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Implementation Learning Science for Supporting the Development of Critical Rationale in Early Childhood

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Abstract
The purpose of this research is to support the maximum development of critical reasoning through real learning experiences in science activities. The research method used in this research is classroom action research which is carried out collaboratively between the research and the classroom teacher. While the subject is the students of group B1 kindergarten State Pembina Kandis totaling 17 children. Data collection techniques through observasion, and documentation. The data analysis technique used descriptive qualitative. The result of this study are based on data generated from the percentage of children's critical thinking abilities starting pre-cycle by 50%. In the pre-cycle,children's critical thinking skills are in the Beginning to Develop (MB) category. In the first cycle, the critical thinking ability of the achievement develops according to expectations (BSH), in the second cycle the achievement of the critical thinking ability to think starting from the pre-cycle, cycle 1, cycle II.

INTRODUCTION

Providing stimulation to enhance the growth and development of early childhood can be maximized through real-life learning experiences, such as science lessons or experiments (Panggabean, Rahman, and Simanullang 2025). Experimental activities provide children with real-life experiences that are highly beneficial for their future education, enabling them to fulfill their needs according to their desires. Meeting children's needs requires the support of a teacher to support these experimental activities, including environmental planning, media provision, and other resources. In other words, teachers are referred to as facilitators for early childhood. Early childhood is defined as children aged from birth to six years and is still undergoing a very rapid developmental process (Gumitri & Suryana, 2022).

Park children are formal institutions that provide service on age 4 to 6 years old, which aims to develop all aspects of development through fun learning activities (Yusuf, Hidayat, and Tauhidah

2022).Thus, these fun learning activities can be carried out through play and can be enjoyed by children for a long time (Ikhlas 2020).

Strategies used by educators in developing basic skills competencies think critical on child educate can done through activity learning scientifically based (Yudha 2019). scientific in process learning use The 5 most basic learning experiences (5M) are observing, ask, gather information, associate, and communicating. This approach aims to optimally develop students' basic competencies, including attitudes, knowledge, and skills. Essentially, the scientific approach has been used since the implementation of the 2013 curriculum. However, the reality in the field is that there are still some teachers who assume that with approach 5 M the Still nature procedure And rule the standard one. Reason other teachers also consider using approach this scientific is the only one method so that teachers find it difficult to apply this scientific approach, so that The teachers' creativity seems rigid (siti Sundari, Handayani, and Mulyawati 2019).

Understanding science often equalized with study field physics, chemistry and biology. According to James in (Sani 2014). definition science is as something row concepts and conceptual schemes which are related each other growing as results A series of experiments and observations that can be observed and tested further. In other words, scientific activities require individuals to conduct experiments so that the results of the observations will provide a solution to a problem that can be proven scientifically.

Reasoning critical thinking is the ability to make decisions that have a basis, (Nuryanti et al., 2018). Every participant educate expected can own ability critical thinking with the aim of being able to answer all the problems they face in the future.

Based on the research results (Nuryanti et al., 2018) it shows that students' critical thinking low. Matter This prove that ability think critical student Still need trained more carry on so that can improved. Hiccough results study (Abdullah, (2016) state that critical mathematical thinking is a mental activity in a field that is carried out using steps in the scientific method, namely: understanding and formulating problems, collecting and analyzing necessary and reliable information, formulating assumptions and hypotheses, testing hypotheses logically, drawing conclusions carefully, carrying out evaluation And decide something Which will done, and predict possible consequences (Puriasih and Trisna 2022) (Peng, Cao, and Yu 2020).

METHOD

This research method uses classroom action research (CAR), which is carried out collaboratively between the researcher and the class teacher. The research target was class B1 of a state kindergarten. Kandis Supervisor. With amount child in One class 17 child. The consists of from 6 children man and 11 child Woman. Moment collection data use instrument observational and documentation research. The assessment criteria are as follows:

Table 1.
Evaluation implementation learning science for support children's critical thinking skills

No	Aspect	Indicator
1	Notice (observation)	Do observation
No	Aspect	Indicator
		Submit question
		Put forward opinion about information new Which heard and seen
2	Formulate Problem (categorize right)	Connect because consequence
		Grouping based on its type
3	Analyze (selecting)	Do test

		Find difference
		Find equality
4	Evaluate	Prepare alternative other in finish problem
		Conclude results activity
		Conclude results activity

Results The assessments obtained by children in science learning implementation activities are quantitative data. To support children's critical thinking skills. Assessments were conducted by observers using observation sheets. Data obtained were analyzed by comparing initial data with final data. after conducting research by researchers with teachers and school principals (collaboration) on children.
The results or data obtained are the values or achievements of the child's development before (pre) cycle until to end cycle (Sahronih, Purwanto, and Sumantri 2019). Whereas mark average presented on table and graph forms using formulas (Ngalim, 2011)

$$S = \frac{R}{N} X\ 100\%$$

Information:
S = Mark Which achieved
R = Amount score items question Which correct N = Maximum score

RESULTS AND DISCUSSION

Results Study

The research results revealed problems with children's critical thinking skills before Cycle 1, namely, they were still lacking in observing, formulating, analyzing, and evaluating each problem (Rahmadani, Syahputra, and Hanifa 2024). This phenomenon is the focus of the research (Taufik et al. 2022). This is also reinforced by interviews with class teachers who stated that children's critical thinking skills are still lacking (Susanto et al. 2023).

Before done cycle (pre cycle)

Before the cycle (pre-cycle), data on children's critical thinking skills showed an average percentage of 50%. Meanwhile, the highest percentage data before the cycle was for AI children, namely 68.75% and FY 70.83%.

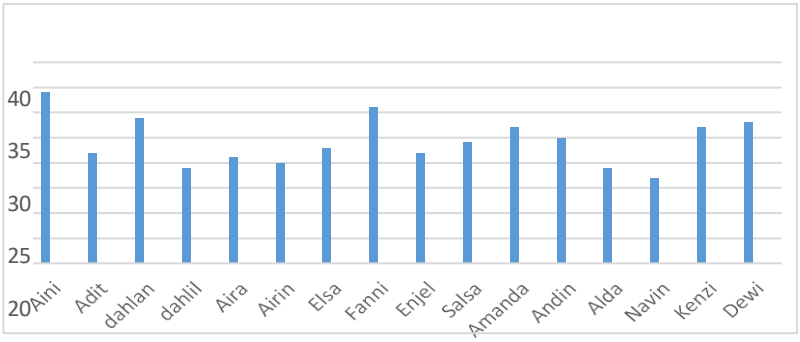

Chart 1. Data ability Pre Cycle Ability Reasoning Critical

The type of research used is experimental research with a descriptive approach. qualitative. Design study is one group pretest posttest design which aims to determine the development of children's critical reasoning through various forms science activities (Anggoro, Sopandi, and Sholehuddin 2017). Based on pre-cycle observation data through graphs Based on the qualitative data above, the researcher can conclude that there needs to be an action designed to improve children's critical thinking skills (Pratiwi, Walanda,

and Napitupulu 2024). The agreed-upon approach is to use a scientific approach, as it is a learning process. Which planned so that child can active For build Alone his knowledge so very important exploration is expected to be able to hone children's critical thinking skills (Utomo, Raharjo, and Dewi 2025).

Cycle 1

On cycle One implemented during 8 time meeting known that level development achievements think critically like an average person only 67 with category developing as expected (BSH). For this matter there are three children who have development achievement level above 75 and 15 children who are at the development achievement level above lower 75. Data cycle one shows critical thinking ability score children with average 63.97%, that is, there were three children who achieved a minimum percentage of 75% of the development achievement level (Vivi Erpianti, Meiliana Nurfitriani, and M Fahmi Nugraha 2021). With say other only 25% child Which reach improvement in accordance 75% with 75% criteria

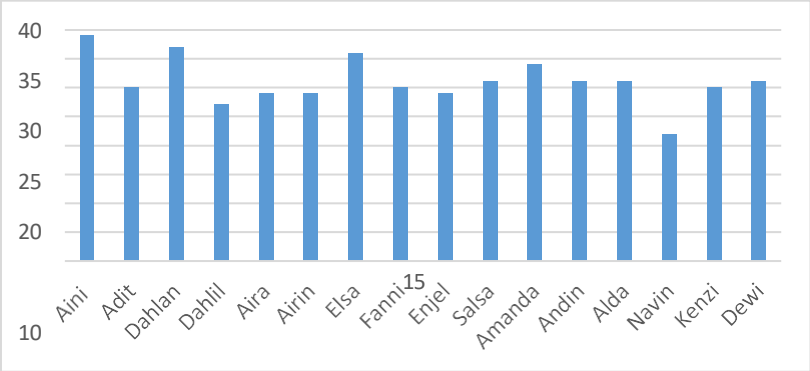

Chart 2. Data Improvement Ability Reasoning Critical Pre Cycle

Cycle II

On action cycle 2 emphasize on activity child for explore in a way independently of the learning material provided. If in cycle 1 the teacher still provided direction and assistance in cycle 2 teachers give more freedom to explore the material The lessons taught. In cycle 2, children's critical thinking skills increased by 89.7%. The ability to observe, formulate problems, analyze, and evaluate improved with the application of the scientific approach. Based on eight cycles, The meeting showed that children's critical thinking skills developed very well, as seen from the increase during the pre-Cycle, Cycle 1 to Cycle II. This shows the ability think critical experience improvement after use approach (Jufrida et al. 2019). Data cycle 2 almost all score increased. Level achievement of the development of children's critical thinking skills in the form of graphs starting from Pre-Cycle, Cycle 1 to Cycle II.

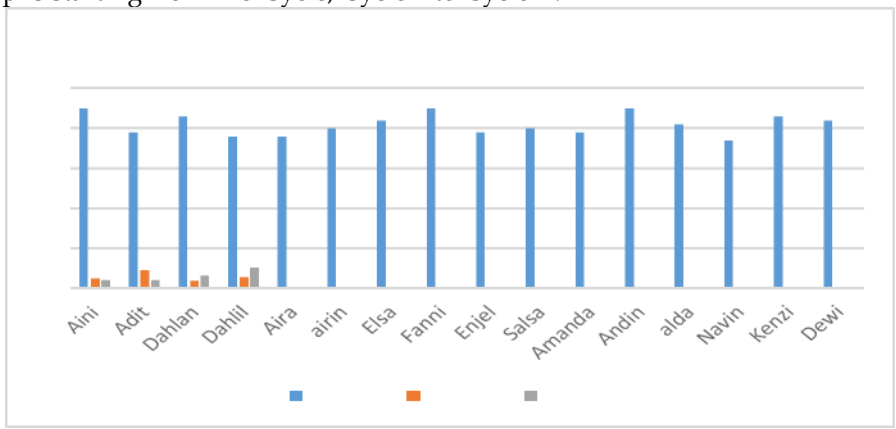

Chart 3. Results Level Achievements Development Ability Critical Thinking Child Group B1 In Kindergarten Country Kandis Supervisor

Table 2.
Data Improvement Ability Think Critical Group B Kindergarten State Development Kandis

Stages / Score	Pre Cycle	Cycle I	Cycle II
Average	24	31	41
Improvement	2	8	11

From data Table on show that existence improvement ability think Children's critical thinking increased from the pre-cycle to cycle II. In cycle II, the average developmental achievement level was in the very good development (BSB) category. This means that the level of developmental achievement had met the success criteria agreed upon by the researcher and collaborators, thus categorizing this study as successful.

Discussion

Learning Science

Draft learning science

In the 21st century, good learning is about how students not only understand the general concepts in each subject matter, but in learning students are required to be able to learn and think or reason critically, how to re-explain a teacher's explanation, so that students can later observe, learn about process skills, problem-solving skills, and thinking skills (Muzana, Rahman, and Yusuf 2021). this reason, learning science is very necessary in bridging the abilities of all students.

The word science comes from the English word science, which means knowledge. Etymologically, the word science originate from Language German Which referring to There is say wissenschaft that own systematic or organized knowledge according to Amien, the meaning of science is something that includes substances and energy in living creatures that discuss nature. In line with James Conan's opinion, he said that the meaning of sense is a concept and conceptual scheme. Which related One The same other Which appear as results a series experiment which can be observed and tested continuously (Sari et al. 2021).

Whereas according to Fischer science is a group knowledge Which obtained eh from observation in a way thorough on in essence science divided 3 that is: 1) science as process, meaning a technique for acquiring knowledge, through a series of processes known as the scientific method, 2) Science as product in the form of fact draft principle, 3) Science as attitude science namely beliefs, opinions or values that must be upheld by a scientist in particular (Wisnuardani and Surya Abadi 2021).

Based on the opinions above, it can be understood that science is not merely a concept but contains within it the value of human integrity. universal in nature And very worthy of development and owned by individuals all over the world. Thus, science learning is very relevant to be developed in learning because it will lead students to real experiences so they can solve problems. problem, find things new while experimenting, constructing thoughts that can be used as basic knowledge in further education.

Structure Learning Science

Structure learning science Which just right for child educate specifically peada education children aged early very need skills or skills Teacher Which competent in manage it.

Apart from that, teachers are also expected can customize the model relevant learning This allows students to play and learn optimally. This aims to help them understand themselves as one of God's creations and to learn about God's other creatures, who are interconnected in life.

Learning science on Park children very give benefit with the correct learning structure then it is meaningful from learning science will can be felt by children, which impacts their learning achievement. Structured learning will make it easier for students to understand the material presented by the teacher and can be implemented in everyday life. One of the principles of structured learning is the introduction of a concept of learning material from the concrete to the abstract. With thus teachers can provide understanding of important concepts. So that students can understand things abstract on material learning science (Muhibbin et al. 2021). In Management of science curriculum planning learning that is implemented systematically and structured will be able to help students develop good critical thinking patterns and gain a valid understanding of natural science, (Saputro et al., 2021)

Science learning in the classroom is a process of training students to observe, ask, try, reasoning And can communicate it, (Nurhidayat, Riani, and Firdaus 2018). In early childhood education, science learning is also meaningful. Through science activities, children gain real-world experiences. Furthermore, science activities can be repeated until students experience the satisfaction of their curiosity, thus providing a solid foundation for learning at the next level (Ayulistiana and Yuliani 2020).

Reasoning critical

Understanding Think Critical

Understanding think critical according to Zubaidah (Lestari et al. 2025) is something process in understand a concept to apply, and synthesize it and then evaluate the data that has been obtained. Evaluation is necessary because not all data or information produced is correct data (Arafa et al. 2021). By thinking critically which is a skill in high-level thinking very play a role in all over aspect development child especially on science learning in early childhood education (Utomo et al. 2025).

Several aspects that can be developed for critical thinking components according to Mal Leicester and Dnise Taylor from Brookfield in (Imamah & Muqowim, 2020) include: a) Asking questions, behavior that is continuously habituated and developed in the teaching and learning process, b) Point of view, children are trained to build a point of view and make their own opinions to develop the aspect of point of view children must learn to assess a problem Then maintain opinion or his opinion so that child will know a proof that other people's opinions or points are different, c) Rationality provides habituation to children For give something reason about his point of view and train to be able to accept differences other people's point of view with experience and different backgrounds too (Habib and Nadira 2024). To support an opinion, you need not only reasons but also real proof so that you can distinguish which opinions are strong and which are not. weak. With other words Child can accept other people's opinions, d) Look for know This is often used by other people to identify characteristics children who can think critically like when children search for know something a child must know will ask, usually the child will find out start from root problem simple until problem Which complicated And more complex usually Also child will look for know from various source for example person old Which near with children or goods sometimes Also look for know from MOBILE PHONE Internet and source other, 5) Analysis to analyze objects or problems, there are several parts used, namely conceptual analysis, meta-analysis, categorization and comparison. From these three analyses, children must be able to recognize and create categories. Sometimes children can also categorize. and compare to analyze a The concept of opinion and ideas must use words that can be used in various contexts in which the opinion is expressed. very clear whereas meta analysis This is A skill For reflect data obtained by a child (Suputra, Basuki, and Septiana 2023).

Child Early age

The essence child early age

On in essence all child own potential unique and dynamics as God's creatures potential has been owned from age from birth to death Humans also have their own uniqueness and dynamics which are characteristic and different from other creatures (Suryana, 2016). Children can develop their potential, for example from field art voice and others. Children age early is figure individual (Darmayanti 2022).
as a socio-cultural creature who is undergoing a development process that is very fundamental for future life and has several characteristics (Sudarwati and Ningrum 2022).

Characteristics development child age early

Cognitive development, the meaning of cognitive is the mental realm which is centered on brain and relate with conation affection development This started since birth, but the intervention of brain cells begins after the child is 5 months old when his sensory abilities are truly visible. According to Piaget, cognitive development goes through four stages of development, namely: the sensory stage motorbikes at the age of 0 to 2 years, preoperative stage at the age of 2 to 7 years, concrete operational stage on age 7 until 11 year, on formal stage operational age 11 until 15 year, but the early childhood category is seen in stages 1 and 2.

In their educational development, early childhood also exhibits certain characteristics compared to their peers. It takes time for children to acquire skills and concepts of self. This can be achieved through close observation and interaction with each child in the classroom (Wahyuni et al. 2020). Each child's concrete actions are assessed by their teacher to determine the extent to which they have developed their abilities. Which owned. For That as educator must capable facilitate the child's essential needs so that the child can develop optimally (Amaliyah and Mulyati 2020).

CONCLUSION

Study This show existence improvement ability think critical child Group B1 of Pembina Kandis State Kindergarten uses an approach. This improvement can be seen when children are willing to observe concrete objects during learning activities. Children begin to actively ask questions and express themselves. his opinion about the object that observed children too can formulate the problem with connecting because the consequences that children encounter During the activity process, children are also able to carry out experimental activities independently or in groups with the aim of hone ability think critical Because Also capable find solution for solve the problems encountered at that time. Finally, the children were able to draw conclusions about the activities they carried out during the process

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