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# Implementation of Scientific Approach-Based Learning with Digital Media in Early Childhood Education

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## ABSTRACT

This study aims to analyze the implementation of learning with a *scientific approach* in Surabaya kindergartens, focusing on integrating digital media to enhance the learning experience. Using a qualitative case study design, the research examines interactions between educators and children through in-depth interviews, participatory observations, and document analysis, with data validity ensured via triangulation. Findings reveal that the *scientific* approach-covering five stages: observing, questioning, gathering information, associating, and communicating-significantly supports cognitive, social, and emotional development. The integration of digital media enriches observation and exploration, promotes active participation, and stimulates critical thinking. Play-based activities, supported by digital tools, foster knowledge association and effective communication among children. The discussion highlights the importance of educator facilitation in creating meaningful, interactive learning environments tailored to developmental stages. The study concludes that combining the *scientific approach* with digital media increases engagement, deepens understanding, and equips children with essential 21st-century skills, with implications for curriculum design in early childhood education.



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## 1. INTRODUCTION

The importance of Early Childhood Education requires ECE educators to be professionals. Professional in this case someone who is educated, dedicated to their work, and has basic skills in accordance with their profession (Erdiyanti & Syukri, 2021). However, in reality, many ECE educators still face urgent challenges such as limited mastery of 21st-century learning approaches, lack of integration of digital media in learning, and low ability to implement the scientific approach effectively. These issues have implications for the quality of stimulation provided to children, which may not optimally support their holistic development. Therefore, this study is urgent to conduct as it aims to address these gaps by analysing how the scientific approach can be implemented in ECE through the integration of digital media, so that the objectives of early childhood education can be achieved more effectively and in accordance with current educational demands. Thus, educators in professionals need to pay attention to their students considering that childhood is a very important stage of life in terms of physical, intellectual, emotional, and social development of children. ECE is very important to prepare children to enter primary school by developing various potentials (Needham & Ülküer, 2020). According to Xu (2022), the reasons for the importance of ECE are: 1) early childhood is a sensitive period that has physical, motor, and cognitive development; 2) the degree of variability in adult intelligence, 50% has occurred during early childhood (first 4 years), the next 30% at age 8 and 20% after reaching age 18; 3) early childhood is during the formation of the initial foundation for the growth and development of children. Thus, ECE helps children develop the skills necessary to face challenges in social and academic environments through planned activities. Planned activities in ECE mean designing activities that are appropriate to the stages of child development, such as cognitive, social, emotional, and physical (Talango, 2020). This ensures that each activity supports children's progress holistically and is appropriate to their needs at each stage of the early childhood development aspect.

Each aspect will go through stages that children will go through. Children experience tremendous growth and development at a young age, including physical motor, cognitive, emotional, psychosocial, and language development (Talango, 2020; Sopiah, 2022). The process of development is related to the improvement or refinement of the functions of the body's abilities or skills. All of these aspects are things that can affect a child's social and psychological functioning in life (Talango, 2020). Developmental aspects are important in the learning process. In conducting learning, educators usually focus on learning topics to improve children's developmental aspects (Rahmawati & Nazarullail, 2020). The five aspects are a unity that cannot stand alone and have an interrelationship. Realizing the importance of development in early childhood, proper stimulation is needed from an early age. Providing this stimulation can be done by educators optimally in all aspects of child development (Krisnani & Pamungkas, 2022).

In stimulating aspects of early childhood development, it must be adapted to the age and stage of development because each child, although of the same age, sometimes has a different stage of development. To stimulate all aspects of early childhood development cannot be separated from learning media because for early childhood learning is done through play. The development of children's developmental aspects will be optimal if the educational process provides opportunities for children to experience directly in the learning process. Children's play activities optimize the use of Educational Game Tools (EGT) and combine some of the EGT owned so that children play more fun and process naturally (Yusri et al., 2025). The play environment used by children is in accordance with their age needs so that any learning that is obtained does not burden children (Kamil & Asriyani, 2023). The

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world of children is a world of play, all children love to play, most of their lives are spent playing. When playing children also learn various things. This can be used as a very appropriate learning method for early childhood, namely learning by playing through a variety of simple games (Wardhani & Nduru, 2023).

Simple play activities include puzzle play, drawing, role play, block building, and water play. These activities can stimulate children's creativity, motor skills, and social interaction (Hikmawati et al., 2022). The child can finger paint a sprig of sunflower with colour according to the original without guidance. Some types of traditional games that can be applied to early childhood are playing and singing, playing and thinking, and playing and fighting (Cendana & Suryana, 2022). The toys available at the worship centre include pictures of mosques, pictures of Kabah, pictures of people praying, pictures of people doing ablutions, pictures of Hijaiyah letters, calligraphy, hijaiyah trees, various puzzles and many others, in the nature centre namely: finger painting, collage, play doh, painting, fishing, cutting, frying, sifting, mixing colour, putting seeds in containers and much more. The role play centre is a centre where children are taught about micro roles such as professions as police, soldiers, firefighters, educators, sellers, cashiers, doctors, nurses and so on. Children play the role of a farmer, mountain climber, educator, singer, become whatever the child imagines (Hasanah, 2020). Educational game tools in the form of Lego are very potential game tools to increase children's interest in creativity or experimentation (Yuniasih & Watini, 2022). Early childhood in general likes this game tool because with Lego children can form certain EGT or buildings according to their imagination, children can also find their own concepts if they arrange Lego so that various children's potential will develop optimally.

The play activities that have been described previously are related to the scientific approach. Scientific approach with play activities for children aged 5-6 years in each centre, namely in the beam centre, children build houses from blocks (Rofiah et al., 2021). In this activity, children make observations, get information about building houses and the functions of house parts, associate and communicate with others. Role play centre, role play about the activities of sellers and buyers or eating at restaurants. Children build skills through a scientific approach by doing, not dictating or memorizing. Natural materials centre, play about the absorption of food juice by plants. During the activity, children make observations, get information about how plants absorb food from the soil, associate and communicate to others. Art centre, children match waterfalls, stick waterfalls, draw recreation areas, in the above activities, namely when children match waterfalls and stick and draw recreation areas through the scientific process, children carry out observing, questioning, gathering information from the materials used, associating and communicating by engaging in discussions about recreation areas. Learning with a scientific approach is applied in ECE institutions to continue the learning behavior that children already have. This is important to help children understand the world around them. The process of collecting, processing information and communicating what they know is a step in developing critical thinking (Pujiana et al., 2024). Thus, learning stimulation with a scientific approach in ECE includes observing, questioning, exploring, associating and communicating. Activities can include play while learning, basic science experiments, and group projects to encourage children's curiosity. The goal is to develop critical thinking and problem-solving skills early on. Learning stimulation applied through the scientific approach in ECE can be strengthened by the role of digital technology. Both complement each other to create an interactive learning environment that supports children's comprehensive development. The use of technology in early childhood learning not only increases children's engagement, but also facilitates the development of skills required for today's digital era. Technology used wisely and

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appropriately will provide many benefits and can even help provide stimulation and fun learning media for children (Nurjanah & Mukarromah, 2021).

The current educational process utilizes digital technology that has developed a lot in the world of education, so technology is utilized for the benefit of improving the service and quality of education, especially for early childhood (Cahyati et al., 2022). Education in the digital era is a learning and teaching process that aggressively utilizes digital technology in the learning process or known as a cyber system (Novitasari & Fauziddin, 2022). Digital Education is a concept/way of providing lessons to students using multimedia media, including using the help of computers/notebooks, smartphones, videos, audio and visuals. This system makes learning take place consistently without being limited by time and space. Technology can impact children's development in the areas of social emotional, physical, cognitive, language, math, and literacy. Technology has provided new opportunities for social-emotional development in the way young students learn, communicate and interact with others. Bedford et al. (2016) recent study has begun to provide insights into how technology can have a positive effect on early childhood physical development. Technology can also affect children's cognitive development in terms of memory, concentration, information seeking and thinking. Technology can be used to communicate in a variety of ways including text, video, pictures, symbols (emojis), and sound. Digital tools allow children to be creative in conveying messages if they cannot read and write yet. By using digital tools, educators can provide opportunities for all students to communicate. The impact of technology use on math development in early childhood has been widely researched. Students understand math concepts better when taught with digital games than students taught in a conventional way and they score slightly better on assessments. The students also reported that they were motivated and enjoyed learning math. Recent research has begun to provide insights into how technology can positively and negatively affect literacy development in early childhood (Muis et al., 2015). Touchscreen tablets are like books and in the form of whiteboards, encourage early literacy skills (Neumann & Neumann, 2015). Thus, the use of digital media encourages children to develop previously owned knowledge and is expected to increase curiosity about the material presented by the educator.

Many educators still have difficulty understanding and implementing the scientific approach such as observing, questioning, collecting data, processing data, and presenting data in the learning process. According to Masithoh (2018), in general educators have understood the scientific approach, but have not understood how to implement this approach in learning in the learning implementation plan or lesson plan made by educators has not described learning activities oriented to the scientific approach. The implementation of learning implementation carried out by educators does not reflect the application of the scientific approach (Krenn et al., 2022). This can hinder teaching effectiveness, as this approach is designed to increase active student engagement and deep dive into concepts. This misunderstanding is often due to a lack of adequate training and resources, so educators feel trapped in traditional methods that no longer fit the needs of the 21$^{st}$ Century. The scientific approach in the learning process in the 21$^{st}$ century is intended to provide meaning for students, for example in the observing step which prioritizes meaningfulness in the continuity of the learning process. In this observing stage, of course, it has advantages, for example in presenting real objects, students feel challenged and students' curiosity. In this scientific approach, students will develop their skills such as critical thinking skills and speaking skills (Pribadi et al., 2022). Field research findings in the science learning process conducted at Artanita Al-Khoeriyah Kindergarten and Math'launnajah Kindergarten in Tasikmalaya City, schools have implemented scientific learning that requires children to

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participate in taking an active role in the educational process. However, this is not currently happening adequately, especially in the part of using children's worksheets. According to the educator, this is because the educator's science teaching method is less interesting. Educators are less imaginative in constructing science activities which is one of the obstacles in the implementation of learning (Islamiati et al., 2021).

Learning with a scientific approach in ECE does not always have to involve complex experiments or experiments. Instead, simple activities that stimulate the aspects of observing, questioning, collecting data, processing data, and presenting data are also very effective. For example, when children play in the park, they can observe different types of plants and animals, then ask questions about things that interest them. Educators can direct the discussion to collect information, such as recording the types of plants found. In this way, children learn in a fun and natural way, and develop curiosity and critical thinking skills early on. The implementation of learning carried out by ECE educators in Koboruno village is to use the steps of the scientific approach so that students can play an active role in learning (Mirnawati et al., 2021). For example, the scientific approach through flower planting activities. In this activity the five children have observed the flower plants, then at the questioning stage 1 child asked the educator questions related to the activities they observed. Then at the trying stage the five children have also carried out the activity of planting flowers. At the stage of reasoning there was 1 child who conveyed his experience related to flower planting activities. Then at the communicating stage, 3 children can talk about having previously seen flower plants, and relate the flower plants they have just seen.

Researchers have carried out learning activities using a scientific approach, namely learning using five understanding such as observing, questioning, gathering information/trying, reasoning/associating, making conclusions and communicating, with the following explanation (Ismawati & Hanifah, 2020). Although the research has shown that the application of the scientific approach can develop children's cognitive and social skills effectively, the study did not specifically examine how digital media could be integrated to strengthen each stage of the approach. In addition, their research was limited to a single institution and did not explore variations in educator competence or learning environment that might influence implementation quality. This leaves a gap in understanding how the scientific approach can be optimized in diverse early childhood education contexts, particularly in the digital era.

The novelty of the present study lies in combining the scientific approach with the use of digital media in multiple ECE institutions, aiming to provide a more interactive, engaging, and contextually relevant learning experience that aligns with 21st-century skill development. Observing in observing activities researchers invite children to observe by looking at the process of sinking, floating, floating eggs that are practiced. In questioning activities, researchers have carried out questioning activities well and the competencies expected in this questioning activity are developing creativity, curiosity, have been achieved in accordance with the explanation above so that the application of the second has been carried out with good results, the children are very enthusiastic in carrying out these questioning activities. From the results of this study, it can be seen that when children try their own activities to put eggs into each different glass so that the application of the third is well achieved and the expected competencies in this information gathering activity are to develop a conscientious, polite, respectful attitude, respect for the environment, and the ability to collect information. The competencies expected in this information gathering activity are developing a conscientious, polite attitude, respecting the opinions of others, being able to communicate, applying the ability to gather information through various means learned.

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Researchers have carried out associating activities during classroom learning. The competencies developed in the process of associating/processing information are developing honesty, thoroughness, discipline, obeying rules, hard work, being able to think creatively and being able to conclude the activities that have been carried out. The researcher has carried out communicating activities well as seen from the research above that the children are very enthusiastic and excited in carrying out communicating activities. The competencies expected in this activity are developing honesty, thoroughness, tolerance, systematic thinking skills, expressing opinions briefly and clearly, and developing good and correct language skills.

Research on the implementation of learning with a scientific approach in ECE is expected to provide in-depth insight into the effectiveness of this method in improving the quality of children's education. The urgency of this research lies in the need to adapt learning methods to suit children's developmental characteristics, given that early childhood is a crucial period in the formation of basic knowledge and skills. The purpose of this study is to evaluate how the scientific approach can be integrated into the early childhood development curriculum, as well as to identify challenges and opportunities that arise during the implementation process, so as to provide recommendations for educators and managers of early childhood development institutions in an effort to improve children's learning experience.

## 2. METHODS

This research method uses a qualitative approach with a case study to analyse the implementation of learning with a scientific approach assisted by digital media in Surabaya kindergartens. Case studies focus on one particular object that is raised as a case to be studied in depth so as to investigate the reality behind the phenomenon (Assyakurrohim et al., 2022). This research focuses on subjects consisting of educators and students at the institution, who were selected to gain a holistic perspective of the learning process. The location of the research was a kindergarten in Surabaya, which represents early childhood education institutions in the region.

Data sources in this study were obtained through three main techniques in-depth interviews, participatory observation, and document analysis. In-depth interviews were conducted with educators to obtain information about their experiences and views on the scientific approach. Participatory observation was conducted in the classroom to directly observe the implementation of learning, while relevant documents, such as curriculum and lesson plans, were analysis to complement the data obtained. To ensure data validity, a triangulation technique was used, combining results from interviews, observations and document analysis. Data analysis was conducted by organizing the data, identifying key themes, and drawing conclusions that reflect the effectiveness of the scientific approach. This process allowed the researcher to delve deeper into learning practices and provide a comprehensive picture of the impact on children's development in Surabaya kindergartens.

## 3. RESULTS AND DISCUSSION

The implementation of learning with a scientific approach by educators starts from preparation to the end of the activity. In the early stages, educators invite children to discuss and provide apperceptions that are relevant to the learning topics to be carried out. Educators direct children to learn through exploration and direct experience, using facilities and infrastructure available at school. Methods applied in scientific learning include observing, questioning, gathering information, associating and communicating. Educators apply this approach by actively involving children in each step, for example by asking them to observe

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certain phenomena, discussing the results of observations, and drawing conclusions together. Based on an interview with Mrs. Educator, she stated "The methods I use are appropriate scientific methods, such as observing, questioning, gathering information, associating and communicating". From the interview, it can be seen that the application of the scientific approach in classes A and B is going well, because most children show the ability to think critically and independently in learning.

Not only that, through observations researchers found educators inviting students to discuss activities related to the theme for Kindergarten A / Kindergarten B. So, so that children are easy to interact to discuss with their friends, a group or seat is formed in a circle and close together. After the opening activity, it is continued with the core activity, recalling and the last is the closing activity. In this activity, a scientific approach is seen which includes observing, questioning, gathering information, associating and communicating. The following is an explanation of the implementation of the scientific approach in Surabaya Kindergarten in figures 1, 2, 3, and 4.

### 3.1. Water/use of water theme for kindergarten A

The lesson on the theme of water/use of water theme for kindergarten A can be seen in **Figure 1**.

**Figure 1.** Learning in kindergarten 1.

Based on **Figure 1**, can be describe: 1) Observing, children are invited to watch a video related to the use of water using a laptop. Children are very enthusiastic to see and answer or say related to the content of the video. All children are compact to answer, for example in the video it appears that someone is washing the car and cooking, then the child immediately says, "washing the car, cooking" said the children. 2) Asking, educators are seen providing stimuli related to the use of water where children can answer questions from educators. 3) Collecting information, children are invited to conduct a simple science experiment "rainbow rain" with tools and materials, water, oil, clear glass, and food colouring with different colour. 4) Associating, where children are seen discussing with their friends and some also ask the educator, why it can happen. 5) Communicating, children are seen conveying the results of their discussions to the educator and the educator also shows videos related to simple science events "rainbow rain" as a form of feedback in this activity in **Figure 1**.

### 3.2. Theme/Subtheme: My homeland/Indonesian leaders and culture for kindergarten A and kindergarten B

The practice with the theme my homeland and subtheme Indonesian leaders and culture for kindergarten A and kindergarten B can be seen in **Figure 2**.

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**Figure 2.** Learning in kindergarten 2.

Based on **Figure 2**, can be describe: 1) Observing, children are very enthusiastic about learning videos through laptops provided by educators as an initial step in learning before entering core activities, 2) Questioning, there were several children who asked questions which the educator then gave feedback from the questions asked by the children who asked after watching the learning video together. 3) Collecting information, children are invited to make Lontong Balap as a form of traditional culinary that is closely related to Indonesian culture (Surabaya city symbol). Next, the activity of stamping the EGT of a banyan tree that contains elements of Pancasila which is a symbol of the third precept of Indonesian unity. Next, making Udeng Cak Surabaya from soursop leaves. So, from this series of activities in the core activities there are 3 types of activities to introduce the homeland/leader and Indonesian culture in accordance with the theme. 4) Associating, children are asked how they feel during today's learning activities, and discuss what activities today. 5) Communicating, children answer questions submitted by the educator regarding the lessons learned from this activity in **Figure 2**.

### 3.3. Theme/Sub Theme: Universe/Sky Objects/Rainbow for kindergarten B

The lesson on the theme/sub theme universe/sky objects/rainbow for kindergarten B can be seen in **Figure 3**.

**Figure 3.** Learning in kindergarten 3.

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Based on **Figure 3**, can be describe: 1) Observing, educators provide stimulus in the form of direct practice in front of children and provide learning videos through laptops related to rainbow events. 2) Asking, when the educator provides a stimulus to children, the educator also provides several questions that are tucked away when providing a stimulus. 3) Gathering Information (Trying) in which the educator shows various pictures of celestial objects which are all creations of God that must be grateful and invited to count the number of pictures of these celestial objects. For an example "pictures of clouds, how many pictures of clouds in one EGT?". 4) Associating, children are invited to associate natural phenomena with their daily experiences. They learn about the process of rainbows by using simple materials, such as cooking oil, water, and food colouring, stirring tools and clear glasses. Through this activity, they not only understand the concept of science. But also develop critical thinking and collaboration skills when discussing what they see and feel. In this way, learning becomes more fun and meaningful. 5) Communicating sees children discussing in groups about what happened and why the rainbow appeared. Children share their opinions and describe their experiences, practicing speaking skills in front of friends. Through this activity, they learn to convey their ideas and observations clearly, improving their self-confidence and social skills. This activity not only enriches science knowledge, but also strengthens communication skills, which are important at an early age in **Figure 3**.

### 3.4. Theme/Sub Theme: Me/Self (Body Members) for kindergarten B

The lesson on the theme of me and sub theme self (body members) for kindergarten B can be seen in **Figure 4**.

**Figure 4.** Learning in kindergarten 4.

Based on **Figure 4**, can be describe: 1) Observing, an educator provides a stimulus of pictures of girls and boys. The educator also tells his students 1 girl and 1 boy to be observed by other children so that they can know the differences between men and women. 2) Questioning, then the children answer the questions asked by the educator what are the

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differences between women and men, of course the other children answer in terms of appearance, women wear skirts and men wear pants, in terms of hair, men have short hair, women have long hair in pigtails, and so on. The educator also gave some questions related to introducing body members, there are head, shoulders, hands, feet which in the end ended with gymnastic activities where the hands while holding body members. 3) In the information gathering activity, the educator divides into 2 groups where group 1, counts the number of body members and colour them, while group 2, is a language group, where the educator provides several alphabets/letters which later the children string the letters into a word which the word refers to body members. 4) Associating, children connect the knowledge they have related to body members, by counting the number of pictures of body members, for example pictures of eyes, of which there are 2 eyes owned by humans, 1 nose, and so on. 5) Communicating, children interact with educators and discuss what activities have been carried out, and share opinions between educators with their students and children with one another (between friends) in **Figure 4**.

Daily learning implementation plan or daily lesson plan, educators develop lesson plans to support the development of children's independence. This planning is adjusted to the existing curriculum, then the educator compiles lesson plans based on the themes and subthemes to be taught. In the lesson plan, there are important indicators consisting of the annual program, semester program, and weekly learning implementation plan or weekly lesson plan. In Kindergarten Surabaya, these indicators include program identity, learning materials, and tools and materials needed. Daily lesson plan also has main indicators that include initial, core, and closing activities. Of the five components, the program identity and daily lesson plan indicators have met the learning planning standards. Meanwhile, the initial and core activities are still in the standard category, but the closing activities have gone well. The lesson plans also include learning objectives.

The development of children's skills is carried out through routines that are carried out by habituation every day, while the indicators of tools and materials function as a complement in the teaching and learning process that is adjusted to the themes and subthemes. Examples of initial activities at Kindergarten Surabaya include reading prayers, short verses, the pillars of faith, the pillars of Islam, and the names of the Prophet and angels. For core activities, in Kindergarten Surabaya applies a scientific approach through five stages: observing, questioning, gathering information, associating, and communicating. In the closing activity, there is a discussion about the game that has been played and questions about children's feelings. In addition, educators inform activities for the next day, pray, read short verses, sing, and before going home, give games. Learning evaluation is done at the end of the session.

Based on the results of the interview analysis, the evaluation of scientific learning conducted by educators includes a systematic approach to assessing children's understanding and skills. Educators observe each stage of learning, from observing to communicating, which reflects children's active engagement. At the end of each session, the educator holds a discussion to assess the extent to which children can understand and apply the concepts that have been taught in today's activities. In the interview, the educator stated that she asks relevant questions to explore children's experiences during the activity, so as to identify each child's progress. In this way, the evaluation serves not only to assess the final outcome, but also to support children's critical thinking development, ensuring that each individual gets attention according to his or her ability.

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Evaluation is part of the learning component to determine the achievement of each lesson (Jatmiko et al., 2020). Previous studies have shown that evaluation in early childhood scientific learning is generally carried out through teacher observations and end-of-session discussions. However, these evaluations often focus only on final outcomes rather than monitoring the learning process in detail, which can lead to less comprehensive identification of children's skill development. Similarly, Zahro et al. (2024) emphasized evaluation indicators but did not address how digital tools could enhance the accuracy and efficiency of this process. This indicates a gap in the integration of digital media for real-time and process-oriented evaluation in early childhood education. In contrast, the present study not only applies the scientific approach but also embeds digital media into the evaluation process, enabling educators to capture children's learning progress more interactively and to provide immediate feedback aligned with 21st-century learning needs. The purpose of this evaluation is to find out the current state of schools implementing scientific learning compared to the past, and also the suitability with the ideal goals expected by the education office. The results of the evaluation are useful for decision-making, including to improve the program, refine activities/programs, stop an activity, or disseminate the ideas underlying the scientific learning program. The end result to be achieved in evaluating scientific learning is learning outcomes. From the observation of the student progress report book (Raport), it turns out that children can follow the learning well. Early childhood learning evaluation is the process of measuring and assessing something so that the objectives of the learning process are achieved. The indicators that must be present in the evaluation are formulate or determine activities, prepare assessment tools or techniques, establish assessment criteria, and determine value (Zahro et al., 2024).

Learning evaluation focuses on how the process takes place and the results obtained after the process. For process evaluation, we can see how students are during teaching and learning activities, we can judge from their interest, enthusiasm, interaction with each other and with groups, respect for their friends' opinions, and others. As for the evaluation of results, we can also see from what students have done, it can be from individual or group assignments, tests, the results of their work or can be asked questions at the end of teaching and learning activities.

The implementation of the scientific approach in early childhood is very important, because it can develop various aspects of child development. It is better to introduce children from birth or before entering school. This is a very important experience for children to understand the surrounding environment. Children's experience of collecting and processing information is the foundation of children learning to think scientifically. The implementation of the scientific approach in early childhood education is the introduction of scientific processes. This can be done by involving children directly in the learning process in early childhood education (Su & Yang, 2023). The implementation of scientific learning in ECE must pay attention to the characteristics and stages of cognitive development of early childhood, as well as each scope of child development aspects such as religious and moral values, socio-emotional, language, physical motor, cognitive, and art. Educators must be able to develop scientific learning in all aspects of development optimally according to the age of the child. The benefits of scientific learning include, among others, easier for children to accept, more meaningful to children, more fully accepted by children, more embedded into children's behaviour, reducing verbalism (avoiding educators to explain a lot verbally), easier to apply

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by children, children appreciate the abilities they get, children are more confident, children are more proud of the abilities they get, and the abilities they get are more permanent (McGregor et al., 2023).

The implementation of the scientific approach to ECE learning can be applied through a variety of interesting educational games that can stimulate spiritual and intellectual intelligence (Subki, 2024). The scientific approach to learning in ECE institutions is not defined as learning science alone but using scientific processes in learning activities. The scientific approach in early childhood makes the learning process more important than just the product. In the scientific approach, students can get information in understanding the material not only from the educator but can be from anywhere and anytime. The scientific approach in the independent curriculum is implemented in project activities such as observing, questioning, reasoning, associating, and communicating. The steps in the scientific approach are observing, questioning, trying/gathering information/experimenting, reasoning/associating/processing information, communicating, and communicating (Puspitasari, 2020). Stages in the application of the scientific approach include: 1) Observing activities are aimed at knowing objects in depth by using senses such as seeing, hearing, smelling, feeling, and touching. 2) Questioning activities, children also need to be encouraged to ask questions, both about objects that have been observed and other new things that children want to know. 3) Gathering information, children can be encouraged to conduct experiments with the help of books, videos, or pictures to get information and answer their questions. 4) Associating activities, children will obtain conclusions about the knowledge they learn from the scientific process by combining old knowledge with new knowledge they gain from all scientific stages, so that children get a better understanding of something. 5) Communicating activities, children are always eager to share information about what they have learned with others (Mlawski, 2021).

The implementation of the scientific approach in learning will take place well if educators design daily learning activities that contain activities that demonstrate the implementation of the scientific approach. Educators need to design daily learning activities that can involve children in every activity both indoors and outdoors (Munastiwi, 2016). The scientific approach is part of a pedagogical approach that applies the scientific method in classroom learning. The understanding of the application of the scientific approach does not only focus on how to develop students' competence in making observations or experiments, but how to develop students' knowledge and thinking skills so that they can support creative activities in innovating or working. According to the Scientific Policy Forum magazine published in America, as quoted by Wikipedia, the scientific approach includes learning strategies that integrate students in the thinking process and the use of scientifically tested methods with varied abilities. In addition, the application of the scientific approach helps educators identify differences in student abilities. There are three main principles in using the scientific approach. First, active student learning in this case including inquiry-based learning or research-based learning, cooperative learning or group learning, and student-centre learning, the existence of assessment, namely measuring student learning progress compared to the target achievement of learning objectives. Second, diversity meaning that the scientific approach develops a diversity approach. This approach carries the consequences of unique students, unique student groups, including the uniqueness of competencies, materials, instructors, teaching approaches and methods, and context. Third, the scientific method

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which is a technique for formulating questions and answering them through observation and carrying out experiments (Khaerani et al., 2024).

## 4. CONCLUSION

Based on the results and discussion, learning with a scientific approach assisted by digital media in Surabaya Kindergarten includes the importance of the role of educators in facilitating the learning and playing process in accordance with the level of development of children's age, namely: 1) Observing various objects, images, or other media so that they can understand the concepts conveyed, 2) Motivating children to ask questions about what was previously observed, 3) Children are invited to gather information through various media will enrich their knowledge, 4) Play activities should also be directed to encourage knowledge association, and 5) Children can communicate their ideas by showing their work. By providing opportunities to explore and interact actively, learning with a scientific approach assisted by digital media that is implemented effectively is expected to have an impact on children's knowledge according to their age development stage. Future research is expected to develop innovative learning models that can foster children's reasoning based on the scientific approach.

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## 6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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