

STEAM-Based Learning with Loose Parts for Developing Children's Creativity at TK Nurul Qur'an Stabat

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Abstract

This study explores the implementation of STEAM-based learning integrated with loose parts media to develop early childhood creativity at TK Nurul Qur'an Stabat. The research was conducted in response to the increasing need for learning approaches that prepare young children to think critically, solve problems, and adapt to rapid technological development. Using a descriptive qualitative method, data were collected through observation, interviews, and documentation to describe the real conditions of children aged 4–5 years before and during the application of STEAM activities using loose parts materials. The findings indicate that children's creativity measured through their ability to generate new ideas, create original products, and modify existing forms had not developed optimally prior to the intervention. The implementation of STEAM with loose parts provided opportunities for children to explore, experiment, imagine, and create freely according to their ideas. The study concludes that STEAM-based learning using loose parts has strong potential to enhance early childhood creativity, supported by engaging activities that integrate science, technology, engineering, art, and mathematics. This approach also fosters children's curiosity, collaborative skills, and problem-solving abilities. The research further identifies supporting and inhibiting factors in the implementation process, emphasizing the need for teacher competence, appropriate learning media, and a conducive environment to optimize children's creative development.

Keywords: STEAM; Loose Parts; Creativity; Early Childhood Education

I. INTRODUCTIONS

The word "education" in Indonesian comes from the word "educate," which has the prefix "pe" and the suffix "an." In the Great Dictionary of the Indonesian Language, the word "dikti" means to nurture and provide training (teaching, guidance, leadership) in morals and intellectual intelligence. Thus, education is defined as "the process of changing the attitudes and behavior of a person or group of people in an effort to mature humans through teaching and training" (Munisa et al., 2019). Education is the most important pillar in the progress of a nation and the progress of human life (Widya, Rozana, & Tasril, 2022). Education plays a crucial role in instilling personality in a child, as it is a

key factor in personality formation. "Education plays a significant role in shaping the good or bad of human personality according to normative standards. It is also through education that these attitudes are formed" (Utami & Ikhwana, 2022). Early childhood education is an effort to facilitate the development and learning of children from birth to the age of 6 (six) years with experiences and stimulation that are developmental, integrated and comprehensive so that children can grow and develop healthily and optimally in accordance with existing values and norms (Rozana & Bantali, 2020). Furthermore, early childhood education is the level of education that every student undergoes before entering primary education

or elementary school. Early childhood education is a development effort aimed at providing complete stimulation, namely educational stimulation to help physical and spiritual growth and development (Nofianti, 2023).

Early childhood education plays a crucial role in preparing children to develop cognitive flexibility, creative expression, and problem-solving skills competencies that are essential for success in the 21st century. Creativity is recognized as a core developmental domain that must be continuously stimulated through rich, meaningful, and exploratory learning experiences. However, preliminary observations at TK Nurul Qur'an Stabat reveal that children's creativity had not developed optimally. Indicators such as originality, fluency of ideas, elaboration, and flexibility were still limited due to repetitive learning routines, structured worksheets, and teacher-centered instruction. The absence of open-ended materials and limited opportunities for exploration further constrained children's creative growth, indicating the necessity for more innovative pedagogical approaches.

STEAM (Science, Technology, Engineering, Arts, and Mathematics) has emerged as a multidisciplinary learning model that supports inquiry, experimentation, design thinking, imaginative expression, and problem-solving. As Guyotte et al. (in Wahyuningsih, 2020) note, STEAM encourages young children to observe phenomena, recognize patterns, collaborate, and engage in hands-on activities that stimulate higher-order thinking. Integrating multiple disciplines allows children to construct knowledge through discovery rather than passive reception. At the early childhood level, STEAM enables learners to explore materials, experiment with possibilities, test simple hypotheses, and translate ideas into creative products, thereby fostering holistic learning experiences that align with children's natural curiosity.

Loose parts media significantly strengthen STEAM implementation by providing children with manipulable, open-

ended, and versatile materials such as wood pieces, bottle lids, pebbles, natural objects, pipes, and recyclable items. Loose parts allow children to construct, deconstruct, recombine, and redesign materials according to their imagination, thereby promoting divergent thinking and problem-solving. Houser (in Azizah et al., 2020) emphasizes that loose parts support cognitive flexibility, creativity, and socio-emotional engagement by encouraging children to explore without predetermined outcomes. In the context of TK Nurul Qur'an Stabat, the use of loose parts had been minimal, resulting in limited opportunities for children to engage in complex, imaginative, and constructive play. Integrating loose parts into STEAM activities is therefore a strategic intervention for enhancing creativity and strengthening exploratory learning.

A substantial body of literature highlights the potential of STEAM and loose parts to promote creativity in early childhood. Imamah and Muqowim (2020) demonstrate that loose parts foster flexible thinking and allow children to generate multiple ideas. Pratiwi (2019) reports that STEAM-based art activities enhance children's creative representation and engagement. Other studies (Yakman & Lee, 2012; Herro & Quigley, 2017; Sousa & Pilecki, 2013) confirm that STEAM encourages innovation, collaboration, and inquiry-driven learning. Similarly, Nicholson's loose parts theory (1971) states that children's creativity increases when environments offer materials that can be freely manipulated. Despite such findings, research integrating STEAM and loose parts holistically particularly in Islamic early childhood institutions remains limited. Most studies investigate these approaches separately or focus on general kindergarten settings, leaving a research gap in understanding contextual adaptation and implementation within faith-based schools such as TK Nurul Qur'an Stabat.

The scientific novelty of this research lies in its contextualized integration of STEAM learning with loose parts media in an Islamic kindergarten environment. This study not only analyzes how STEAM-loose parts

activities enhance creativity but also examines the supporting and inhibiting factors throughout the implementation process. Unlike prior studies, this research provides a comprehensive account of children's behavioral responses, creative outputs, and learning interactions before and after intervention. This contributes new empirical evidence and pedagogical insights for early childhood educators seeking to adopt exploratory and child-centered approaches within localized cultural and institutional contexts.

Based on preliminary observations, the key problems identified include: (1) low levels of children's creativity, reflected in limited idea generation and low variability in creative products; (2) insufficient use of open-ended materials that allow children to manipulate and explore freely; and (3) the absence of integrated STEAM activities that stimulate imaginative and higher-order thinking. These problems underscore the need for a learning model that allows children to explore materials openly, express ideas creatively, and engage in meaningful problem-solving through hands-on experiences.

Therefore, the purpose of this scientific article is to describe the implementation of STEAM-based learning using loose parts at TK Nurul Qur'an Stabat, analyze the supporting and inhibiting factors that influence its application, and explain how this learning model contributes to the development of children's creativity. The study aims to offer practical guidance and theoretical enrichment for early childhood educators and institutions seeking to enhance creativity through innovative, exploratory, and integrated pedagogical approaches.

II. RESEARCH METHODOLOGY

This study employed a qualitative descriptive design to understand the implementation of STEAM-based learning using loose parts in developing children's creativity at TK Nurul Qur'an Stabat. A qualitative approach was chosen because it allows researchers to examine natural

learning situations, children's spontaneous creative behaviors, and the real classroom context. The participants consisted of children aged 4-5 years and a classroom teacher selected through purposive sampling based on their direct involvement in STEAM loose parts activities.

Data were collected through observations, interviews, and documentation. Observations were used to capture children's creative expressions such as idea generation, material manipulation, construction processes, and creative products during STEAM learning. Interviews with the teacher provided insights into the implementation steps, supporting conditions, and challenges encountered. Documentation, including photographs of activities, children's artworks, and teaching materials, was used to strengthen the data and provide visual evidence of the learning process.

The data analysis followed an interactive model consisting of data reduction, data display, and conclusion drawing. Information from all data sources was categorized according to themes related to learning implementation, children's creativity, and influencing factors. Triangulation of techniques comparing observations, interviews, and documentation was conducted to ensure data credibility. Ethical procedures were maintained by obtaining informed permission from the school and parents while ensuring confidentiality of participants. Overall, this methodology enabled a clear and systematic description of how STEAM-based learning with loose parts contributed to creativity development in young children.

III. RESULTS AND DISCUSSION

The findings indicate that the initial level of creativity among children aged 4-5 years at TK Nurul Qur'an Stabat was generally low to moderate. Pre-assessment results showed that most children were only at the Emerging or Developing as Expected category, with none reaching the Very Well Developed category. Children tended to rely heavily on teacher instructions, imitate

peers' creations, and hesitated to express original ideas. Such conditions reflect the dominance of convergent, product-oriented teaching practices that limit children's opportunities for exploration and creative expression. These findings are consistent with previous studies showing that monotonous and highly structured learning environments hinder the development of children's creativity (Mastuinda et al., 2020; Lestarinigrum & Wijaya, 2020).

Implementation of STEAM Learning with Loose Parts

The implementation of STEAM learning followed the Ask Imagine Try Try Again sequence, which is recommended for young children because it allows them to question, imagine, test ideas, revise, and engage in joyful experimentation (Imamah & Muqowim, 2020). The loose parts used in the intervention including popsicle sticks, shells, bottle caps, seeds, stones, and scraps of fabric served as open-ended materials that children could move, combine, modify, and reinterpret freely. This aligns with Nicholson's loose parts theory, which emphasizes that open-ended materials stimulate creativity due to their flexibility and lack of fixed functions (Azizah et al., 2020).

During implementation, the teacher acted as a facilitator rather than a direct instructor. The teacher provided rich stimuli, encouraged dialogue through open-ended questions such as "What else can you add?" or "What if you try another way?", and refrained from giving rigid examples that could restrict children's creativity (Auliyalloh & Rakhman, 2020). This approach also enhanced children's social interaction, collaboration, and communication skills. These outcomes support findings by Guyotte and colleagues, who argue that STEAM learning promotes collaborative and creative processes across disciplines (Fitriyah & Ramadani, 2021). Throughout the activities, children showed high enthusiasm and initiative. They created houses, vehicles, and sea animals using various combinations of materials. These observations are consistent with research

stating that loose parts enhance imagination, creativity, physical engagement, and social problem-solving (Farida, 2020).

Initial Condition of Children's Creativity

Pre-research findings indicate that the creativity of children aged 4–5 years at TK Nurul Qur'an Stabat was still at a low to moderate level. Most children showed a high dependence on teacher instructions and tended to imitate examples rather than generate new ideas. Learning activities were dominated by coloring, pasting, and copying teacher-made models, causing children to act more as followers than creators. This limited the development of key aspects of creativity, namely fluency, flexibility, originality, and elaboration. Teachers also reported that the learning media used were limited to closed-ended materials such as puzzles, blocks, and letter cards, which did not provide opportunities for free exploration of ideas. Pre-observation data further showed that out of 16 children, only 50% were in the "developing as expected" category, and none had reached the "very well developed" category. This situation aligns with findings indicating that learning was still predominantly teacher-centered, offering minimal opportunities for children to take initiative or develop their creativity independently.

Such conditions are not aligned with the characteristics of children in the pre-operational stage according to Piaget, who emphasized the importance of free exploration and manipulation of concrete objects. A learning environment that lacks stimulation and is limited in open-ended materials restricts children's ability to express their imagination optimally. Teachers also acknowledged that limited planning time, unfamiliarity with integrative thematic approaches, and the underutilization of loose parts materials were key factors hindering creativity development in the classroom. Therefore, a learning intervention that provides opportunities for experimentation, creation, and idea integration through more flexible and child-centered approaches is urgently needed.

Changes in Children's Creativity After STEAM Implementation

After three months of consistent STEAM-based loose-parts implementation, significant improvements were observed across all four dimensions of creativity: fluency, flexibility, originality, and elaboration. Children no longer produced only one or two ideas but were able to generate multiple alternatives during creative tasks. Flexibility also improved; for instance, when a structure they built collapsed, they independently experimented with different materials, added support, or discussed solutions with peers. This shift reflects the emergence of alternative thinking, as noted by Auliyalloh & Rakhman (2020).

Originality increased most prominently. Children produced unique creations, such as “a two story house made of leaves and sticks,” “a curved bridge for tiny animals,” or “a spaceship made from bottle caps and wire.” These outputs demonstrate divergent thinking, which is central to creative development and aligns with earlier findings showing that loose parts promote imaginative and novel thinking (Farida, 2020).

The elaboration dimension also showed improvement. Children added detailed features to their creations decorating structures, naming objects, identifying functions, and creating stories to accompany their work. This demonstrates the maturation of symbolic, narrative, and artistic abilities, which are core features of the preoperational developmental stage described by Piaget. Overall, the results reinforce previous evidence that STEAM learning integrated with loose parts effectively enhances creativity in early childhood (Rohmatun et al., 2021; Fitriyah & Ramadani, 2021). This approach not only boosts creativity but also strengthens collaboration, communication, perseverance, and confidence skills essential for 21st-century learning.

IV. CONCLUSION

The findings of this study demonstrate that implementing STEAM-

based learning using loose parts materials has a significant positive impact on the development of creativity among children aged 4–5 years at TK Nurul Qur'an Stabat. The initial assessment revealed that children's creativity was still at a low to moderate level, characterized by strong dependence on teacher instructions, limited originality, and restricted opportunities for idea exploration. These conditions were further reinforced by the use of closed-ended learning media and a predominantly teacher-centered learning approach.

The intervention through STEAM learning provided children with opportunities to explore, experiment, and generate ideas freely. The use of loose parts materials open ended and manipulable objects enabled children to express creativity through various forms, strategies, and problem-solving attempts. Throughout the implementation, children showed notable progress across four key dimensions of creativity: fluency, flexibility, originality, and elaboration. They became more confident in proposing ideas, more adaptable in responding to challenges, and more capable of producing unique and well-developed creations.

Overall, the study concludes that STEAM-based learning with loose parts is an effective, developmentally appropriate, and child-centered approach for enhancing early childhood creativity. This method not only supports the cognitive and imaginative growth of young learners but also aligns with the characteristics of children in the pre-operational stage who require hands-on, exploratory, and flexible learning experiences. The results underscore the importance of providing rich, open-ended learning environments and empowering teachers to adopt innovative, inquiry-based pedagogical practices in early childhood education.

V. RECOMMENDATIONS

Based on the findings, it is recommended that teachers receive ongoing training in STEAM and open-ended learning so they can design activities that encourage exploration and creativity. Schools should

also provide a variety of loose parts and make them easily accessible in the classroom to support children's creative play. Learning should gradually shift from teacher-centered to child-centered, giving children more freedom to make decisions, try ideas, and solve problems independently.

Integrating STEAM into daily and thematic activities is also important so that children can naturally explore science, technology, engineering, arts, and mathematics through play. Creating a supportive classroom environment with flexible spaces and rich materials will help children engage more deeply in creative activities. In addition, parents should be involved by contributing materials and supporting creative play at home. Future research is encouraged to explore the long-term effects of STEAM and loose parts, as well as their impact on other developmental areas.

VI. REFERENCES

- Auliyalloh, A. Q., & Rakhman, A. (2020). Media pembelajaran STEAM untuk meningkatkan kreativitas berbahan loose parts di Kelompok B TK Kasih Ibu. *Jurnal Ceria*, 3(6), 554.
- Azizah, S. N., Munawar, & Ds. (2020). *Analisis metaphorming melalui media loose parts pada anak usia dini*.
- Farida, A. (2020). Penggunaan media loose parts untuk mengembangkan kreativitas anak usia dini di PAUD Al-Musfiroh Gunung Sindur Jawa Barat, 33.
- Fitriyah, A., & Ramadani, S. D. (2021). Pengaruh pembelajaran STEAM berbasis PjBL terhadap keterampilan berpikir kreatif dan berpikir kritis. *Jurnal Inspiratif Pendidikan*, 10(1), 215.
- Guyotte, K., Sochacka, N., Costantino, T., Walther, J., & Kellam, N. (dalam Wahyuningsih, S., 2020). *Pembelajaran STEAM dalam pengembangan kreativitas anak usia dini*.
- Herro, D., & Quigley, C. (2017). Exploring teachers' perceptions of STEAM teaching through professional development. *Journal of Science Education and Technology*, 26(1), 1–14.
- Houser, N. (dalam Azizah et al., 2020). *Loose parts and children's creativity*.
- Imamah, Z., & Muqowim. (2020). *Pengembangan kreativitas dan berpikir kritis anak usia dini melalui STEAM and loose parts*.
- Nicholson, S. (1971). The theory of loose parts: An important principle for design methodology. *Landscape Architecture*, 62(1), 30–34.
- Lestarinigrum, A., & Wijaya, I. P. (2020). Penerapan bermain loose parts untuk kemampuan memecahkan masalah sederhana anak usia 4–5 tahun. *PEDAGOGIKA Jurnal Ilmu Pendidikan*, 11(2), 106.
- Mastuinda, Z., Zulkifli, & Febrialismanto. (2020). Persepsi guru tentang penggunaan loose parts dalam pembelajaran di PAUD se-Kecamatan Tampar Kota Pekanbaru. *Jurnal Review Pendidikan Dan Pengajaran*, 3(1), 91.
- Munisa, M., Nofianti, R., Widya, R., & Rozana, S. (2019). Peningkatan psikologi dan aktivitas mahasiswa Panca Budi dengan peran guru di masa Covid-19. *Jurnal Ilmiah Abdi Ilmu*, 12(2), 150–157.
- Nofianti, R. (2023). *Dasar-dasar pendidikan anak usia dini*. EDU Publisher.
- Nugrahani, F. (2014). *Metode penelitian kualitatif dalam penelitian pendidikan bahasa*. Solo: Cakra Books.
- Pratiwi, L. (2019). *Penggunaan pendekatan STEAM untuk melatih kreativitas anak usia dini*.
- Rohmatun, S., et al. (2021). Penerapan loose parts terhadap kreativitas anak usia dini selama belajar dari rumah. *Journal of Education and Teaching (JET)*, 2(2), 130. <https://doi.org/10.51454/jet.v2i2.114>.
- Rozana, S., & Bantali, A. (2020). *Stimulasi perkembangan anak usia dini melalui permainan tradisional engklek*. EDU Publisher.

- Sudaryono. (2016). Metode penelitian pendidikan. Jakarta: Kencana.
- Sousa, D., & Pilecki, T. (2013). *From STEM to STEAM: Using brain-compatible strategies to integrate the arts*. Corwin Press.
- Wahyuningsih, S. (2020). *Pembelajaran STEAM dalam pengembangan kreativitas anak usia dini*.
- Utami, R. D., & Ikhwana, N. S. (2022). Dampak penggunaan media sosial TikTok terhadap kepribadian anak usia dini. *Jurnal Kewarganegaraan*, 6(3), 5864–5871.
- Yakman, G., & Lee, H. (2012). Exploring the STEAM education approach for preparing future teachers. *Journal of the Korean Association for Science Education*, 32(6), 1182–1196.
- Widya, R., Rozana, S., & Tasril, V. (2022). Permainan tradisional berbasis multimedia. Jejak Pustaka.