Journal of Islamic Education Students
Website: https://ejournal.uinmybatusangkar.ac.id/ojs/index.php/jies/index
Email: jies@uinmybatusangkar.ac.id
Volume 5 Nomor 1 (2025) Pages 199-212
Faculty of Education and Teacher Training
State Institute for Islamic Studies Batusangkar

The Impact of Project-Based Farming Gardening on Collaboration and Critical Thinking Skills in 5-6 Year Old Children

Faridah Ummu Imara[1]✉, Ruqoyyah Fitri[2], Yes Matheos Lasarus Malaikosa[3], Andi Kristanto[4], Utari Dewi[5], Miftakhul Jannah[6]
Universitas Negeri Surabaya, Indonesia[1,2,3,4,5,6]
Email: faridah.23008@mhs.unesa.ac.id
DOI: 10.31958/jies.v5i1.15071

Article info

Article History
Recieved:
20/04/2025
Recived:
22/04/2025
Accepted:
25/04/2025

✉
Corresponding author

This study aims to examine the effect of project-based farming gardening activities on collaboration and critical thinking skills of children aged 5–6 years. The activity engages children in planning, planting, caring for, and harvesting plants for four weeks through a collaborative project that emphasizes joint decision-making, problem-solving, and individual and group responsibility. A quantitative approach with a quasi-experimental non-equivalent control group design was applied to 30 children from two kindergartens in Maduran District, Lamongan Regency, purposively divided into experimental and control groups. Data were collected through validated and reliable observation instruments, and analyzed using an independent sample t-test. The results showed a significant increase in collaboration skills (t = 3.688, p = 0.00) and critical thinking skills (t = 2.369, p = 0.02) in the experimental group. These findings indicate that project-based farming gardening activities are effective in developing collaboration and critical thinking skills in early childhood and support the strengthening of 21st-century skills in early childhood education.

Keywords: *Early Childhood Education, Project-Based Learning, Collaboration Skills, Critical Thinking*

Abstrak
Penelitian ini bertujuan untuk mengkaji pengaruh kegiatan farming gardening berbasis proyek terhadap keterampilan kolaborasi dan berpikir kritis anak usia 5–6 tahun. Kegiatan ini melibatkan anak dalam perencanaan, penanaman, perawatan, dan pemanenan tanaman selama empat minggu melalui proyek kolaboratif yang menekankan pengambilan keputusan bersama, pemecahan masalah, serta tanggung jawab individu dan kelompok. Pendekatan kuantitatif dengan desain kuasi-eksperimen non-equivalent control group diterapkan pada 30 anak dari dua TK di Kecamatan Maduran, Kabupaten Lamongan, yang dibagi secara purposif ke dalam kelompok eksperimen dan kontrol. Data dikumpulkan melalui instrumen observasi yang valid dan reliabel, dan dianalisis menggunakan uji independent sample t-test. Hasil penelitian menunjukkan peningkatan signifikan dalam keterampilan kolaborasi (t = 3,688, p = 0,00) dan berpikir kritis (t = 2,369, p = 0,02) pada kelompok eksperimen. Temuan ini mengindikasikan bahwa kegiatan farming gardening berbasis proyek efektif dalam mengembangkan keterampilan kolaborasi dan berpikir kritis pada anak usia dini, serta mendukung penguatan keterampilan abad ke-21 dalam pendidikan anak usia dini.

Kata Kunci: Pendidikan Anak Usia Dini, Pembelajaran Berbasis Proyek, Keterampilan Kolaborasi, Berpikir Kritis

DOI: 10.31958/jies.v5i1.15071

INTRODUCTION

Global transformation in the 21st century has brought great challenges to education systems around the world. Education is no longer sufficient to focus only on academic aspects, but is required to prepare students with skills that are relevant to the needs of the times (Wijaya et al., 2016; Jaya et al., 2023). In this era, society has shifted from a condition where technology was unknown to a state where technology plays a very important role in everyday life (Puspa et al., 2023). This change requires education to not only focus on academic aspects, but also on developing digital skills, critical thinking, and the ability to collaborate (Cahya et al., 2023; Nur Fadilah et al., 2025; Sari & Paidil, 2025). An international study conducted by the Assessment and Teaching of 21st Century Skills (ATC21S) consisting of 250 researchers from 60 educational institutions has identified and classified 21st century skills into four main categories, namely ways of thinking, ways of working, use of work tools, and life skills. ATC21S also groups 21st century skills into four main categories, namely critical thinking, creativity and innovation, communication skills, and collaboration. (Angga et al., 2022).

According to (Mabrur, 2020; Chusna et al., 2024; Okpatrioka & Abdullah, 2024), it is also emphasized that one of the main challenges of 21st century skills is requiring students to have the ability to think critically, solve problems, be creative, collaborate, and communicate effectively. A similar view was also expressed by Apollo Education Group, a leading education program provider in the United States, which identified ten skills needed for students to be able to compete in the 21st century. These skills include critical thinking, communication, leadership, collaboration, adaptability, productivity and accountability, innovation, global citizenship, entrepreneurial spirit, and the ability to access, analyze, and synthesize information. All of these skills further emphasize that education in Indonesia must make improvements and adjustments, with no other choice (Mabrur, 2020; Pahrijal et al., 2023).

Collaboration skills are a learning process that is carried out together to align differences in views and knowledge, and contribute to discussions through giving advice, listening, and supporting each other. In other words, collaboration skills include the ability to work together to achieve a common goal (Sunbanu et al., 2019). Collaboration skills are very important in learning, because they can support academic achievement and increase a sense of social and healthy democracy among students (Kusuma et al., 2019; Maromi et al., 2024; Salum et al., 2024). Collaboration skills allow students to gain knowledge from others, which can also improve individual abilities and skills (Anggraini et al., 2024).

Trilling & Fadel (2009) stated that there are many significant benefits for students who engage in cooperation and collaboration during the learning process, when compared to children who learn independently. He stated that "these benefits include increased growth in knowledge both individually and collectively, increased self-confidence and motivation, and improvements in social interactions and positive

DOI: 10.31958/jies.v5i1.15071

attitudes towards other students". The importance of social interaction in education cannot be ignored either. Collaboration in learning helps students develop vital social skills, such as communication, negotiation, and problem solving (Muliawati et al., 2023). All of these benefits show that collaboration in learning not only improves academic results, but also contributes to the development of students' character and social skills which are very important for their future lives (Trilling & Fadel, 2009; Mardiani et al., 2023).

Another skill that is also important in 21st century learning is critical thinking. (Kurniawan et al., 2021) explain that critical thinking is a rational, reflective, and responsible thinking process. This ability can be understood as an individual's ability to translate their own thought patterns based on the responses received. Indicators of critical thinking skills can be seen from how well someone provides a responsible response that is in accordance with reality and rationality (Kurniawan et al., 2023). The importance of critical thinking skills also lies in its function in helping students achieve good academic achievement and is an essential need that must be present in all components of education (Kurniawan et al., 2021). However, the study by Kurniawan et al., (2021) still focuses on strengthening the concept of critical thinking in general at the high school level, without exploring in depth how this ability begins to form from an early age, especially at the early childhood education (PAUD) level. In fact, strengthening critical thinking skills from an early age has the potential to provide a stronger foundation for children's cognitive and social development.

Teaching children to think critically from an early age, especially at the preschool level, provides a strong foundation for their cognitive, emotional, and social development. Preschool children who are guided to observe, ask questions, and explore simple situations in everyday life tend to grow into individuals who are more confident in making decisions, even in small things like choosing toys, resolving minor conflicts with friends, or determining the order of activities (Natalina, 2015; Saputri & Katoningsih, 2023). These abilities not only enrich children's learning process in the classroom, but also equip them with important life skills. Children who are accustomed to thinking critically will be better prepared to face various challenges, both in the learning environment and in their future social life (Kusuma et al., 2023).

Collaboration and critical thinking skills are essential skills for children in the 21st century. Both not only support academic achievement, but also contribute to the development of vital social skills. Collaboration helps children learn to work together, interact, and exchange ideas with peers, which can boost their self-confidence and motivation. Meanwhile, critical thinking encourages children to analyze information, consider arguments, and make decisions based on logical reasons. These two skills should be the focus of education, to prepare children to face future challenges. Based on the results of previous observations at Dharma Wanita Duriwetan Kindergarten, one of the kindergartens in Maduran District, it was seen that the learning implemented in schools still uses conventional methods such as the use of books, whiteboards, and

DOI: 10.31958/jies.v5i1.15071

flashcards. This learning, although helpful in certain aspects, is not entirely in accordance with the characteristics of early childhood. Learning that relies too much on conventional media limits children's ability to collaborate and think critically optimally. In the group drawing activity, only 6 children actively participated in the collaboration, while 9 children chose to draw alone without interacting with friends. Furthermore, in the critical thinking skills of children when drawing together, when the teacher asked about the drawings made, 7 children gave a simple explanation related to the drawings and 8 children could not give a simple explanation of the meaning of their drawings and only followed their friends' words. From the results of this observation, it shows that a more effective approach is needed in learning activities to improve children's collaboration and critical thinking skills.

One approach that is gaining increasing attention in developing skills in early childhood is project-based learning (PjBL) which prioritizes children's involvement in practical projects that enable them to learn independently and collaboratively (Tumbel, 2024). This is in line with Mabrur (2020) who stated that to face various challenges of 21st century education, especially collaboration and critical thinking skills in children, the Indonesian education curriculum adopts a project-based learning model (PBL) as an alternative learning method that can be used by teachers, including for Early Childhood Education (PAUD) levels. PjBL not only improves students' understanding of the material being studied, but also hones practical skills and critical thinking which are very useful in everyday life and the professional world (Malaikosa et al., 2024). PjBL involves giving assignments that focus on challenging questions or problems, which encourage students to engage in planning, problem solving, decision making, or investigative activities over a period of time, and produce tangible products or presentations (Thomas, 2000; Williamson, 2023).

As various learning-based projects involving collaboration and critical thinking develop, project-based farming and gardening emerge as a promising approach in the context of early childhood education. Farming and gardening activities provide space for children to experience a holistic learning process, starting from planning, planting, maintenance, to harvesting. In this activity, children are involved in solving practical problems and are faced with challenges that require cooperation, joint decision-making, and evaluation of the results obtained. In addition to the cognitive aspect, through this activity, children are also invited to learn about responsibility, patience, and sustainability, all of which support the development of critical thinking skills. In the study (Fadiana et al., 2021), it was revealed that project-based farming gardening is a form of active learning that integrates concepts and actions, where children are given the opportunity to apply the topics and materials learned in real-life contexts. As a structured learning method, project-based farming gardening focuses on achieving abilities through interactions between children and the surrounding environment.

This study has two main aspects of novelty. First, from the approach used, namely the combination of project-based learning with the context of farming gardening

DOI: 10.31958/jies.v5i1.15071

activities that have not been widely explored in early childhood education. Second, from the local context where the study was conducted, which adjusts the implementation of this method to the characteristics of the local environment, culture, and resources. Although there are a number of studies that review the effectiveness of PjBL in general, there is still a gap in the literature related to its application to farming and gardening activities in Early Childhood Education settings.

Referring to the results of initial observations and findings of the problems that have been explained previously, one of the problems that often occurs is that schools as learning environments are not optimal in providing stimulation for the development of 21st century skills, especially collaboration and critical thinking skills in early childhood. This condition is thought to be caused by the lack of utilization of media and learning methods that are contextual and in accordance with the characteristics of child development. Therefore, this study aims to evaluate the effectiveness of the implementation of project-based farming gardening in improving two specific indicators of 21st century skills in children aged 5-6 years, namely: (1) the ability to work together in groups, the ability to adapt to roles and responsibilities, have empathy and various points of view, the ability to reach agreement with other group members in order to achieve predetermined goals; and (2) critical thinking skills, which include the ability to provide simple explanations, build basic skills, draw conclusions, provide additional explanations, organize strategies and techniques.

This research is expected to provide practical contributions for PAUD teachers in selecting and designing more contextual and meaningful learning methods, by integrating approaches that are relevant to children's needs and environment. Through the implementation of project-based learning based on natural activities such as farming gardening, it is hoped that learning can become more real and down-to-earth, so that children not only gain knowledge, but also practical skills that can be applied in everyday life. The theoretical contribution of this research will enrich the existing literature related to the implementation of project-based learning methods in the context of early childhood education, as well as provide new insights into the importance of natural activities as an effective learning medium.

METHODS

Research Design

This study uses a quantitative approach with a quasi-experimental design, namely a quasi-experimental non-equivalent control group design. The selection of this design is based on the purpose of the study which aims to test the influence of project-based farming gardening activities on children's collaboration and critical thinking skills. The quantitative approach allows the collection and analysis of data in the form of numbers to measure the relationship between variables. Referring to Creswell (2018), experimental research is used when researchers want to identify the cause-and-effect relationship between independent and dependent variables. In this study, the

DOI: 10.31958/jies.v5i1.15071

experimental class received treatment in the form of project-based farming gardening activities (independent variable), while the control class did not receive special treatment. Meanwhile, the dependent variable in this study is the children's collaboration and critical thinking skills. To increase the validity of the design, efforts were made to equate the basic characteristics between the experimental and control groups, through equality of age, socio-economic background, and similar quality of education in the two educational institutions studied.

Table 1. ***Non-Equivalent Control Group Design***

Group	***Pre -Test***	***Treatment***	***Post - Test***
Experimental Class	O_1	X	O_2
Control Class	O_3		O_4

Explanation:

O_1 : Pre-test scores of experimental class

O_2 : Post-test scores of the experimental class

X : *Treatment using project-based farming gardening activities*

O_3 : Pre-test score of control class

O_4 : Post-test scores of control class

– : Conventional learning without intervention

Population and Sample

The population in this study were all children in group B (aged 5-6 years) registered in two kindergartens, namely Dharma Wanita Duriwetan Kindergarten and PGRI II Taji Kindergarten, Maduran District, Lamongan Regency. The total population of this study was 30 children, each consisting of 15 children per school. The determination of the sample in this study was by using a purposive sampling technique, the sample of this study was selected based on predetermined criteria. These criteria are children who are included in age group B, registered as active students in the designated kindergarten, have an adequate level of attendance during the observation period. Several conceptual considerations in selecting the location include ease of access by researchers, equality of education quality between schools, and representation of diverse socio-economic characteristics. Based on these considerations, each school contributed 15 children as research subjects.

Data Collection Technique

Data collection techniques are carried out through structured observation using behavioral-based instruments. This instrument is designed to measure two main variables, namely children's collaboration skills and critical thinking skills. Each indicator in the instrument is developed based on the theory of cognitive and social development of early childhood, as proposed by Vygotsky and Piaget. Collaboration ability indicators include the ability to work together in groups, the ability to adapt to roles and responsibilities, having empathy and various points of view, the ability to

DOI: 10.31958/jies.v5i1.15071

reach agreement with other group members in order to achieve predetermined goals (Rahayu et al., 2019). Meanwhile, critical thinking skills are measured through indicators of the ability to provide simple explanations, build basic skills, draw conclusions, provide additional explanations, organize strategies and techniques (Ennis, 1985). The instrument has been validated by early childhood education experts, and is used as a systematic guide in observations to ensure objectivity and consistency of data.

Data Analysis Techniques

The data analysis techniques used in this study consist of two types, namely descriptive statistical analysis and inferential statistical analysis. Descriptive statistics are used to describe initial data, while inferential statistics are used to test the hypothesis of the effect of treatment.

Before hypothesis testing is conducted, assumption tests are conducted to ensure the feasibility of using parametric analysis. Normality tests are conducted using Shapiro-Wilk, while homogeneity of variance tests use Levene's Test. The use of parametric tests in the form of Independent Sample T-Test is based on the fulfillment of the assumptions of normality and homogeneity of data. The use of T-Test is also chosen because it is able to identify significant differences in the average between two groups, making it suitable for testing the effectiveness of the treatment. In addition, the effects of the treatment will be analyzed through a comparison of pre-test and post-test values, to assess the extent to which project-based farming gardening activities contribute to improving children's collaboration and critical thinking skills.

RESULTS AND DISCUSSION

Based on the results of the analysis, the collaboration ability and critical thinking ability instruments were proven to be valid and reliable for use in children aged 5–6 years. The validity testing process used the IBM SPSS 25 program with a significance level of 0.05. The results of the validity test with Pearson correlation showed that the r-count value for each item was greater than 0.632, which means (r-count > r-table), so that each item was declared valid and none were eliminated. In terms of reliability, both instruments showed high consistency with a Cronbach's Alpha value of 0.839 for collaboration and 0.848 for critical thinking, which were included in the good category. The Cronbach's Alpha coefficient value on both research instruments was above 0.6, indicating that both the collaboration ability and critical thinking ability instruments had a high level of reliability. Thus, both instruments are worthy of use in research.

Table 2. Normality Test

	Class	**Collaboration Skills**			**Critical Thinking Skills**		
		Shapiro-Wilk			**Shapiro-Wilk**		
		Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Pretest	Control	.916	15	.169	.946	15	.465
	Experiment	.901	15	.100	.905	15	.112
Posttest	Control	.912	15	.145	.943	15	.420

DOI: 10.31958/jies.v5i1.15071

Experiment	.902	15	.100	.944	15	.440

Based on the results of the normality test using Shapiro-Wilk, all data in each group (control and experiment), both in the pretest and posttest for collaboration skills and critical thinking skills showed a significance value (Sig.) above 0.05. The highest Sig. value is 0.465 and the lowest is 0.100, all exceeding the threshold of $\alpha = 0.05$. This shows that the data in each group is normally distributed, so it can be concluded that the normality assumption is met for all data used in this study.

Table 3. Homogeneity Test

	Collaboration Skills				**Critical Thinking Skills**			
	Levene Statistic	df1	df2	Sig.	Levene Statistic	df1	df2	Sig.
Pretest								
Based on Mean	0.718	1	28	0.404	0.284	1	28	0.598
Based on Median	0.209	1	28	0.651	0.193	1	28	0.664
Based on Median and with adjusted df	0.209	1	23.324	0.652	0.193	1	27.527	0.664
Based on Trimmed Mean	0.641	1	28	0.430	0.269	1	28	0.608
Posttest								
Based on Mean	0.752	1	28	0.393	0.040	1	28	0.844
Based on Median	0.477	1	28	0.496	0.041	1	28	0.842
Based on Median and with adjusted df	0.477	1	27.580	0.496	0.041	1	27.940	0.842
Based on Trimmed Mean	0.513	1	28	0.480	0.058	1	28	0.811

Based on the results of the homogeneity test using Levene's Test, all data in both the pretest and posttest for collaboration skills and critical thinking skills showed a significance value (Sig.) above 0.05. The Sig. value for the pretest ranged from 0.404 to 0.664, while the posttest ranged from 0.393 to 0.844. Since all significance values are greater than $\alpha = 0.05$, it can be concluded that the variance between data groups is homogeneous or uniform. Thus, the assumption of homogeneity is met in the data analysis of this study.

Table 4. Results of the T-Test of Collaboration Skills

	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Pretest							
Equal variances	0.718	0.404	0.849	28	0.403	0.40000	0.47140

DOI: 10.31958/jies.v5i1.15071

assumed							
Equal variances not assumed			0.849	26.475	0.404	0.40000	0.47140
Posttest							
Equal variances assumed	0.752	0.393	-3.688	28	0.001	-2.26667	0.61464
Equal variances not assumed			-3.688	27.216	0.001	-2.26667	0.61464

Based on the results of the independent sample t-test, the pretest data showed a significance value of 0.403 (p> 0.05), which indicated that there was no significant difference in collaboration ability between the control group and the experimental group before the treatment was given. However, in the posttest data, the significance value of 0.001 (p <0.05) indicated a significant difference between the two groups. The average collaboration ability of the experimental group was higher than the control group, with an average difference of 2.27. This shows that the treatment in the form of project-based farming gardening learning significantly improves children's collaboration ability compared to conventional learning.

This finding is in line with the research results of Andriyani & Anam (2022) which showed that more than 70% of students had a positive perception of project-based learning, which had a positive effect on their collaborative skills. Furthermore, Sagala et al., (2019) explained that PjBL was indeed designed to encourage students to be able to work together effectively in groups. Project-based learning provides space for students to be involved in planning, implementing, and evaluating projects together. This process requires open communication, sharing of responsibilities, and close cooperation between group members, which ultimately strengthens their collaborative skills.

However, during the implementation of project-based learning, there were several obstacles faced in the field. One of them is the limited time in implementing project-based activities, especially in the context of PAUD which has a relatively short learning schedule. In addition, the capacity of teachers in facilitating group work also still needs to be improved, especially in managing group dynamics that often change in early childhood. The narrow classroom and garden space and the lack of gardening facilities are also obstacles in implementing activities with this approach optimally. These obstacles show that even though the results are positive, the implementation of project-based learning (PjBL) still requires careful planning and adequate resource support.

Table 4. Results of the T-Test of Critical Thinking Skills

	F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**
Pretest							
Equal variances assumed	0.284	0.598	-0.475	28	0.638	-0.20000	0.42088

DOI: 10.31958/jies.v5i1.15071

Equal variances not assumed			-0.475	27.290	0.638	-0.20000	0.42088
Posttest							
Equal variances assumed	0.040	0.844	-2.369	28	0.025	-1.20000	0.50647
Equal variances not assumed			-2.369	28.000	0.025	-1.20000	0.50647

Based on the results of the independent sample t-test, the pretest data obtained a significance value of 0.638 ($p > 0.05$) and a t-count of -0.475, indicating that there was no significant difference in critical thinking skills between the control group and the experimental group before the treatment was given. However, in the posttest, the significance value of 0.025 ($p < 0.05$) and the t-count of -2.369 indicated a significant difference between the two groups after the treatment. The average critical thinking skills of the experimental group were higher than those of the control group, with an average difference of 1.20. This shows that project-based farming gardening learning has a positive and significant impact on improving children's critical thinking skills compared to conventional learning.

This finding is in line with the research results of Sungkono & Ekaputra (2023) which showed that the application of project-based learning models is effective in improving students' critical thinking skills, and the application of the same model is also effective in improving students' creativity. Furthermore, Salamun et al., (2023) stated that project-based learning emphasizes the learning process, takes place over a certain period of time, and is oriented towards problem solving. PjBL presents meaningful learning through the integration of various concepts from various fields of science, knowledge, or disciplines. In its implementation, learning is carried out in groups consisting of students with diverse backgrounds. PjBL is very effective in training students' thinking skills, especially in developing critical thinking skills at every stage of learning. Project-based learning also presents complex tasks that encourage students to be actively involved in problem-solving, decision-making, investigation, and reflection activities, with teacher guidance as a mentor.

Given that this study uses a contextual and participatory approach, the results obtained have significant potential to be used as a basis for consideration in developing curriculum and learning policies at the institutional level. The application of the project-based farming gardening model can be a strategic alternative in strengthening the curriculum that emphasizes the development of soft skills from an early age. Policy implications that can be taken include the importance of providing flexibility in designing PAUD curricula that are responsive to the local context. In addition, it is necessary to strengthen teacher capacity through ongoing training so that they are able to design, implement, and evaluate project-based learning effectively. Although the results of this study show a positive influence of the model used, it should be stated that these findings are contextual, limited to the 5–6 year old age group in a particular socio-

DOI: 10.31958/jies.v5i1.15071

cultural environment. Therefore, it is important to consider the possibility of variation in results if a similar model is applied at a different level or context, such as a younger age group or PAUD environment with different cultural and socio-economic characteristics.

CONCLUSION

This study demonstrates that the application of project-based learning (PjBL) through farming gardening activities effectively enhances the collaboration and critical thinking skills of children aged 5–6 years compared to conventional methods. PjBL has proven effective in promoting children's social and cognitive development through active involvement in real and relevant projects. These findings align with the demands of the 21st-century curriculum, which emphasizes the importance of developing soft skills from an early age. However, the implementation of PjBL requires attention to challenges such as limited time, facilities, and teacher capacity, highlighting the need for explicit integration into the Early Childhood Education curriculum and continuous professional development for educators. Further research on broader populations and diverse socio-cultural contexts is recommended to strengthen external validity and expand the application of this effective learning model.

REFERENCES

Andriyani, S., & Anam, S. (2022). Exploring The Relationship between Project-Based Learning and Collaborative Skills: EFL Learners' Voices. *Al Lisan: Jurnal Bahasa*, *7*(1), 51–63. https://doi.org/10.30603/al.v7i1.2413

Angga, A., Abidin, Y., & Iskandar, S. (2022). Penerapan Pendidikan Karakter dengan Model Pembelajaran Berbasis Keterampilan Abad 21. *Jurnal Basicedu*, *6*(1), 1046–1054. https://doi.org/10.31004/basicedu.v6i1.2084

Anggraini, A. P., Pramasdyahsari, A. S., & Lita, A. (2024). Kemampuan Kolaborasi Peserta Didik Tingkat SD Dalam Implementasi Project Based Learning. *Jurnal Penelitian Bidang Pendidikan*, *30*(2), 139–154. https://doi.org/10.24114/jpbp.v30i2.61205

Cahya, U. D., Simarmata, J., Suleman, N., Nisa, K., Nasbey, H., Muharlisiani, Lusy, T., Pagiling, S. L., & Rahmadi, E. (2023). *Buku Inovasi Pembelajaran-Berbasis Digital Abad 21* (D. D. Karim, Ed.; 1st ed.). Yayasan Kita Menulis.

Chusna, I. F., Aini, I. N., Putri, K. A., & Elisa, M. C. (2024). Literatur Review: Urgensi Keterampilan Abad 21 Pada Peserta Didik. *Jurnal Pembelajaran, Bimbingan, Dan Pengelolaan Pendidikan*, *4*(4), 1–164. https://doi.org/10.17977/um065.v4.i4.2024.1

Creswell, J. W. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (J. D. Creswell, Ed.; 5th ed.). Sage Publications.

DOI: 10.31958/jies.v5i1.15071

Ennis, R. H. (1985). Goals for a Critical Thinking Curriculum. In A. Costa & V. Alexandria (Eds.), *Developing Minds: A Resource Book for Teaching Thinking*. Association for Supervision and Curriculum Development.

Fadiana, M., Apriono, D., Sulistyaningrum, H., & Mu'minin, M. (2021). Farming Gardening Project; Kegiatan Penanaman Nilai-Nilai Karakter Pada Siswa Tunagrahita. *AKM: Aksi Kepada Masyarakat*, *2*(1). https://doi.org/10.36908/akm.v2i1.221

Jaya, H., Hambali, M., & Fakhrurrozi. (2023). Transformasi Pendidikan: Peran Pendidikan Berkelanjutan Dalam Menghadapi Tantangan Abad Ke-21. *JRPP: Jurnal Review Pendidikan Dan Pengajaran*, *6*(4), 2416–2422. https://doi.org/10.31004/jrpp.v6i4.21907

Kurniawan, F. A., Nurfahrudianto, A., & Yohanie, D. D. (2023). Kemampuan Berpikir Kritis Matematis Ditinjau Dari Hasil Belajar Siswa. *Jurnal Ilmiah Pendidikan Citra Bakti*, *10*(3), 636–649. https://doi.org/10.38048/jipcb.v10i3.2077

Kurniawan, N. A., Hidayah, N., & Rahman, D. H. (2021). Analisis Kemampuan Berpikir Kritis Siswa SMK. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *6*(3), 334–338. https://doi.org/10.17977/jptpp.v6i3.14579

Kusuma, F. F., Jalmo, T., & Yolida, B. (2019). Penggunaan Discovery Learning dalam Meningkatkan Keterampilan Kolaborasi dan Berpikir Tingkat Tinggi. *Jurnal Bioterdidik*, *7*(2). https://doi.org/10.58258/jupe.v8i1.5501

Kusuma, T. C., Boeriswati, E., & Supena, A. (2023). Peran Guru dalam Meningkatkan Berpikir Kritis Anak Usia Dini. *Aulad: Journal on Early Childhood*, *6*(3), 413–420. https://doi.org/10.31004/aulad.v6i3.563

Mabrur, H. (2020). Implementasi Project Based Learning Pada Jenjang PAUD. In *Bunga Rampai Pendidikan Anak Usia Dini* (pp. 95–114). Kementerian Pendidikan dan Kebudayaan, Direktorat Jenderal PAUD Dikdasmen.

Malaikosa, Y. M. L., Saroinsong, W. P., & Widyaswari, M. (2024). Pengembangan Modul Ajar Kurikulum Merdeka Berbasis PJBL: Panduan Praktis Bagi Guru PAUD. *IJCE (Indonesian Journal of Community Engagement)*, *5*(2), 149–159. https://doi.org/10.37471/ijce.v5i2.1035

Mardiani, Santoso, G., Adam, A. S., & Alwajih, A. A. (2023). Kontribusi dan Internalisasi: Keterampilan Sosial Melalui Bergotong Royong dan Collaboration di SD Kelas VI. *JPT: Jurnal Pendidikan Transpormatif*, *2*(4), 1–10. https://doi.org/10.9000/jpt.v2i4.612

DOI: 10.31958/jies.v5i1.15071

Maromi, C., Turhan Yani, M., Sya'dullah, A., Jannah, M., & Malaikosa, Y. M. L. (2024). The Impact of Violence, Bullying and Intolerance on Early Childhood. *Journal of Islamic Education Students (JIES)*, *4*(1), 177–185. https://doi.org/10.31958/jies.v4i1.12370

Muliawati, S. N., Syachruroji, A., & Rokmanah, S. (2023). Pembelajaran Kolaboratif Untuk Peningkatan Keterampilan Sosial Siswa Sekolah Dasar. *Jurnal Dunia Pendidikan*, *4*(1), 1–6. https://doi.org/10.55081/jurdip.v4i1.1465

Natalina, D. (2015). Menumbuhkan Perilaku Berpikir Kritis Sejak Anak Usia Dini. *Cakrawala Dini*, *5*(1). https://doi.org/doi.org/10.17509/cd.v6i1.10508

Nur Fadilah, S., Fitri, R., Matheos Lasarus Malaikosa, Y., Kristanto, A., Dewi, U., & Jannah, M. (2025). The Impact of Game-Based Learning Science for Kids on the Development of Logical Thinking in Children Aged 5-6 Years. *Journal of Islamic Education Students (JIES)*, *5*(1), 24–34. https://doi.org/10.31958/jies.v5i1.14821

Okpatrioka, & Abdullah, M. (2024). Pengembangan Kurikulum Berbasis Keterampilan Abad ke-21: Perspektif dan Tantangan. *IKRA-ITH HUMANIORA: Jurnal Sosial Dan Humaniora*, *8*(3), 322–340. https://doi.org/10.37817/ikraith-humaniora

Pahrijal, R., Priyana, Y., & Sukini. (2023). Keterampilan Penting dalam Abad ke-21: Pendidikan dan Kesuksesan Profesional. *Jurnal Pendidikan West Science*, *1*(9), 583–589. https://doi.org/10.58812/jpdws.v1i09.679

Puspa, C. I. S., Rahayu, D. N. O., & Parhan, M. (2023). Transformasi Pendidikan Abad 21 dalam Merealisasikan Sumber Daya Manusia Unggul Menuju Indonesia Emas 2045. *Jurnal Basicedu*, *7*(5), 3309–3321. https://doi.org/10.31004/basicedu.v7i5.5030

Rahayu, S., Pramiarsih, E. E., & Sritumini, B. A. (2019). Pengaruh Model Project Based Learning Terhadap Peningkatan Kemampuan Kolaborasi Siswa Dalam Mata Pelajaran Ekonomi Bisnis. *JP2EA*, *5*(2), 132–143. https://jurnal.fkip.unla.ac.id/index.php/jp2ea/article/view/330

Sagala, Y. D. A., Mariati, P. S., Bukit, N., & Motlan. (2019). Implementation of Project-Based Learning (PjBL) in Collaboration Skills and Communication Skills of Students. *Proceedings of the 4th Annual International Seminar on Transformative Education and Educational Leadership (AISTEEL 2019)*, 608–612.

Salamun, Widyastuti, A., Syawaluddin, Iwan, R. N. A., Simarmata, J., Simarmata, E. J., Suleman, Y. N., Lotulung, C., & Arief, M. H. (2023). *Model Model Pembelajaran Inovatif* (A. Karim, Ed.; 1st ed.). Yayasan Kita Menulis.

DOI: 10.31958/jies.v5i1.15071

Salum, R. N., Khadijah, K., & Nasution, N. L. (2024). Optimization of Early Childhood Social Emotional Development Through Exercise Methods and Learning Videos. *JIES: Journal of Islamic Education Students*, *4*(1), 163–176. https://doi.org/10.31958/jies.v4i1.1281

Saputri, D. A., & Katoningsih, S. (2023). Peran Guru PAUD dalam Menstimulasi Keterampilan Bahasa Anak untuk Berpikir Kritis pada Usia 5-6 Tahun. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *7*(3), 2779–2790. https://doi.org/10.31004/obsesi.v7i3.4353

Sari, S., & Paidil. (2025). Peran Teknologi Terbaru Membentuk Kehidupan Di Era Digital. *JUPEIS: Jurnal Pendidikan Dan Ilmu Sosial*, *4*(1). https://doi.org/10.57218/jupeis.Vol4.Iss1.1326

Sunbanu, H. F., Mawardi, & Wardani, W. K. (2019). Peningkatan Keterampilan Kolaborasi Siswa Menggunakan Model Pembelajaran Kooperatif Two Stay Two Stray Di Sekolah Dasar. *Jurnal Basicedu*, *3*(4), 2037–2041. https://doi.org/10.31004/basicedu.v3i4.260

Sungkono, S., & Ekaputra, F. (2023). Effectiveness of project-based learning model on improving critical thinking skills and student creativity. *Daengku: Journal of Humanities and Social Sciences Innovation*, *3*(5), 859–863. https://doi.org/10.35877/454ri.daengku2063

Thomas, J. W. (2000). *A Review of Research on Project-Based Learning* (1st ed.). The Autodesk Foundation. http://www.autodesk.com/foundation

Trilling, B., & Fadel, C. (2009). *21st Century Skills Learning for Life in Our Times* (1st ed.). Jossey-Bass.

Tumbel, M. E. (2024). Application of Project-Based Learning to Improve the 4C Abilities (Critical Thinking, Creativity, Collaboration, and Communication) of Children Aged 5-6 Years. *International Journal of Information Technology and Education (IJITE)*, *3*(2), 2809–8463. https://doi.org/10.62711/ijite.v3i2.173

Wijaya, E. Y., Sudjimat, D. A., & Amat, N. (2016). Transformasi Pendidikan Abad 21 Sebagai Tuntutan Pengembangan Sumber Daya Manusia Di Era Global. *Prosiding Seminar Nasional Pendidikan Matematika*, *1*, 263–278.

Williamson, E. (2023). The Effectiveness of Project-Based Learning in Developing Critical Thinking Skills among High School Students. *European Journal of Education*, *1*(1), 1–11. https://www.forthworthjournals.org/