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INTRODUCING PROJECT-BASED LEARNING STEPS TO THE PRESCHOOL TEACHERS IN BANDUNG, INDONESIA

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Abstract

The Merdeka Belajar curriculum is the current curriculum developed by the Indonesian Ministry of Education, which should be implemented thoroughly in 2024. Project-based learning is identically engaged with this curriculum, which offers many advantages to enrich the quality of education. This method has been promoted and implemented in several schools across the region in Indonesia, yet many teachers still need help applying it. This research explores the project-based learning steps for preschool teachers in Bandung through a community service program by Industrial Engineering lecturers in Indonesia. There were 42 participants from 35 kindergarten and playgroup schools who joined the PJBL workshop. With an active learning workshop delivery, a significant result has been achieved that could increase their understanding of the PJBL concept. The "A Healthy House" project was an example of the topic covered in the workshop. To check the participant's knowledge of the PjbL steps, the questionnaire was distributed two times, before and after the workshop ended. Using the Mc Nemart test, the PJBL workshop has significantly impacted the teachers. They could understand the principles of PjBL and the steps of the methods.

Keywords – Project-based learning, Merdeka belajar, Kindergarten, Children, Toddler.

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1. Introduction

The Ministry of Education in Indonesia has recently declared that all schools, from playgroups to higher education, should implement project-based learning into their curricula. Project-based learning is a student-centered approach to instruction involving students in-depth investigations of real-world problems and issues (Bell, 2010; Ferrero, Vadillo & León, 2021; Lee & Galindo, 2021). This type of learning encourages students to understand the real problems and discover solutions to the problems rather than rely solely on memorizing facts and figures the teacher feeds them. With this method, students can apply their knowledge in their own ways, which can help them develop critical thinking, problem-solving, and communication skills (Bell, 2010). Additionally, project-based learning can foster a sense of collaboration and teamwork among students, and empathy as they work together to complete a project. Implementing the method into the curriculum can provide students with a more comprehensive and engaging educational experience and can lead to improved learning outcomes, as shown in the research from Sari, Suryana, Bentri and Ridwan (2023), that implementing PjBL in kindergarten has significantly improved student's performance.

As stated by Lee and Galindo (2021), the core soft skills students need in this 21st century are hardly obtained by using traditional teaching delivery. Some scholars suggest changing the method to be more student-centered since the impact produces significant results (Dole, Bloom & Doss, 2017; Yerizon, Permata-Syafermi & Oktavian, 2018; Pratami, Tripiawan & Puspita, 2023). Most of the studies that discussed the implementation of PJBL were mostly found in the domain of higher education institutions, but little evidence was implemented in pre-schools like the kindergarten level (Ferrero et al., 2021). Although they used PJBL in their study, few researchers take the teacher as the object of the study. PjBL is a formal method that requires rigorous steps and comprises some principles (Dias & Brantley-Dias, 2017). Hence, it brings the urgency of teacher comprehension toward the PjbL itself before the implementation.

PISA scores were the reason why The Indonesian Ministry of Education has a total commitment to encouraging all schools level to apply project-based learning since this approach has been promised to help students develop a better understanding of key concepts and ideas, which reflects their increased critical thinking, problem-solving, and creative skills. Indonesian PISA scores had not yet changed in these decades and the pandemic made the situation worse which caused "learning loss" (Ihsan, 2023). The premise of the perfect method was orchestrated across all education levels, starting from HEI to kindergarten. Some universities even put the technique as the strategic goal to be made. It was targeted that Implementing project-based learning into the curriculum is a great way to ensure that students are engaged and actively learning, as it allows them to explore topics, construct solutions, and give room for self-learning (Kasih, 2020).

Despite the benefits of PjbL, some issues still arise if some teachers need help understanding the method. The significant trajectory in the Indonesian education curriculum could have been better than the teacher perceived. Some teachers need to familiarize themselves with the Merdeka Belajar curriculum and project-based learning. According to Abidah, Hidaayatullaah, Simamora, Fehabutar and Mutakinati (2020), some teachers needed help in defining assessment. Although they know about the method, they still need to learn, especially the evaluation in practice. Lack of resources to understand the concept and technology illiterate are common obstacles for teachers when applying to the curriculum, let alone project-based learning. To ensure that everyone is on the same boat, providing teachers with adequate information and training may be helpful. Additionally, it's essential to create an open dialogue with teachers to identify gaps in understanding and address any questions or concerns they may have regarding the methods. With this activity, it might be possible to fill in the existing gap between teacher expectations and the desired target and ensure that teachers are confident to apply the methods.

Community service is one of the mandatory activities which should be carried out by lecturers in Indonesia. To address project-based learning challenges in Indonesia, some lecturers from the Industrial Engineering Department at Telkom University held a workshop for kindergarten teachers in Bandung, Indonesia, as a part of a community service program. Merdeka Belajar has now landed at the kindergarten

level, which still leaves some questions to the teachers. Hence, this workshop could be a great way to explore how teachers feel about the methods and how they can apply them in their classrooms. To start, the steps of PjbL were combined with the basic principle of cooperative problem-based (CPBL) learning by Yusof, Hassan, Jamaludin and Harun (2012) since PJBL can only be done using collaboration or group. The CPBL methods by (Yusof et al., 2012) provide comprehensive steps of collaboration learning, comprising three stages: individual learning, solution generation, and reflection. Most of PjbL's existing frameworks rarely mention the role of individual learning, which is the basic principle of cooperative learning. According to Johnson and Johnson (2013), the core element of cooperative learning requires 5 components including individual accountability, positive interdependence, group processing, social skills, and promotive interaction. Integrating this element into the proposed PjbL steps will add to the existing framework to be enhanced.

The workshop will guide on how teachers can apply what Merdeka Curriculum in their classrooms. This could include activities and strategies that teachers can use to help their students learn and engage with the material and also examples of relevant themes to be applied. They will be asked about how teachers may feel about this method and provide guidance on how to apply it in their classrooms.

The workshop was delivered by using Cooperative Problem Based Learning which allows the participants of the workshop to identify the problems, peer teaching, define the group problems, and whole class problems, generate solutions, and reflect (Yusof et al., 2012). Commonly, the most used workshop delivery is the only way where the instructor gives the lecture in the conventional method. This will lead to little engagement among participants. Hence, the participant may forget the steps and the principles of the methods. The ideal duration to apply the CPBL normally takes a minimum of a month to the whole semester. Since the workshop had a time limitation, semi-cooperative problem-based learning was used to deliver the material in the workshop. Some parts were fastened like generating solution activity although it did not neglect the collaborative principles. This method of the workshop also aims to increase the effectiveness of the workshop which could give a space for the participants to immerse in the methods, thus, later they will learn 2 methods at the same time, Project-based learning, and Collaborative learning. There were 42 participants from different kindergartens in Bandung who participated in the workshop and they will have a workbook as the guidance. The PjbL steps were taken from the PMI project life cycle (Project Management Institute, 2017) and the Cooperative Problem Based Learning by Yusof et al. (2012)The project management life cycle is a great tool to help project managers understand and plan the journey of a project. It typically includes four phases: initiation, planning, execution, and closure. Each phase has its own set of tasks and activities that help ensure the project runs smoothly. Understanding the project management life cycle can help students and also teachers save time, resources, and money. It can also help create a more successful outcome for the project.

2. Theoretical Framework

2.1. Project Based Learning

Referring to (Bell, 2010), project-based learning (PjBL) is a student-centered learning in which the lecturer/teacher facilitates the students to get the learning. It starts with questions, and they inquire about the solution with their curiosity, as monitored by their lecturer. The core element of the Pjbl is collaborative work which fosters individual learning (Bell, 2010). Meanwhile, according to Aldabbus (2018), PjBL is a student-centered learning that allows students in a group to work on problems/projects for a temporary lengthy time. PMI (Project Management Institute, 2017) states that the project is a temporary effort to create a definitive product or service. It has a specific final product/service as the cumulative of the effort. The typical problem or project is real which requires student's exploration and often requires multidiscipline areas. They will be working in a group to complete the project scope, report on the progress of the project, and do several presentations to demonstrate their understanding in solving the tasks/problems in the project.

PjBL offers many advantages, for example, nurturing critical thinking, communication skills, problem-solving, leadership skills, time management, creativity, motivation, engagement, teamwork, and

responsibility as the student takes ownership in solving the problems (Aldabbus, 2018; Bell, 2010; Dole et al., 2017; Pratami et al., 2023; Sari et al., 2023). Those skills are important in this 21st century to address the current worldwide challenge. What makes the PjBL different from other methods is the wide room for elaboration (Aldabbus, 2018). Students are given the freedom to define the topic, delegate the responsibility among team members, formulate the solution, and present the final product. They are also allowed to consult with their teachers and peers in completing the work.

To measure the effectiveness of the method, it should be aligned with authentic assessment. According to (Bell, 2010), the teacher should deploy the rubric to assess their performance including their collaborative skills, communication, and interaction among groups. Teachers could give them the freedom to evaluate peer performance with constructive feedback that aligned with long-life learning. principles Hence, they will know which aspects need improvement (weakness) also the strengths in making effective teamwork. To implement the method, it is suggested to look at the standard to give a consistent result/outcome. PjbL has the gold standard as stated by Larmer, Mergendoller and Boss (2015). This standard will drive the success skills of problem-solving/critical thinking skills, and collaboration (Larmer et al., 2015). The standards highlight 7 points include:

1. Challenging questions/problem: the project should start with challenging questions/problems that drive them to solve problems and explore the solutions. The problems that students faced are designed by the level of difficulty of the lecturers. The project should be designed meaningfully for the student so they can memorize it well like the process, step, and solution generation.

2. Authenticity: After the students graduate from school, they may encounter real-world problems. The problems brought to the school must be authentic or close to real-world problems. Hence, they will easily adapt to the problems in the future.

3. Student Voice and Choice: The students are allowed to provide their input on the resolution of the issue, the resources they utilize, and the outcomes they create to complete the project task.

4. Critique and Revision: teachers give room for students within a group to conduct peer review assessments. This process is advisable to know the strengths and the weaknesses of each other. This could maintain the team's performance, which could impact on the project's performance as well.

5. Public Product: the tangible outcome/products as the result of the student's work. The products are presented to their class as the application of the knowledge, learning, and skills they had acquired in completing the project.

6. Sustained Inquiry: It refers to immersing the students in a problem or issue for a prolonged duration of time. The problem is not designed to be solved in a few meetings or discussions. Thus, they will drive the questions again and again to me them utilize their capability. They use problem-solving skills and resources to investigate solutions to the problem. This process includes finding the answer, exploring the solution, conducting research, analyzing, and making connections about the findings during the project completion.

7. Reflection: Students and teachers take the time to evaluate the process of the PjbL, their experience in managing the project, what they learnt, what their weaknesses, strengths, the challenges they faced, and how they correlate the project problems to the real problems.

Most of the PjbL research has been primarily conducted in Higher Education Institutions (HEIs) and has shown promising results compared to traditional teaching methods. However, research in kindergarten and elementary levels is still limited and requires more evidence, as noted by Ferrero et al. (2021). In their study, Ferrero et al. (2021) investigated the effectiveness of PjbL for kindergarten and elementary students by reviewing various papers in this area. They identified several shortcomings in PjbL at this level, including a lack of experimental design, variability in participant samples and project durations, insufficient method assessment to determine effectiveness, and limited data accessibility for reproducibility

by other researchers, among others. Despite these challenges, PjbL also presents difficulties such as topic selection, lengthy monitoring periods, and potential limitations in content coverage compared to conventional teaching methods. These challenges may be amplified in kindergarten and elementary settings, where teachers need to ensure class readiness before implementation, consider varying communication abilities among students, and engage parents to enhance the success of PjbL at this level.

2.2. Cooperative Problem Based Learning (CPBL)

According to the World Economic Forum (2015), when it comes to the essential soft skills that students need in the 21st century, there are three key categories. Firstly, basic skills or literacy skills encompass literacy, numeracy, ICT, scientific, financial, and cultural competencies. Secondly, there are skills aimed at tackling complex problems, such as communication, collaboration, creativity, and critical thinking/problem-solving skills. Lastly, there are skills geared towards adapting to a changing environment, including leadership, adaptability, persistence, curiosity, initiative, and cultural awareness. These skills can be challenging to develop without the right teaching methods from educators. Implementing student-centered learning with problems as the focal point, along with collaborative learning, can help enhance communication, collaboration, and problem-solving abilities. Cooperative Problem-Based Learning (CPBL), which integrates team-based or collaborative learning with problem-based learning, offers a method to address the demands of the 21st century effectively.

CPBL has distinguished characteristics compared to other methods. CPBL according to (Yusof et al., 2012)encourages the student to work in collaboration with peers or team members, the typical group consisting of 3-5 members to increase collaboration, communication, and share responsibility awareness / task delegation among team members. CPBL uses the real problem and allows the knowledge to be applied in solving the problem. Next, this method used collaborative/cooperative learning principles including positive interdependence, individual accountability, group function assessment, interpersonal soft skill acquisition, and face-to-face interaction. The unique characteristic of this method is peer teaching, in which the team explains in front of their peer about the task. It aims to increase the understanding of the task and also reach the group consensus on learning materials. The framework to conduct CPBL consists of 3 stages (Yusof et al., 2012):

1. Phase 1 (Problem Identification and Analysis)

    a) Students prepare to discuss with their team member about the problems.
    b) Students try to answer the problem identification and restatement individually.
    c) Team members try to reach a consensus about problem identification and restatement by using peer teaching or explaining their perspective about problem identification and restatement.
    d) The lecturer/teacher /facilitator monitors the group discussion and tries to finalize the problem identification and restatement.

2. Phase 2 (Learning, application, and solution generation)

    a) Team members try to apply their understanding and knowledge to analyze the possible solution to the problem. Peer teaching is also possible to be carried out in this stage. They will use role-playing as the presenter and the audience in their team. At the end, they must set the final group solution.
    b) The cooperative learning principles are being applied to this phase.

3. Phase 3 (Generalization, internalization, closure)

    a) This phase allows students to reflect on the activity that already done during CPBL, what the strengths, the weaknesses in dealing with problem-solving
    b) Facilitator closes the method by restating any feedback or learning that might not yet be resolved during group discussions.

Cooperative learning offers numerous benefits, as highlighted in studies by (Amrullah & Suwarjo, 2018) and (Wang & Wu, 2022) such as enhancing critical thinking, intelligence, and problem-solving skills. However, it is important to note that cooperative learning can yield different outcomes, as indicated by (Turan, Konan, Kl, Zvar & Sayek, 2012), potentially impacting its effectiveness. Various challenges may arise, including difficulties faced by certain students in group work, especially over extended periods. Additionally, distractions like noise can lead to a loss of concentration among students during the learning process. Facilitators must be aware of these challenges and actively seek solutions. Continuous improvement in the delivery of workshops using CPBL methods is essential to ensure their effectiveness. Nonetheless, CPBL will continue to be applied in the workshop, with some processes being expedited, such as solution generation in phase 2. Typically, it takes several weeks to find the best solution during the workshop, but due to time constraints, the duration of this phase is shortened.

3. Methodology

Introducing PjBL to pre-school students were carried out using a workshop with 42 participants including 16 playgroup teachers and 25 kindergarten teachers in Bandung, Indonesia. The participants were from 35 different kindergarten and playgroup schools. The workshop was done as a part of the Community Service program in Telkom University (Tel -U), Indonesia. The 6 Industrial Engineering lecturers from Tel U were the host of the workshop and 2 of them were the speakers of this event. It took 6 hours from 08:00 am to 03:30 pm and the material was delivered through active learning such as collaborative group and role-playing. Participants were grouped by 5 members and required to discuss the task to make the workshop alive. The first part was conducted for 2 hours, and they got the PjBL introduction and the challenges in implementing it as the topic presentation. The second part was practicing PjBL with role-playing method. The example of a STEM project was introduced in the second part of the workshop, where creativity and environment were selected as the theme.

Figure 1. Healthy House Project Theme

"My Healthy House" was the topic of the PjbL that was associated with the selected theme as shown in Figure 1. The owner of the problem is a fictional character which is called "Boni". Boni expects to build the house to keep him safe from coldness and rain. It was also made for his family so his mom could make him food, and it was great for sanitation issues, especially toilets. The illustration was made using Canva to offer the participants an efficient solution for making a cartoon in just a second. The participants were given a challenge to create a prototype of a healthy house using recycled cardboard. The cartoon was animated during the workshop to allow them to understand Boni's problems.

The workshop aims to introduce participants to the practice of PjbL with the collaborative learning principles outlined by Johnson and Johnson (2013), which include positive interdependence, individual accountability, group autonomy, heterogeneous groups, collaborative skills, simultaneous interaction, equal participation, and cooperation as a core value. A questionnaire was administered twice, both before and after the workshop, as depicted in Figure 2. The purpose was to assess their understanding of the PjbL

technique. The questionnaire consists of two sections: the first section profiles the workshop participants, while the second section gauges their familiarity with PjbL, their comprehension of its implementation, and the steps involved. The final question is open-ended to allow participants to provide feedback based on their understanding gained during the workshop. To evaluate participant familiarity and comprehension of the methodology, the McNemar Test will be conducted due to the dichotomous nature of the questionnaire responses (i.e., "Yes/No"). This research combines qualitative and quantitative methods.

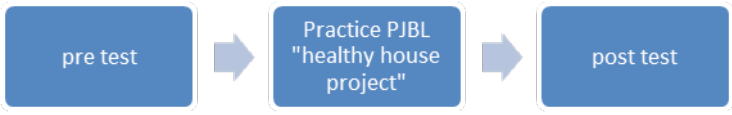

Figure 2. Research Steps

There are plenty of papers showing the PjBL steps but few papers discussed with cooperative learning principle in the stages. Moreover, the PjBL steps were developed with the combination of the PMI project management process (Project Management Institute, 2017) and the Cooperative Problem Based Learning (CPBL) (Yusof et al., 2012). The project management process will tell us the mandatory deliverables in every stage of the project, effort, resources needed to complete the project. By contrast, the CPBL will give us the adequate information about the cooperative learning principle which is integrated with the formal steps of the teaching method. The steps are followed by 3 phases, including problem definition, problem analysis and synthesis, and solution generation.

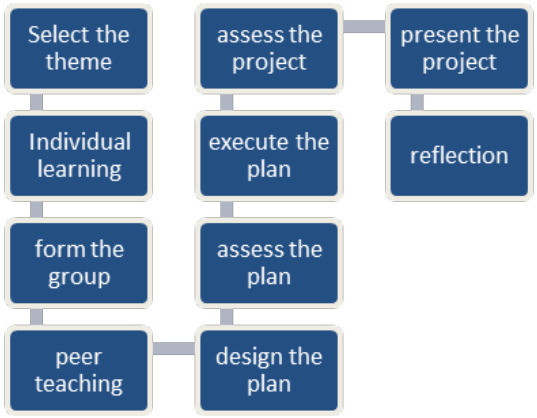

Figure 3. Project-Based Learning Steps for Pre-school Students

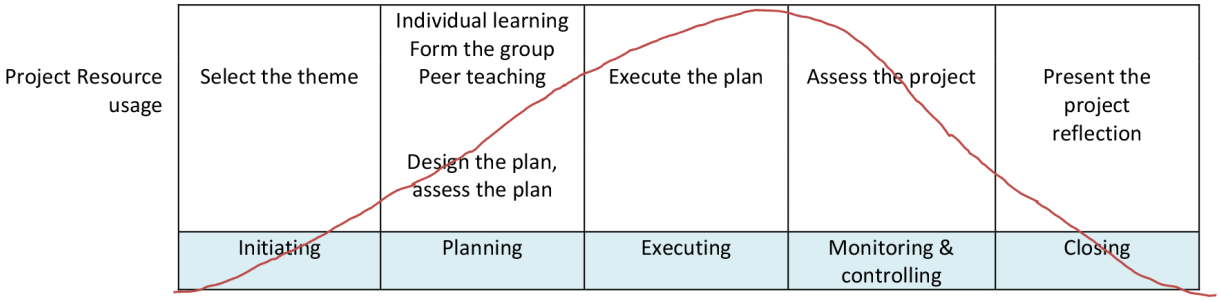

Figure 4. Project Management Process

Figure 3 and 4 exhibit the 10 steps to implement the PjbL for preschool students, starting from picking one of the relevant themes and ending up with the reflection stages which contain the review of all the processes that have been done by the teachers. Overall, there are 5 distinguished stages of the steps including initiating stage, planning stage, project execution stage, monitoring & controlling, and closing

stage all of them is adopted from project management process taken from PMI (Project Management Institute, 2017). The project resource comprises time, budget, material, effort needed to complete the project. The largest project resource percentage is in the executing stage. By contrast, the initiating or closing stage is recorded as the lowest percentage of resource usage in the Pjbl implementation.

The average PjBL duration may vary from 1 month to 1 semester, resulting in the steps can be divided by the duration that has been taken. The first step which is noticeable found in the initiating stages is picking the theme. According to the Merdeka Curriculum, issued by Indonesian Ministry of Education, there are 4 big themes for playgroup students, including: I love the earth, I love Indonesia, play and collaboration, my Imagination/my creativity. As for kindergarten students, the theme is more various such as Myself, My family, My environment, Animals, Plants, Transportation, Universe and My Country. At this stage, teachers should pick only one of the themes, meaning that they can carry out the PjbL more detail and focus. At the end, if the selected theme is associated with another theme, then it might be a side effect to the implementation and they may observe or do assessment at the same time. The point is selecting one theme are more recommended in order to create more feasible teaching plan rather than choosing more than one theme.

PjbL requires a ton of documentation which could be the main factor why they reluctant to apply it in their class. However, the documentation or preparation materials are compulsory in the beginning stage for instance making a work book/guidance for the students. This workbook will guide the students to understand the flow of the process that will be met. It may cover the theme description, sub theme, the goals will be made, instruction, the process of PjbL, the materials needed, the observation form, project report form etc. Although they may not understand enough about how to read and decipher the context, the it will guide both teachers and parents to understand the project. For example, parents will be given the information about the assessment, the material needed, the soft skills observation. In addition, they can motivate their children to finish the project since they are being informed earlier through the workbook. Teachers also can introduce and give instruction to their children based on the workbook. Hence, it is necessary to give more attention to the design of the workbook. It should be attractive and easy to follow, so it would be recommended to make the workbook at the initiating stage before providing it to the students.

Moving on to next stage, the students are given the problem through the videos/storybooks/site observation. Teachers are free to apply the appropriate means for project communication. During the planning stage, they must give some space to understand and solve the problems individually before they will be grouped by 3-4 team members. After the group formation, teachers should conduct peer teaching or mini-presentations among team members. It will give the opportunity to enhance communication skills. Each member may watch the peer's presentations and also give some feedback. Each grouped should be equipped with one teacher that will guide throughout the process include the presentation session. This situation is relevant with collaborative principles called individual learning. The teachers should navigate flow of the process, motivate, and guide them if one of the members don't understand and need clarification.

After peer presentation, they were instructed to design the group solution. Teacher may provide them a sheet of paper and colourful pen. She/he must divide the task based on the number of the team since toddlers are still difficult to share and understand the concept of collaboration. PjBL indeed will give the taste of the collaboration in the early stage, albeit it may not perfect one. During designing the plan, teacher may also give some feedback in the small group discussion. Videos, books, observation can support to accentuate the children in understanding the real problems and simple solutions. Lead teacher can randomly assign one of the available groups to present their plan so everyone can see the different perspective. In addition, it will also give some room again to the children to cultivate communication and collaboration skills.

After the plan has been established, now they can move to executing the project that may need several times to complete. The project is done in the class with evenly task division. Later on, the project is ready

to be checked for the correctness. At this time, the teachers should make a rubric about how to measure the project deliverable. Next, the project presentation is carried out in team. This last activity is called team teaching, so every student can see the final solution made by the other group. Team review, lesson learned are also discussed after the presentation is over. Reflection is very important to finish the PjBL steps and teachers can ask them about their feeling, the process, the team collaboration and also the advantage of the project to their life. To celebrate the final project milestone, teacher can choose the best team, the best presenters and many more to respect the achievement made by the students. It will also motivate them that the work will be valued highly if they can do it in great manners.

4. Results

Referring to Figure 5 it gives us information about the comparison between the kindergarten teachers and playgroup teacher, before and after PjBL workshop in the community service program held by lecturers from Tel-U, was started. Of 42 questionnaire feedbacks, filled by the participants, only 38 responses were valid. Most of invalid responses were due to missing answer in several questions then they were not counted to further analysis. Overall, the majority of participants were familiar with the PjBL and understood about PjBL implementation. There were substantial differences before and after the event, especially for kindergarten teachers, all of them understood about the methods. By contrast, playgroup teacher, 84% understood and the rest 16% was not clear about it.

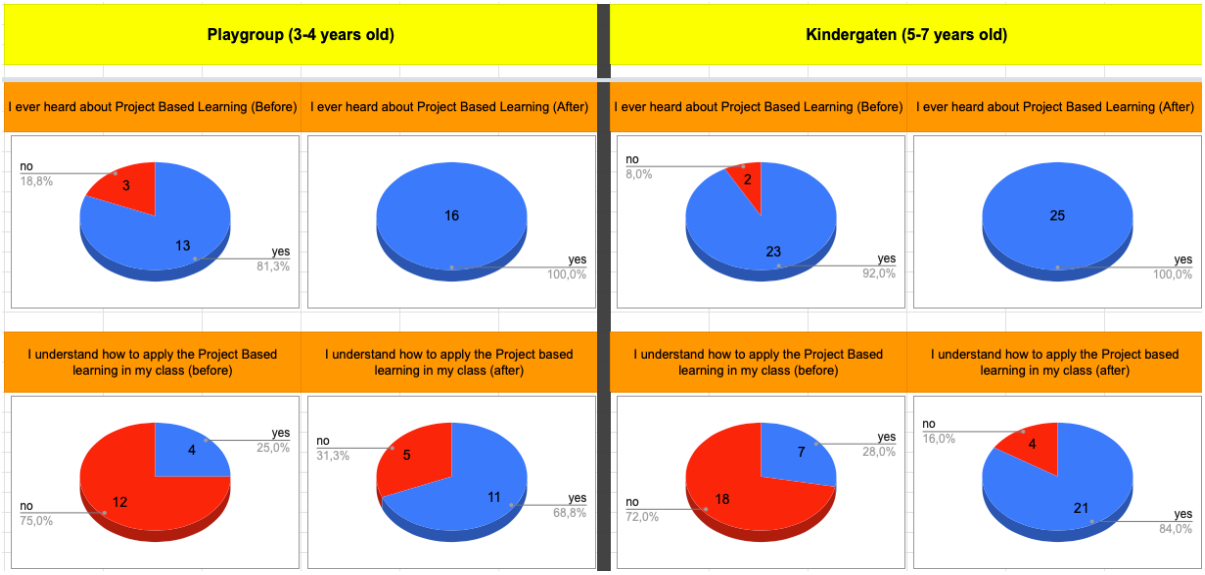

Figure 5. The comparison data of Kindergarten and Playgroup teacher during PjbL workshop

For teaching method familiarity aspect, the play group teachers was recorded an increase after the workshop finish by 18,87%, from 81,3% to 100%. Meanwhile, the same experience also happened in kindergarten teachers from 92% to 100% after the they got the workshop, respectively. For method understanding aspect, the playgroup teachers recorded the largest number of participant who didn't understand about the PjbL (75%) and only 25% were capable to identify the process before they had the workshop,. Kindergarten teachers also undergone the similar situation as playgroup in which only 28% understand about PjbL process and the rest was 72%, had no idea about it.

Compare to the ending workshop's results, both participant from two groups were noticeably experienced sizeable results. The majority of both groups were understood about the methods especially Kindergarten teachers reached 84%, resulting in the largest group who understood the material of the workshop. Moving on to the second group which was playgroup, had reached a moderate number which was 68% participants, understood the methods, and recorded 31% participant still need workshop to comprehend the method.

The Mc Nemar test is a statistical test used to analyze paired nominal data especially for dichotomous data (Fagerland, Lydersen & Laake, 2013). Since the response of the questionnaire is between "yes" or "not" related to understanding about PjbL, then a non-parametric test, Mc Nemar's test was used. The formulated hypothesis from the research can be drawn as follows:

Null Hypothesis (H0): the mean of before and after test are equal

Alternative Hypothesis (H1): The mean of before and after test are not equal.

To conduct the test, the participant response was summarized into 2 × 2 contingency table as shown in Table 1. After the table is set then proceed to be tested by using Mc Nemar's test. This test use Chi-squre distribution. To get the p value, the test was processed using Minitab. The decision criteria is used in the following number:

Rows: Before-Understand Column: After-Understand			
	No	**Yes**	**All**
No	9	19	28
Yes	0	10	10
All	9	29	38

Table 1. Contingency Table

Estimated difference	**95%CI**	**P**
0,5000	(0,3147;0,6853)	0,000
Difference = p(Before-Understand = no) – p(After-Understand = no)		

Table 2. Mc Nemar's Test

If the p-value is less than the chosen significance level, then reject the null hypothesis.

If the p-value is greater than the significance level, then do not reject the null hypothesis.

The result of the test is presented in Table 2. According to the test there is a difference after the intervention as depicted by 0,5000. The proportion changing from "Not" to "Understanding" after the intervention (0.5000) is much higher than the proportion changing from "Understanding" to "Not". By using 95% Confidence Interval (CI), indicates that, with a 95% confidence level, the actual difference in proportions between the two groups (before and after) lies between 0.3147 and 0.6853. in addition, the p-value can be obtained and from the table shows that the p-value of 0.000 is much smaller than 0.05. hence, it rejects H0 and accept H1. This suggests strong statistical evidence to conclude that there is a significant difference between the two groups. Further, the workshop has affected the participant in understanding the process of PjbL. There is a significant difference in between pre and post-survey, meaning that the workshop contribute to the participant's insight, as displayed in the table test.

In addition, according to the open-answer surveys distributed after the workshop, most of participants were able to explain the stage of the PjBL. The question of the survey including the sample answer can be seen in Table 3. Compared to the pre-test with the same questions, there were still few participants who didn't know exactly about the material, either of definition or the steps. It would probably be argued that the workshop delivery used active learning so that they are able to memorize it better. In Table 1, the participant responses were kept and analyzed. From pre and post-test results, mixed with open survey questions, play group teachers still need to learn the methods, albeit the majority of the group was able to catch the information about PjBL. It is probably the characteristic of playgroup students who are still quite young then the teachers are not really confident about project success. After they had the

explanation about the method, just getting a taste about the project will likely be more feasible rather than completely implemented.

No	Questions	Participant A	Participant B
1	To what extent you can explain about the Project Based learning?	It is a learning type that use project where the student are the center of the learning	A type of learning model that used project as the media
2	Please mention the step to implement PjbL in your own word	a) Define the theme. b) Generate the questions based on the selected theme. c) Create project design. d) Create schedule. e) Monitor the project. f) evaluation	a) and define the problem and question. b) design the project. c) arrange the schedule. d) check the progress. e) check the result. f) review the experience

Table 3. The sample of open survey question

The proposed PjBL steps comprise 10 steps which follow collaborative learning principles and also gold standard of the Project based learning. From the workshop it can be found some several findings. The detailed steps, including instructions, are described as follows:

a) Select the theme

Before the group formation, they were told to create a group consisting of students and the teacher since they will have role-playing session. One participant of the workship will act as the teacher the remaining team member will act as the student. The teacher should pick the intriguing problem/questions that make student's curiosity arise. This aligns with one of the PjbL gold standards that the problem should provoke student's curiosity and relate to their real-life problems. The problem is about how to make healthy house so it will prevent sickness. If the problem is being given in an ordinary discussion, it will not probably increase the curiosity and somewhat not attractive by the real students which is in the age of 3-7 years. The problems are made in the simple video with a made-up cartoon character called "Boni". These fictional characters were made to engage students' attention and imagination. The story begins with he finds the empty space and want to build the house that will keep him safe form danger and sickness. The house also must accommodate enough for 3 people including his parents. The presenter of the workshop threw the problems by playing the video. about Boni's story. At the end of the video, Boni asks the audience about can we built the Boni's house that will accommodate the safety and space issue. The sample of the Boni video can be found through this link: https://tinyurl.com/storyofboni.

b) Individual learning

The participants, playing role as if they were a student, was given a sheet of paper and try to figure out the 2 dimensions drawing of the healthy house project. Each group also must assign one Guide Teacher that will play as living "Boni" so the students can ask them about the detail information in creating the building and the design as well. When project starts, it means the guide teacher should be aware of what students' behavior, attitude, engagement, activity during the project completion. She/he can write some notes and put some highlight in the observation form. During individual learning, there are many things to introduce the house to them, for example using a puzzle, cutting the shape and stick them into a house like shape, coloring the house image and many more with some adjustment to the children level. Although they will be later work in a group, they must also responsible for individual learning. This also align with the cooperative learning and PjbL principles which emphasize the importance individual accountability to function the group learning. If a student has a little responsibility and ownership to learn individually about the lesson then it will increase the probability of fail group. In the Project they will have the equal voice to solve the challenges together. The individual learning will encourage the

students to prepare the group discussion and realising their point of view in seize the challenges or problems.

c) Form the group.

After they had designed the Boni's House, now they were working a group, consisting of 3-4 members. This group will stay the same until the project ends. Each group also must assign the leader of the group. The leader is responsible to delegate the task and navigate the Project. Regarding the Boni's healthy house projects, group should finalize the problems to get the same understanding what group solution that will be generated in the next stage. By the aid of facilitated teacher, students can try to decide the problems and formulate the suitable solution through attractive explanation.

d) Peer teaching

After they define the challenges now the group must find the solution. the final solution is generated through group discussion which allow the students to present the initial solution individually. Facilitated teacher lead each member in the group to formulate the solution. They presented the ideas of initial solution among the group and leader decide the best initial solution though consensus. The peer teaching will encourage the students to see different perspective of the ideas. With simple presentation. It also increases the confidence in speaking, empathic listening skills, problem solving skills and vocabulary which is great for kindergarten students. They will also learn to respect other ideas and criticism toward the ideas.

Figure 6. Guide teacher distributed the task to the "students"

e) Design the plan

The guide teacher gave only one sheet of paper to discuss about the final house design. A real professional architect was invited to share the ideal healthy house. She explained the criteria based on Indonesian Ministry of Health such as every house should have a proper ventilation and water system, the house should have robust wall, ceiling and floor, the space requirement that are estimated based on the total number of people that will live in the house. The guide teacher was also playing the living "Boni" so the students can ask the detail house like the color of the house, the expected total story, the expected room to be built. They must complete the interview form in the workbook with some adjustment like circle the available option, drawing the results of the interview etc. because the real students will probably around 4-6 years old. After they were being told about the criteria by the expert and did an-interview with the living Boni, they could design the house with the right reference. The professional people or expert could be invited through this stage so the children can also learn the variation of the Jobs. The expert can be customized based on the selected topic and available resources.

f) Assess the plan.

The proposed design was displayed and presented among another group. The Guided teacher and students will likely give the feedback about the design. One of the PjbL gold standards and collocative learning is giving feedback and critics. This will increase the quality of the outcome and also introduced the children to normalize giving the constructive feedback or critics. In real practice, teacher might be possibly invited the parents to see what children did in completing the projects and give the scores.

g) Execute the plan

To sustain the inquiry process, they must execute the approved plan. They were now in the middle of the project journey that required a lot of effort according to the project life cycle by PMI (Project Management Institute, 2017). They must create a house for Boni with 1 shoe box and one sizeable 40 × 40 cm cardboard with masking tape. The guide teacher divided the project task just like cutting the cardboard, sticking the cardboard by masking tape, draw the pattern for specific room, painting the wall using selected paint to the students. This activity aims to prevent the children fight during the project execution.

h) Assess the project

The prototype of the project had been built so the upcoming activity is checking house. There are rubrics (as shown in Table 3) to check the house. The rubrics is included in the PjbL worksbook given in the initial stage. It consists of the criteria of the healthy house, the instruments to check the criteria and the resources requirement in carry out the assessment.

Figure 7. Participants were making the prototype

No	Criteria	Instruments	Resource requirements
1	Robust ceiling, wall, and floor	Teacher shakes the house gently if the house is collapsed then the structure was not good	-
2	Light Ventilation	The teacher inspects the window and the door to see whether they can be opened or closed. The teacher can also bring a flashlight and shoot it across the door and the window. Invite the students to check the light that comes in through the window or door. If they can see the light, then the house is good	Mini flashlight
3	Wind ventilation	The teacher inspects the window and the door to see whether they can be opened or closed. The teacher can also bring a mini fan and shoot it across the door and the window. Invite the students to check the wind that comes in through the window or door. If they can feel the wind, then the house is good.	Mini fan
4	Sanitation	The teacher asks the students where they put the restroom inside the house. If the students can answer the location of the restroom, then the house is good	-
5	Leakproof	The teacher brings a large container and put the house inside the container. Ask the students to pour the rice on top of the house as if it were raining. If the rice remains on top of the roof, then it would probably cause the leak later at the house. If the situation happens, it is supposed to be the bad house.	A cup of rice A large container

Table 3. The Checklist of House Prototype

a) Present the project

Students present the final prototype made by cardboard. All the students wait for their turn see other presentation and give their critics/feedback about their performance. This activity will allow students to increase communication skills and appreciate other works. Final prototype will be a form of cumulative knowledge obtained by PjbL, and the application of method/tools/technique used. In real practice, parents might also be invited to the final presentation of the projects and they can also decide the best Project.

Figure 8. A house prototype

b) Reflection

At the end of the stage, let student express their feeling when they finished the projects. In this session, teacher can also give the score about student achievement, the aim of project house, why we need designing healthy house, the shape of the house, the function of the house, the detail room etc. She/he also gave the student peer review form, so she/he ask the student to rate the peer score from 1 to 5 (the bigger the better).

PjbL emerged as one of the excellent methods to assist kindergarten students in developing problem-solving, communication, creativity, agility, critical thinking and collaborative skills. Study from (Syahril, Nabawi & Safitri, 2021) there is strong relation between the effect of PjbL to students softskills. From the test calculation between pretest and posttest, the workshop effectively enhanced teachers' comprehension of project-based learning . However, some academic papers primarily focus on students' perspectives, highlighting challenges such as limited teacher facilitation, knowledge, technical skills, and collaborative learning principles (Setemen, Sudirtha & Widiana, 2023; Syahril et al., 2021; Valero, 2022). Moreover, research findings often stem from higher education institutions, making it challenging to replicate procedures in kindergarten settings (Ferrero et al., 2021). For instance, studies from Requies, Agirre, Barrio and Graells (2018) lack detailed explanations or steps for implementing PjbL, which cause difficulty in reproducibility and understanding among educators and students.

To address identified challenges, workshops serve as a critical solution for teachers to grasp project-based learning methods and implementation strategies. By incorporating student-centered learning approaches like CPBL, workshops aim to optimize memory retention since the community program was held within a limited duration. Topics covered include the fundamentals of project-based learning, project creation, student assessment, and discussions on best practices. Additionally, integrating cooperative learning principles and established project management processes from PMI enhance the proposed Pjbl procedures, emphasizing essential project stages and deliverables. Cooperative learning principles such as emphasizing individual accountability, pre-group learning, and peer teaching can enhance softskills acquisition like communication and problem solving. Next, overcoming challenges related to student readiness in diverse kindergarten students as proposed by Ferrero et al. (2021) requires collaboration between educators, parents, and tailored learning outcomes to ensure inclusivity and engagement. Establishing a roadmap towards PjbL implementation, starting with active learning and gradually transitioning to full adoption, fosters a supportive and motivating learning environment for both teachers and students.

5. Discussion and Conclusion

The workshop was successful, as evidenced by the results of both the pre and post-tests. Upon analyzing the data from the tests, it was observed that participants had varying levels of understanding. The playgroup teachers faced challenges with grasping the PjBL method, with 75% of them indicating difficulty, while kindergarten teachers showed a similar struggle with 72% reporting a lack of comprehension. These high percentages indicated a significant gap in understanding the PjBL method, especially considering its immediate implementation in their classrooms. However, after the workshop was introduced by using the CPBL method, most participants were able to understand the material and apply it effectively. Notably, all kindergarten and playgroup teachers understood the method, followed by 84% of playgroup teachers, and 68% for Playgroup teachers. Furthermore, statistical tests revealed a p-value of 0.000, indicating a significant difference between the pre and post-test results, affirming the effectiveness of the workshop in transferring knowledge.

In conclusion, the workshop on project-based learning (PjBL) using cooperative project-based learning (CPBL) methods demonstrated significant improvements in the comprehension of kindergarten and playgroup teachers in Bandung, West Java, Indonesia. Some highlights taken from the study following several points:

1. This study has developed a procedure for implementing Project-Based Learning (PjbL) at the early education level. Early education has been limited in discussions, especially regarding PjbL. Bell (2010) supports this research that the urgency of applying PjbL in early education due to its long-term benefits, including preparing students to face real-world problems and developing strategies to overcome them. Furthermore, this approach ensures students will not be bewildered by future challenges.

2. Teacher readiness is crucial for the successful implementation of PjbL. This is also recorded in the research by Lee and Galindo (2021) that teacher need a training and effective support for Pjbl implementation. In addition, teachers must grasp the principles of cooperative learning from Johnson and Johnson (2013), understand the gold standard of PjBL by Larmer et al. (2015), and be familiar with the method's procedures to achieve benefits such as problem-solving, critical thinking, and creativity. A significant challenge, especially among Indonesian kindergarten teachers, is a lack of knowledge about the method. Hence, it is important to solve the challenges prior the implementation. This finding supports Aldabus's (2018) conclusion that addressing PJBL challenges is essential for successful implementation. Once these challenges are addressed, subsequent steps become more manageable.

3. The workshop's material delivery was meticulously planned, taking into consideration the limited time and the number of participants to select the most effective method of delivery. A semi-CPBL approach proved effective. Yusof et al. (2012) indicate that CPBL can enhance student's learning in medium to large classes, suggesting that it can accommodate many participants, as was the case in the workshop. Further, surveys conducted before and after the workshop showed an increase in understanding of PJBL, supporting the notion that CPBL can enhance learning and engagement (Wang & Wu, 2022). Following the workshop, participants were able to accurately document the PjbL procedures, demonstrating the effectiveness of the CPBL model, which is based on constructive alignment principles ensuring alignment between learning outcomes, activities, and assessments to promote student engagement and understanding (Yusof et al., 2012). This process aims to address the weaknesses identified in previous research such as study from Ferrero et al. (2021)and is aligned with professional project standards by PMI (Project Management Institute, 2017), covering various stages from theme selection to reflection, thereby facilitating thorough supervision and assessment by teachers.

4. When it comes to PJBL then it should not neglect the basic principles of cooperative learning from Johnson and Johnson (2013), to gain the real benefit of the PJBL. The finding from Requies

et al. (2018) also strengthens cooperative learning principles that must be hold in PjbL implementation. They applied PjbL which used the cooperative learning principles in engineering students. From their findings, working in a small group is preferable and functioning the learning group, then it is advisable to form the members of the group is limited by 3-4 students. If the teacher is already familiar enough about the cooperative learning principles, the implementation and also some standards in PJBL, then it can reduce the failure of the implementation and also increase the positive outcome that may get by the method.

5. As a researcher, then it is important to ensure all the steps in the procedure are clearly stated, and explained in detail to facilitate others teachers and researcher to adopt the method easily. This was one of the suggestions in the paper by Ferrero et al. (2021) that the current PjbL methods for elementary and kindergarten teacher were not clear enough to specify the detail process which cause difficulty in method reproduction. While other researcher focus on the measuring the final impact/outcome, and assessment, without further explaining the detail steps, this research will be one of the solution by bringing up the issue of the teacher point of view. Some researches are mainly focus on the student's response, perception while taking teachers' perception is still rare. For example, study from Requies et al. (2018) which focus on the assessment taken in the PJBL implementation and the influence of PJBL to students softskills. They didn't mention the readiness of the teacher itself in adopting the method. Next, study by Setemen et al. (2023), stated that PjbL has impact on learning agility skills, problem-solving skills and critical thinking skills by implementing the method to 58 students. However, despite the significant finding of the research, the step for implementation is limited to be written, as consequence it will have difficulty in reproduction by other researchers.

6. We aim to refine the procedure to address the shortcomings of previous research identified by Ferrero et al. (2021). The proposed procedure for conducting Project-Based Learning (PBL), applicable across educational levels from playgroup/kindergarten to university, includes: theme selection, individual learning, group formation, peer teaching, project plan development, project plan assessment, project plan execution, final project assessment, and reflection. This process adheres to the professional project standards set by the Project Management Institute (PMI). The deliverables of the project life cycle, such as project planning, execution, monitoring, and closing, serve as milestones for students to achieve. This framework is also beneficial for teachers to monitor student projects, conduct assessments, create rubrics, and manage time effectively. Time management poses a significant challenge in PBL. The breakdown of the process aids teachers in preparing and organizing project resources and efforts.

7. The implementation of PjBL incorporates cooperative learning principles as outlined by Johnson and Johnson, and the PjbL gold standard proposed by Larmer et al. (2015), emphasizing that project problems should reflect real-world issues. For instance, in the workshop took Healthy House Project theme, allowing children to easily understand the concept due to its relevance to their environment. Next PjbL standard is individual accountability. The peer teaching, which is included in the procedure, fosters individual accountability, a key factor in enhancing student learning.

8. Cooperative learning creates an environment conducive to teamwork, discussion, defense of viewpoints, and constructive peer feedback, which enhances learning. This approach also increases student satisfaction. Turan (2012) noted that cooperative learning boosts learning satisfaction, supporting (Requies et al., 2018) findings that PBL implementation in courses leads to enhanced academic performance, student engagement, and academic motivation.

Overall, The Pjbl community service workshop has encouraged the teachers to feel the benefit of the project would be for instance think critically, explore multiple solutions, and collaborate with others in order to find the best solution. Thus, they will know what their students feeling when they implement PjbL. The way to deliver the workshop were considered in detail because the aim of the workshop that

the teachers can apply and understand the PjBL. Using role playing, CPBL or other active learning in the workshop are the most effective thing that they do because it also provides them with the opportunity to develop communication skills as they explain their ideas and work together. Additionally, this type of learning provides students with the opportunity to use their imaginations to create projects that are engaging and meaningful to them. With project-based learning, kindergarten students can develop valuable skills that will help them in the future for example problem solving. These skills can be acquired through student centered learning compare to traditional one (Lee & Galindo, 2021).

While the workshop demonstrated effectiveness, certain limitations were identified. This study focused solely on kindergarten and playgroup teachers in Bandung, West Java, Indonesia, potentially limiting the generalizability of the findings to other educational programs or levels. Additionally, the research did not delve into the long-term effects of PjBL and CPBL implementations. To address these limitations, a longitudinal survey could be conducted to assess teachers' comprehension of the methods and the workshops' overall effectiveness. Moreover, considering the predominantly female participation and low male representation in the workshop, it is essential to note that the workshop's outcomes may vary when implemented by other researchers. To enhance understanding of collaborative learning principles inherent in the PjBL method and its detailed implementation, it is recommended that future workshops span more than the current such as 2-3 day duration. Regarding the sample size, larger simples is recommended, the different region can be counted to get more general result. The soft skills assessment also can be added in the future. Lastly, the theme of the project can be elaborated to give more deeper insight about the Project and related to the children age development.

Declaration of Conflicting Interests

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