Volume 9 Issue 6 (2025) Pages 2880-2892
Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini
ISSN: 2549-8959 (Online)

Fostering Creativity Through Digital Art Activities in ScratchJr for Kindergarten in Indonesia

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DOI: 10.31004/obsesi.v9i6.7181

Abstract

This study aims to describe the process of digital art activities through ScratchJr to develop creativity in early childhood. This study uses a qualitative approach with children aged 5-6 years at Nur Hidayah IT Kindergarten Surakarta. Data collection was carried out through documentation, observation, and interviews. Data analysis uses the qualitative descriptive model of Miles and Huberman, which includes data reduction, data presentation, and conclusion drawing or verification. The results of this study suggest that digital art activities, such as those facilitated by ScratchJr, can encourage children to think imaginatively through a simple coding process that is both creative and fun, leveraging technology. Based on the results of interviews with children's teachers who are allowed to learn using technology more enthusiastically, imagination games such as ScratchJr can provide opportunities to think creatively, and children can freely express themselves with their creativity to make animations. Digital art activities through ScratchJr are recommended for early childhood learning, so that children can gain learning experiences using digital technology and stimulate creativity as a provision for the future.

Keywords: *art activities, creativity, digital, early childhood, ScratchJr.*

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Received 26 June 2025, Accepted 16 November 2025, Published 16 November 2025

Introduction

The development of technology in digital form has both challenges and opportunities. Whether children are aware of it or not, children use digital technology media as a daily consumption activity. Therefore, there is a need for digital education as a provision for children to face the world. One of the efforts to realise digital education is digital art. Digital art is a variety of art whose manufacturing process uses technology media. Digital art invites children to get to know technological developments directly. This will help children adapt to the times. Digital art offers several advantages compared to traditional art forms (Sungkar, 2023). Digital art offers an array of unlimited tools for experimentation. Like learning art in general, learning digital art from an early age will help children increase their creativity. Digital art can bring children's creativity to a higher level (Anggraeni, 2023). Unlike traditional art, digital art is not limited to the availability of paper and colored paint in making art. That way, children can make various arts according to their imagination and creativity. In addition, digital artwork allows for easy editing, error correction, and exploration of various artistic styles (Nurhasanah, 2022). The benefit of learning digital art for the future is that it provides better career and job security. Because the need for workers in the field of digital art continues to grow (Munawar, 2020; Quinn et al., 2023). Children who have basic digital

DOI: 10.31004/obsesi.v9i6.7181
art skills develop careers as designers, illustrators, logo makers, and digital agencies. Children can also become digital game developers.

Digital art can be in the form of graphic design, photography, digital painting, digital illustration, or digital animation (Umi Rahmawati et al., 2023). This research focuses on discussing digital art in the form of digital animation for early childhood through ScratchJr. The most effective learning in early childhood is when the child can produce meaningful work (Metin, 2020; Silvis et al., 2022). ScratchJr is one of the media for children to make artwork in the form of digital animations. ScratchJr is a graphic programming tool for kindergarten through second-grade elementary students (Angeli & Valanides, 2020; Delacruz, 2020). ScratchJr is a visual programming language application designed for children aged 5-7 years in the form of simple coding activities to create digital animation projects (Govind et al., 2020). ScratchJr can create a visual programming environment that allows children to create animations independently using programming blocks, called the coding process (Clarke-Midura et al., 2023). The child creates code in an object called a sprite in the form of a character or other object. ScratchJr comes with a sprite library, and sprites can be edited or new ones created using the paint editor. The paint editor allows children to paint in different colours, with different thicknesses. Children can also draw shapes and remove paint.

In a global context, a number of studies have shown that the integration of coding in early childhood learning significantly improves systematic and flexible thinking skills. Research on ScratchJr related to early childhood cognitive development in Indonesia has been conducted. Previous research has shown that there is an influence of the game ScratchJr on the computational thinking ability of children aged 5-6 years (Hardiyanti et al., 2023). Other studies have shown that ScratchJr is effective in stimulating problem-solving and critical thinking abilities in early childhood (Sipahutar et al., 2023). Another study using a research and development approach model of the development of an app-based imaginary game through ScratchJr to improve the critical thinking skills of children aged 5-6 years indicates that the application of Scratch Jr-based imaginary games can be an effective tool to stimulate early childhood critical thinking skills (Kartika et al., 2024). Recent research confirms that coding games can systematically improve children's problem-solving skills while strengthening Islamic values such as cooperation and perseverance in the learning process (Ubaidillah et al., 2025). Although many studies related to ScratchJr have been conducted in Indonesia, there has been no research that explores coding activities in more depth when children use ScratchJr to create digital art projects in the form of animations. To address this gap, this research employs a qualitative case study approach that explores children's coding activities when creating digital art project works in the form of animation using ScratchJr. Kids connect simple graphics programming blocks to help characters move, jump, dance, and sing. These activities help children master coding logic and encourage children's creativity to program their own animated stories and interactive games. However, the majority of previous studies have been conducted in a Western educational environment that is relatively neutral from cultural and religious values, so there has not been much research in the context of educational institutions based on Islamic values. This research was conducted at IT (Islam Terpadu) Nur Hidayah Kindergarten Surakarta, a private school based on the Islamic religion.

The challenges faced by educators are not only limited to developing learning methods that are able to stimulate children's creativity, but also lead to a deep understanding of the role of learning media, especially technology-based ones. Early childhood with high creativity is characterised by great curiosity, strong imagination, and the ability to produce works. The lack of digital-based innovation in early childhood learning in Indonesia contributes to the low level of children's creativity. The low level of early childhood creativity in Indonesia, which is associated with a lack of digital-based innovation in learning, is supported by several studies. Research highlights that the lack of use of electronic-based learning media has an impact on children's creativity (Rahmawati & Tirtayani, 2021). The results of the study show the significant contribution of technology-based learning media in stimulating children's creativity through visual elements, interactivity, and personal involvement. The implication of this research is the importance of developing a curriculum that integrates technology, as well as the role of teachers in supporting the

DOI: 10.31004/obsesi.v9i6.7181
use of learning media. The findings of the study highlight that the wise use of technology-based learning media can form a strong foundation for the development of early childhood creativity (Asmara et al., 2023). Other research shows that teachers' low understanding of using digital media, lack of supporting facilities, and lack of support from educational institutions are factors that cause the lack of use of digital media for early childhood learning (Lukman, 2023). This has an impact on the lack of stimulation of children's creativity, which should be improved through innovative learning media and in accordance with the characteristics of children's development. Other research shows that the low development of children's creativity in digital works is caused by teachers' lack of understanding in using computers or laptops. As a result, teachers have not been able to provide creative and fun learning media for early childhood (Karmila, 2024). Improving the quality of teachers, providing adequate facilities, and support from educational institutions are needed to encourage optimal use of digital media and increase children's creativity.

In the digital era, every school is required to prepare human resources to master technology. Learning in the digital era must optimise the use of technology. Moreover, kindergarten, which will form the basic foundation of school children, must conform to the times must be considered in detail. By presenting digital art, schools will be able to keep up with the times. This will show the school's commitment to providing the latest and up-to-date curriculum. However, the application of digital art in kindergartens in Surakarta City is still not optimal, causing problems. One of the problems is that children's creativity is still low. This problem is because teachers in early childhood education have limited abilities in applying digital art, especially by utilising digital technology media in learning. The use of appropriate media greatly affects the learning process. The selection of technological tools and interactive media must be adjusted to the child's developmental age, readiness, and individual interests, which will determine how effectively technology is used as a learning medium. Therefore, early childhood learning requires alternative media that are by the stage of development and able to attract children's attention so that a pleasant atmosphere is created in learning.

Technological developments are a challenge for teachers. The urgency of this research is the importance of fostering early childhood creativity through digital art activities, because it will have an impact on children's abilities when facing the challenges of the increasingly digitised industrial development era 4.0. If children are not introduced to learning using digital technology media from an early age, it will have an impact on adapting difficulties to compete in the world of work that demands children with a strong understanding and digital technology skills. To overcome this, activities are planned that can stimulate children's creativity through the creation of digital works. The purpose of this creativity stimulation is to improve the quality of education and the learning process, so that children can solve problems, generate ideas and ideas, make decisions, and develop their curiosity and talents, especially at Nur Hidayah IT Kindergarten Surakarta. The solution that will be developed from this problem is digital art activities through ScratchJr. This research is based on the low use of learning media that can increase creativity skills in early childhood. It is still found that the use of teaching media is less varied in developing early childhood creativity, so this study aims to describe digital art activities through ScratchJr that are effective in fostering creativity. The results of this study are expected to provide an overview for teachers on how to manage art learning through digital art that is effective, efficient, and fun to fostering creativity in early childhood.

Methodology

This study uses a qualitative descriptive approach by collecting and analysing data through direct observation. The researcher chose the case study to explore and examine the information in more depth. Data collection was carried out using observation, interviews, and documentation. The data collected was from children's digital art activities using ScratchJr to create simple animations. Researchers used documentation, observations, and interviews to collect data. The researcher conducted interviews with teachers and collected document data in the form of written documents, photos or images, and videos during observation. The data is analysed qualitatively. The data validity techniques used in this study are source triangulation, method triangulation, and theoretical

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triangulation. Data analysis was carried out using interactive analysis techniques, which include the process of data collection, data condensation, data display, and conclusion drawn (Miles et al., 2020). The collected data is then deduced, coded, divided by theme, and classified, while the final stage is conclusion drawing and verification. The results of the interpretation of the data that have been collected are concluded and validated based on data extracted from field reports or existing documents. Data verification is carried out by describing findings based on arguments and reviews of promoters and colleagues to find consensus among informants to ensure accurate, valid, reliable, and meaningful results. Data analysis techniques are illustrated in Figure 1.

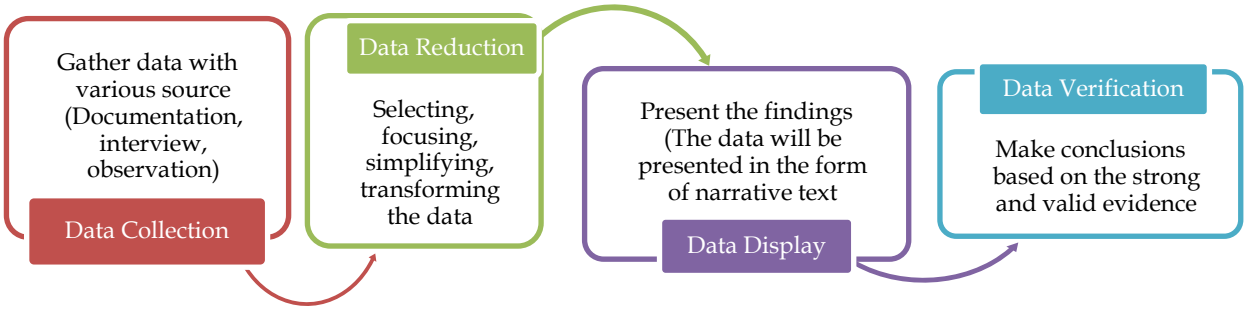

Figure 1. Data Analysis Technique

The data collection techniques in this study include direct observation of the digital art activities of ScratchJr process at Nur Hidayah IT Kindergarten Surakarta for two months with 13 research subjects and an in-depth interview with one teacher who teaches digital art through ScratchJr and the principal to identify the challenges faced in implementing the practice of digital art activities of ScratchJr. The study used unstructured interviews, which are free interviews where the researcher does not follow the guidelines of planned and systematic interviews. In addition, a documentation study was carried out to obtain relevant evidence of written information to complete the research data. The process of data collection and analysis in qualitative research is interrelated. Researchers continually refine their thinking as they gather data. To reinforce the findings of this study, the researchers supplemented the data with relevant documents to support the research. Data from observations, documentation, and interviews were analysed using descriptive analysis techniques. After completing the data collection process, all observation results and documentation of children's ScratchJr work are thoroughly analysed to reveal the results of the research. The last stage is the drawing of conclusions from the results of the analysis that using sentences that are easy to observe.

The data of this study were collected from 13 children aged 5-6 years at the IT Nur Hidayah Kindergarten, Surakarta City, Indonesia. All children have the same knowledge background, socioeconomic status, and ability to use technological media devices. Qualitative research that the depth and originality of knowledge is more important than generalization, so it focuses on in-depth and specific data from smaller groups rather than large samples. Therefore, 13 child samples will produce data for this study. Participants were selected based on the purposive sampling method. Purposive sampling was used in this study to select information-rich cases for in-depth analysis according to the research objectives. Due to the ethical research process, to ensure the confidentiality of participants' privacy, the children's data analysis was abbreviated "Child" (C) followed by a number so that it became a code form C1, C2, C3, ..., and C13. To maintain the ethical research of the children's subjects, documentation is taken so as not to show their faces directly. The data analysis procedure was applied by applying in-depth descriptive analysis and found two themes, namely: 1) Application of digital art activities through ScratchJr; and 2) ScratchJr as a medium of creativity.

DOI: 10.31004/obsesi.v9i6.7181

Result and Discussion

Result

Application of digital art activities through ScratchJr

Based on the results of observations and interviews with teachers and school principals, information was obtained that digital art activities through ScratchJr have a positive impact on fostering early childhood creativity. Digital art activities through ScratchJr play an important role in fostering children's creativity by presenting a different learning environment. Based on data from interviews with teachers and school principals, digital art activities through ScratchJr are still rarely taught for early childhood education or kindergarten. Therefore, the child's growth period, which is often referred to as the golden age, needs to be used as optimally as possible by providing useful activities to help children's development according to their age and developmental stages. Teachers and principals socialise digital art activities through ScratchJr as a means for children's self-expression while fostering children's creativity.

Based on the results of interviews with teachers and principals:

> *"Early childhood is greatly influenced by what they see, hear, and feel. The process of observing is an important part of early childhood development, as children's curiosity about their environment develops rapidly. Digital art activities through ScratchJr allow children to learn simple coding to create artwork in the form of animation. Kids learn various types of features in ScarcthJr such as understanding the functions of various programming blocks, choosing a background, choosing a character, deleting characters, and moving characters. Children are taught to use ScratchJr by following the teacher's instructions at the same time to create artwork in the form of an animation. Digital art activities through ScratchJr are based on the principles of early childhood education, such as learning while playing, a conducive environment, and the STEAM (Science, Technology, Engineering, Art, and Mathematics) approach, where learning uses digital media with a focus on holistic aspects of child development"* (Data from research interviews, 2025).

The initial activity of digital art began with the introduction of ScratchJr, where the teacher explained the various features in ScratchJr and their functions. Then the teacher gave an example of how to make a digital animation through ScratchJr using the demonstration method directly in front of the children. After that, the children were asked to try the practice of making digital animations one by one. During the digital art activities, the teacher gives directions and repeats instructions if the child makes a mistake. The activity ended with an evaluation or reflection session, where children were invited to tell their friends about the successful digital animation artwork. The teacher gave appreciation and input related to the work of the digital animation project that was successfully made by the child. The appreciation of children's artworks provides motivational support to children to increase enthusiasm and confidence when making digital animations through ScratchJr. Teachers hope that with the appreciation of artworks, children will be more motivated to be more active in participating in digital art activities and be able to create interesting artworks in the form of digital animations. Documentation of digital art activities through ScratchJr in Figure 2.

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Figure 2. Digital art activities through ScratchJr

Based on the observations, most children randomly choose ScratchJr's programming blocks to explore first. Children choose the theme of the story according to their liking, choose the background or stage background, and choose a character and provide coding using programming blocks to the selected character so that the character can move according to their wishes. Most of the coding process that children do to create digital animation art projects is associated with real life. Once the children have completed the first coding process, they can organise the programming blocks based on the goal of the story theme project to be created. During the second coding process onwards, the children had a story in creating artwork for an animation project through ScratchJr.

Based on the results of interviews with teachers and principals:

> "*Digital art activities through ScratchJr show that early childhood can create artwork in the form of digital animations. That ScratchJr is entirely block-based with images or symbols, rather than coding blocks in the form of text. Even if children can't read yet, they can use ScratchJr because it's entirely graphic (non-text). Digital art activities through ScratchJr encourage new ways of thinking. When children create digital animations with ScratchJr, children learn how to explore and express themselves by trying out complex programming blocks. Most of the children explored the various programming blocks of ScratchJr to produce artwork in the form of engaging digital animations. The integration of technology has become an important part of education, and educational technology has been combined with art activities that can be taught from early childhood education. In addition to being able to introduce the progress of technological development, this can develop children's creativity*" (Data from research interviews, 2025).

Based on observations, most children use their time until the last minute, while some spend their time productively exploring the features of ScratchJr. This is by the results of the study which shows that the experience of preschoolers aged 5 to 6 years using ScratchJr programming is generally enthusiastic and enthusiastic when creating a ScratchJr project, children face challenges, feel failures, and do repeated trials until they become works of art in the form of digital animation projects that contain interesting storylines. Most of the children are very interested in the ScratchJr programming application, they are enthusiastic about the coding process in choosing various kinds of programming blocks as the basis for creating artwork in the form of digital animation projects using the features in ScratchJr. The child compiles the programming blocks and completes the coding process to create a digital animation with a meaningful and engaging storyline. Digital art activities through ScratchJr encourage children's curiosity. Curiosity is one aspect of the early childhood learning process. Children's curiosity becomes complex because it can involve affective, cognitive, expressive, physiological, and motivational processes. Therefore, early childhood is very important for having curiosity when learning art. Children's curiosity during digital art activities through ScratchJr is evidenced by children questioning many things during the coding process of making digital animation artworks.

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Questions that children often ask include:

"What is the name of this game?"; "What is the function of this block?; "How to move the character?"; "How do I change the background of the theme?"; "Can I add another character?"; "How do I delete a character?"; "How to move your character right, left, up, and down?".

Some children actively ask a lot of questions, some children complete the coding process by asking a few questions, and there are even children who never ask questions at all. Children's curiosity is one part of the design process. This is in line with research that states that the design process in ScratchJr begins with children asking questions that can trigger ideas and ends with creating product works that can be shared with others. In addition, several processes in the coding process are interactive, including: asking, imagining, planning, producing, testing, improving, and sharing with others. This method is open because there are many possible answers to a particular problem. Therefore, asking questions during the coding process plays an important role when creating artwork in the form of digital animation through ScratchJr because it shows the ability of the child's design process. This process can help stimulate the development of critical thinking and early childhood creativity when creating animations through simple coding activities in ScratchJr.

ScratchJr as a medium of creativity

The digital art activities through ScratchJr support the results of the research that ScratchJr is a medium for creating animations by arranging a sequence of graphic coding blocks. ScratchJr is an integral part of early childhood, learning about coding with guided instructions. Guided instruction will be effective when children have no prior knowledge in the area of learning, and will be beneficial for the child before tackling open tasks. When children try to learn the coding process of creating a ScratchJr project for the first time, they need guidance from an adult regarding the functions of ScratchJr's features and how to use them to produce an attractive animation artwork. In this study, there are guided instructions from teachers to make it easier for children to make animation works through ScratchJr. After the child can follow the instructions from the beginning to the end, the child is free to make works of art in the form of animations according to their imagination and creativity. Artwork of children's animation can be illustrated in Figure 3.

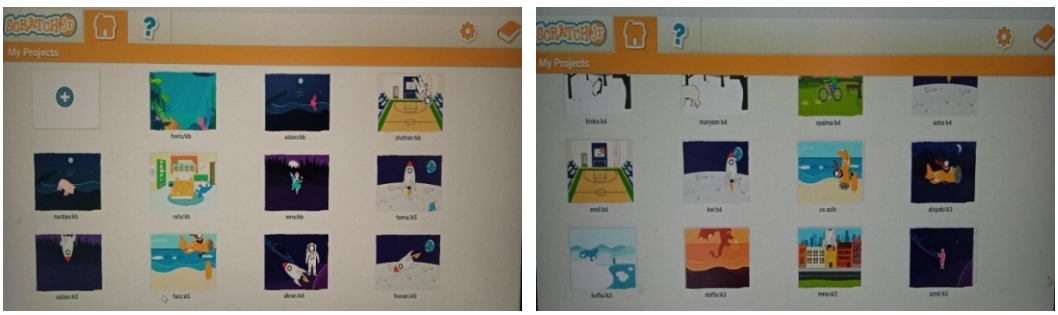

Figure 3. Children's digital artwork through ScratchJr

Based on the results of interviews with teachers and principals :

"The challenge when implementing digital art activities through ScratchJr is that teachers are not from an art education background, so they need to learn to operate ScratchJr to teach children about digital art in an innovative, creative, and fun way. In addition, some teachers have not been able to operate digital technology media, so children's art learning is still carried out traditionally using existing media such as paper, crayons, colored pencils, or colored paint. Efforts are needed to improve teacher competence in the field of digital technology media management. The improvement is carried out as an encouragement for teachers to be able to use digital media optimally, so that when the

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learning process of digital art activities through ScratchJr, teachers are technically ready and operate properly" (Data from research interviews, 2025).

Observation of digital art activities through ScratchJr at IT Nur Hidayah Kindergarten Surakarta is carried out naturally, which is when children do simple coding activities to make artworks in the form of digital animations, as usual, or naturally, without any engineering. This ensures that the results of the observations reflect the child's true potential, interests, and talents. Researchers found that high enthusiasm, courage, and confidence in children were positively correlated with the ability to create digital animations. The observation results showed that all children had achieved a very good level of development in doing digital art activities through ScratchJr, shown by the children being able to follow the instructions from the teacher so that they could successfully create artworks in the form of interesting digital animations. Based on the observations, 13 children randomly chose the ScratchJr programming block to explore first. These 13 children choose the theme of the story, choose the stage background, choose the characters for the theme of the story, and provide coding to the selected characters so can move according to their wishes. Most of the coding processes that children do are associated with real life. Children learn to choose characters that match the theme of the story based on goals, and remove characters that do not match by using the eraser or cross-out feature. Children do trial and error in the coding process to create animations using ScratchJr programming blocks. These findings are that early childhood coding is a series of cognitive processes that start from a simple stage to a higher level to solve problems by finding effective and efficient, or systematic solutions. This indicates that digital art activities through ScratchJr are by the stages of early childhood development.

Discussion

In recent years, there has been an increase in efforts to introduce coding in early childhood education. In keeping with international trends, coding has become an increasingly growing focus in European education. Research related to usage trends in Europe reveals that countries with strong computer science initiatives, such as the UK and Nordic countries, have high usage of ScratchJr. Early childhood in Europe is more likely to use ScratchJr during the school week than on weekends, suggesting that the app is widely used in educational settings (Bers, 2018). Meanwhile, in Indonesia, the use of ScratchJr is still very rarely applied or integrated into the early childhood education curriculum (Sipahutar et al., 2023). In contrast to schools in Europe that are more likely to use ScratchJr during the school week, the results of this study show that children use ScratchJr once a month when discussing learning themes related to digital literacy. This is because the introduction of coding that starts early, technology, and pedagogical approaches are developed and take into account children's cognitive maturity and abilities. This is due to the limitations of technology tools.

Research outlining how to engage early childhood with code literacy using visual programming languages in ScratchJr using iPads and Android tablets. Teachers who want to implement coding into the literacy curriculum should give children free time to explore technology. The child is motivated and engaged in activities, and the project expands thinking in a more critical way, allowing the child to reach the highest level of Bloom's taxonomy. Children practice typing and writing while adding words to characters (Delacruz, 2020). The difference with this study is in the tools used; this study uses laptops available at school, and children take turns playing ScratchJr. The unique aspect of children's behaviour in using ScratchJr in this study, compared to the results of studies in other developed countries, is that children learn to queue (play according to turns). If in developed countries facilities support to integrate ScratchJr in the early childhood education curriculum which requires facilities in the form of digital technology media tools (iPad, tablet, computer or laptop) where one child can use one digital technology tool at the same time, while in developing countries such as Indonesia the number of infrastructure facilities that utilize digital technology media is still limited. This can have a positive impact on the behavioural aspect of early childhood, namely, children can learn to queue and wait for their turn to play. In addition, teachers can also design learning methods in the form of small groups where one laptop can be for 2-3

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children, so that children can learn collaboration and cooperation to create simple animations using ScratchJr with their friends. Forming small groups will help children who are not able to operate ScratchJr; children can see other friends who are able, so that they can learn together (peer teaching).

Research on coding curriculum in early childhood education using ScratchJr proposes different phases in the creation of research-based curriculum. Constructionism presents a computationally rich project-based methodology based on the identification of great ideas from the learning domain and positive technology development. The pedagogical foundation of the coding curriculum using ScratchJr involves understanding coding as literacy, which places great ideas that are appropriate to the development of computer science in conversation with those taught in language arts. These findings suggest that coding curriculum using ScratchJr is not only feasible to implement, but also effective for improving early childhood coding skills and creativity (Bers et al., 2023). The benefit of digital art activities through ScratchJr for children is that it can help develop creativity. Children can explore a variety of digital tools and techniques to create unique works of art. This is supported by research that shows that when children compose programming blocks to create artwork in the form of digital animations through ScratchJr, children learn to express themselves and develop creativity (Clarke-Midura et al., 2023; Na et al., 2024). This is supported by research that shows that when children create animated artwork with ScratchJr, children learn to think in sequence, explore cause and effect, develop design and problem-solving skills, which can help develop creativity (Martins et al., 2023). In addition, digital art activities through ScratchJr can also expand children's expression media. Digital art gives children a new medium to express their ideas and feelings in the form of animation. Children's success in creating digital works can increase their confidence and ability to create. Children are free to express themselves using programming blocks to create animated artworks according to their creativity.

Digital art is an important ability today, because through digital art, children can develop creativity based on the knowledge and experience gained to help achieve the next stage of development optimally. ScratchJr is a graphic programming tool for kindergarten to second-grade elementary students (Master et al., 2023; Harper et al., 2023). ScratchJr is a visual introductory programming application to create digital animation projects through coding activities for children aged 5-7 years (Clarke-Midura et al., 2023). The results show that children aged 5-6 years have limited ability to understand coding, so simple features in the form of images or symbols are needed that will be easier for children to understand, such as ScratchJr (Misirli & Komis, 2023). Children can change the look of the character, design the background, add sounds, and then use those programming blocks to bring the character to life. Programming is created by dragging blocks to the coding area and putting them together. All blocks are completely graphic-based (with no text other than numbers) to make it easier for children to use this programming language before they can read. Research proves that through ScratchJr, children learn to compose programming blocks to create works of art in the form of simple digital animations that can develop problem-solving skills and creativity (Çiftçi & Topçu, 2023). By implementing ScratchJr's digital art in early childhood, it can create a more interactive, creative, engaging, and fun learning environment for children.

Digital art activities through ScratchJr can also help develop problem-solving skills. Children in the process of creating digital artwork learn to solve problems, such as finding ways to create certain effects or correct mistakes. These findings support research that suggests that the preschool period is a critical time to develop problem-solving skills (Misirli & Komis, 2023; Guss et al., 2024; Zurnacı & Turan, 2024). The preschool period seems to be a critical time to develop problem-solving skills because children at this age are in a transitional stage between concrete and abstract processes. This is important because providing an active experience that encourages children's thinking processes is known to support the transition from concrete to abstract processes (Piaget, 1976). Children aged 5-6 years in Piaget's theory are in the pre-operational stage, where children know the world through symbols, colours, and signs. The result of the ScratchJr story animation project is a representation of symbols, colours, and signs. In addition, children can learn to understand the various forms and functions of programming blocks to create story animation projects through ScratchJr. The child's process of recognising the form and function of the various features of ScratchJr

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helps develop children's symbolic thinking skills (Delacruz, 2020). Other research results stated that children who were given technology-based learning were able to solve problems more creatively, and higher levels of cognitive skills, such as analysis and evaluation, were more developed compared to children who were not given technology-based learning or traditional learning (Gerosa et al., 2022). Children who are introduced to digital art activities through ScratchJr from an early age are allowed to learn to start solving problems in the concrete world through systematic steps related to the coding or programming process. This can be seen when children choose the theme of the story according to their wishes, choose the backgorund or stage background and choose the character according to the theme of the story, add sounds, and provide coding to the chosen character so that the character can move according to their wishes when making artwork in the form of attractive digital animation. This shows that early childhood can create simple animations through ScratchJr, as stated by Unahalekhaka & Bers (2021). That ScratchJr is entirely block-based with images or symbols, rather than coding blocks in the form of text. Even if children can't read yet, they can use ScratchJr because it's completely graphic (with no text other than numbers).

Digital art activities through ScratchJr are effective activities to develop creativity in early childhood. Several studies have proven the positive impact of using ScratchJr as a learning medium in an early childhood education environment (Konstantina & Stamatios, 2024; Amante et al., 2023; Bers et al., 2023; Misirli & Komis, 2023; Yang et al., 2023). Overall, the research findings support the integration of ScratchJr as an effective and engaging learning medium, as it is an application created specifically for children aged 5-7 years in the form of graphics, developing children's creativity, and creating a positive digital learning environment. Digital art activities through ScratchJr support the learning of today's generation of children in the 21st century, who are called digital natives.

Digital art for early childhood is one of the applications of digital art education learning, which is driven by the development of the 21st century or the digital native generation. Technology is used from various ages until children unknowingly grow up to be digital natives. Digital native is a term for children who are born and raised in the digital era (Yildiz & Guler Yildiz, 2021). Early childhood children who sit in kindergarten are currently included in the digital native generation because they use digital technology media as a daily consumption activity. This is by several research results that seek to make children not only consume digital media, but also need to provide positive activities, so that programs focused on STEAM (Science, Technology, Engineering, Art, and Mathematics) emerged (Yalçın & Erden, 2021). One of the positive activities that utilises digital technology media in early childhood education learning is through digital art. Digital art in early childhood education is the use of digital technology, such as computers, tablets, or smartphones, to create works of art, such as paintings, drawings, graphic design, or animation. Digital art is important to be introduced from an early age because it can help children develop creativity and understanding of digital literacy through the use of technology for children. One of the applications of digital art in early childhood education is digital art activities through ScratchJr.

This research resulted in a finding that the practice of the coding process through ScratchJr can develop children's artistic expression and creativity. ScratchJr provides tools to create interesting story animations by composing a sequence of graphic programming blocks. In addition to coding blocks, ScratchJr also has a painting tool to edit and characters according to the desired colour. Therefore, children are free to express themselves using coding blocks or painting tools to create animations according to their creativity. In addition, this research also produced findings on how to invite children to learn coding, including: (1) Make creativity the focus. The teacher emphasised that coding learning activities can also be a form of creative expression that strengthens the ability of art to stimulate children's creativity. (2) Choose a child-friendly application. Teachers should look for coding learning applications that attract children's attention so that activities are more fun and children do not feel bored. One of the kid-friendly coding learning apps is ScratchJr. ScratchJr is a computer programming application made specifically for children aged 5-7 years old that features graphics (without text) to make it easier for children to use this programming language before children can read to create story animation projects through coding activities. Children aged 5-6

DOI: 10.31004/obsesi.v9i6.7181

years have limited ability to understand coding languages, so it is necessary to have an application with simple features in the form of symbols that will be easier for children to understand.

This research has limitations in terms of using means in the form of computers. This is due to the limited number of computers owned by schools. Schools do not have the same number of computers, so children need to take turns to be able to learn using computers. Another limitation is that the school does not have an art-specific teacher from an art education background who supports the application of digital art activities through ScratchJr. Limited access to facilities, such as a lack of computer availability in schools, can hinder the application of effective programs in certain educational settings. Teachers need support and training to make effective use of technology, and children need guidance to explore the process of digital art activities through ScratchJr.

Conclusion

Digital art activities through ScratchJr by utilising technology can develop forms of symbolic expression by encouraging children to think imaginatively through a simple coding process that is creative and fun. Children who are allowed to learn using technology are more enthusiastic about imagination games, such as ScratchJr can provide opportunities to think creatively, and children can freely express themselves with their creativity to make animations. Digital art activities through ScratchJr are recommended for early childhood learning, so that children can gain learning experiences using digital technology and stimulate creativity as a provision for the future. The limitation of this study is that the research time was only conducted for two weeks, which was adjusted to the school schedule to implement learning using ScratchJr. The next research recommendation is expected to be able to conduct longitudinal research over a longer period of time, so that the results of the research data obtained about coding activities through ScratchJr are more in-depth, and the subjects can also be more involved, so that they can be used as a comparison.

Acknowledgement

The authors would like to thank all of the teachers and children at IT Nur Hidayah Kindergarten in Surakarta City, who have helped participate in this research. The authors would also like to thank the Indonesia Endowment Fund for Education (LPDP), Ministry of Finance for funding the research.

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