Developing Earth and Environmental Science Knowledge Through Project Based Learning

Rachma Audina Al Khanza[1*], Reni Pawestuti Ambari Sumanto[1]

[1] Early Childhood Teacher Education Program, faculty of education and psychology, Universitas Negeri Semarang, Jawa Tengah, Indonesia.

Abstract: This research focuses on the understanding of science knowledge of children which is still considered low. The learning process still uses the lecture method and also LKPD. With this study, researchers aim to analyze the effectiveness of earth and environmental knowledge with the help of project-based learning at the age of 5-6 years. The type of research used uses pre-experimental research with a one group pretest and postest design. The population of this study used all group B children at RA Miftakhul Hidayah with a sample of 36 children using purposive sampling technique. Tests carried out using instruments in the form of observation sheets, Normality Test with pretest results of 0.221 and post-test results of 0.134 can be declared normally distributed. Then for the results of the N-Gain Test has a score on Meab of 77.31 with a percentage of> 76%, it can be concluded that with earth and environmental science knowledge in children aged 5-6 years through Project Based Learning learning in the effective category used.

Keywords: Earth and environment; Project based learning; Science knowledge

Introduction

Education is a systematic student learning process that aims to change student behavior and develop the quality of knowledge for students. According to Indonesian Law number 20 of 2003 article 1 paragraph 14 concerning the National Education System, early childhood education is a coaching effort shown to children from birth to 6 years of age which is carried out through educational stimuli that help the physical and spiritual growth and development of children so that they are ready to enter further education, both formal and non-formal. Early childhood education is an important starting point in a child's development, as their bodies and minds develop rapidly. Therefore, early childhood education is a form of environmental implementation (Azizah, 2023).

According to the National Association for Education for Young Children (NAEYC), explaining the definition of early childhood is a group of individuals who are in the age range of 0-8 years. Children at this age experience very rapid growth and development, often referred to as a developmental surge (Hikam et al., 2020). Aspects of development in early childhood include religious and moral values, physical motor skills, cognitive, language, socio-emotional, and art (Hidayat et al., 2023). One aspect that can be improved in their development is cognitive ability, which involves their ability to observe, classify, connect, analyze, and develop their understanding (Ardiana, 2022).

Education services should be provided compulsorily in informal, non-formal and formal forms (Watini, 2019). For children aged 4-6 years, formal education such as kindergarten is considered an appropriate choice. Pestalozzi in Umboh et al. (2022) emphasizes the importance of paying attention to the maturity of children in education by using learning objects as the basis of learning. The main goal of this education is to develop and perfect the child's potential

through six aspects of development, including religious and moral values, social emotional, physical motor, cognitive and language, and art (Nurachadijat et al., 2023). These six aspects are very important for early childhood development in improving their knowledge and skills according to these competencies in the PAUD curriculum (Agrippine et al., 2023).

An interesting and useful learning approach is essential to support classroom learning activities (Munawaroh et al., 2020). Early childhood development will not be successful without the right method (Hikam et al., 2020). Teacher-centered learning can cause students to not get consistent stimulation and become passive (Faustina et al., 2023). Monotonous learning that is only teacher-centered and requires students to memorize or use conventional learning will not improve children's abilities in the modern era, especially cooperation skills (Mariamah et al., 2021).

Science is knowledge that studies everything about nature which consists of a number of knowledge obtained through in-depth research and experiments and further tested (Nurqolbi et al., 2019). Science process skills are very important for early childhood because they provide valuable experiences that will last throughout their lives (Setiawati et al., 2023). Science is not just about collecting knowledge of the world but also a process that involves observing, recording, analyzing, combining ideas, and making conclusions (Amelia et al., 2021). Therefore, it is important for children to start learning science from an early age, as this not only builds their knowledge base but also enriches their ability in critical and creative thinking.

Science games can affect children's physical, emotional, creative and cognitive development (Kurniawati et al., 2021). Children need to develop critical thinking skills and the ability to solve problems. They also need to hone their creativity through science experiments, whether orally, in writing, or visually (Santika et al., 2024). Teamwork skills are also important, especially when conducting scientific experiments (Sari et al., 2023). Science learning in early childhood can form characteristics such as high curiosity, initiative, perseverance, self-confidence, and the ability to accept other people's opinions (Zahro et al., 2019). Stimulation that comes from the environment will help children develop various skills and talents they have (Kadir et al., 2024). Many learning activities in schools today are not effective in improving higher-order thinking skills in students (Pratiwi et al., 2020). Activities such as sticking, cutting, and coloring that are commonly done in PAUD learning tend to only strengthen Lower Order Thinking Skills (LOTS).

Based on the problems that have been encountered at RA Miftahul Hidayah in the Tamanrejo village area,

Limbanagn District where during learning still uses the lecture method or is only teacher-centered, this makes children only focus on educators and does not give freedom to children in expression, one of which is science knowledge, because the teacher at the school is still racing to the magazine without directly involving children in the learning process. There are 55% of children who still lack science knowledge. The data was obtained from researcher interviews with RA Miftahul Hidayah teachers. This results in children who ultimately do not have the opportunity to discover science facts or concepts themselves, and children do not have the opportunity to develop their opinions in solving problems. The lack of understanding of science at the school is also due to the lack of facilities and infrastructure at school and the limitations in parental costs where each family's economy is different.

Based on observations made by Sirait (2024) it appears that the lecture method is the dominant learning approach. Learning activities here are still very much focused on the role of the teacher who is often the main center in providing information to students. A more student-centered approach is less emphasized. This can hinder students' critical thinking and communication skills, which should be the focus of student-oriented education. Therefore, the learning strategy should be changed to pay more attention to the role of students in the learning process. This project-based learning approach is expected to be achieved optimally. Project-based learning is one way to provide appropriate stimulation for children's growth and development in science experiment activities (Souisa et al., 2024).

Their golden age for learning also shows that this period is crucial for developing a solid cognitive, emotional, and social foundation through fun and meaningful learning experiences (Sakinah, 2022). Project-based learning not only facilitates active exploration and discovery, but also allows them to expand their understanding of the world around them naturally and deeply (Khasanah et al., 2024). As stated by Agrippine et al. (2023) the project approach to learning can help teachers improve cognitive and social skills for early childhood. Project-based learning is an innovative learning approach that emphasizes contextual learning through complex activities (Halawa, 2021). Project-based learning is a learning method that allows children to construct their own knowledge in a "constructivist" learning environment (Aisyah et al., 2023). Simbolon et al. (2020) suggests that project-based learning is a teaching method that focuses on building characters who care about the environment. This learning experience creates positive concepts that will be useful in the future.

Project-based learning also has several advantages, namely making children's creativity sharpened where through projects children are given the opportunity to design and complete their own tasks. This encourages them to think creatively and find unique solutions (Harianja et al., 2024). Effective learning, among other things, can occur in the environment. The environment can be centered for students to easily focus on integrated, energetic, and problem-based learning. Educators are also the main facilitators for students to support the learning process (Toledo-López et al., 2015). Project based learning allows children to learn actively and engage in projects that are relevant to the real world. Some examples of simple project-based learning that can be used in PAUD institutions are making innovative products from used goods, where students can be invited to make products from used goods such as toys or wall hangings. This project will teach children creativity, innovation, and how to recycle used goods (Zulkarnaen et al., 2023). Based on the above background, this study aims to analyze the effectiveness of earth and environmental science knowledge through Project Based Learning for 5-6 year olds.

The impact obtained in using the Problem Based Learning model can improve children's thinking skills, with this model aiming to provide experience for children in solving a problem that occurs such as the material studied, namely the earth and the environment. It is hoped that using this Problem Based Learning model can be an effective solution for children to improve critical thinking, problem solving and also children's creativity (Masruro et al., 2021). With that, it is in line with previous research which also says that the use of the Problem Based Learning model can increase the effectiveness of learning (Khariyyah et al., 2023; Listyaningsih et al., 2023; Madoi et al., 2023).

Method

The type of research used in this study is quasi-experimentation with the type of pre-experiment one group pretest postest desaign. According to Sugiyono (2019) this method is used because of the symptoms called training. The Project Based Learning model is an influence on the ability of earth and environmental science in children aged 5-6 years at RA Miftahul Hidayah.

The use of a pre-experiment research design one group pretest postet design can solve a symptom or problem through practice. With practice, the relationship between cause and effect will be seen as an influence on the exercise (Sugiyono, 2019). This research will affect the target of children's emotional intelligence.

The research villageign according to Sugiyono (2019) is as follows:

Table 1. One-group Pretest Posttest Design Research Design

Q_1	X	Q_2

Description:
Q1 = Test scores of children's life science skills before the implementation of learning PJBL model
X = Application of PJBL learning on children's life science
Q2 = Test scores of children's life science abilities before the application of PPA learning PJBL model

Result and Discussion

Result

This research was conducted at RA Miftahul Hidayah, Gunungpati District, Semarang City, Central Java. This study involved 36 children of RA Miftahul Hidayah with an age range of 5-6 years. The selection of RA Miftahul Hidayah as the research location was based on the results of initial observations which showed that the knowledge of children aged 5-6 years about science was still low as seen from the children's knowledge about the kinds of garbage and the impact of disposing of garbage carelessly or out of place and needed stimulation to be able to develop as expected. This is due to the dependence of teachers at RA Miftahul Hidayah on the use of worksheets or LKPD, which causes children to feel bored. Therefore, the researcher plans to use a project-based learning approach to improve earth and environmental science knowledge in children aged 5-6 years at RA Miftahul Hidayah. This study was attended by 36 children of RA Miftahul Hidayah aged 5-6 years and was conducted in 10 meetings. The following is a table of learning activities:

Table 2. Learning Topics

Meeting	Learning Topic
1st meeting	Pretest
2nd meeting	Watch a short movie with the title "sorting garbage"
3rd meeting	Categorizing types of waste
4th meeting	Recycling waste (inorganic)
5th meeting	Cooperation in collecting inorganic waste
Sixth meeting	Ecobricking
7th meeting	Ecobricking
Eighth meeting	Making ecobrick products

Descriptive Analysis Results

Descriptive analysis is used to find the maximum, minimum, range, and average values of data. The results of the descriptive statistical calculations are shown in

Figure 1. Figure 1 shows that the results of science knowledge from all children who took the pretest, there were 3 children in the category of starting to develop, 29 children were in the category of developing as expected, and 4 children were in the category of developing as expected. At the posttest stage, there were no more children in the category of starting to develop with 14 children in the category of developing as expected and 22 children in the category of developing very well.
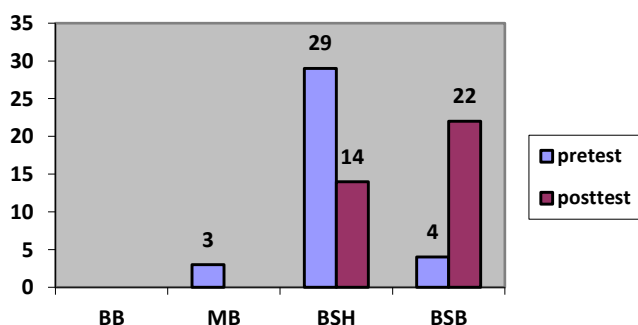

Figure 1. Pretest and posttest result data

Based on the results of the table 3, that in pretest statistics with an average of 84.38, for maximum statistics 88, for minimum 80, and for the range is 8. Then for the posttest with an average of 107.38, for maximum 113, minimum 104, and for the range is 9.

Table 3. Descriptive Analysis Result Data

Statistic	Pretest	Posttest
Maximum	88	113
Minimum	80	104
Range	8	9
average	84.38	107.38

Normality Test Data Analysis

The normality test aims to determine whether the residual value is normally distributed or not. A good regression model is to have a normally distributed residual value. Data is declared normally distributed if

the significant value is> 0.05 and the data is declared not normally distributed if the significant value is <0.05.

Table 4. Normality Test Results

		Kolmogrov-Smirnov			Shapiro-Wilk		
	Group	Statistic	df	Sig.	Statistic	df	Sig.
Result	Pretest	0.184	36	0.03	0.960	36	0.221
	Postest	0.158	36	0.23	0.960	36	0.134

Based on the results of the normality test calculation, the score obtained on the pretest is 0.221, while the posttest is 0.134. From these results, it can be concluded that the data are both normally distributed because the value of the pretest and posttest results> 0.05. After doing the normality test, the next hypothesis test is carried out.

Hypothesis Test Analysis

Hypotheses are an important part of research, namely temporary answers to research questions. Hypotheses must be designed from the beginning of the research (Yam et al., 2021). Hypothesis testing in this study uses the t-test in order to determine the difference before and after the treatment is given from the pretest and posttest data.

Table 5. Pretest-Posttest Descriptive Statistics

	Pair	Mean	Std.Depation	Std
Pair 1	Pretest	89.3889	1.975	.329
	Posttest	107.3889	2.060	.343

From the table above, it can be seen that the average pretest and posttest scores with the manufacture of ecobrick products to develop earth and environmental science knowledge are 84.38% to 107.8%, an increase of 23%. So that through the above data it can be concluded that by doing a project-based learning approach by making ecobrick products has an effect on stimulating or developing science knowledge in children aged 5-6 years at RA Miftahul Hidayah which proves a significant difference.

Table 6. Paired Sample T-Test Result (Paired Sample Test)

				Paired Differences			
	Pair	Mean	Std. Deviation	Sig. Mean	t	df	Sig. (2- tailed)
Pair	Pre-	-23.000	-23.000	0.508	-45.217	36	0.000
	Post	0.158	36	0.23	0.960	36	0.134

Based on the data in table 6, it shows that the average score is 84.38 and increased in the posttest data 107.38, and it is seen that the significance value is 0.000 <0.05, then Ho is rejected and Ha is accepted. In the table above, it can be seen that the tcount is 45.217 and for the ttable df = 35 is 2.03 with a sig value. (2-Tailed) 0.000 <0.05 which means Ho is rejected and Ha is accepted.

There is a significant increase in children's science knowledge after being given treatment using project-based learning.

N-Gain Test Results

The N-Gain score test is conducted to measure the effectiveness of using a particular treatment in research.

N-Gain is a measure that shows how much students learn divided by how much students can learn. The N-gain category if the score g> 0.7 then it can be said to have high criteria, if $0.3 \leq g \leq 0.7$ then the criteria obtained are moderate, then for low criteria, the N-gain score obtained is g < 0.3. Then for the interpretation category if the percentage is < 40% then it can be said to be ineffective, for a percentage of 40%-55% then the interpretation is less effective, a percentage of 56%-75% then it is declared quite effective, then for an effective interpretation the required percentage is < 76%. The following is a table of N-Gain categories and N-Gain effectiveness interpretation categories:

Table 7. N-Gain Test Results

	N	Mean
N-Gain Score	36	0.6443
N-Gain Percentage	36	77.314

Based on the results of the above calculations, it can be seen that the N-Gain Score value on the Mean is 0.644, therefore the criteria for increasing the science knowledge of the earth and the environment of children aged 5-6 years after the application of treatment through project-based learning with ecobric making are in the medium criteria. As well as the results of the calculation in the N-Gain percent table on the Mean, which is 77.31 with a percentage category> 76%, it is concluded that the science knowledge of the earth and the environment in children aged 5-6 years through project-based learning with the N-Gain interpretation category is effective.

Discussion

Project Based Learning is a teaching approach known as learning based on constructive principles, problem solving, investigative research, integrated research, and reflection. This approach emphasizes aspects of theoretical study and its application. The project-based learning method is able to help students develop projects both individually and in groups to produce a product. Therefore, it can be concluded that the project-based learning approach is child-centered (Nugraha et al., 2023). Some of the benefits of using the project method in early childhood learning include providing opportunities for children to express their creative ideas in completing tasks, teaching them to be responsible for the tasks assigned, and improving their creative thinking skills (Amelia et al., 2021).

In this case the theme "My Environment" was chosen because it is very close to children's daily lives. The purpose of this lesson is to provide children with an understanding of the different types of waste that exist in the environment and the importance of managing waste properly. Through this process, children learn to differentiate between organic and inorganic waste and understand the negative impact of littering. In addition, they are also introduced to the concept of waste management, such as how to recycle organic waste into ecobricks that become alternative construction materials.

This learning is more than just the introduction of waste concepts, the main goal is to develop children's scientific understanding of the earth and the environment. Scientific knowledge about the environment must be given from an early age through methods that are fun and easy for children to understand (Prima et al., 2021). In the context of this study, there were 10 meetings consisting of one observation and pretest meeting, eight implementation meetings, and one posttest meeting. At each meeting, children were involved in activities that encouraged them to work together in groups. There were four groups of 8-9 students, with a total of 36 students. During the lesson, the children were given an explanation of the types of waste, the adverse effects of littering, and how to recycle organic waste into ecobricks. This approach not only broadens the students' knowledge of the environment, but also shapes positive attitudes towards cooperation and social responsibility, which are important skills in everyday life. Therefore, project-based learning has a meaningful impact (Suci et al., 2023).

According to Chandra et al. (2023), Fitrianingtyas et al. (2023), and Irayana et al. (2024), project-based learning has a significant positive impact on the way children learn science. Through this approach, children are not only invited to receive information passively, but also encouraged to be actively involved in the learning process. They will face challenges that can stimulate critical and creative thinking, utilizing direct learning experiences that are relevant and contextual. In this model, children are given the opportunity to develop problem-solving skills in a more applicable manner, so that they can find their own knowledge and solutions, and understand scientific concepts more deeply and meaningfully (Luaili et al., 2024). This approach also encourages collaboration between students, which in turn will enrich their learning experience and improve their teamwork skills in solving the problems they face. From the above it can be concluded that project-based learning significantly improves the way children learn science by encouraging active engagement, stimulating critical and creative thinking, and providing relevant and applicable experiences. This approach allows children to discover knowledge independently and deepen their understanding of scientific concepts, while improving collaboration and teamwork skills in solving problems.

Conclusion

Based on data analysis, it can be concluded that through the application of the Project Based Learning method in the 5-6 year age group it is proven to be effective in developing science knowledge, especially about the earth and the environment, seen from the calculation of the average value of the pretest results which is 84.38 and has increased by 23% in the posttest results 107.38. As well as from the research hypothesis test that t count> t table, namely 45.21> 2.03 with sig. (2-tailed) 0.000 <0.05 which means Ho is rejected and Ha is accepted. There is a significant increase in children's science knowledge after being given treatment using the project-based learning method. And through the project-based learning approach, it is proven effective to increase science knowledge in children aged 5-6 years. Normality test with pretest results of 0.221 and post-test results of 0.134 it can be declared normally distributed. Then for the results of the N-Gain Test has a score on Meab of 77.31 with a percentage of> 76%, it can be concluded that with earth and environmental science knowledge in children aged 5-5 years through Project Based Learning learning in the effective category used.

References

Agrippine, Z. F., Amahorseya, M., Artha, I. K. A. J., & Yulianingsih, W. (2023). Implementasi Project Based Learning dalam Kegiatan Proyek Penguatan Profil Pelajar Pancasila di Taman Kanak-Kanak. *Murhum: Jurnal Pendidikan Anak Usia Dini*, *4*(2), 640–650. https://doi.org/10.37985/murhum.v4i2.350

Aisyah, E. S., Djoehaeni, H., & Listiana, A. (2023). Pengembangan Karakter Peduli Lingkungan Anak Usia Dini melalui Implementasi Project Based Learning. *Aulad: Journal on Early Childhood*, *6*(2), 205–212. https://doi.org/10.31004/aulad.v6i2.501

Amelia, N., & Aisya, N. (2021). Model Pembelajaran Berbasis Proyek (Project Based Learning) Dan Penerapannya Pada Anak Usia Dini Di TKIT AL-FARABI. *BUHUTS AL-ATHFAL: Jurnal Pendidikan Dan Anak Usia Dini*, *1*(2), 181–199. https://doi.org/10.24952/alathfal.v1i2.3912

Ardiana, R. (2022). Strategi Guru dalam Mengembangkan Kemampuan Kognitif Anak Usia 5-6 Tahun di Taman Kanak Kanak. *Murhum : Jurnal Pendidikan Anak Usia Dini*, *3*(2), 1–10. https://doi.org/10.37985/murhum.v3i2.116

Azizah. (2023). Permainan Engklek Modifikasi Sebagai Alternatif Dalam Mengembangkan Motorik. *Jurnal Pendidikan Anak Usia Dini*, 59–74. https://doi.org/10.35706/murangkalih.v4i02.9210

Chandra, A., Fitriana, S., Karmila, M., & Widiharto, C. A. (2023). Peningkatan Resiliensi dengan Project Based Leaning pada Anak Usia Dini. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, *7*(4), 4295–4304. https://doi.org/10.31004/obsesi.v7i4.4803

Fitrianingtyas, A., Rasmani, U. E. E., Wahyuningsih, S., Jumiatmoko, J., Zuhro, N. S., Winarji, B., & Nurjanah, N. E. (2023). Mengembangkan Pendidikan Karakter melalui Pembelajaran Berbasis Proyek di PAUD. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *7*(5), 5675–5686. https://doi.org/10.31004/obsesi.v7i5.4970

Halawa, E. S. (2021). Penerapan Model Project-Based Learning Dalam Meningkatkan Motivasi Anak Usia Dini Melalui Media Komik Di II SD NEGERI 071057 Hiliweto Gido. *Jurnal Review Pendidikan Dan Pengajaran*, *4*(1), 201–208. https://doi.org/10.31004/jrpp.v4i1.1939

Harianja, & Anggereini, N. (2024). Pengaruh Penerapan Model Project Based Learning Terintegrasi Ecoprint Terhadap Kreativitas Anak Usia Dini. *Jurnal Ilmiah Potensia*, *9*(2), 188–194. https://doi.org/10.33369/jip.9.2.188-194

Hasan, M., Hemawati, H., & Sirait, R. (2024). Efektifitas Metode Ceramah Bervariasi Dalam Pembelajaran Alquran Hadist Di Mts Al Washliyah 47 Binjai. *Tahdzib Al-Akhlaq: Jurnal Pendidikan Islam*, *7*(1), 1–15. https://doi.org/10.34005/tahdzib.v7i1.3654

Hidayat, Y., & Nurlatifah, L. (2023). Analisis Komparasi Tingkat Pencapaian Perkembangan Anak Usia Dini (STPPA) Berdasarkan Permendikbud No. 137 Tahun 2014 Dengan Permendikbudristek No. 5 Tahun 2022. *Jurnal Intisabi*, *1*(1), 29–40. https://doi.org/10.61580/itsb.v1i1.4

Hikam, F. F., & Nursari, E. (2020). Analisis Penggunaan Metode Eksperimen Pada Pembelajaran Sains Bagi Anak Usia Dini. *Murhum: Jurnal Pendidikan Anak Usia Dini*, 38–49. https://doi.org/10.37985/murhum.v1i2.14

Irayana, I., & Assyauqi, I. (2024). Eksperimen Penerapan Pembelajaran Berbasis Proyek (PJBL) pada Peningkatan Kreativitas Anak Usia Dini. *JEA*

(Jurnal Edukasi AUD), *10*(1), 47–56. https://doi.org/10.18592/jea.v10i1.11422

Khariyyah, N., Darwis, M., & Asyari, S. (2023). Analisis Penerapan Model Problem Based Learning Guru Matematika pada Kelas IX SMP. *Issues in Mathematics Education*, *7*(1), 27–34. https://doi.org/10.35580/imed47551 Abstract

Khasanah, M., Nurita, T., Risma, M. W., & Arinais, F. (2024). Meningkatkan Kerangka Berpikir Peserta Didik melalui Metode Pembelajaran Beragam pada Materi Pengetahuan Bumi dan Antariksa. *Trigonometri: Jurnal Matematika Dan Ilmu Pengetahuan Alam*, *2*(2), 1–11. https://doi.org/10.3483/trigonometri.v2i2.3310

Kurniawati, R., & Mulyati, M. (2021). Mengembangkan Kognitif Anak Usia Dini Melalui Permainan Sains. *Jurnal Pendidikan Tambusai*, *5*, 5734–5735. https://doi.org/10.31004/jptam.v5i3.1859

Listyaningsih, E., Nugraheni, N., & Yuliasih, I. B. (2023). Peningkatan Hasil Belajar Melalui Pendekatan Tarl Model PBL Dalam Matematika Kelas V SDN Bendan Ngisor. *Madani: Jurnal Ilmiah Multidisiplin*, *1*(6), 620–627. https://doi.org/10.5281/zenodo.8139269

Luaili, N., Santoso, A., & Dewi, R. S. I. (2024). Problematika Literasi Yang Dihadapi Anak Pada Masa Golden Age. *Jurnal Ilmiah Pendidikan Dasar*, *09*. https://doi.org/10.23969/jp.v9i1.11470

Madoi, R., & Sadaria. (2023). Upaya Meningkatkan Pengetahuan Sains Anak Usia 5-6 Tahun Melalui Pendekatan Eksplorasi Lingkungan Sekitar di TK Negeri Pembina II Parepare Rosdiana Madoi; Sadaria. *Jurnal Pemikiran Dan Pengembangan Pembelajaran*, *5*(20), 1361–1371. https://doi.org/10.31970/pendidikan.v5i2.662

Mariamah, S., Yusri Bachtiar, M., & Indrawati. (2021). Penerapan Project Based Learning untuk Meningkatkan Kemampuan Kolaborasi Anak Usia Dini. *Profesi Kependidikan*, *2*(1), 125–130. Retrieved from https://ojs.unm.ac.id/JPK/article/viewFile/27494/13651

Masruro, S., Sudibyo, E., & Purnomo, T. (2021). Profile of Problem Based Learning to Improve Students' Critical Thinking Skills. *IJORER: International Journal of Recent Educational Research*, *2*(6), 682–699. https://doi.org/10.46245/ijorer.v2i6.171

Munawaroh, H., Widiyani, A. Y. E., & Muntaqo, R. (2020). Pengembangan Multimedia Interaktif Tema Alam Semesta pada Anak Usia 4-6 Tahun. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, *5*(2), 1164–1172. https://doi.org/10.31004/obsesi.v5i2.619

Nugraha, I. R. R., Supriadi, U., & Firmansyah, M. I.

(2023). Efektivitas Strategi Pembelajran Project Based Learning dalam meningkatkan Kreativitas Siswa. *Jurnal Penelitian Dan Pendidikan IPS*, *17*(1), 39–47. https://doi.org/10.21067/jppi.v17i1.8608

Nurachadijat, K., & Selvia, M. (2023). Peran Lembaga Pendidikan Anak Usia Dini dalam Implementasi Kurikulum dan Metode Belajar pada Anak Usia Dini. *Jurnal Inovasi, Evaluasi Dan Pengembangan Pembelajaran (JIEPP)*, *3*(2), 57–66. https://doi.org/10.54371/jiepp.v3i2.284

Nurqolbi, R. I., Riyanto, A. A., & Lestari, R. H. (2019). Pengaruh Keterampilan Proses Sains Terhadap Kemampuan Berpikir Logis Pada Anak Usia Dini. *CERIA (Cerdas Energik Responsif Inovatif Adaptif)*, *2*(5), 189. https://doi.org/10.22460/ceria.v2i5.p189-196

Pratiwi, E. T., & Setyaningtyas, E. W. (2020). Kemampuan Berpikir Kritis Siswa Melalui Model Pembelajaran Problem Based Learning dan Model Pembelajaran Project Based Learning. *Jurnal Basicedu*, *4*(2), 379–388. https://doi.org/10.31004/basicedu.v4i2.362

Prima, E., & Lestari, P. I. (2021). Pembelajaran Sains bagi Anak Usia Dini Melalui Pembelajaran Berbasis Proyek pada Masa Belajar dari Rumah. *Media Edukasi: Jurnal Ilmu Pendidikan*, *5*(1), 1–8. Retrieved from https://jurnal.undhirabali.ac.id/index.php/jmk/article/download/1461/1255

Santika, V. V., Muthohar, S., & Muslam, M. (2024). Pemanfaatan Sampah Non Organik sebagai Media Belajar untuk Meningkatkan Aspek Kognitif Anak Usia Dini. *Murhum : Jurnal Pendidikan Anak Usia Dini*, *5*(1), 267–277. https://doi.org/10.37985/murhum.v5i1.484

Sari, A. M., Suryana, D., Bentri, A., & Ridwan, R. (2023). Efektifitas Model Project Based Learning (PjBL) dalam Implementasi Kurikulum Merdeka di Taman Kanak-Kanak. *Jurnal Basicedu*, *7*(1), 432–440. https://doi.org/10.31004/basicedu.v7i1.4390

Setiawati, N., Putra, D., & Zukhairina, Z. (2023). Penerapan Metode Bercerita Dalam Pengembangan Bahasa Anak Usia Dini 5-6 Tahun. *Al-Miskawaih: Journal of Science Education*, *2*(1), 1–16. https://doi.org/10.56436/mijose.v2i1.202

Simbolon, R., & Koeswanti, H. D. (2020). Comparison Of Pbl (Project Based Learning) Models With Pbl (Problem Based Learning) Models To Determine Student Learning Outcomes And Motivation. *International Journal of Elementary Education*, *4*(4), 519–529. Retrieved from https://ejournal.undiksha.ac.id/index.php/IJEE

Souisa, F. C., Lestari, G. D., & Yusuf, A. (2024). Penerapan Model Pembelajaran Project Based

Learning pada Anak Usia Dini. *Murhum: Jurnal Pendidikan Anak Usia Dini*, *5*(1), 752–765. https://doi.org/10.37985/murhum.v5i1.616

Suci, R. A., & Fathiyah, K. N. (2023). Implementasi Pembelajaran Berbasis Proyek untuk Meningkatkan Kemandirian Anak Usia Dini. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, *7*(4), 3917–3924.
https://doi.org/10.31004/obsesi.v7i4.3723

Sugiyono. (2019). *Metode Penelitian Kuantitatif*. Bandung: Alfabeta.

Toledo-López, A. A., & Pentón Herrera, L. J. (2015). Dual language immersion in higher education: An introduction. NABE Perspectives. *NABE Perspectives*, *37*(2), 24–28. Retrieved from https://mes.sccoe.org/mes/Documents/NP_April-June_2015.pdf#page=24

Umboh, A. A., & Kasih, D. (2022). Upaya Meningkatkan Pengetahuan Sains Melalui Pendekatan Eksplorasi Lingkungan Sekitar Pada Anak Usia 5-6 Tahun. *Jurnal Pendidikan Dan Bisnis*, *3*(2), 246–264. Retrieved from https://shorturl.at/GJvVz

Watini, S. (2019). Implementasi Model Pembelajaran Sentra pada TK Labschool STAI Bani Saleh Bekasi. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, *4*(1), 110. https://doi.org/10.31004/obsesi.v4i1.190

Yam, J. H., & Taufik, R. (2021). Hipotesis Penelitian Kuantitatif. *Perspektif: Jurnal Ilmu Administrasi*, *3*(2), 96–102.
https://doi.org/10.33592/perspektif.v3i2.1540

Zahro, I. F., Atika, A. R., & Westhisi, S. M. (2019). Strategi Pembelajaran Literasi Sains Untuk Anak Usia Dini. *Jurnal Ilmiah Potensia*, *4*(2), 121–130. https://doi.org/10.33369/jip.4.2.121-130

Zulkarnaen, Z., Wardhani, J. D., Katoningsih, S., & Asmawulan, T. (2023). Manfaat model Pembelajaran Project Based Learning untuk Pendidikan Anak Usia Dini dan Implementasinya dalam Kurikulum Merdeka. *Jurnal Bunga Rampai Usia Emas*, *9*(2), 394. https://doi.org/10.24114/jbrue.v9i2.52951