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The Importance of Agricultural Knowledge in Early Childhood Education: A Scoping Review

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Keywords:

Agriculture-based Learning,
Agricultural Knowledge, Early
Childhood Education.

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Received 09 08 2023

Revised 25 09 2023

Accepted 26 09 2023

Published Online First

30 09 2023



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Abstract

Indonesia is an agrarian country with potential in agriculture that aligns differently from the possibility of supporting human resources. Therefore, it is necessary to introduce agriculture from an early age. Early childhood learning programs with an agricultural perspective can teach children the importance of agriculture and basic skills such as caring for, watering and planting plants. This research aims to understand the significance of agriculture-based learning in early childhood education environments. This research method uses Preferred Reporting Items for Systematic Review and Meta-Analyze Extensions for scoping reviews using three databases, namely Science Direct, Google Scholar, and Sage journals. The literature reviewed from the scoping study obtained eight articles that used qualitative and quantitative or mixed methods. The types of journals produced are primarily children's education journals, environmental education journals for children, and journals about nutrition for children. Many research subjects also centre on children's intelligence, scientific and nature-friendly attitudes, and cognitive, language, and social skills that children can acquire from gardening or agriculture-based learning. From data collection and preparation of literature material, benefits from agricultural-based learning programs are obtained. This benefit is the basis for the importance of agriculture-based learning in kindergarten children. The benefits of agricultural learning-based activities in Early Childhood Education (ECE) include increasing early childhood knowledge and love of farming activities, increasing children's naturalistic intelligence, promoting healthy food in early childhood, environmentally friendly attitudes, and cognitive intelligence.

To cite: Fadlillah, M., et al., (2023). The Importance of Agricultural Knowledge in Early Childhood Education: A Scoping Review. *Golden Age: Jurnal Ilmiah Tumbuh Kembang Anak Usia Dini*, 8(3), 133–142. <https://doi.org/10.14421/jga.2023.83-03>

Introduction

Indonesia is an agricultural country, which means that Indonesia has abundant natural wealth, and many Indonesians work in the farm sector. From a geographical perspective, Indonesia is located in a region with high rainfall. It is a tropical area with even sunlight intensity, thus producing various kinds of agricultural commodities such as palm oil, rubber, cocoa, etc. The Center for Research and Development of Land Resources in 2016 showed that 15.9 million ha of land in Indonesia has the potential for agricultural areas (BBSDLP, 2017).

Indonesia's vast agricultural land has enormous potential to support the national economy. The high agrarian potential in Indonesia requires human resources who are capable and professional in the agricultural sector. Agricultural knowledge intelligent service technology is now seen as a fundamental solution to the challenges of organising and utilising agricultural information, enhancing the quality and yield of farm products (Zhao, 2023). Furthermore, a review of agrarian literacy studies underscores the pivotal role of formal education in fostering agricultural literacy among school-aged children, hinting at the requirement for innovative strategies (Cosby et al., 2022).

Education and age are essential to sustain farmers' resources who can produce quality agricultural commodities. Based on the results of the 2018 inter-census agricultural survey, the farm workforce is primarily elderly, namely 20.8% 55-46 years old, 27.4% 45-54 years old, and 24% in the 35-44-year-old age group 4% (Kementerian Pertanian, 2021). The survey results show

that young people's interest in becoming agricultural entrepreneurs is still low. Therefore, it is necessary to increase young people's interest in the farm sector through applicable learning methods in schools about agriculture. Practical learning about agriculture can be taught to middle school, elementary school-age children, and even early childhood.

The younger generation tends to have less desire to work in the agricultural sector, especially to become a farmer, because they are less likely to have a degree and provide less guarantee for the future (Susilowati, 2016). The younger generation has obstacles in becoming young farmers because there is a lack of income for farmers, it is challenging to obtain ownership of an adequate farm, and there needs to be more availability of part-time jobs. This causes the younger generation to be reluctant to take up the farming profession and have no desire to be interested in agriculture. The lack of agricultural knowledge in the younger generation causes a decline in the younger generation's interest in pursuing a career in agriculture. This phenomenon is a severe issue of agricultural poverty in Indonesia. Indeed, the digital transformation is reshaping agricultural knowledge, fostering enhanced human-tech connectivity and augmented transparency, although it poses governance challenges (Fielke et al., 2020).

Currently, knowledge about agriculture among children is shallow (Trexler, 2000), especially for children who live in urban environments. Introduction to the potential of agriculture in early childhood has an excellent opportunity to increase interest, awareness and development in the future. Providing agricultural insight into early childhood can facilitate understanding and concern for nature and the surrounding environment, especially in the farming sector. For instance, a study by Kountios et al. (2023) emphasises the influential role of Information and Communication Technology (ICT) in transmitting agricultural knowledge, shaping a competitive edge in the field.

Learning about agriculture at an early age will increase interest and liking for agriculture in young Indonesians from an early age. Early childhood learning programs with an agricultural perspective can teach children the importance of agriculture and basic skills such as caring for, watering and planting plants. Therefore, this research aims to understand the significance of agricultural-based learning programs in early childhood education. This research uses the Preferred Reporting Items for Systematic Review and Meta-Analyze Extensions for scoping reviews using three databases, namely Science Direct, Google Scholar, and Sage journals (Tricco et al., 2018).

Methods

In this research, we aim to review relevant literature regarding the importance of agriculture-based learning programs in early childhood to increase young children's knowledge and interest in agriculture. The method used in this study was a scoping review using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMAScR) checklist (Tricco et al., 2018). This design uses several questions prepared using 5 of the six stages developed by Arksey and O'Malley (Arksey & O'Malley, 2005). The five stages are identifying the research question, identifying relevant studies, study selection, data extraction, and collating, summarising and reporting the results (Levac et al., 2010).

2.1. Identifying the research question

The questions in this research were prepared using specific keywords using PICO. Researchers used particular keywords arranged according to the PICO framework (Population, Intervention, Comparison, Outcome). PICO is a model for developing questions that are structured to be relevant (Eriksen & Frandsen, 2018).

Table 1. Scoping Review Questions

P	I	C	O
<ul style="list-style-type: none"> • Early childhood 	<ul style="list-style-type: none"> • Know about agriculture • Efforts to increase young children's knowledge and interest in agriculture through agriculture-based learning programs in ECE 	<ul style="list-style-type: none"> • Lack of knowledge about agriculture • Lack of agriculture-based learning programs in ECE 	<ul style="list-style-type: none"> • Increased knowledge and intelligence as well as emotional early childhood through agriculture-based learning

2.2. Identifying relevant studies

The literature search will include published and unpublished primary studies and reviews (grey literature). The databases used are Science Direct, Google Scholar, and Sage Journals. Search for relevant articles using keywords in English and Indonesian: gardening-based learning program in early childhood education to increase knowledge and love of agriculture.

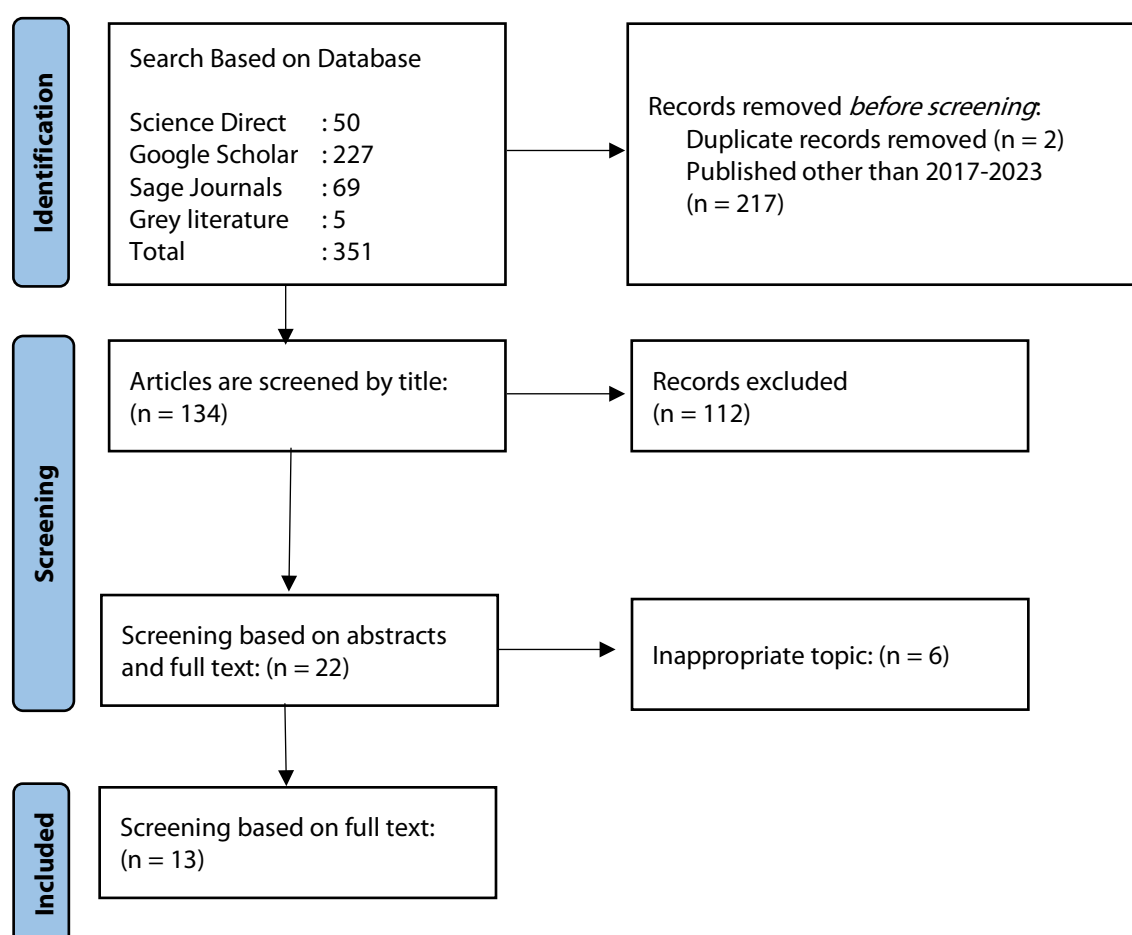


Figure 1. PRISMA Flowchart

2.3. Study Selection

Literature was selected by identifying relevant articles using inclusion and exclusion criteria. The first screening of the title and abstract was with inclusion criteria, namely original research, English or Indonesian, published between 2018-2023, complete article, and accessible free of charge. The second screening will be screened using exclusion criteria: essays, reviews, books and case reports. The literature obtained will be selected using a PRISMA flowchart.

2.4. Data extraction

The article selection process uses Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA_{ScR}) (Tricco et al., 2018). PRISMA flowchart is an evidence-based minimum set of items for reporting in systematic reviews and meta-analyses. PRISMA flowchart (Fig. 1) is considered appropriate because it can improve the quality of publication reporting.

2.5. Collating, summarising and reporting the results

After the data extraction process on the eight selected articles, it was continued to summarise with a qualitative description. Summarising these eight articles was done by filtering analysis, mapping and sorting material according to the main issues and themes by synthesising related topics in relevant journal articles. This research examines journals about the importance of agricultural-based learning programs in early childhood education environments to foster knowledge about agriculture.

Result

Search identification was done by searching for related articles in 3 databases, namely Science Direct 50 articles, Google Scholar 227 papers, and Sage Journals 69 articles. The total articles are 343 articles. Then, it eliminated duplicate journals other than the 2017-2023 publication period. Next, the papers were screened based on the title and abstract to form 15 articles. Then, the last one was screened based on the contents of the full text into eight pieces.

From the scoping review process, eight selected articles were produced, which were then compiled to find the characteristics of the articles through data mapping. The study discussed the importance of agriculture in early childhood and agricultural or plantation-based learning programs that could be applied to early childhood. This study also compared the results of the analysis of the articles and reached a consensus through several discussions.

3.1. Characteristics of the Article

Eight articles met the inclusion and exclusion criteria. Articles obtained. Eight articles used qualitative and quantitative or mixed methods. The types of journals are primarily children's education journals, environmental education for children, and journals about nutrition for children. Many research subjects also centre on children's intelligence, scientific and nature-friendly attitudes, cognitive, language, and social skills that children can acquire from gardening or agriculture-based learning. These results can be seen from the articles whose data have been extracted in Table 2.

From the data extraction that has been carried out, we found several conclusions about providing agricultural insight so that young children are interested and willing to carry out agricultural activities; apart from the lack of knowledge and interest of the younger generation in the farm sector, but also the many benefits for young children if they are given knowledge about agriculture. Some of the benefits that we summarise in the extraction of articles are Increasing young children's learning and love for agricultural activities (Rymanowicz et al., 2020), Increasing children's naturalistic intelligence (Pratiwindya, 2018), Promoting healthy foods to young children (McCloskey et al., 2020), Nature-friendly attitude (Kim et al., 2020), and Cognitive intelligence (Pratiwindya, 2018).

Table 2. Data Extraction

Author/year	Journal Type	Research subject	Objective	Method/design	Conclusion
Murakami et.al. 2017	Environmental education	Early childhood teacher	Describes a framework for children's learning opportunities	Iterative qualitative analyses	The Gourd Tee-Pee Model helps represent the perceived value of garden education and positive practices to support learning and achieve

Author/year	Journal Type	Research subject	Objective	Method/design	Conclusion
			through garden-based education narratives provided by teachers		the basic psychological needs of autonomy, relatedness, and competence (Murakami et al., 2018).
McCloskey <i>et al.</i> 2020	Environmental Research and Public Health	healthy eating behaviours of early childhood	Understand participation in the farm-to-ECE program and the perceived benefits and barriers of the three farm-to-ECE program components.	A cross-sectional design	Farm-to-ECE programs offer healthy food promotion techniques through learning activities and opportunities for repeated taste exposure and sensory exploration. These can build children's familiarity with new foods and increase their likelihood of accepting healthy foods and diets (McCloskey et al., 2020).
Wells <i>et al.</i> 2023	Environmental Research and Public Health	Physical Activity among Children Aged 3–5 Years in North Carolina	To examine the impact of a childcare gardening intervention on children's PA in a low-resource community	Linear mixed models (SAS v 9.4 PROC MIXED)	Gardening in daycare has potential as a CL intervention. Its impact is moderated by sex and age, with the effect being more substantial for boys and the youngest child (Wells et al., 2023).
Taniguchi <i>et al.</i> 2022	Nutrition and Gardening Intervention	Families of children attending Osage Nation ECE programs	To describe results from the six-month Food Resource Equity for Sustainable Health (FRESH) study among Native American families.	Randomised wait-list controlled trial design	Vegetable consumption increased significantly in the children's intervention compared to controls for chayote and peas. Willingness to try grown nuts in intervention children and tomatoes in both groups (Taniguchi et al., 2022).
Rymanowicz <i>et al.</i> 2020	Early Childhood Environmental Education	children's cognitive, language, and social skills, scientific inquiry, interaction with nature, interest in exploration	To bridge the gap between research and practice by presenting a description and program evaluation of the Farm Sprouts agriculture-based preschool program	quantitative and qualitative data survey	Evaluation results show that agriculture-based programs positively impact children's language and conversation skills, increase their interest in nature and desire to explore, and positively impact family interactions (Rymanowicz et al., 2020).
Pratiwindya <i>et al.</i> , 2018	children's naturalistic intelligence	Parents and children	Understanding the influence of hydroponic gardening and parental involvement in improving early childhood naturalistic intelligence.	ex post facto research/comparative quantitative research	The natural intelligence of kindergarten children who garden hydroponically is higher than the group of kindergarten children who do not garden hydroponically (Pratiwindya, 2018).
Kim <i>et al.</i> 2020	Childhood Education	Scientific and Nature-Friendly Attitudes in Children	To examine the park-based curriculum in South Korea and its impact on scientific and nature-friendly attitudes in children aged 4 to 6 years.	Qualitative and quantitative	The gardening-based curriculum provides opportunities to develop scientific attitudes, namely curiosity and inquiry. Apart from that, direct experience opens children's eyes to the importance of nature and the value of harmony with nature, thus having an impact on increasing friendly attitudes towards nature (Kim et al., 2020).

Author/year	Journal Type	Research subject	Objective	Method/design	Conclusion
Best & Kerstetter 2019	Childhood Education	Children's Culture	Identify success factors for farm-to-school programs, drawing on evidence from exploratory case studies of farm-to-school programs in the Mid-Atlantic region located in densely populated urban areas.	Systematic observation of program activities, writing fieldnotes of observation, coding and analysis of fieldnotes	Students from resource-rich environments can utilise learning environments better than those with less access to contexts that combine learning and play. Social and educational disparities have different impacts on program success and student learning conditions (Best & Kerstetter, 2020).
Koyimah, S. 2023	Education	reduce the level of dependence on gadgets and increase interest in farming from an early age	qualitatively describe the implementation of urban programs farming in PAUD units as an effort to reduce the level of dependence on gadgets and increase interest in agriculture from an early age	Qualitative	Urban farming can improve creativity and motor skills in young children, increase children's understanding of the environment and sustainability, encourage parental participation in children's education, and become an attractive alternative play activity for children (Koyimah, 2023).
Brand M, et.al. 2017	Agricultural Education	students' agrarian literacy through National Agriculture Learning Goals	to further understand students' agricultural literacy through National Agriculture Learning Goals-based assessment of student's knowledge	a sequential exploratory mixed methods design	The agriculture program provides insight into strategies to increase the accessibility of the National Agriculture Learning Goals for elementary school students and teachers, in addition to research findings showing a synergistic relationship between core STEM concepts and students' agricultural literacy (Brandt et al., 2017).
Dannefer et al. 2017	Journal of Hunger & Environmental Nutrition	to encourage fruit and vegetable consumption	the evaluation included product sales, the redemption of product coupons provided through nutrition education, nutrition school attendance, and cross-sectional surveys with parents and staff, child care centre directors, nutrition educators, and child care centre teachers.	Four separate surveys	Most agree that the curriculum is applicable (97%), the curriculum is easy to use (87%), and learning is appropriate (84%). All teachers stated that students enjoyed gardening activities. The most frequently identified challenges were fitting weekly activities into class schedules (55%), lack of tools and equipment (24%), and lack of space (21%).
Gustiana et al., 2019	Journal of Early Childhood Education	science process skills of young children	to determine the effectiveness of the method with activities gardening on the science process skills of young children	Quasi Experiment with a Nonequivalent Control Group Design research design	The implementation of science learning using gardening activities to improve the science process skills of group B kindergarten children is developing well (Deni Gustiana et al., 2019).

Author/year	Journal Type	Research subject	Objective	Method/design	Conclusion
Mirawati and Nugraha 2017	Early Childhood	early childhood science process skills	to see the initial conditions of early childhood science process skills before implementing gardening activities, an overview of the implementation of gardening activities in Kindergarten Lab. UPI and increasing children's science process skills after implementing gardening activities.	qualitative data analysis using thematic analysis techniques	Gardening activities can improve science process skills in the Kindergarten Lab. UPI. Gardening also contributes to children's physical-motor, language, cognitive, social-emotional and moral-religious development (Mirawati & Nugraha, 2017).

Discussion

Early childhood is essential for children's cognitive, psychomotor, social and emotional development. Therefore, there is a need for innovation in children's learning by directing learning activities that stimulate children's creativity and imagination. Some programs that can be carried out in the early childhood learning process are agricultural or gardening activities, which have many benefits for developing children's intelligence and emotions. The benefits of gardening activities or other agricultural activities in early childhood can be seen in the following explanation:

4.1. Increasing young children's knowledge and love for agricultural activities

Agriculture-based learning in early childhood can become a habit in children regarding farming activities (Rymanowicz et al., 2020). This agricultural-based program can be made part of the early childhood education curriculum so that it can be implemented more intensively so that children of this age are accustomed to carrying out agricultural activities, namely outdoors. Agricultural activities, especially outdoor ones, can give children the experience of getting to know their surroundings and becoming more environmentally friendly (Chawla, 1998). The introduction to agriculture given to elementary school students can also increase children's liking for agriculture and their desire to work in the agricultural sector.

The learning materials that can be delivered are simple activities such as explanations using children's language about plants, flowers, fruit or vegetables. Then, you can also carry out gardening activities that do not burden children, such as planting flowers, picking fruit, and eating agricultural products. This activity will provide more significant opportunities for children to explore the origins of food, gardening and nature (Rymanowicz et al., 2020).

4.2. Improve children's naturalistic intelligence

Naturalistic intelligence is a form of intelligence to love the environment and fellow living things. In addition, natural intelligence is also related to the capacity to recognise and classify certain features in the surrounding physical environment, such as animals, plants and weather conditions. Agriculture-based activities can increase naturalistic intelligence (Pratiwindya, 2018).

According to Rosenow (2008), when children explore the environment, they also develop new knowledge and relate it to learning that children already know. This agricultural activity

allows children to be directly involved in growing plants, which will become the food source they eat later.

The study shows that hydroponic gardening activities can improve children's naturalistic intelligence compared to kindergarten children who do not do hydroponic gardening activities (Pratiwindya, 2018). In addition, parental involvement in children's gardening activities also affects children's naturalistic intelligence. Children their parents accompany in gardening activities will have better natural intelligence than children who do gardening activities but are not accompanied by their parents (Faridy & Rohendi, 2020; Pratiwindya, 2018).

4.3. Promoting healthful foods to young children

Some agricultural activities aim primarily to improve health, increase children's willingness to try new foods and increase fruit and vegetable consumption (Izumi et al., 2015; Namenek Brouwer & Benjamin Neelon, 2013). Research by Taniguchi explains that agricultural activities can significantly increase the intake of vegetables such as chayote, beans, and tomatoes (Taniguchi et al., 2022). Other researchers also explained that gardening influences vegetable consumption (Farfan-Ramirez et al., 2011) because farming activities can increase children's willingness to try new foods (Izumi et al., 2015).

4.4. Nature-friendly attitude

Gardening activities can foster children's curiosity and make observations naturally. Children like this activity because it is fun for them to solve problems and answer their questions with fun activities (Eriksen & Frandsen, 2018). Kim et al. (2020) explain that gardening activities as a curriculum will provide opportunities to develop a scientific nature and curiosity about nature. Children will also realise the importance of protecting wildlife through planting experiences. They will be more enthusiastic about caring for and watering plants (Kim et al., 2020) to develop a sense of environmental concern (Chawla, 1998).

4.5. Cognitive intelligence

Another benefit of gardening for children is that it improves children's memory and focus. Children have a tendency to prefer studying outdoors, and children who like nature are better able to focus and can improve cognitive skills. Gardening activities, which are pretty complex for early childhood, require children to focus and be calm (Klemmer et al., 2005; Smith & Motsenbocker, 2005).

Conclusion

Early childhood learning programs with an agricultural perspective can teach children the importance of agriculture and basic skills such as caring for, watering and planting plants. The literature reviewed from the scoping review found eight articles that had fulfilled their requirements using qualitative and quantitative or mixed methods. The types of journals produced are primarily children's education journals, environmental education for children, and journals about nutrition for children. Research subjects also focus on children's intelligence, scientific and nature-friendly attitudes, cognitive, language and social skills that children can gain from gardening or agriculture-based learning. Data extraction and preparation of literature material benefit from agricultural-based learning programs. This benefit is the basis for the importance of agriculture-based education for kindergarten children. The benefits of agricultural-based learning activities in ECE include increasing young children's knowledge and love of agricultural activities, increasing children's naturalistic intelligence, promoting healthy foods to young children, nature-friendly attitude, and cognitive intelligence.

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