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3R BASED LEARNING METHOD (REUSE, REDUCE, RECYCLE) IN ENHANCING EARLY CHILDHOOD CREATIVITY

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Abstract

Background: *Creativity is a fundamental aspect of early childhood development because it enables children to generate original ideas, solve problems, and express themselves through meaningful learning experiences. The 3R-Based learning method (Reuse, Reduce, Recycle) has emerged as an innovative and environmentally friendly instructional approach that encourages children to explore, reuse, and recycle materials while fostering creativity and environmental awareness. However, empirical evidence regarding its implementation in authentic early childhood education settings remains limited.* ***Objective:*** *This study aimed to analyze the effect of the 3R-Based learning method on the creativity of children aged 4–5 years at PAUD Cahaya Pasar Tani Kolhua.* ***Method:*** *This quantitative study employed an ex post facto research design involving 25 children selected through total sampling. Data were collected using questionnaires measuring the implementation of the 3R-Based learning method and children's creativity and were analyzed using descriptive statistics and simple linear regression.* ***Results:*** *The findings revealed that the 3R-Based learning method had a positive and statistically significant effect on children's creativity ($p = 0.002$; $p < 0.05$). The coefficient of determination ($R^2 = 0.342$) indicated that the method explained 34.2% of the variance in children's creativity, while 65.8% was influenced by other factors.* ***Novelty:*** *This study provides empirical evidence of implementing the 3R-Based learning method through an ex post facto design in an authentic early childhood education setting by integrating environmental sustainability with creativity development.* ***Conclusion:*** *The 3R-Based learning method can effectively support early childhood creativity by providing meaningful, exploratory, and environmentally oriented learning experiences.*

Keywords: *3R-Based Learning Method; Creativity; Early Childhood Education; Environmental Learning; Ex Post Facto.*

INTRODUCTION

Early childhood education is a fundamental effort to optimize children's holistic development during the first six years of life, often referred to as the *golden age*. Educational stimulation provided through meaningful learning experiences supports children's physical, cognitive, language, socio-emotional, moral, and creative development, thereby preparing them for future learning in formal, non-formal, and informal education (Amseke et al., 2024). Creativity is recognized as one of the essential developmental domains in early childhood education because it enables children to generate original ideas, solve problems, and adapt to new situations. The Regulation of the Minister of Education, Culture, Research, and Technology of the Republic of Indonesia Number 137 of 2014 also emphasizes creativity as an important developmental outcome that should be stimulated through play-based and exploratory learning activities (Nainggolan & Purba, 2022).

Creativity refers to children's ability to generate original ideas, think divergently, and produce meaningful products through imagination and exploration (Andriani & Kusumastuti, 2023; Lumban Gaol & Sinaga, 2022). Munandar (in Wibisana et al., 2023) explains that creativity is reflected in children's fluency, flexibility, originality, and elaboration of ideas. Likewise, Vygotsky's social constructivist theory emphasizes that creativity develops optimally when children actively interact with their environment and are provided with opportunities to explore various learning materials (Situmorang & Aritonang, 2022).

Despite its importance, the development of creativity remains a challenge in many early childhood education settings. Previous studies reported that many children still demonstrate limited originality, low confidence in expressing ideas, and dependence on teacher instructions during learning activities (Pasaribu & Manurung, 2024; Simanjuntak et al., 2023). These conditions indicate that conventional teacher-centered learning provides insufficient opportunities for children to explore, experiment, and express their creativity independently.

Several studies have shown that children's creativity is influenced not only by individual characteristics but also by the quality of learning environments and instructional media. Hasibuan and Tampubolon (2022) reported that many children experienced difficulties in producing creative works because learning activities relied primarily on ready-made educational toys. Similarly, Bakara and Hutagalung (2023) and Sihombing et al. (2023) demonstrated that learning activities utilizing recycled and natural materials significantly improved children's creative thinking and environmental awareness. These findings suggest that learning media encouraging active exploration can enhance children's creativity more effectively than conventional instructional approaches.

Based on constructivist learning theory, children aged 4–5 years are in the preoperational stage, during which imagination and symbolic thinking develop rapidly (Manik & Silaban, 2023). Therefore, learning experiences that encourage exploration, experimentation, and problem-solving are essential

for creativity development. Munandar (in Tobing et al., 2024) also emphasizes that creativity grows when children are provided with freedom to manipulate various materials and express their own ideas through meaningful play activities.

One innovative approach that supports creativity while introducing environmental awareness is the 3R-Based learning method, which emphasizes Reuse, Reduce, and Recycle. Unlike conventional learning that relies on standardized teaching materials, the 3R-Based learning method encourages children to reuse available materials creatively through exploration, experimentation, and collaboration (Marbun & Silitonga, 2025). This approach not only promotes creativity but also develops children's awareness of environmental sustainability from an early age.

Previous studies consistently demonstrate the effectiveness of 3R-based learning in improving children's creativity. Tampubolon and Sitorus (2023), Nadeak and Purba (2024), Aritonang and Manurung (2023), Pangaribuan and Hutabarat (2023), and Marpaung et al. (2024) reported significant improvements in children's creative thinking, originality, flexibility, and divergent thinking after implementing learning activities based on recycled materials. However, these studies were conducted in different educational settings and did not specifically investigate the implementation of the 3R-Based learning method among children aged 4–5 years at PAUD Cahaya Pasar Tani Kolhua, Kupang City.

Although previous studies have demonstrated the effectiveness of recycled-material learning in enhancing children's creativity, empirical evidence regarding the implementation of the 3R-Based learning method in authentic early childhood classrooms in Kupang City remains limited. In addition, few studies have examined the contribution of this learning method using an ex post facto quantitative approach. Therefore, this study addresses this research gap by providing empirical evidence on the implementation of the 3R-Based learning method in supporting creativity development among children aged 4–5 years.

Initial observations and interviews conducted with teachers at PAUD Cahaya Pasar Tani Kolhua revealed that many children still experienced difficulties in generating new ideas, combining different materials creatively, and demonstrating awareness of environmental conservation. Teachers also reported that classroom activities remained dominated by standardized learning materials, limiting children's opportunities to explore recycled objects independently. These findings highlight the need for a more innovative and environmentally oriented learning approach to improve children's creativity.

Based on the research gap and preliminary findings, this study aims to analyze the effect of implementing the 3R-Based learning method (Reuse, Reduce, and Recycle) on the creativity development of children aged 4–5 years at PAUD Cahaya Pasar Tani Kolhua, Kupang City. The findings are expected to contribute to the development of environmentally friendly, child-centered

learning strategies while providing empirical evidence to support creativity development in early childhood education.

METHODS

The research employed a quantitative approach using an ex post facto research design to examine the effect of the 3R-Based learning method (Reuse, Reduce, Recycle) on the creativity of children aged 4–5 years at PAUD Cahaya Pasar Tani Kolhua. An ex post facto design was selected because the researcher investigated the relationship between variables without manipulating the existing learning process, allowing the study to observe naturally occurring educational practices in an authentic classroom setting.

The study involved 25 children aged 4–5 years enrolled at PAUD Cahaya Pasar Tani Kolhua. A total sampling technique was employed because the entire population met the research criteria and was included as research respondents. The independent variable (X) was the implementation of the 3R-Based learning method, while the dependent variable (Y) was children's creativity. The 3R-Based learning method refers to learning activities that encourage children to reuse, reduce, and recycle used materials through exploration, experimentation, collaboration, and environmental awareness (Marbun & Silitonga, 2025; Nadeak & Purba, 2024). Children's creativity was operationally defined as their ability to demonstrate fluency, flexibility, originality, elaboration, imagination, willingness to try new ideas, and environmental awareness during learning activities.

Data were collected using structured observation sheets and documentation. The 3R-Based Learning Method Scale was developed based on the framework proposed by Marpaung et al. (2024), consisting of three dimensions: Reuse, Reduce, and Recycle. The instrument comprised 28 items, all of which met the validity requirements based on the Corrected Item–Total Correlation test. Reliability testing using Cronbach's Alpha produced a coefficient of 0.712, indicating acceptable internal consistency.

Children's creativity was measured using an observation instrument developed from the creativity indicators proposed by Hasibuan and Tampubolon (2022). The instrument included seven dimensions: thinking fluency, thinking flexibility, originality, elaboration, imagination, willingness to try new things, and environmental awareness. Before data collection, both instruments were reviewed to ensure content validity and subsequently tested for empirical validity and reliability, confirming their suitability for measuring the research variables.

Data collection was conducted during regular classroom learning activities after obtaining permission from the school. Observations were carried out systematically using standardized observation sheets, while documentation was used to support observational findings. The collected data were checked for completeness and accuracy before statistical analysis.

Data analysis consisted of descriptive statistics to describe respondent characteristics and research variables, followed by simple linear regression analysis to examine the effect of the 3R-Based

learning method on children's creativity. Statistical analyses were performed using SPSS version 25.0. Statistical significance was determined at $\alpha = 0.05$, and the regression analysis included the coefficient of determination (R^2), F-test, and t-test to evaluate the contribution and significance of the independent variable toward children's creativity.

RESULTS AND DISCUSSION

RESULTS

The statistical description of the data on the implementation of the 3R-Based learning method and the creativity of children aged 4–5 years at PAUD Cahaya Pasar Tani Kolhua is presented below.

Table 1. Category of 3R-Based Learning Method Implementation

Category	Interval	Frequency	Percentage
High	29–32	6	24%
Medium	23–28	15	60%
Low	16–22	4	16%
Total		25	100%

Based on Table 1, the implementation of the 3R-Based learning method was categorized as high for 6 children (24%), medium for 15 children (60%), and low for 4 children (16%). Therefore, the implementation of the 3R-Based learning method at PAUD Cahaya Pasar Tani Kolhua was predominantly in the medium category (60%). This finding indicates that the majority of children participated in learning activities that applied the principles of Reduce, Reuse, and Recycle (3R) at a moderate level, suggesting that the method was implemented consistently in the classroom, although not yet optimally across all learning activities. The relatively smaller proportion of children in the high category and the presence of several children in the low category indicate variations in the implementation of the method among participants. Overall, these results demonstrate that the 3R-Based learning method has been adequately implemented and provides a supportive learning environment for developing children's creativity through the use of recyclable materials and environmentally oriented activities.

Table 2. Category of Children's Creativity (4–5 Years)

Category	Interval	Frequency	Percentage
High	32–38	8	32%
Medium	26–31	12	48%
Low	20–25	5	20%
Total		25	100%

Table 2 shows that children's creativity was categorized as high for 8 children (32%), medium for 12 children (48%), and low for 5 children (20%). Thus, most children were in the medium creativity category (48%). These findings indicate that the creativity of children aged 4–5 years at PAUD Cahaya Pasar Tani Kolhua has developed at a moderate level, with nearly half of the participants demonstrating creativity within the medium category. Although a considerable proportion of children achieved high creativity scores, the presence of children in the low category suggests that creativity development varies among individuals. Overall, the results reflect that most children have begun to demonstrate creative thinking and expression in learning activities, while further stimulation is still needed to enhance creativity and help more children reach the high category.

Table 3. Summary of Simple Linear Regression (Simultaneous F-Test)

Relationship	F	Sig.	Decision	Conclusion
3R-Based Learning Method → Children's Creativity	11.954	0.002	$p < 0.05$	Hypothesis Accepted

The simultaneous regression analysis indicates that the implementation of the 3R-Based learning method has a statistically significant effect on children's creativity ($F = 11.954$; $p = 0.002$). Since the significance value is lower than 0.05, the proposed hypothesis is accepted, indicating that the 3R-Based learning method contributes significantly to the creativity of children aged 4–5 years at PAUD Cahaya Pasar Tani Kolhua. These findings suggest that learning activities incorporating the principles of Reduce, Reuse, and Recycle (3R) play an important role in stimulating children's creative thinking, imagination, and ability to produce original ideas through hands-on experiences using recyclable materials.

Table 4. Coefficient of Determination

Model	R	R Square	Adjusted R Square	Std. Error
1	.585	.342	.313	3.117

The coefficient of determination analysis shows an R Square value of 0.342, indicating that the implementation of the 3R-Based learning method explains 34.2% of the variance in children's creativity, while the remaining 65.8% is influenced by other variables not examined in this study. This finding suggests that although the 3R-Based learning method makes a meaningful contribution to enhancing children's creativity, creativity development is also affected by various other factors, such as individual characteristics, family environment, teacher support, learning experiences, and the availability of educational resources. Therefore, the 3R-Based learning method can be considered an important factor in fostering creativity, but it should be complemented by other supportive educational strategies to achieve more optimal outcomes.

Table 5. Partial Regression Analysis (t-Test)

Relationship					T	Sig.	Decision	Conclusion
3R-Based Learning Method → Children's Creativity					3.458	0.002	$p < 0.05$	Hypothesis Accepted

The partial regression analysis confirms that the implementation of the 3R-Based learning method has a positive and statistically significant effect on children's creativity ($t = 3.458$; $p = 0.002$). Since the significance value is lower than 0.05, the research hypothesis is accepted, indicating that the 3R-Based learning method positively influences the creativity of children aged 4–5 years at PAUD Cahaya Pasar Tani Kolhua. These results suggest that increased implementation of learning activities based on the principles of Reduce, Reuse, and Recycle (3R) is associated with higher levels of children's creativity. The use of recyclable materials and hands-on learning experiences encourages children to explore ideas, solve problems creatively, and express their imagination, thereby supporting the development of creative abilities in early childhood.

Table 6. Descriptive Statistics of the 3R-Based Learning Method

Aspect	N	Mean	Median	Mode	SD	Min	Max
Reuse	25	3.16	3.00	3	0.688	2	4
Reduce	25	2.60	3.00	3	0.500	2	3
Recycle	25	3.64	4.00	4	0.490	3	4

Among the three dimensions of the 3R-Based learning method, Recycle obtained the highest mean score ($M = 3.64$), followed by Reuse ($M = 3.16$) and Reduce ($M = 2.60$). This finding indicates that recycling activities were implemented more consistently than reuse and reduction activities during classroom learning. The higher mean score for the Recycle dimension suggests that children were more frequently involved in activities that transformed used materials into new and useful products, while Reuse activities were implemented at a moderate level and Reduce activities were the least emphasized. These results reflect differences in the intensity of implementing each 3R component in classroom practice and indicate that recycling-based activities were the dominant strategy used to stimulate children's participation and creativity.

Overall, the regression analysis demonstrates that the proposed hypothesis is accepted. The implementation of the 3R-Based learning method significantly influences the creativity of children aged 4–5 years at PAUD Cahaya Pasar Tani Kolhua. The positive regression coefficient indicates that better implementation of the 3R-Based learning method is associated with higher levels of children's creativity. These findings suggest that learning experiences based on the principles of Reduce, Reuse, and Recycle (3R) provide meaningful opportunities for children to explore ideas, utilize recyclable

materials creatively, and develop imaginative thinking through active participation in classroom activities.

DISSCUSSION

The findings of this study demonstrate that the implementation of the 3R-Based learning method has a positive and significant effect on the creativity of children aged 4–5 years at PAUD Cahaya Pasar Tani Kolhua. The regression analysis showed a significance value of 0.002 ($p < 0.05$) with an R Square value of 0.342, indicating that the 3R-Based learning method contributed 34.2% to the variance in children's creativity. These findings suggest that learning activities emphasizing Reuse, Reduce, and Recycle provide meaningful opportunities for children to explore ideas, manipulate materials, and express creativity through authentic experiences. Nevertheless, the remaining 65.8% indicates that creativity is also influenced by other internal and external factors, such as parental support, teacher competence, home environment, and children's individual characteristics.

The descriptive findings indicate that the implementation of the 3R-Based learning method at PAUD Cahaya Pasar Tani Kolhua was predominantly classified in the medium category (60%), suggesting that teachers have begun integrating environmentally friendly learning activities into classroom practices, although implementation remains inconsistent across learning sessions. Classroom observations showed that teachers frequently utilized used bottles, cardboard, newspapers, plastic containers, and fabric scraps as learning materials. However, several learning activities continued to rely on commercially manufactured educational toys, indicating opportunities to further optimize the integration of 3R principles throughout the curriculum. These findings support the argument of Marbun and Silitonga (2025) that successful implementation of the 3R-Based learning method requires consistent teacher commitment to providing opportunities for exploration and creative manipulation of recyclable materials.

Children's creativity was also predominantly categorized as medium (48%), indicating that although many children demonstrated the ability to produce creative products, considerable variation still existed among individuals. Children with higher creativity levels were generally able to combine different recycled materials, propose original ideas, modify objects for multiple purposes, and complete projects independently. Conversely, children in the lower creativity category tended to imitate examples provided by teachers, required continuous assistance, and showed limited initiative during creative activities. These findings illustrate that children's creative development progresses differently according to the quality of stimulation received during classroom learning and interactions with adults.

The hypothesis testing confirms that the implementation of the 3R-Based learning method significantly influences children's creativity. These findings are consistent with Tampubolon and Sitorus (2023), who reported that learning activities involving structured management of recycled materials significantly improved children's creative thinking abilities. Similarly, Pangaribuan and

Hutabarat (2023) found that recycling-based learning positively influenced children's divergent thinking, particularly in idea fluency and originality. Nadeak and Purba (2024) also demonstrated that integrating natural and recycled materials into classroom activities effectively enhanced children's originality and creative performance. Collectively, these studies reinforce the present findings that meaningful experiences with recyclable materials stimulate children's imagination and creative expression.

The descriptive analysis of the three dimensions of the 3R-Based learning method revealed differences in implementation across learning activities. The Recycle dimension achieved the highest mean score (M = 3.64), indicating that recycling activities were the most consistently implemented by teachers. Activities such as creating toys from plastic bottles, wall decorations from newspapers, dolls from used socks, and craft projects from cardboard attracted children's enthusiasm and encouraged experimentation with various materials. According to Aritonang and Manurung (2023), recycling activities promote creativity because children actively transform discarded materials into meaningful products while simultaneously developing fine motor skills, imagination, and problem-solving abilities.

The Reuse dimension obtained a mean score of 3.16, indicating that children had reasonably good opportunities to reuse discarded materials in creative ways. Classroom observations showed that children successfully reused plastic bottles as flower pots, cardboard boxes as miniature houses, and fabric scraps as decorative materials. These activities encouraged children to discover multiple functions for everyday objects rather than viewing them as waste. Marbun and Silitonga (2025) argue that reuse activities help children develop flexible thinking by encouraging them to identify alternative uses for familiar materials, thereby supporting divergent thinking processes essential for creativity.

Among the three dimensions, the Reduce aspect received the lowest mean score (M = 2.60). This finding suggests that reducing material consumption remains more challenging for young children because it requires understanding abstract concepts related to environmental conservation. Teachers reported that children understood reduction more effectively when learning activities involved concrete examples, such as saving paper, minimizing unnecessary material use, and reusing leftover craft materials. Nadeak and Purba (2024) explain that reduction concepts become meaningful for early childhood only when embedded within practical daily experiences rather than abstract verbal explanations. Therefore, teachers should design more contextual activities that gradually cultivate children's awareness of sustainable resource use.

The findings of this study can also be interpreted through Piaget's cognitive development theory, which states that children aged 4–5 years are in the preoperational stage, where symbolic thinking, imagination, and representational abilities develop rapidly. Learning experiences involving recycled materials provide concrete objects that support children's symbolic play and imaginative thinking. Likewise, Vygotsky's social constructivist theory emphasizes that creativity develops through

social interaction, scaffolding, and collaborative learning experiences. During classroom observations, teachers guided children by asking open-ended questions, encouraging discussion, and facilitating collaborative projects, thereby creating learning environments that supported creative development through meaningful interaction.

Observations and interviews conducted at PAUD Cahaya Pasar Tani Kolhua further strengthened these quantitative findings. Teachers reported that after implementing the 3R-Based learning method, children became more enthusiastic during classroom activities, demonstrated greater confidence in expressing ideas, explored materials more independently, and showed increased awareness of environmental cleanliness. Parents also observed that children became more interested in collecting recyclable materials at home and frequently shared stories about the creative products they produced at school. These qualitative findings support the statistical evidence that the 3R-Based learning method contributes positively to early childhood creativity while simultaneously promoting environmental awareness through authentic learning experiences.

Overall, the findings indicate that the 3R-Based learning method provides an effective child-centered learning approach that integrates creativity development with environmental education. Although its contribution accounts for 34.2% of children's creativity, the findings also emphasize that creativity is multidimensional and influenced by numerous contextual factors beyond classroom instruction. Consequently, educators should consistently integrate Reuse, Reduce, and Recycle activities into daily learning while strengthening collaboration with parents and providing rich opportunities for exploration to maximize children's creative potential.

CONCLUSION

Main Findings: This study found that the implementation of the 3R-Based learning method (Reuse, Reduce, Recycle) had a positive and statistically significant effect on the creativity of children aged 4–5 years at PAUD Cahaya Pasar Tani Kolhua. The regression analysis demonstrated a significant relationship between the implementation of the 3R-Based learning method and children's creativity ($p < 0.05$). The coefficient of determination ($R^2 = 0.342$) indicated that the 3R-Based learning method explained **34.2%** of the variance in children's creativity, while the remaining 65.8% was influenced by other factors beyond the variables investigated in this study. **Research Contribution:** This study provides empirical evidence on the implementation of the 3R-Based learning method in an authentic early childhood education setting using an ex post facto research design. The findings contribute to the growing body of literature by demonstrating that integrating environmental sustainability concepts through Reuse, Reduce, and Recycle activities can effectively foster children's creativity while simultaneously promoting environmental awareness from an early age. **Theoretical and Practical Implications:** The findings support constructivist learning theory by demonstrating that creativity develops through active exploration, meaningful interaction, direct experience, and the manipulation of recycled materials within authentic learning environments. Practically, early childhood educators are

encouraged to consistently integrate 3R-Based learning into classroom activities by utilizing safe recyclable materials, promoting creative problem-solving, and collaborating with parents to provide rich learning experiences that stimulate children's imagination, creativity, and environmental responsibility. **Research Limitations:** This study involved only 25 children from a single early childhood education institution and examined only one independent variable, thereby limiting the generalizability of the findings to broader educational contexts. **Future Research Directions:** Future studies should involve larger and more diverse samples and investigate additional variables, such as parental involvement, teacher competence, classroom environment, environmental literacy, and children's learning motivation, to provide a more comprehensive understanding of the factors influencing creativity development in early childhood education.

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