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Fostering Scientific Literacy in Young Children Through Small-Scale Fish Farming

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Abstract

This study aims to foster scientific literacy in young children through small-scale fish farming activities integrated into school-based learning, emphasizing experiential, hands-on learning processes that are contextual and meaningful for children. Using approach qualitative with design studies case, research This dig phenomenon in a way deep in specific context. Data is collected through observation direct, semi-structured interviews with teachers, parents, and children, as well as discussion group focused (FGD). Research results show that activity cultivation fish scale small become an effective learning medium in integrate literacy science to in activity daily children. Activities This No only help children understand draft like ecosystem, cycle life fish, and its importance guard environment, but also develop skills social like cooperation and communication. Teachers and parents report existence improvement enthusiasm child to science as well as better understanding deep after follow this activity. This research own implications important, namely that learning based on experience like cultivation fish scale small can become a relevant and attractive alternative model for applied in education child age early. Besides that, the findings this support development curriculum based on an integrating environment theory with practice in a way balanced. With Thus, research this expected can push policy more education inclusive, contextual, and learning-oriented based on experience.

Keywords: *literacy science, children age early, cultivation fish, learning based on experience.*

INTRODUCTION

The problem important child age early to arrive moment This Still Not yet fully completed is about literacy science (Chen & Xiao, 2021; Ke et al., 2021; Valladares, 2021) . Draft scientific in children age early show that theory education science capable strengthen understanding they about the world around (David et al., 2022; Ortiz-Revilla et al., 2022) . On in fact, access For get experience sufficient learning, especially of a nature contextual and based experience direct Still Lots child who has not get it. Activities

practical like learning experiments and projects based on nature that can grow understanding scientific child moment This Still seldom found (Johnstone et al., 2022; Speldewinde & Campbell, 2024) . Mostly in various area more use approach learning dominated with theories and books text. Gap This need overcome with method utilise activity cultivation fish scale small as a medium for activity learning. Activities This No only give experience practice, but also able to introduce to children about draft base science that is capable they apply in life everyday.

Various study previously show that understanding science in children age early can improved through learning based on experience. Research by Jordan et al. (2023) state that learning based on natural is context effective and capable learning make supportive environment for various characteristics more students wide than learning based on traditional. Besides that, research from Faber Taylor et al. (2022) disclose that learning science outside room is supporting strategies for interesting power interest children and support learning children. Some studies also show that activity based on nature, such as gardening and cultivation animal, capable interesting Power interest child as well as more easy introduce concepts scientific for children (Petrou & Korfiatis, 2022; Speldewinde et al., 2024) . Although Thus, the utilization cultivation fish scale small as tool for to cultivate literacy science in children age early Still limited. Research this try fill in gap the with explore How cultivation fish can made into means effective For introduce children on concepts science for to cultivate literacy science in children age early in a way direct.

Study this own difference from study previously located in the implementation cultivation fish scale small as means learning literacy science in children age early. Although a number of study has highlight importance activity based on natural in learning, use cultivation fish as method concrete For teach concepts literacy, biology, ecosystems, and cycles life not yet lots studied (David et al., 2022; Wantzen, 2024) . Cultivation fish presented for give chance for children for direct observing scientific processes, such as growth, maintenance and management ecosystem micro. Besides that, through activity this, children can also develop skills practical and useful in life everyday, such as work same, responsibility answer, and solution problem. Research this focus on implementation method this in context education age early, which is approach new and relevant for increase literacy science among children.

Question main thing to want answered in study This is: "How cultivation fish scale small can to cultivate literacy science in children age early ?" research this aiming For explore learning Interesting and effective science for children age early through method cultivation fish. Focus main is for evaluate how involvement children in activity cultivation fish can help they understand concepts base biology, ecosystems, and cycles alive. Besides that, research this will also identify reflection and evaluation as well as sustainability and development in implementation method this is in the environment education child age early, and the impact to skills and knowledge science children.

As answer meanwhile, we argue that effective method for to cultivate literacy science in children age early is cultivation fish scale small because can give experience direct in understand concepts scientific. In activity cultivation fish, children can observe in a way direct biological processes like growth, cycle life, and interaction between organism in ecosystem. Engagement in maintenance fish also provide chance For develop skills practical like not quite enough answer, care, and resolution problem. Based on theory education based on experience and results study previously, activities this potential increase understanding science children in a way more profound and enjoyable. Therefore that, the implementation cultivation fish scale small in learning at age early can

become relevant alternatives For introduce literacy science in a way more effective and contextual.

METHODS

Approach qualitative with design studies case used in study This. Approach This chosen for understand in a way deep How activity cultivation fish scale small can applied as a learning medium in increase literacy science children age early in RA Darul Mukmin. Method qualitative used in study this because focus the main thing is explore the learning process, experience children, and the perspectives of the parties involved. Study case allow researcher for dig complex phenomenon in specific context, providing outlook detailed which is not can achieved with method other.

Data were collected through direct observation, semi-structured interviews, and Focus Group Discussions (FGD) conducted from September to October 2025 at RA Darul Mukmin, Karanglo Hamlet, Sukorejo Village, Sukorejo District, Pasuruan Regency. Location this chosen because have a learning program based on supportive environment activity cultivation fish scale small, and existence active community support learning this. Respondent study covers 10 children age early involved in activity cultivation, 4 teachers who manage learning, as well as 5 parents who provide perspective additional. Data collection techniques supported with table coding for source person following this:

Table 1. Table Coding For Source Person

Code	Source person	Amount	Description Role
A1-A10	Children aged early	10	Follow activity cultivation fish and give response.
G1-G4	Teacher	4	Manage learning and integrating literacy science .
P1-P5	Parent	5	Give perspective about impact home learning .

(Source: Research Data, 2025).

Data analysis was performed with use technique analysis from Miles and Huberman consisting of from three stages main, namely: First data reduction, collected data from interviews, observations, and FGDs are summarized, selected, and simplified. For ensure only relevant data is analyzed more continue. Second data presentation, data is arranged in form narrative, tables, and graphs For make it easier interpretation and providing description more findings clear. Third verification and withdrawal, conclusion of data that has been served verified For ensure validity, and then interpreted For answer question research. Research techniques this allows complex data managed in a way systematic, so that produce in-depth and relevant findings with objective study.

RESULTS AND DISCUSSION

Results

Learning media planning Cultivation Small Scale Fish (Budikdamber) at RA Darul Mukmin Pasuruan is step strategic for integrate method practical based on experience in learning science for child age early. This process covers selection of relevant media, such as plastic buckets, seeds fish, feed, and tool observation simple. Purpose main from planning this is create experience interesting , interactive, and appropriate learning with level development child for increase understanding they about draft base science, including cycle life creature life, ecosystem simple, and sustainable environment. Approach This designed For support improvement literacy science in children age early. Here is visual representation of the flow activity Budikdamber at RA Darul Mukmin Pasuruan, which depicts steps taken children in this activity:

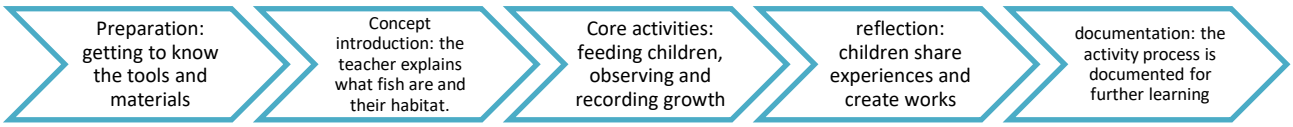


Chart 1. Steps Taken Children
(Source: Research Data, 2025).

Interview results with teacher RA Darul Mukmin disclose that emphasize importance learning based on experience in support development children. Activities like give Eat fish or observe growth fish allow child understand draft in a way concrete and easy digested. Learning media used designed to be safe and easy accessed, created atmosphere comfortable and friendly learning children. Teachers have role central, no only as companion, but also as designer activities, ensuring that learning in progress with effective. Besides that, the use of book notes as means documentation activity child become effective way For push child express self through writing or storytelling. Strategy This No only enrich experience Study child but also improve skills literacy them, making the learning process more meaningful and sustainable.

Observation results show that thorough planning play role important in smoothness activity learning. The teacher prepares all need with careful, start from a bucket of clean water until election seed appropriate fish. Schedule activities are also arranged in a way organized, ensuring all walk with smooth. For involving every children, teachers divide they to in groups small so that every individual can participate active. Children looks enthusiastic follow guide from learning media as well as directions direct from the teacher.

Data collected underline importance structured planning for success activity Budikdamber as a learning medium. Planning process this involving selection of relevant media For child age early, equipped with interesting tool attention they. Observation show that good planning create atmosphere fun and interactive learning, so that children more easy understand the material presented .

Besides aspect technical, teacher is very prioritize involvement active children in every activities. This is give they experience meaningful learning, not only limited to listening, but also doing in a way directly. This pattern confirm that comprehensive planning, plus with designed learning media in accordance development child, able increase understanding at a time enthusiasm them. When media and aids are designed in a way relevant, children more easy absorb concepts science basic. This show that good planning, according to need child, can optimize potential literacy science them and give experience valuable learning.

Implementation literacy science in activity Cultivation Small Scale Fish (Budikdamber) at RA Darul Mukmin Pasuruan is the process of integrating concepts base science to in activity everyday that involves participation active children. Literacy science this covers ability child in observe, ask, and understand draft simple like need creature life, relationship between water cleanliness and health fish, and cycle life fish. Learning process this designed for children can study through experience real fun, like give eat fish, note growth, and understanding importance guard cleanliness environment.

Interview results with teacher RA Darul Mukmin disclose that show that integration literacy science through approach exploration and observation very effective in learning child age early. Children invited for understand draft science in a way experience with provoke curiosity know they through questions simple and relevant with

life everyday. Approach this no only introduce science as knowledge, but also as method think critical and analytical. With experience directly, such as observe behavior fish moment water conditions change, children can recognize connection cause and effect. This process help they understand importance cleanliness and responsibility answer to environment since early.

Observation results show that children very active in ask and observe fish during activity Budikdamber. Questions like "Why fish move to above?" or " Why?" the food must small ?" often appear, signify high desire know they. Children also take notes observation they are on the sheet work simple, like take notes size fish, water color, or amount the food provided.

Data collected show that approach based on experience direct This succeed increase understanding children to draft base science. Children involved in activity This seen more active ask and show participation high, reflect ability think critical that begins developing. Observations also noted that activity this create atmosphere interactive and relevant learning with life children.

The teacher plays role important in success integration this, with providing interesting and engaging learning media explanation simple as it is with level understanding children. Data shows that approach this no only increase understanding child to science, but also fosters a sense of responsibility answer to environment. Approach based on practice this give experience meaningful learning at a time help to plant the basics thinking scientific in children since early.

Reflection and evaluation in activity Cultivation Small Scale Fish (Budikdamber) at RA Darul Mukmin Pasuruan is step important for analyze and evaluate success learning, especially in reach objective literacy science for child age early. The teacher did reflection for evaluate response children, identify obstacles that arise during activities, and measure impact learning to understanding they. Evaluation done through observation live, discussion groups, and work children like notes observation or image that reflects understanding them. This process No only help teachers improve future activities but also ensure literacy science integrated in a way effective in learning.

Interview results with teacher RA Darul Mukmin disclose that show how importance reflection and evaluation in ensure child understand the material taught. Reflection done with submit question direct to children, who help measure how far the information accepted and understood. Answer they become tool effective diagnostics For evaluate success activities. While that, evaluation based on works, such as draw or tell experience they, give description concrete about understanding children at a time push their creativity and verbal abilities. The approach This make the evaluation process as an integral part of learning holistic, where understanding child rated through involvement directly, not just results formal test.

Observation show that children very enthusiastic participate in reflection group. They active share what they learn, such as method give eat fish or importance keep the water constant clean. Mostly child capable describe fish with additional details such as water and food, which shows that they understand connection between fish and their environment. The teacher notes that more children active during activity usually more proficient convey understanding they moment reflection.

Data collected confirm that reflection and evaluation is component key in measure effectiveness activity Budikdamber. Interview and observation show that children no only enjoy activity but also capable show understanding they through answers and works creative. Enthusiasm and involvement children during reflection also becomes indicator that approach this succeed increase literacy science.

The data pattern shows existence connection positive between reflection structured and understanding child to literacy science. Active children in reflection group tend own understanding more good, which is reflected from answer they in discussion and results work they. Teachers play a role important in directing the reflection process with submit relevant questions and provide appreciation on contribution children. This pattern confirm that reflection and evaluation is step crucial For ensure success integration literacy science through Budikdamber. Besides that, pattern this also shows that activity based on experience practical, if supported with structured reflection, can create meaningful and in - depth learning for child age early.

Sustainability and development activity Cultivation Small Scale Fish (Budikdamber) at RA Darul Mukmin Pasuruan is effort For make activity This as part important from the learning process term long at a time Keep going increase quality. Sustainability involving steps for ensure activity this still in progress with involving students, teachers, and parents. While that, development focus on innovation in learning media, enrichment materials, as well as variation more activities wide, such as integration theme environment and sustainability.

Interview results with teacher RA Darul Mukmin disclose that show two pillar main sustainability and development: the role active parents and innovation in learning. With involving parents, experience study child expanded until to home, make learning more deep at a time tighten parent relationship with child. Innovation like introduction aquaponics no only enrich activity but also open outlook new for children about interaction between fish and plants in ecosystem simple. Approach this create more learning interactive, relevant, and interesting, so that the learning process no only sustainable but also more meaningful.

Observation show that activity Budikdamber still in progress although cycle beginning learning has finished. The children brought it experience this to House with parental support often share story or report results maintenance fish they to the teacher. At school, activities are also increasingly varies, such as race make story about fish or study nurse plant in system aquaponics. Activities this no only strengthen interest children but also helps they understand more in about ecosystem and responsibility answer to environment.

Data collected show that sustainability and development activity Budikdamber very depends on collaboration between school and parents. Interview show that involvement active parents ensure learning keep going continue, while innovation in method learning give a richer experience for children. Observation strengthen matter this with take notes impact positive from activities addition to enthusiasm and understanding child to literacy science.

The data pattern shows existence close relationship between sustainability activity with parent participation and development through innovation. Children who continue activities at home, with parental assistance, tends to show interest more big to learning. While that, innovation like aquaponics give dimensions new in learning, making it more interesting and relevant. This pattern confirm that sustainability and development activity Budikdamber can realized through synergy between strong collaboration with parents and approach continuous learning customized with need child age early.

Discussion

Our findings indicate that small-scale fish farming activities are an effective learning medium for integrating scientific literacy into children's daily activities. These activities not only help children understand concepts such as ecosystems, fish life cycles,

and the importance of environmental conservation, but also develop social skills such as cooperation and communication. Social skills are skills that help individuals interact and communicate with others both verbally and nonverbally (Rachman & Cahyani, 2019). In our findings, teachers and parents reported increased enthusiasm for science among children and a deeper understanding after participating in these activities. This illustrates that the development of social skills in early childhood in the school environment is certainly influenced by the environment, especially teachers and parents. According to Widjayatri, et al. (2023), children's social skills include: being able to practice togetherness, fostering a sense of solidarity, cooperation, and responsibility. Therefore, social skills need to be developed because children will eventually live socially in the community. This is supported by previous research reporting that early childhood social skills are a critical foundation for children's future success in socializing, learning, and building relationships (Husain et al. 2025). Furthermore, these broader findings support the development of an environment-based curriculum that integrates theory and practice in a balanced manner. Therefore, this research is expected to encourage more inclusive, contextual, and experiential learning-oriented education policies.

Study this disclose that careful planning in implementation activity Cultivation Small Scale Fish (Budikdamber) at RA Darul Mukmin Pasuruan capable create experience interactive and meaningful learning for child age early. Findings this consistent with studies previously highlighted importance structured learning media planning, including election visual aids, appropriate media, as well method based on experience directly, for increase understanding child to concepts base science (Choi et al., 2022; Hsiao & Su , 2021). Involvement active teacher in planning and evaluation proven play a role big in ensure success activities, showing how importance the role of teachers in support development child. However, the results this also highlights existence difference with another study found that over planning rigid can reduce ability For respond individual needs of children (Huang et al., 2022; Sneck et al., 2023).

Implications from findings this is that planning that involves observation as well as involvement direct child can support development literacy science them. With utilizing interesting learning media, children can understand concepts science like cycle life creature life and ecosystem simple through a fun and relevant approach. This is in line with theory constructivism, which emphasizes that knowledge built through experience direct and interaction with environment (Alismailel et al., 2022; Huang et al., 2022; Morado et al., 2021). Through activity Budikdamber, children no only Study draft science but also develop ability think critical and curiosity know, which is element important in education child age early.

Sustainability and development activity this also becomes factor important factors that contribute to its success. Parental involvement, for example, plays a role significant in support experience study children at home. With help children nurse fish, parents no only strengthen results learning but also expand the impact, such as increase interest child to ecosystem and issues sustainability environment. Innovation like system aquaponics add dimensions new in learning, enabling child for understand more concept complex with interesting way. Studies previously also supported idea that collaboration between school and parents can strengthen results learning, both in the environment school or at home (Mahoney et al., 2021; Roberts & Webster, 2022).

Besides that, the findings this show importance reflection and evaluation routine as tool for evaluate understanding child to the material being taught. In study this, reflection help teachers understand how far the children understand draft science, at the same time become base For repair future activities. Approach this in accordance with

theory evaluation formative, which emphasizes importance give bait come back as part from the learning process (Alt et al., 2023; Lin et al., 2023). As for example, children who are older active in session reflection group tend capable explain observation they with more good, show deep understanding about connection between fish and their environment. Structured reflection this no only strengthen understanding child to draft science but also enriching experience study they, created a more environment responsive to need child age early.

CONCLUSION

Study This show that activity cultivation fish scale small can become an effective learning medium for increase literacy science in children age early. Through this process, children no only introduced to the concept scientific base like cycle life and ecosystem, but also trained for develope skills think critical, working same, and make decision. Findings this emphasize importance learning based on experience (experiential learning) in build base knowledge science for children. With involving they in a way active in relevant and contextual activities, children can understand draft science with more deep at a time recognize How draft the applied in life daily.

This article give contribution significant in the field education with offer corner view new about development of learning media based on activity real like cultivation fish. Besides that, integration literacy science through approach interdisciplinary become mark add relevant For applied in various context education. However, research This own a number of limitations, especially related with location implementation, coverage age participants, as well as lack of gender representation among children involved. This research has important implications, namely that experience-based learning such as small-scale fish farming can be a relevant and interesting alternative model to be applied in early childhood education. For overcome limitation mentioned, it is necessary study advanced with more methods wide, such as survey involving location, group age, and background behind more participants diverse. Further research comprehensive this important for ensure that findings can used as base for policy inclusive and appropriate education with need various group children.

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