Supplementary Table 1. Reviewed studies

No.	Origin	Authors (Year)	Journal	Study objective	Study design/ method	Study results
1	Foreign	Zakaria et al (2019)[1]	Creative Education	To analyze studies related to disciplines of PBL and its effects on education	Quantitative	Results show that 95% of learners who have utilized PBL believe that PBL has positive effect towards learning and can be used for all levels of education.
2	Foreign	Hallinger and Bridges (2017)[2]	Educational Administration Quarterly	To address major components of PBL	Quantitative	As the first published article on PBL in leadership preparation and development within schools, study results highlight major components of PBL and states the need for more rigorous research in the research field.
3	Foreign	dos Santos (2017)[3]	IEEE Transactions on Education	To propose a management process for PBL implementation	Quantitative	The study proposes an assessment model for successful implementation as well as its actual use in software engineering education.
4	Foreign	Tortorella et al (2017)[4]	Production	To propose a method to enhance Lean Manufacturing learning through PBL implementation	Qualitative	Research findings show that PBL implementation within Lean Manufacturing, a subject included in industrial engineering programs, may serve as an effective method for teaching.
5	Foreign	dos Santos (2015)[5]	2015 IEEE Frontiers in Education Conference (FIE)	To evaluate whether the application of xPBL is practical in real learning environment	Qualitative	The research proposes a learning method titled xPBL, which successfully incorporates elements deemed necessary for application of PBL within the software engineering field.
6	Foreign	Salinitri et al (2015)[6]	Interdisciplinary Journal of Problem-Based Learning	To propose a theoretical framework for developing a PBL facilitator training program	Qualitative	The research proposes a theoretical framework for creating a facilitator training program incorporating PBL of the pharmaceutical sciences sector, with evaluation including inter-rater variability between facilitators and student performance.
7	Foreign	Wosinski et al (2018)[7]	Nurse Education Today	To identify and facilitate elements that contribute to successful PBL implementation among undergraduate nursing students	Qualitative	The study utilizes a qualitative systematic review in accordance with meta-aggressive methodology using the JBI SUMARI system to identify the elements undergraduate nursing students deem as necessary for effective PBL application.
8	Foreign	Alrahlah (2016)[8]	The Saudi Dental Journal	To discuss the effectiveness of PBL as a teaching method in dental education	Quantitative	The study claims that students in PBL courses exhibited stronger professional capacity and compared to those who have not taken such courses.
9	Foreign	Jaleniauskiene (2016)[9]	Procedia - Social and Behavioral Sciences	To state the relevance of PBL in teaching foreign language education	Quantitative	Results address the necessity of PBL implementation in the foreign language field in higher education and proposes methods for successful application.
10	Foreign	Almulla (2019)[10]	IEEE Access	To assess PBL's effect on various aspects of student achievement	Qualitative	The study concludes that PBL does have a positive effect in increasing overall student achievement.
11	Foreign	Huang and Wang (2020)[11]	International Journal of Environmental Research and Public Health	To combine PBL method in an emergency-care situation in a nursing course	Qualitative	Results show that combined PBL method proves to have a positive effect in enhancing the core competencies of nursing students.
12	Foreign	Hung and Lin (2015)[12]	BMC Medical Education	To formulate a general understanding in the use of PBL	Qualitative	Using the quasi-experimental study model, the study concludes that PBL has a positive impact on the acquiring and combining knowledge.
13	Foreign	Rodríguez González and Fernández Batanero (2016)[13]	International Journal on Advancesin Education Research	To observe and identify theoretical frameworks of PBL and its application in the engineering education field	Quantitative	The research identifies frameworks grounded in PBL and provides general guidelines for effective implementation.
14	Domestic	Kang et al (2019)[14]	Journal of the Korean Applied Science and Technology	To examine the effectiveness of PBL learning withing nursing students	Qualitative	Results display that core competencies of students can be enhanced through PBL learning.
15	Domestic	Kim (2018)[15]	The Journal of the Korea Contents Association	To identify the impact of tutor's expertise and experience on student satisfaction during PBL learning in a nursing course	Qualitative	Study result shows that the tutor's expertise did have a statistically significant influence on student satisfaction.
16	Domestic	Kim (2015)[16]	Journal of Digital Convergence	To observe students' learning experience in a PBL context at English language courses	Qualitative	Through a survey to determine the benefits of implementing PBL learning in English language courses, the study proposes that PBL does benefit students' learning.
17	Domestic	Shin and Kim (2019)[17]	The Journal of the Korea Contents Association	To identify the characteristics of successful PBL learning in a culinary arts course	Qualitative	Four characteristics, which involves problem-solving ability, collaboration, self-directed learning, and future preparation, have been highlighted as benefits provided by PBL learning.
18	Domestic	Lee (2017)[18]	The Journal of Korean Association of Computer Education	To study the effect of PBL learning in a computer system programming course on students' academic accomplishments and professional competencies	Qualitative	The research suggests that PBL does have a positive impact on students' academic accomplishments and professional competencies.

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