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IMPROVING COLLABORATIVE TECHIQUES IN SCIENCE LEARNING AS A PROCESS FOR EARLY CHILHOOD AT KINDERGARTEN CERIA 2 SUMBERMANJING-MALANG

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ABSTRACT

Abstract *The implementation of children's collaborative abilities is a challenge for teachers and parents in creating science learning as a process. Where, students will create science-based works carried out in stages. Science as a process has a complex level of difficulty with a gradual level of difficulty. The purpose of describing collaborative abilities and science learning. The researcher's methodology uses classroom action (CAR), the researcher has a strategy in providing actions to overcome every problem-solving in the class. So that it can be done communicatively in the form of active collaboration. with observation, interview, and documentation data collection techniques. The results of research and learning are carried out based on learning strategy planning, determining learning techniques, and improvement results. The learning strategy emphasizes theme selection and creating creative learning strategies, while the learning techniques use object analysis, experiments, and loose parts. The collaborative concept is carried out in the form of internal teamwork, individual collaboration, and collaboration with external teams/parents. The results of the improvement show that the data for meeting cycle 1 reaches 37.5% - 70%. Meeting cycle 2 reaches 51% - 75%, meeting cycle 3 reaches 65% - 82%. The average cycle results for each meeting reached 54.5% for meeting 1, 63% for meeting 2, and 73% for meeting 3. Therefore, the data shows a significant increase in collaborative skills in science learning from cycle 1 to cycle 2 at each meeting. This represents the latest innovation in learning, in terms of learning strategies, learning techniques, and learning media in every lesson for early childhood.*

Keywords:
Collaborative Skills, Learning, Science as a Process

Abstrak: Penerapan kemampuan kolaboratif anak menjadi tantangan tersendiri bagi guru dan orangtua dalam menciptakan pembelajaran sains sebagai proses. Dimana, peserta didik akan menciptakan hasil karya berbasis sains dilakukan secara bertahap. Sains sebagai proses memiliki tingkat kesulitan bersifat kompleks dengan tingkat kesulitan bertahap. Tujuan mendeskripsikan kemampuan kolaboratif dan pembelajaran sains. Metodologi peneliti menggunakan tindakan kelas (PTK), peneliti memiliki strategi dalam memberikan tindakan dalam mengatasi setiap problemsolving yang berada di kelas. Sehingga mampu dilakukan secara komunikatif dalam bentuk kerjasama secara aktif. dengan teknik pengumpulan data observasi, wawancara, dokumentasi. Hasil penelitian dan pembelajaran dilakukan berdasarkan perencanaan strategi pembelajaran, menentukan teknik pembelajaran, dan hasil peningkatan. Strategi pembelajaran menitikberatkan pada pemilihan tema dan membuat strategi belajar secara kreatif, sedangkan pada teknik pembelajaran menggunakan analisis benda, eksperimen, dan loose part. Konsep kolaboratif dilakukan dalam bentuk kerjasama tim internal, kerjasama perorangan, dan kerjasama bersama tim eksternal/orangtua. Hasil peningkatan menunjukkan data siklus pertemuan 1 mencapai 37,5%-70%. Siklus pertemuan 2 mencapai 51%-75%, siklus pertemuan 3 mencapai 65%-82%. Hasil rata-rata siklus dalam setiap pertemuan mencapai meliputi pertemuan 1 mencapai 54,5%, pertemuan 2 mencapai 63%, dan pertemuan 3 mencapai 73%. Sehingga, data menunjukkan bahwa adanya peningkatan kemampuan kolaboratif dalam pembelajaran sains sangat signifikan dari siklus I hingga siklus II di setiap pertemuan. Hal tersebut menjadi inovasi terbaru dalam pembelajaran dari segi aspek strategi pembelajaran, teknik pembelajaran dan media pembelajaran dalam setiap pembelajaran untuk anak usia dini.

INTRODUCTION

Science is a science that can be tested from the results of observations of its true truth and is developed consistently with certain rules based on truth or reality alone so that the knowledge that is guided can be trusted theoretically meaning that science is a process as well as a result or product as well as an attitude (Fitriyanti.et al., 2025). Science is related to how to find out about the universe systematically and is not only a collection of knowledge in the form of facts, concepts, principles, but also a process of discovery, which emphasizes direct experience (Hanum.et.al., 2023; Tasdemir & Yildiz, 2024). Science is a process of seeking and finding a truth through science. Science learning for early childhood today aims to develop students as a whole, both in mind, heart, and body, as well as developing intellectual, emotional and physical, as well as cognitive, affective and psychomotor (Harlistyarintica & Muryani., 2024; Nurdiani, 2024). The goal of science learning is for children to actively understand information about their environment. Science should be introduced from an early age, with a variety of fun and engaging activities so children can experience the scientific process firsthand.

Science-based science activities are inseparable from our daily lives, providing experiences such as observing events in nature and the environment in which we live so that children not only know the results but also the processes of scientific matters (Ilma, et al., 2021). Science allows children to explore various objects, both living and inanimate. The concept of science learning can use the five senses to recognize symptoms that have causes and effects and realize the impact of changes for recipients of information in the form of basic scientific knowledge (Kadir, et al., 2024). Teachers' science learning is easier in delivering learning materials concretely and directly in training aspects of early childhood development. Science learning can integrate with child-centered communicative aspects so that it can contribute to solving a problem in group learning activities (Latifah & Anza, 2025; Ningsih, et.al., 2025). Collaborative skills are the ability of a person to work together in a group space and communicate between teams so that learning runs well. The results of observations conducted on January 10 at the Ceria 2 Sumberagung Kindergarten institution, that teacher competence in recognizing science learning is still very low, due to the lack of exploration in the concept of science learning and student interaction during learning is still less understanding in asking questions directly to the teacher. sometimes students are also still confused in organizing science learning that has been instructed by the teacher, such as the teacher gives games from natural materials then asks children to make toy cars from banana stems, plastic bottles but the children do not understand how to make toy cars from natural materials. So, it requires a science learning strategy with fun learning techniques, aimed at optimizing collaborative abilities in early childhood.

Collaboration skills during a child's growth and development are a form of soft skill ability to work together effectively, which is strengthened in internal, personal, and external team patterns to achieve common goals (Ekeh, 2023). The goal of completing complex activities, as well as collaboration skills, helps provide stimulation for children in creating appropriate strategic management. Team collaboration has a major influence on children's growth, especially in

developmental aspects such as cognitive abilities where children are trained independently in thinking about game strategies in completing activities or tasks. Contributions to social-emotional abilities can build idealistic thinking in children or pragmatism in children and build communication in developing concepts/ideas in completing certain activity goals (Silitubun, et.al., 2024). In line with the thoughts from the results of research conducted by Herlina.et.al., (2023) states that collaboration skills are important to be given to children from an early age, aiming to train self-habituation in the scope of socialization as the main goal in education. Collaboration skills are one of the techniques that provide skills in solving problems systematically, decomposition, pattern recognition, abstraction, and algorithms (Khaerani & Syairahma., 2024; Nadine, et al., 2024). In line with research conducted by Ferreira, (2023) said that the form of knowledge gap requires early childhood education professionals to utilize peer dynamics in collaborative interactions in the classroom and provide adequate support, such as adjusting instructions, making intentional pairs, or mediating interactions at key moments in learning activities. The meaning of training children in collaborative skills to develop more structured ways of thinking.

In science learning, we introduce natural patterns and collaborate systematically on pattern thinking (Suweleh, et.al., 2024). The science patterns that will be introduced to children have challenges based on the level of difficulty such as the ability to collaborate in an internal team, meaning children will work with peers in groups of more than one member. The ability to collaborate personally, meaning collaborating with oneself and among peers but personally and the ability to collaborate in an external team, meaning children will be directed to work with their family members in completing the objectives of science learning activities. Science as a process is a form of learning that has advantages in creating complex works of art with selected materials and specified techniques to the creation of original works such as making tall and sturdy towers using straws, making handicrafts from natural materials such as floor mats, shopping baskets, or wallets. Of course, it requires collaborative strategic management in realizing dynamic science learning.

Science learning of dynamic using experimental techniques, loose parts, and 4R (Recycle, Reuse, Reduse, Replace). Experimental techniques are simulation learning that involves a certain event that has a clear cause and effect such as natural phenomena. Loose part techniques are a learning approach that uses natural materials that can be combined and redesigned to create simple forms of work. Then, the 4R technique (Recycle, Reuse, Reduse, Replace) is a learning approach with natural materials but with a choice of materials that still have quality to be recycled as a form of handicraft that has a selling value in the surrounding environment. It appears that the role of learning with several techniques that will be used has a complex level of difficulty and requires a more efficient time duration. Thus, the purpose of the study is to describe collaborative abilities in science learning for 5-6 year olds at Kindergarten Ceria 2 Sumberagung, and to describe the results of increasing collaborative abilities in science learning for early childhood at Kindergarten Ceria 2 Sumberagung.

RESEARCH METHODOLOGY

The type of research used in this study is Classroom Action Research (Action Research). This research emerged due to the awareness of the perpetrators in carrying out activities that were considered less than satisfactory with the results of these activities starting from self-awareness, the perpetrators of the activities tried to improve their activities by using experiments that were carried out repeatedly with a process of observing seriously until producing a process that was considered better than before. CAR aims to obtain real results in conducting investigations so that fulfillment in solving class-related problems can be resolved using a controlled cycle in order to realize the quality of enjoyable learning. Based on the classroom action research method previously explained, the design used in this study is the Kurt Lewin model (in Cohen, et.al., 2007).

Classroom action research conducted at Ceria 2 Kindergarten The number of students is 18 children, consisting of 10 boys and 8 girls. The main problem is the lack of enthusiasm of children in collaborative learning guided by teachers, namely the activities are still too monotonous and less creative so that children are less enthusiastic in doing an activity, so to follow up on this problem the solution from the researcher is implementing a game from natural materials using banana stems and used materials, toy cars and others. This aims to provide various kinds of knowledge such as children doing various things, being creative in making toys when children make toys as well as a medium for socializing and strengthening friendships and can train collaboratively through science learning so that children can develop creativity in an activity. Research data collection techniques According to Somekh, B. (2026) include observation data, structured field notes, interview data, statistical instrument data and documentation data. The development of children's communication is studied as well as data related to this research.

The chosen classroom action research model is the Kurt Lewin model (in Ritonga, et al., 2024) which includes the stages of planning the implementation of observation and reflection. If the car game does not reach the desired development index in the first cycle, it can be improved in the second cycle to achieve the specified objectives, and if it is not achieved in the second cycle. Then, the next cycle. The study carried out learning steps prepared in the aspect of collaborative skills through science learning through several themes and concepts that have been designed from the beginning to the end of learning. According to Murni, (2024) explains that the form of learning effectiveness is an aspect of testing strategies in providing actions based on organized learning patterns until at the end of learning, children understand a concept of the meaning of science as a process. a method in learning activities needs to be checked for the validity of the analysis of the first data findings, namely the persistence of observation, which will be carried out by researchers conducting careful, detailed and continuous observations during the research process at TK Ceria 2 Sumberagung. After the observation process, it can be followed by conducting interviews with class teachers in learning activities to improve collaborative skills through science learning. Furthermore, the data triangulation used in this study involves comparing concrete observations of children's increased collaborative skills during learning activities with practical science learning processes. Meanwhile, the results of this technical interview are used to validate the findings based

on detailed documentation data through active discussions with experts in the field of early childhood education.

RESULTS AND DISCUSSION

The each child has different characteristics according to their developmental level. A good learning system with a fun delivery method will certainly support a child's psychological development. Here, the role of parents is also very influential in the process of developing a child's way of thinking, making it easier to understand and accustom children to be disciplined in learning at home. The majority of students at TK Ceria 2 Sumberagung are from Sumberagung village itself, with a small number from outside the village. Because it can be said that TK Ceria 2 Sumberagung is still relatively new to the community. Having been running for more than four years, of course there are still many shortcomings that need to be addressed. The residents' livelihoods are farmers, traders, farm laborers, entrepreneurs and livestock breeders, some also work abroad.

The results of observations and observations that have been carried out by researchers in improving collaborative skills in early childhood science learning were identified during the implementation of learning carried out in cycle I meeting I in science learning found that children are still not used to collaborating with peers, so that children still show awkwardness or do as they please when participating in learning. This will affect the child's passive concentration ability. The researcher's actions will improve the learning concept planning system in cycle I meeting 2. The results show that in cycle 1 meeting 2 there are three stages of learning activities, namely initial activities, core activities, and final activities. The teacher conducts learning that is adapted to the RPPH, through the concept of learning to know the environment. Where, children are directed to analyze the differences in plant parts, especially in the types of leaves. Here children will be divided into groups of three children to find types of leaves that do not have similarities in shape. Then, children will be directed to identify parts of the leaves based on shape and color. The results of learning collaborative skills through scientific learning are increasing, because each group of its members represents the findings that have been analyzed on the types of leaves from different plants. Children's representation has a big influence in increasing children's thinking power on an object, namely leaves. proven by the results obtained in cycle I, second meeting.

In the first cycle of the first meeting, only 6 children passed with an average of 37.5%. In the first cycle of meeting 2, the average value achieved was 51%, because science learning with the theme of the environment in the sub-theme of the type of leaves from different plants. There was an increase in the moderate category. The results of the data found between the first and second meetings still showed that children's egocentric abilities did not follow the learning well. Thus, it affected the concentration of learning for some children in the classroom. In addition, some children were not very enthusiastic when participating in learning. Therefore, the researcher made a change in strategy on the theme of experiments from several objects including dry leaves, straws, and water for learning in the first cycle of meeting 3 which had three stages of learning activities, namely initial activities, core activities, and final activities. Educators showed demonstrations of

several dry objects that could be used to change shape such as cassava leaves into necklaces or crowns, dry leaves into handicrafts such as vigura or figer painting. Then, straws could be made into towers where teamwork was needed to arrange the tower parts through straws. The third stage of learning strategy used water. Here, educators guide children in making infused water from natural ingredients, including lemon, cucumber, and turmeric or ginger. The ingredients can be modified to suit their preferences. The learning activity takes two hours to complete three learning activities in groups.

The results of the previous data in the first cycle of the second meeting reached an average of 51%. Continuing in, cycle I Meeting 3, the average score reached 65%, because science learning has an attraction for children when participating in group learning. Here, children are directed to complete three densities or three different activities but carried out in groups. The children demonstrated extraordinary cooperation in completing the provided learning, the focus of the assessment emphasized speed, accuracy, and patience. Three activities using dry leaves, straws, and water have challenges for children in providing stimulation to their competitive abilities. It is very visible in the learning process the challenge of the more dominant activity is making a tall and sturdy tower using straws. Because it requires concentration and teamwork in creating tower creations. Thus, it can be concluded that children's collaborative abilities have begun to be seen when the learning strategy in selecting learning themes influences the stimulus to children's abilities. However, the results of the percentage of numbers are still not categorized as good. Therefore, the researcher went through the next stage in cycle II meeting 1.

The first meeting of the second cycle of learning activities consisted of three stages: initial activities, core activities, and final activities. The teacher implemented learning that had been adapted from the RPPH using the theme of finger painting using banana stems and vegetables. This technique seems easy but requires careful exploration because there are some stems that cannot be used in finger painting learning. Here, the teacher only provides direction to find some basic materials and the children look for mediators, namely stems, for the next learning activity. When the children had prepared the learning activity, their enthusiasm began to emerge, but this time the activity was not collaborative. Children were directed to complete the collaborative learning activity independently. The learning activity began, the children prepared a picture book, several stems that had been found previously, and then the children prepared their preferred paint colors. The activity was given forty-five minutes. After the learning was complete, the children were asked to rest and wash their hands. Meanwhile, the teacher's role here was through evaluating the results of the tasks that had been completed by the children. The results showed that children began to complete the tasks quickly, although some were still late in submitting. The percentage of data findings shows 70% achievement of independent collaborative skills in science learning for early childhood with learning completion of 10 children out of 18 students.

In the second meeting of cycle II, there are three stages of learning activities, namely initial activities, core activities, and final activities. The teacher carries out learning that is adjusted to the RPPH with the theme of natural phenomena, sub-theme of volcanic eruptions, using active

experimental techniques. Educators prepare several media and media needs that are appropriate to the theme for learning. Activities are carried out outside the classroom, here education creates 3 groups with 5-6 members. The materials needed are baking soda, vinegar, red food coloring, sunlight, plastic bottles, and newspapers/cardboard. Each group member has a companion in conducting the experiment. The activity is carried out for 45 minutes, then the children are invited to retell the story related to the materials prepared and the steps of the trial carried out. This stage has an assessment including memory, accuracy in conducting trials and the final results. The results of collaborative learning with scientific learning increased, as evidenced by the score obtained in the second meeting of cycle II reaching 75% with the success of children who completed collaboratively as many as 14 out of 18 children. The results of the researcher's evaluation of mastery of fairly complex material become a learning challenge for children in collaborative abilities in science learning.

In the third meeting of cycle II, there are three stages of learning activities: initial activities, core activities, and final activities. Teachers implement learning adapted to the RPPH with the theme of science as a process. Where science learning has a process that can produce materials or products. This activity is carried out with parents at home. Learning activities such as making wallets from leaves or making wallets from plastic food, making lanterns from several used bottles and many other materials can be explored. Creativity is determined based on the steps given by the educator. During the activity, teamwork will be tested at home. Parents will be provided with continuous information. This stage has assessments including creativity, punctuality, and cohesiveness. The results of collaborative learning with scientific learning increased, as evidenced by the score obtained in the third meeting of cycle II reaching 82% with the success of 17 out of 18 children who completed collaboratively. The results of the researcher's evaluation of mastery of very complex material become a learning challenge for children in collaborative abilities in science learning. The table of improvements produced as research findings is shown in Table 4.1, as follows:

Table 4.1 Results of improvement in cycle 1 and cycle II

Meeting	Siklus I	Siklus II	Average of Result Cycle	Category
I	37,5	70	54,5%	Passable
II	51	75	63%	Passable
III	65	82	73%	Good
Average	51,16	75,66	63,50%	Good

Table 4.1 data analysis. The results of the increase in the first meeting cycle reached 37.5% - 70%, the results of the data increase reached 32.5%, the average results of the first meeting cycle reached 54.5%, categorized as quite good in the field of collaborative science learning abilities for early childhood in the introduction of environmental material, subtheme of leaf types from different plants. In the results of the second meeting cycle reached 51% - 75%, the results of the data increase reached 24%, experiencing a decrease in increase when compared to the first meeting cycle. However, the average results of the second meeting cycle showed an increase of

63%, the results can be concluded to be in the fairly good category with the environmental theme with the subtheme of the stem type section. The materials of meetings 1 and 2 are analysis of shape and color. The results of the analysis continued in the third meeting cycle reached 65% - 82% showing an increase of 17%. The average change in results was 73% and was declared good. This means that students' collaboration abilities have increased in accordance with creative and innovative learning activities. The action assessment graph. Seen in Figure 4.1, as follows:

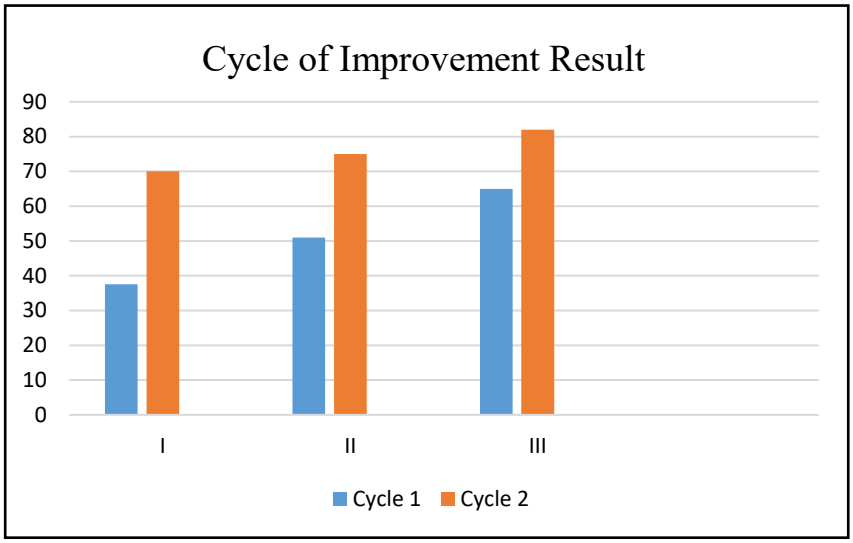

Figure 4.1 Action Assessment Graph for Each Cycle

CONCLUSIONS AND SUGGESTIONS

Research on collaborative improvement in science learning has a concept in learning planning strategies that focus on the design of themes and their components. Educators prepare the material needs for each meeting in each cycle. The planned themes are the environment, science as a process, and 4R (Recycle, Reuse, Reduce, Replace). Techniques involved in learning object analysis, experiments, and loose parts. Where, children are given tasks in the form of teamwork, individual or independent collaboration, and collaboration with parents. Complex material presents challenges for students to stimulate collaborative skills competitively. Of course, it requires strategy and collaboration with several accompanying teachers and parents. The findings show the level of difficulty of the material lies when children build tall and sturdy towers using straws and experiments with families using the 4R technique. The results of the analysis of improvement, the data from the first meeting cycle reached 70% indicating in science learning for early childhood in the introduction of material with a collaborative pattern of internal teams. The results of the second meeting cycle reached 75% in the development of practical learning with simple natural materials with a personal collaboration pattern. The material of meetings 1 and 2 is an analysis of shape and color. The results of the analysis continued in the 3rd meeting cycle, reaching 82% of students' collaboration abilities, which were in accordance with creative and innovative science learning with external teams involving activities with families.

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