

The Effectiveness of the Inquiry-Based Learning Model on the Problem-Solving Skills of Children Aged 4–5 Years

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ABSTRACT

This study aimed to determine the effectiveness of the Inquiry-Based Learning model in improving the problem-solving skills of children aged 4–5 years at TK Aisyiyah Karangagung. This research employed a quantitative approach using a quasi-experimental method with a Pretest–Posttest Control Group Design. The participants consisted of 30 children who were divided into an experimental group and a control group, with 15 children in each group. Data were collected through observation sheets developed based on the Early Childhood Development Achievement Standards (Standar Tingkat Pencapaian Perkembangan Anak [STPPA]). Data analysis was conducted using descriptive statistics, the Shapiro–Wilk normality test, Levene’s homogeneity test, and the Independent Samples t-test with the assistance of IBM SPSS Statistics version 26. The findings revealed that the mean score of the experimental group increased from 10.00 in the pretest to 15.20 in the posttest. Furthermore, the Independent Samples t-test yielded a significance value of

0.000 ($p < 0.05$), indicating a statistically significant difference between the experimental and control groups. Therefore, the Inquiry-Based Learning model was proven to be effective in improving the problem-solving skills of children aged 4–5 years. These findings suggest that Inquiry-Based Learning can serve as an alternative instructional model to support children's cognitive development, particularly in fostering problem-solving skills.

Introduction

Early Childhood Education (*Pendidikan Anak Usia Dini* [PAUD]) serves as an essential foundation for optimizing all aspects of children's development during the golden age. At this developmental stage, cognitive growth progresses rapidly and therefore requires appropriate stimulation through learning activities that are active, enjoyable, and meaningful (Tabun et al., 2025; Fitria, 2025). One of the essential cognitive competencies that should be developed from an early age is problem-solving skills (Asridoni et al., 2025; Lestari, 2020; Oktaviany et al., 2021). These skills enable children to identify simple problems, generate various alternative solutions, select the most appropriate solution, and evaluate the outcomes in their daily lives. Mastering problem-solving skills from an early age provides the foundation for the development of critical thinking, creativity, decision-making abilities, and independent learning at subsequent educational levels (Asfar & Nur, 2018; Puriani & Dewi, 2021; Parapat, 2020). The importance of developing problem-solving skills is also emphasized in the Regulation

of the Minister of Education and Culture of the Republic of Indonesia Number 137 of 2014 concerning the National Standards for Early Childhood Education. Within the cognitive development domain, children aged 4–5 years are expected to demonstrate the ability to observe, classify, compare, recognize cause-and-effect relationships, and solve simple problems through exploratory activities. Therefore, according to Munawarah (2021) and Alfadhilah (2025), teachers need to design learning experiences that allow children to construct knowledge independently rather than merely receiving information passively.

The theoretical foundation of this study is based on Piaget's theory of cognitive development (1977), which posits that children aged 4–5 years are in the preoperational stage of development. At this stage, children construct knowledge through concrete experiences, play activities, exploration, and interaction with their environment. Therefore, student-centered learning is considered more appropriate than teacher-centered instruction because it provides children with opportunities to think, ask questions, experiment, and independently discover solutions.

Based on the results of the preliminary observation conducted at TK Aisyiyah Karangagung, the problem-solving skills of children aged 4–5 years had not yet developed optimally. Some children still experienced difficulties in identifying simple problems, determining alternative solutions, completing tasks independently without teacher assistance, and explaining the reasons for the solutions they selected.

During classroom learning activities, teachers continued to serve as the primary source of information, limiting children's opportunities to explore, experiment, and independently discover answers. This condition indicates the need for implementing a learning model capable of actively engaging children throughout the learning process.

One learning model that aligns with the characteristics of early childhood learners is the Inquiry-Based Learning (IBL) model. This model positions children as the central participants in the learning process through stages of observing, asking questions, gathering information, conducting investigations, drawing conclusions, and communicating findings. Teachers function as facilitators who guide children's thinking processes, thereby making learning more meaningful while fostering curiosity, logical thinking, creativity, and problem-solving skills.

Numerous studies have demonstrated that inquiry-based learning positively influences the cognitive development of young children. Haenilah, Yanzi, and Drupadi (2021) reported that learning based on the scientific approach significantly enhanced young children's problem-solving skills through observation, exploration, and investigative activities. Similarly, the study conducted by Dal Berberoğlu and Alabay (2021) found that inquiry-based problem-solving activities implemented over a ten-week period significantly improved the ability of children aged 60–72 months to identify solutions to various problems compared with those in the control group.

Comparable findings were reported by Lin et al. (2021), who found that a twelve-week Inquiry-Based Science and Engineering program not only enhanced preschool children's scientific knowledge but also improved their problem-solving skills and learning motivation. Other studies have further indicated that inquisitiveness is positively associated with children's ability to solve science-related problems. Children who actively ask questions and engage in exploration tend to demonstrate stronger problem-solving abilities than those who participate more passively.

Although numerous studies have confirmed the effectiveness of inquiry-based learning, most previous research has focused primarily on improving scientific competence, creativity, learning motivation, or critical thinking skills. Research specifically examining the effect of the Inquiry-Based Learning model on the problem-solving skills of children aged 4–5 years using a Pretest–Posttest Control Group Design in Indonesian early childhood education settings remains relatively limited. Furthermore, only a small number of studies have compared learning outcomes between experimental and control groups within the context of kindergarten education. This limitation constitutes the research gap that underpins the significance of the present study.

Based on the foregoing discussion, this study aims to analyze the effect of the Inquiry-Based Learning model on the problem-solving skills of children aged 4–5 years at TK Aisyiyah Karangagung. The novelty of this study lies in the implementation of the Inquiry-Based

Learning model using a quasi-experimental Pretest–Posttest Control Group Design to compare the effectiveness of learning between the experimental and control groups. The findings are expected to provide empirical evidence regarding the effectiveness of the Inquiry-Based Learning model and to serve as a reference for early childhood educators in designing learning experiences that optimally foster children's problem-solving skills.

Methods

This study employed a quantitative approach using a **quasi-experimental** method to examine the effect of the Inquiry-Based Learning model on the problem-solving skills of children aged 4–5 years (Syahrizal & Jailani, 2023; Anantasia & Rindrayani, 2025). The research adopted a Pretest–Posttest Control Group Design, involving two groups: an experimental group and a control group. The experimental group received instruction using the Inquiry-Based Learning model, whereas the control group participated in conventional learning activities. Both groups completed a pretest before the treatment and a posttest after the treatment to determine changes in children's problem-solving skills.

Table 1. Research Design

Group	Pretest	Treatment	Posttest
Experimental	O ₁	X	O ₂
Control	O ₃	–	O ₄

Notes:

O₁ = Pretest of the experimental group

O₂ = Posttest of the experimental group

O₃ = Pretest of the control group

O₄ = Posttest of the control group

X = Learning using the Inquiry-Based Learning model

The study was conducted at TK Aisyiyah Karangagung, Palang District, Tuban Regency, during the second semester of the 2025/2026 academic year. The study population consisted of 30 children aged 4–5 years who were enrolled in two classes. A total sampling technique was employed because the entire population was included as the research sample. The experimental group consisted of 15 children, while the control group also consisted of 15 children.

The research instrument was an observation sheet designed based on the cognitive development indicators specified in the Early Childhood Development Achievement Standards (Standar Tingkat Pencapaian Perkembangan Anak [STPPA]) stipulated in the Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 137 of 2014. The observed indicators included the ability to identify simple problems, determine alternative solutions, select appropriate solutions, complete tasks independently, and communicate the outcomes of problem-solving activities. Prior to data collection, the research instrument underwent both validity and reliability testing to ensure its suitability for use.

Data were collected through classroom observations conducted during both the pretest and posttest phases. The collected data were analyzed using IBM SPSS Statistics Version 26. The analysis began with

descriptive statistics to provide an overview of children's problem-solving skills in each group. Subsequently, assumption testing was conducted using the Shapiro–Wilk normality test and Levene's Test of Homogeneity of Variance. Hypothesis testing was then performed using the Independent Samples t-test with a significance level of 5% ($\alpha = 0.05$). The research hypothesis was accepted when the significance value (Sig. 2-tailed) was less than 0.05, indicating that the Inquiry-Based Learning model had a significant effect on the problem-solving skills of children aged 4–5 years.

Result and Discussions

This study was conducted to examine the effect of the **Inquiry-Based Learning** model on the problem-solving skills of children aged 4–5 years at TK Aisyiyah Karangagung. The research data were obtained through observations conducted before the treatment (**pretest**) and after the treatment (**posttest**) in both the experimental and control groups.

The descriptive statistical analysis was conducted to provide an overview of children's problem-solving skills before and after the learning intervention in both groups. A summary of the descriptive statistical results is presented in Table 2.

Table 2. Descriptive Statistics of Problem-Solving Skills

Group	Test	N	Mean	SD
Experimental	Pretest	15	10.00	1.85

Experimental	Posttest	15	15.20	2.21
Control	Pretest	15	10.67	1.67
Control	Posttest	15	11.20	1.08

Based on Table 2, the mean score of problem-solving skills in the experimental group increased from 10.00 to 15.20 after the implementation of the Inquiry-Based Learning model. Meanwhile, the control group also demonstrated an increase, from 10.67 to 11.20; however, the improvement was relatively smaller than that observed in the experimental group. These findings indicate that learning through the Inquiry-Based Learning model produced a greater improvement in children's problem-solving skills.

The normality test was conducted using the **Shapiro–Wilk test** because the sample size in each group consisted of fewer than 50 participants. The results of the normality test are presented in **Table 3**.

Table 3. Results of the Shapiro–Wilk Normality Test

Group	Data	Sig.	Interpretation
Experimental	Pretest	0.111	Normal
Experimental	Posttest	0.166	Normal
Control	Pretest	0.106	Normal
Control	Posttest	0.070	Normal

As presented in **Table 3**, all significance values exceeded **0.05**, indicating that the data were normally distributed. Therefore, the data met the assumption of normality, allowing further analysis to be conducted using **parametric statistical tests**.

The homogeneity test was performed to determine whether the variances of the experimental and control groups were equivalent before hypothesis testing was conducted.

The results of the homogeneity test indicated that the **pretest** data exhibited homogeneous variances, whereas the **posttest** data showed non-homogeneous variances. Therefore, in the **Independent Samples *t*-test**, the results reported under the **Equal variances not assumed** row were used for hypothesis testing.

Table 4. Results of the Homogeneity Test

Data	Levene Statistic	Sig.	Interpretation
Pretest	0.000	1.000	Homogeneous
Posttest	5.458	0.027	Not Homogeneous

Hypothesis testing was conducted using the Independent Samples *t*-test to determine whether there was a significant difference in problem-solving skills between the experimental and control groups after the implementation of the learning intervention.

Table 5. Results of the Independent Samples *t*-Test

<i>t</i>	Sig. (2-tailed)	Mean Difference	Decision
6.198	0.000	3.867	Hypothesis Accepted

Based on Table 5, the significance value obtained was 0.000, which is lower than 0.05. This result indicates a statistically significant difference between the experimental and control groups. Therefore, the research hypothesis was accepted, demonstrating that the Inquiry-Based Learning model had a significant effect on the problem-solving

skills of children aged 4–5 years.

The findings of this study demonstrate that the implementation of the Inquiry-Based Learning (IBL) model had a significant effect on the problem-solving skills of children aged 4–5 years at TK Aisyiyah Karangagung. This conclusion is supported by the increase in the mean score of the experimental group from 10.00 in the pretest to 15.20 in the posttest. In contrast, the control group showed only a modest improvement, with the mean score increasing from 10.67 to 11.20. Furthermore, the results of the Independent Samples t-test yielded a significance value of 0.000 ($p < 0.05$), indicating a statistically significant difference between the experimental and control groups after the treatment was administered.

The improvement in the problem-solving skills observed in the experimental group suggests that the Inquiry-Based Learning model provides a more active learning experience than conventional instructional approaches. Within this model, children do not merely receive information from the teacher; instead, they actively participate in observing objects, asking questions, exploring various alternative solutions, discovering answers, and communicating their findings. Such active engagement enables children to construct knowledge through authentic experiences, thereby making the learning process more meaningful.

The findings of this study are consistent with Piaget's theory of

cognitive development, which posits that children aged 4–5 years are in the preoperational stage of cognitive development. During this stage, children learn most effectively through concrete experiences, play activities, exploration, and interaction with their surrounding environment. When children are provided with opportunities to investigate problems and discover solutions independently, their cognitive structures develop through the processes of assimilation and accommodation. Therefore, inquiry-based learning represents an instructional approach that is well aligned with the developmental characteristics of early childhood learners.

The results also support the principles of constructivist learning theory, which views knowledge as something actively constructed by learners through meaningful learning experiences. Within inquiry-based learning, teachers function as facilitators who create supportive learning environments, pose guiding questions, and assist children in discovering concepts independently. Consequently, children are provided with opportunities to develop logical thinking skills, connect prior experiences with newly acquired knowledge, and formulate strategies for solving the problems they encounter.

The findings of this study are in agreement with the research conducted by Haenilah, Yanzi, and Drupadi (2021), who reported that inquiry-based learning effectively improves young children's problem-solving skills through observation, exploration, and experimental activities. Likewise, Dal Berberoğlu and Alabay (2021) found that

inquiry-based activities significantly enhanced preschool children's ability to identify solutions to a variety of simple problems. In addition, Lin et al. (2021) explained that inquiry-based learning not only strengthens children's scientific thinking abilities but also promotes reasoning skills, collaboration, and problem-solving through authentic learning experiences.

Although the control group also demonstrated improvements in learning outcomes, the magnitude of improvement was considerably smaller than that observed in the experimental group. This finding indicates that conventional learning still provides valuable learning experiences for children; however, it does not fully encourage them to explore ideas, conduct investigations, and independently discover solutions. In contrast, the Inquiry-Based Learning model offers broader opportunities for children to actively seek information, examine multiple possibilities, and draw conclusions based on their observations. As a result, children become more confident in addressing the problems they encounter throughout the learning process.

This study also has important practical implications for the implementation of learning in early childhood education settings. Teachers may integrate the stages of Inquiry-Based Learning into daily play-based and instructional activities, such as conducting simple experiments, exploring the surrounding environment, engaging children in problem-solving games, and implementing collaborative group projects that are appropriate to children's developmental stages.

Consequently, learning becomes oriented not only toward achieving academic outcomes but also toward fostering critical thinking, creativity, communication, collaboration, and problem-solving skills, all of which are recognized as essential competencies for the twenty-first century.

Nevertheless, this study has several limitations. The sample size was relatively small and involved only a single early childhood education institution, limiting the generalizability of the findings. Future studies are therefore recommended to involve larger and more diverse samples while combining quantitative and qualitative approaches to obtain a more comprehensive understanding of the effectiveness of the Inquiry-Based Learning model in developing young children's problem-solving skills.

Conclusion

Based on the findings of this study, it can be concluded that the Inquiry-Based Learning model has a significant effect on the problem-solving skills of children aged 4–5 years at TK Aisyiyah Karangagung. This is evidenced by the greater increase in the mean problem-solving skill scores of the experimental group compared with those of the control group, as well as by the results of the Independent Samples t-test, which yielded a significance value of 0.000 ($p < 0.05$). These findings confirm that inquiry-based learning provides a more active, meaningful, and child-centered learning experience, thereby enhancing children's ability to identify problems, generate alternative solutions, select appropriate solutions, and solve problems independently. Therefore,

the Inquiry-Based Learning model can be considered an effective instructional alternative for fostering the problem-solving skills of young children.

References

- Alfadhilah, J. (2025). Filsafat pendidikan anak usia dini menurut Jean Piaget. *Alzam: Journal of Islamic Early Childhood Education*, 5(1), 94-111. <https://doi.org/10.51675/alzam.v5i1.1092>
- Anantasia, G., & Rindrayani, S. R. (2025). Metodologi penelitian quasi eksperimen. *Jurnal Pendidikan dan Keguruan*, 3(1), 47-56. <https://jutepe-joln.net/index.php/JURPERU/article/view/811>
- Asfar, A. I. T., & Nur, S. (2018). *Model pembelajaran problem posing & solving: meningkatkan kemampuan pemecahan masalah*. CV Jejak (Jejak Publisher).
- Asridoni, N. S., Karimah, N. A., Husna, M., & Aulia, P. (2025). Pengaruh Permainan Puzzle terhadap Kemampuan Problem Solving Anak Usia 4-6 Tahun. *Arus Jurnal Psikologi dan Pendidikan*, 4(2), 83-89. <https://doi.org/10.57250/ajpp.v4i2.1220>
- Dal Berberoğlu, Y., & Alabay, E. (2021). Examining the Effect of Inquiry-Based Problem-Solving Activities on the Problem-Solving Skills of 60-72 Months Old Children. *Anadolu University Journal of Education Faculty*, 5(3), 309-323. <https://doi.org/10.34056/aujef.897292>
- Fitria, R. (2025). Strategi Pendidik dalam Mengoptimalkan Stimulasi Tumbuh Kembang Anak Usia Dini di Tengah Tantangan Era Digital. *Inspirasi Dunia: Jurnal Riset Pendidikan dan Bahasa*, 4(4), 17-33. <https://doi.org/10.58192/insdun.v4i4.3877>
- Haenilah, E. Y., Yanzi, H., & Drupadi, R. (2021). The effect of scientific approach-based learning on problem solving skills in early childhood. *International Journal of Instruction*, 14(2), 289-304. <https://doi.org/10.29333/iji.2021.14217a>
- Lestari, L. D. (2020). Pentingnya mendidik problem solving pada anak melalui bermain. *Jurnal Pendidikan Anak*, 9(2), 100-108. <https://doi.org/10.21831/jpa.v9i2.32034>

- Lin, X., Yang, W., Wu, L., Zhu, L., Wu, D., & Li, H. (2021). Using an inquiry-based science and engineering program to promote science knowledge, problem-solving skills and approaches to learning in preschool children. *Early Education and Development*, 32(5), 695-713. <https://doi.org/10.1080/10409289.2020.1795333>
- Munawarah, S. (2021). Strategi Discovery Learning dalam Pembelajaran Anak Usia Dini. *Kaisa: Jurnal Pendidikan Dan Pembelajaran, Sekolah Tinggi Agama Islam Negeri Bengkalis*, 1, 2775-2577. <http://ejournal.kampusmelayu.ac.id/index.php/kaisa>
- Oktaviany, F., Hafidah, R., & Dewi, N. K. (2021). Profil Kemampuan Problem Solving Anak Usia 4-5 Tahun. *Kumara Cendekia*, 9(3), 148-155. <https://doi.org/10.20961/kc.v9i3.49293>
- Parapat, A. (2020). *Strategi Pembelajaran Anak Usia Dini: Panduan Bagi Orang Tua, Guru, Mahasiswa, dan Praktisi PAUD*. Edu Publisher.
- Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 137 Tahun 2014 tentang Standar Nasional Pendidikan Anak Usia Dini.
- Piaget, J. (1977). *The development of thought: Equilibration of cognitive structures*. Viking Press.
- Puriani, R. A., & Dewi, R. S. (2021). *Konsep adversity & problem solving skill*. Bening Media Publishing.
- Syahrizal, H., & Jailani, M. S. (2023). Jenis-jenis penelitian dalam penelitian kuantitatif dan kualitatif. *QOSIM: Jurnal Pendidikan Sosial & Humaniora*, 1(1), 13-23. <https://doi.org/10.61104/jq.v1i1.49>
- Tabun, N. L., Andriani, N., Wekke, I. S., Misrahayu, Y., Dewanti, L., Mutmainnah, M., Zulhendri, Z., & Arianto, T. (2025). *Pendidikan Anak Usia Dini. Pendidikan Anak Usia Dini: Konsep, Pendekatan, Dan Praktik Holistik*. Penerbit Yayasan Tri Edukasi Ilmiah.
- Undang-Undang Republik Indonesia Nomor 20 Tahun 2003 tentang Sistem Pendidikan Nasional.