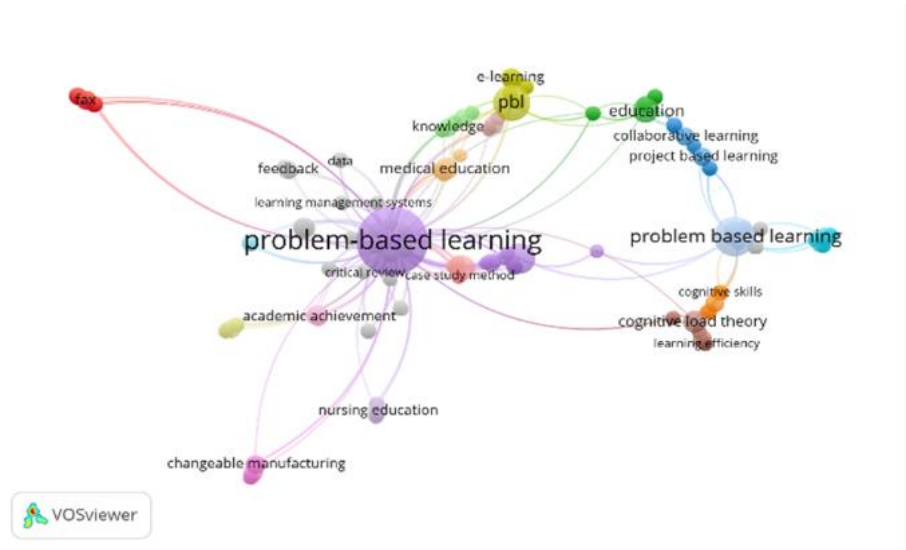

Fig 9. Network analysis of Keywords Problem Based Learning

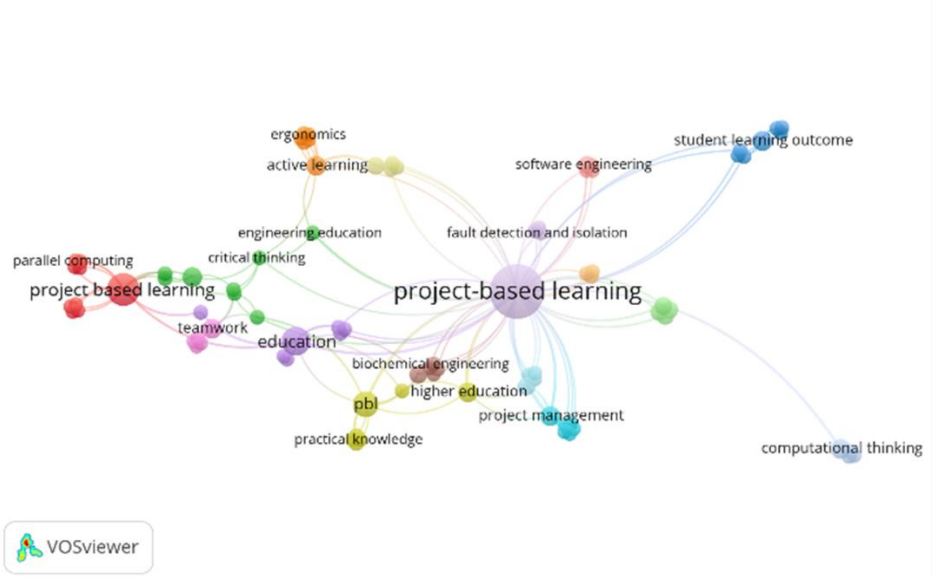

Fig 10. Network analysis of Keywords Project Based Learning

Top 20 Journals with the most publications on PBL and PjBL for learning

Table 5. shows the top 20 journals with the most documents discussing PBL/PjBl for learning. Journal of computer science leads with a total of (1433) documents, followed by social and behavioral science with 727 documents.

Table 5. Top 20 journals with the most publications on PBL/PjBL for learning

No	Journal	No. of Pubs
1	Computer Science	1433
2	Social and Behavioral Science	727
3	CIRP	477
4	Manufacturing	353

5	Heliyon	291
6	Engineering	273
7	Transportation Research	150
8	Technological Forecasting and Social Change	102
9	Technology, Market, and Complexity	94
10	Economics and Finance	79
11	Ain Shams Engineering	77
12	Design, Economics, and Innovation	74
13	Journal of Cleaner Production	66
14	Alexandria engineering	59
15	Research Policy	57
16	Energy Procedya	57
17	Systems and Software	53
18	Business Research	51
19	Computer and Education: Artificial Intelligence	50
20	Procedia Technology	48

Difference and Similarities of PBL and PjBL methods

After reviewing all the literature and other scientific sources, we concluded that there are similarities and differences between AR and PjBL. To reduce misconceptions about PBL and PjBL, we briefly summarize their similarities and differences in Tables 6 and 7.

Table 6. Differences between PBL and PjBL

Description	PBL	PjBL
Learning Focus	Focuses on problem solving as the core learning process. Students are given a problem or complex situation that requires solving, and they work to understand and solve the problem.	ocuses on project work that involves a structured set of tasks or activities. The project may involve research, design and implementation of a solution, and requires a final deliverable that can be presented.
Characteristics of the Project	Involves problem solving through group discussion, problem analysis and solution identification. Focus is on developing concept understanding and problem solving	Involves problem solving through group discussion, problem analysis and solution identification. Focus is on developing concept understanding and problem solving

Description	PBL	PjBL
Learning Outcomes	More oriented towards concept understanding and critical thinking skills obtained through problem solving.	It is more oriented towards developing practical skills and applying knowledge in the context of a real project. The outcome can be a product, a presentation, or an implementable solution.
Orientation to Teachers and Students	Tends to be more guided, where the teacher acts as a facilitator or guide who helps students in problem solving.	May involve the teacher's role as project director, but also provides opportunities for students to take an active role in the planning, implementation and evaluation of the project.
Study Time	More flexible in terms of time, with students working on their own problem solving and discussing in groups	Tend to take longer, as projects often involve complex stages of development

Table 7. Similarities between PBL and PjBL

Description	Similarities PBL and PjBL
Problem Based Learning	Both focus on problem-based learning as a core strategy. Students are presented with a situation or problem that requires solving, and they must be actively involved in understanding and solving the problem.
Collaboration and Communication	Both PBL and PjBL encourage collaboration between students. They work in groups to discuss, solve problems and develop projects. This promotes social skills and communication ability
Active Student Engagement	Both encourage students' active involvement in the learning process. Students do not just receive information from the teacher, but they are directly involved in the exploration, analysis and synthesis of information.
Application of Knowledge	Students in both are given opportunities to apply their knowledge in real-life contexts. This can include concrete problem solving, project development, or application of concepts in real situations
Other Skill Development	Both PBL and PjBL support the development of various skills, including critical thinking skills, problem-solving skills, collaboration skills, and presentation skills.
Concept Understanding	Although the main focus may differ, both PBL and PjBL can provide students with a strong understanding of concepts. They involve providing a real context to help students internalize and relate academic concepts.
Importance of	Both require the role of the teacher as a guide or facilitator.

Description	Similarities PBL and PjBL
Mentoring	Although the level of teacher involvement may differ, both PBL and PjBL recognize the importance of guidance in guiding and supporting students throughout the learning process.
Results Orientation	Students in both are given the responsibility to produce something as a result of learning. This could be problem solving, a project, a presentation or other product

Advantages and Disadvantages of PBL and PjBL Methods

Problem-Based Learning (PBL) and Project-Based Learning (PjBL) are learning approaches that encourage active student engagement and application of concepts in a real context. The advantages of PBL involve the development of problem-solving abilities, critical thinking skills, and high student engagement. The focus on complex problem solving and group discussions allows students to internalize academic concepts in a relevant and meaningful way. However, the implementation of PBL can take longer and demands students' readiness to take an active role in learning.

Meanwhile, PjBL offers the advantage of developing practical skills and real-life experience through project work. Students engage in research activities, design, and implementation of solutions, improving teamwork and coordination skills. PjBL can also increase students' motivation as they see concrete results of their efforts. However, challenges can arise in time management, proper project planning, and contextualized project evaluation.

While both approaches have significant advantages in developing students' skills, it should be noted that their successful implementation can depend on a careful approach, teacher support, and adaptation according to the learning context.

Discussion

The discussion section provides a response to each obtained result. This section contains explanations of facts and should not be hyperbolic. This segment elucidates the extent to which these facts support or contradict the previously proposed hypotheses and delves into the reasons behind these outcomes. All speculations must be substantiated with relevant references. Drawing comparisons with previous findings from up-to-date, primary, and relevant literature (approximately 50% of references from journals are used here) is crucial. These comparisons should highlight differences with prior research, indicating the potential for contributing to the advancement of knowledge, aligning with the anticipated benefits outlined in the introduction.

In this section, the author should articulate practical or theoretical implications arising from the obtained results. The discussion closes by presenting the limitations of the study and offering recommendations for future research.

Paparan bagian pembahasan adalah respon dari setiap hasil yang diperoleh, bukan menulis ulang data. Bagian ini besisi penjelasan fakta dan tidak boleh hiperbolis. Sejauh mana fakta tersebut mendukung atau menentang hipotesis yang diajukan sebelumnya, serta mengapa hasil ini mungkin terjadi. Semua spekulasi harus didukung referensi yang relevan. Berikan perbandingan dengan temuan-temuan sebelumnya berdasarkan hasil kajian pustaka yang relevan, mutakhir dan primer (sekitar 50% referensi dari jurnal ada dan digunakan disini). Perbandingan tersebut sebaiknya mengarah pada adanya perbedaan dengan temuan penelitian sebelumnya sehingga berpotensi untuk menyatakan adanya kontribusi bagi perkembangan ilmu, sesuai manfaat yang dijanjikan pada pendahuluan. Pada bagian ini penulis harus menyatakan implikasi praktis atau teoretis dari hasil yang diperoleh. Bagian ini ditutup dengan penyampaian limitasi dari penelitian dan rekomendasi untuk penelitian di masa depan.

CONCLUSION

Education's pivotal role in societal progress necessitates a departure from traditional teacher-centered approaches that often fall short in developing contemporary skills. The emergence of innovative learning models, notably Problem-Based Learning (PBL) and Project-Based Learning (PjBL), addresses this gap by actively engaging students in authentic problem-solving and real-world projects. The literature review underscores the significance of these models in enhancing critical thinking, problem-solving skills, and practical knowledge application.

Bibliometric analysis reveals a growing interest in PBL and PjBL over the past decade, with key research questions focusing on publication trends, distribution of most cited papers, impact on Sustainable Development Goals (SDGs), lead authors, leading journals, and a detailed exploration of the differences and similarities between PBL and PjBL. A comparative analysis between the two models indicates substantial differences in focus, project characteristics, and learning outcomes. While PBL emphasizes problem-solving and critical thinking, PjBL places a strong emphasis on practical skill development and real-world application. Both models, however, require effective guidance from teachers. As education evolves to meet 21st-century demands, the adoption of these innovative learning models becomes crucial in providing students with the skills needed to navigate the rapidly changing

global landscape.

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