Self-Independent Computer Operation by Children in Early Childhood Education

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***Abstract*— This research investigates how young children in early childhood education settings using computers independently. It studies the independent way in which children engage with and gain knowledge from computer technology, without the need for continuous adult monitoring. By conducting qualitative observation and analysis, the study investigates the developmental advantages, obstacles, and consequences of individuals interacting independently with computers. This research focuses on how children interact with technology and how it affects their learning. Observation of children, interviews with teachers, and documentation of children's learning were used to collect data. The findings of this study reveal that kids use computers on their own and play educational games to enhance their learning. Research indicates that being exposed to independent computer use at a young age promotes digital literacy, problem-solving skills, and self-directed learning in children. The research results suggest that incorporating ICT into early childhood education shows great potential for improving children's learning experiences. The study underscores the importance of balancing technological access with pedagogical support to optimize educational outcomes in early childhood contexts.**

Keywords*: Early Childhood Learning, Computer Operation, Teacher Support*

I. INTRODUCTION

The world has entered the Society 5.0 period, where Society 5.0 is a concept develop by Japan to form smart humans who can optimize big data, internet of things (IoT), and artificial intelligent (AI) as solutions for human society (Narvaez Rojas et al., 2021). Society 5.0 occurs because of the role of humans who can control the real world and the virtual world, so that there is integration between the two (Setiawan & Lenawati, 2020). This makes Society 5.0 a human-centric technological movement where the use of big data analysis and AI has provided many conveniences for human life in communicating and using technology (Deguchi et al., 2020). The development of digital technology can produce qualified, productive, creative, and critical thinking human resources (Apryanto, 2022; Nastiti & Ni'mal 'abdu, 2020). Several countries in Europe have studied the various benefits of the development of digital technology. This makes countries in Europe continue to develop human resources to be able to continue to adapt to very rapid technological developments (Carayannis & Morawska-Jancelewicz, 2022; Guevara et al., 2021). In contrast to China, China criticizes the rapid technological development that have occurred at this time. China considers that use of big data and AI has a negative impact in various opportunities such as data leakage resulting in privacy violations and social inequality (Wu et al., 2023).

The rapid technological changes that occur will certainly have an impact in various sectors such as early childhood education. Various impacts caused by the existence of Society 5.0 such as teachers must understand technological development to prepare Generation Alpha to face world challenges (Widiasanti et al., 2023). Some studies mention that the implementation of early childhood education in Indonesia is still in the early stages so there are still many challenges that must be faced (Priyanti & Haryanto, 2023a; Yuniarni, 2022). This includes digital literacy, problem solving, and creativity in using technology as learning tools and media. Other research indicates that when early childhood educators use digital technology, they may more readily optimize the development of the children, especially when it comes to their physical-motor development (Demeshkant et al., 2023; Gjelaj et al., 2020; Omojola et al., 2021). It is imperative for educators to ensure that children's use of digital technology enhances their skills across multiple developmental areas. Teachers need to learn about early childhood education-related hardware and software in order to apply digital technology in the classroom (Luo et al., 2023). Teachers are expected to provide relevant and interesting lesson plans in addition to employing technology (Priyanti & Haryanto, 2023b).

While the potential of digital technology in early childhood education has been widely recognized, its implementation in the research sites faces a number of structural and pedagogical challenges. One of the main challenges is the lack of readiness of technological infrastructure and resources. Previous research shows that the implementation of technology in learning in Indonesia, particularly at the early childhood education level, is still at an early stage (Priyanti & Haryanto, 2023a). This is reflected in the limited number of computer devices available in the research sites, which often hinders children's access to technology-based learning equally.

Furthermore, it was evident that many teachers lacked the requisite skills to effectively utilise technology in the classroom, particularly in the context of developing cognitive and social competencies in their students. The teachers at the study sites demonstrated deficiencies in their ability to strategically integrate technology into the curriculum, a challenge that is prevalent in numerous early childhood education institutions (Luo et al., 2023). The absence of comprehensive training and professional guidance for educators results in suboptimal management of technology in learning environments, which in turn affects children's learning outcomes.

Another challenge is the inconsistent time allocation for technology activities in educational research sites, which has the potential to limit students' overall exposure to technology. Technology-based learning is often disrupted by other curriculum priorities, including preparation for art activities or school events, which hinders the development of digital skills in children (Widiasanti et al., 2023).

Regulation of Minister of Education, Culture, Research, and Technology of The Republic of Indonesia Number 12 of 2024 About Curriculum In Early Childhood Education, Primary Education, and Secondary Education that establish information and communication technology-based learning at various levels of education to build curiosity in children. The presence of technology-based media in early childhood learning is an issue that needs to be considered in terms of the use and utilization of digital media in teaching and learning activities for early childhood (Lestari et al., 2024). In the era of technology and digital literacy, the ability to operate computers independently by children has become a very important skill. Computers are a very effective medium in developing children's skills. In early childhood education, schools play an important role in introducing children to computer skills to prepare them for the digital society. Previous research has shown that children’s ability to use computers independently can develop children’s cognitive, problem-solving, critical thinking, collaboration skills, and spatial awareness (Hmelo-Silver, 2004; Knez & Hygge, 2001; Shute, 2008). Despite these benefits, there is still limited research on the feasibility and effectiveness of independent computer use by kindergarten children.

Independent computer operation, where children engage and use computer without continuous adult intervention. This will enhance children’s active involvement in the learning process and improve

digital proficiency from an early age (Knezek & Christensen, 2016). The concept of independent computer operation in early childhood education integrates developmental theories and modern educational practice, aiming to foster an environment where learners can explore and interact with digital tools confidently. In addition, the ability to operate computers independently can give them a sense of control and competence in the use of digital tools to other areas of learning and development (L. S. Vygotsky, 1978).

Independent computer use in early childhood attempts to improve children's development by promoting digital platforms for collaborative learning, strengthening fine motor abilities, and cultivating a growth mentality (Palmér, 2015). Children who are allowed to use technology on their own will grow more independent and self-assured, traits that they can use to other areas of their education. In addition, independent computer operation supports the development of critical thinking and decision-making skills as children take on digital challenges and creatively solve problems (Haugland, 2000).

Vygotsky also emphasized the importance of social interaction in the learning process and how technology can serve as a mediating tool to enrich to children's interactions. Children can attain higher learning levels when they employ digital technology as a tool (Hatzigianni et al., 2023). According to Vygotsky, children learn best when they are in the Zone of Proximal Development, which is the space between tasks that can be completed on their own and tasks that need help. Giving kids the chance to gradually engage with technology and computers can help them become more independent and self-sufficient, which in turn can help them operate computers independently (L. Vygotsky, 1978).

Computer-mediated learning can shift the teacher's position from knowledge provider to learning facilitator, allowing students to become more independent, creative, and self-regulated. Mediated learning by Vygotsky also provides a new view of intelligence, considering it as a dynamic ability that can change through meaningful social interactions (Presseisen & Koluzin, 1992). Learners construct their own knowledge by interacting with information and the environment. Collaboration and aspects of collaborative learning such as communities of practice, functional skills, peer exchange and reciprocal teaching. Learners interact with each other, help each other, and solve the problems together (Bull et al., 1998).

Technological developments can influence culture in the use of learning media. Technology, especially computer, can affect the way individuals interact think, and understand their environment. Understanding a computer-oriented culture is not just about understanding computer operation and functions, but also how computers affect the ay people perceive and interact with their environment (Guile, 2023; Westby & Atencio, 2002) Digital technologies such as computers, tablet, and educational software are becoming important cultural tools. These tools allow children to interactively engage with educational content, support self-directed learning, and expand their access to information. Technology should be used wisely and in a balanced way, taking into account children's developmental needs and their cultural context (Levin & Mamlok, 2021; Nuttall et al., 2019).

According to Bandura's social learning theory, kids pick up new skills through imitation and observation. Positive role models can help children develop their independence when using computers, which in turn motivates them to emulate these behaviors (Bandura, 1977; Caner & Aydin, 2021). The independent operation of computers is in line with Piaget's suggestion that children learn through experience. It allows children to interact with the digital environment in ways that promote cognitive development through exploration and manipulation. Operating the computer independently gives children the opportunity to develop themselves, thus promoting cognitive development (Hmelo-Silver, 2004; Nasution et al., 2023).

Operating computers independently with a STEAM approach encourages children to build knowledge about the world by observing, investigating, and asking question (Wahyuningsih et al., 2020). STEAM education in early childhood allows children to explore science, technology, engineering, art, and math through play. It encourages children to explore their ideas, creativity, autonomi, and play. In early childhood, STEAM teaching ins encouraged to integrate a range of meaningful knowledge. This integration helps teachers to focus on both content and process (Johnston et al., 2022).

This article focuses on how children interact with computers at school and how the use of computer affects children's self-independent. This article also provide discusses how the implementation of technology-based learning in school.

II. METHODS

This research uses a descriptive qualitative approach. Qualitative research is a type of research used to examine a natural object condition where the author is the key instrument (Sugiyono, 2013). Qualitative research is descriptive and uses a theoretical basis as a guide so that the author is in accordance with the facts. Qualitative research tends to use an inductive approach analysis (Hikmawati, 2020). Descriptive qualitative research aims to describe existing phenomena. In this study, information retrieval was carried out using purposive sampling technique, which is a technique if determining informants based on certain criteria or considerations. The selections of informants in this study was based on the criteria of how children interaction in operating computers at school.

The data collection technique used were observation, interview, and documentation. Observations were made in the form of observing learning activities carried out at school and observing the utilization of ICT in learning. Interviews were conducted with teachers to explore how children interact with computers and how teachers provide children's understanding in the use of ICT. Documentation in this study is needed the sharpen the analysis of research related to children's interaction in operating computers at school.

Picture 1.1 Research Flow

The research flow is a systematic series of steps undertaken to answer the questions or solve the problems posed by this study. The process commences with the determination of a specific research focus, followed by the selection of an appropriate research approach (quantitative or qualitative). Subsequently, the research subject is identified, and data is collected and processed. The final stage is data analysis, whereby conclusions are drawn that are both valid and relevant to the research question. Each stage is interrelated and forms a coherent process in generating new knowledge. The data that has been collected is processed and data processing is done by data reduction, data presentation, and providing conclusions.

III. RESULTS AND DISCUSSION

This school observed in this study offer computer learning programs designed to develop children's technological skills. These activities ais to complement children's overall development by integrating technology into their learning process. During the observation period, the school was simultaneously preparing for an art performance, which resulted in the computer activities being scheduled as an additional session. On the day of the observation, the computer teacher was absent, thus requiring the main class teacher to lead the computer session. This situation provided a unique insight into the adaptability and flexibility of the school's educational approach.

In the observed computer activities, the teacher started by explaining to the children the activities that they would be undertaking in the computer room. The teacher explains that computer activities had not been conducted for a while, so the children were tasked with creating shapes of houses using the paint application. The teacher began the session by engaging the children with a question about shapes of houses, promoting responses that included triangles and squares. This initial discussion set the stage for the day's task. Creating house shapes using the paint application.

"Do you know what houses look like?"

Then the children answer "Triangles and squares"

"So today's activity is using the paint application"

After gave the perception, the teacher provided detailed instructions on using the paint application. Once the children understood what they were expected to do, the teacher instructed them to sit properly and the allowed them to choose their preferred computer. The children were guided to turn on their computers independently. The children then asked to switch on the computer independently, demonstrating the school's emphasis on fostering independence and self-reliance among its students. After the computers were switched on, the teacher instructed the children to open the application. Some children, unfamiliar with the symbols of the paint application on the computer and asked for help from the teacher and their peers. This interaction highlights the collaborative learning environment fostered by the school.

The results demonstrated that the computer activities conducted at the research site effectively captured the children's attention and provided them with avenues for engagement with technology. The primary activity observed was the utilization of the Paint application for the purpose of illustration, which afforded children the autonomy to explore and cultivate their creative abilities. The majority of the children demonstrated proficiency in recognizing and drawing fundamental shapes, including houses, triangles, and squares. However, there was a discernible range in the degree of creativity exhibited by each child. Some children exhibited greater creativity, combining different geometric elements, while others demonstrated a proclivity for simpler shapes.

Based on information provides by the teacher, this computer activity has been a part of the curriculum since the first semester. The children are not only engaged in educational games, but are also taught to familiarize themselves with computer devices such as monitor, speakers, mouse, keyboard, and the process of turning the computer on and off. The computer activities not only conducted in Kindergarten B, but also done with Playgroup and Kindergarten A children, and Kindergarten B did a simple coding exercise.

Based on the observation, the children were assigned to use the paint application to create a house according to their creativity. The children were seen making pictures of houses by adding various geometric shapes such as abbreviations, hearts, stars, and some even made pictures of the Indonesian flag. This activity allows children to express their creativity and imagination while learning about

different shapes and colors. The teacher goes around the room, observing each child as they work on their drawings. The children were also asked to write down the names of the buildings they made, thus integrating literacy skills into the computer activity.

The teacher explained that this computer activity actually has its own teacher to teach about computer.

> *"The school provides computer science teacher to teach the children to operate the computer and the children also learn various application on the computer"*

While the children were making drawings using computer, it was observed that not all children were familiar with how to use the paint application. There were some children who asked how to delete pictures, add pictures, and give colors. After finishing their drawings, the children were instructed to save the file with their name independently. The children were able to use the keyboard to write the file name on the drawing independently. This was followed by session of educational games. This was clarified by the teacher that the children have often done thus activity every week. The children can choose the various games on the application. They can open and close the game independently.

The results demonstrated notable discrepancies in the proficiency levels exhibited by the children when utilizing computer devices. Children who had greater access to technology devices at home demonstrated superior capabilities in the use of hardware, such as the mouse and keyboard, and in the comprehension of application functions. They demonstrated greater autonomy in navigating applications and exhibited a more rapid comprehension of instructions. Conversely, some children who had not been afforded the same exposure to technology experienced difficulties, particularly in recognising app symbols or understanding the use of the mouse to select and draw. These findings suggest that children's digital skills are significantly shaped by their prior exposure to technology. This highlights the crucial role of educational institutions in fostering early technology integration.

Moreover, the dynamics of interaction among children during computer-based activities warrant further investigation. It is not uncommon for children to assist one another in completing tasks, such as demonstrating how to alter the colors or incorporate specific shapes within the Paint application. This collaborative process facilitates social learning and communication skills, whereby children learn to work together and share knowledge. Furthermore, the teacher assumes a pivotal role in managing this activity. The teacher provides preliminary instructions on the tasks to be performed and facilitates children's comprehension of the tools and applications utilized. However, subsequent to the instructions being imparted, the teacher assumes a more facilitative role, allowing children the autonomy to explore independently.

At the same time, difficulties emerge when children encounter technical obstacles. Some children who were initially utilizing an application like Paint encountered challenges when identifying symbols or executing basic actions like mouse drawing. To address this, educators provide supplementary guidance to individuals or small groups. Nevertheless, these challenges underscore the necessity for additional visual aids or more explicit guidance, so that children could rapidly comprehend the app interface and utilize the devices with greater autonomy.

After all activities in the computer room, the children should turn off the computer independently. If they turn off the computer, they can return to class to continue practicing the art performance. This highlights the school's emphasis of fostering independence among its students.

This computer learning program demonstrated how technology can be integrated into the early childhood education curriculum. Through activities such as using painting apps and educational games, children not only learn technical skills but also develop creativity, independence, and social

skills. The use of technology in learning also helps children to be better prepared for an increasingly digital worlds. In addition, the program also demonstrates the importance of flexibility in education, where teachers can adapt to unexpected situations, such as the absence of a computer teacher, and still provide meaningful learning experiences for students.

Overall, this observation revealed that computer learning program at this school does not only focus on teaching skills, but also on he holistic development of children. Through an approach that integrates technology, creativity, and independence, the school succeeds in creating a learning environment that support children's development.

In addition to these aspects, the program also provides how technology integration can affect traditional teaching methods. By giving children access to digital devices, school help them develop a better understanding of the ever-evolving digital world. This is especially relevant given the importance of digital literacy in children's daily lives.

The observed activities also emphasize the importance of project-based learning, where children given concrete tasks to complete. This method allows children to see the direct result of their efforts, which can increase their motivation and engagement in the learning process. This approach also encourages children to work independently and take initiative skills that are invaluable later in life.

The collaboration observed during the computer sessions was also very important. When children help each other in using the paint application, they learn not only technical skills but also social skills such as working in the team, communication, and empathy. This shows that while technology is an important tool in leaning, interaction between students remains a key component in an effective educational process.

In the general, this observation offers a detailed insight into how a properly structed computer learning program cam assist in different areas of children's growth. This program showcases how technology has the potential to enhance early childhood education by helping children develop technical skills, creativity, independence, and social skills. Through a holistic and flexible approach the school has succeeded in creating a dynamic learning environment that supports children's development in all aspects.

The findings of this study offer a comprehensive examination of the influence of technology, particularly computer applications such as Paint, on the growth of young children's digital abilities, creativity, and social competencies. As evidenced in the pertinent literature, the incorporation of technology in early childhood education holds significant promise for fostering children's cognitive and motor development. Hmelo-Silver underscores that the integration of computers in education not only enhances children's technical abilities but also enriches the learning experience through exploration and creative problem-solving (Hmelo-Silver, 2004). In the context of this research, the use of Paint for drawing activities enables children to cultivate fundamental competencies in navigating digital devices while nurturing their creativity.

Computer use in children can have a positive impact on children's development such as memory, problem solving, creativity and cooperation (Bernneman et al., 2018). The result indicate that computer technology has a lot of promise in enhancing early digital literacy, a crucial skill in the current digital era. Children who are exposed to technology at a young age will be more equipped to handle the challenges brought on by fast technology progress. The results of the above research show that not all children have skills in using computers. In this activity, children are given the responsibility to turn on the computer and select applications independently. The teacher gave initial instructions about the shape of the house and explained the use of the application. After that, the children were asked to select the computer and open the application independently. However, some children still needed help to recognize the symbols of the application, indicating that individual

adaptation and support may be needed. This is in line with previous research that there are still children who have difficulty in using computer hardware. The child has not been able to understand the symbols (Hernawati, 2023).

This activity also shows that children learn to use computer devices and specific applications such as paint apps, which helps them develop fine motor skills, creativity and understanding of geometric shapes . The learning method used by the teacher, which was to give instructions and then let the children try themselves, supports a constructivist approach where children learn through exploration and hands-on experience (Kim et al., 2021; Meyer et al., 2021; Tok, 2022). However, challenges encountered, such as difficulty recognizing the application symbols, indicate the need for additional teaching or clearer visual aids. The use of information and communication technology devices by teachers as a control and guidance tool also provides benefits in providing stimulation on aspects of child development (Sitompul, 2022). Teachers can monitor each child's progress and provide evaluations directly to the child, thus facilitating individualize learning. Information and communication technology also allows teachers to record learning activities and report directly to parents (Indrawan & Marvida, 2023).

However, the findings also indicated notable discrepancies in digital proficiency levels between children who had greater exposure to technology at home and those who did not. Children who were more familiar with technological devices such as computers and tablets at home demonstrated superior abilities in using hardware and software independently and exhibited accelerated comprehension and execution of instructions. This finding is consistent with the conclusions of Hernawati, who asserted that the level of digital proficiency exhibited by children is significantly shaped by the frequency and quality of technology exposure they experience within their domestic environment (Hernawati, 2023). Conversely, children with restricted access to technology encounter challenges in recognising application symbols or operating devices in an appropriate manner. This phenomenon underscores the necessity of ensuring equitable access to technology in educational settings, thereby enabling all students to have an equal chance to develop digital skills at an early age.

These computer activities also support the development of social skills, children helping and interacting with each other. One of the main benefits is improved problem-solving skills. Engaging on interactive tasks such as educational games promotes critical thinking and encourages children to find solutions on their own (Bandura, 1977; Dunbar, 1998; Newell & Simon, 1972). These abilities are important and can be applied not only in an academic environment, bit also in their daily lives and future endeavors. This is an important aspects to building the skills in children, as social interaction and problem solving play important role in children’s cognitive and emotional development. Based on the results of this study, computer acivities in kindergarten provide significant benefits in the development of children's skills, independence and creativity.

Furthermore, social interaction during technology-based learning activities was identified as a crucial element in children's learning process. Children who encountered difficulties in using the app frequently sought assistance from their peers, thereby fostering a collaborative environment within the classroom. Such collaboration not only encourages children to share technical knowledge but also strengthens their social skills, including communication, empathy, and cooperation. In alignment with Vygotsky's perspective on the significance of social interaction within the zone of proximal development (ZPD), these findings indicate that children demonstrate enhanced learning outcomes when they are encouraged to engage in collaborative learning and provide assistance to one another in the completion of more complex tasks (L. S. Vygotsky, 1978). Therefore, while technology can facilitate independence, social interaction remains a crucial component of early childhood learning.

However, it is important to tailor teaching methods to the individual needs of the child (Čokor & Bernik, 2021; Kumtepe, 2006; Liu et al., 2021). The use of information and communication technology in early childhood education illustrates how technology integration can improve the quality of learning and broaden the scope of children's learning experiences. Therefore, developing learning content by utilizing information and communication technology in early childhood education can be an important part of improving learning effectiveness. The use of creative apps such as drawing program also has a significant impact on child development. These apps allow children to express themselves and build their confidence through creativity. This process not only develops their fine motor skills, but also helps them understand aesthetic and artistic concept. According to Sigmund Freud, creativity is a dynamic process that involve changes and interactions between imaginative and rational thought processes (Dimkov, 2018). Creativity honed through technology can foster innovation and their ability to think out-if-the-box which is much needed in various fields of work in the future.

The study also uncovered several obstacles encountered by children. Some children struggled to identify the symbols and navigate the app, showing a requirement for more assistance and explicit guidance from teacher. These challenges highlight how crucial it is for teacher to act as facilitators, assisting children in their independent exploration and education. Educators need to create teaching tactics that can support the different technology skills of students. This involves offering precise visual guidance, rigorous training session, and personalized support of necessary.

The findings indicate deficiencies in the management of human resources in the school, particularly with regard to the unavailability of the computer teacher, which necessitates the class teacher's assumption of the teaching role. The absence of teachers with the requisite technological competence may impede the efficacy of technology-based learning activities, as classroom teachers may lack the requisite technical skills to provide optimal instruction. Training for educators in the implementation of educational technology is imperative to optimize students' learning experiences (Priyanti & Haryanto, 2023a). It is therefore evident that improvements in the management of human resources and the provision of enhanced technology training for teachers are crucial steps to guarantee that technology can be utilised to its full potential in early childhood education.

The use of digital technology in the classroom can build a dynamic learning environment and support the development of children’s skills from various aspects of development (Ale et al., 2022; Etta & Kirkorian, 2019). Teachers can utilize digital technology to create more interesting and relevant learning content that can increase children's engagement and motivation to learn. Regular training for teachers on the latest technologies and effective teaching methods is essential to ensure relevant and engaging teaching for children (Derks et al., 2022; Sjöberg & Brooks, 2022).

In addition to the importance of teachers in teaching digital technology, the curriculum should also be designed to integrate technology seamlessly into daily activities and leaning projects, ensuring the technology is used as a tool to achieve broader educational goals (Dodge & Clocker, 2001; Marisa, 2021; Rahmi et al., 2023). This includes the use of interactive and engaging educational software, as well as the development of technology-based projects that involve real problem-solving and collaboration, In addition, collaboration between educators, parents, and policy makers is needed to support the use of technology in early childhood education (Cicconi, 2014; Lestari et al., 2024).

By implementing these recommendations, it is hoped that computer activities in kindergarten can provide greater benefits in developing children's skills, as well as addressing the challenges that exist in the learning process. These activities not only prepare children for the future, but also support holistic development in social, cognitive and emotional aspects.

IV. CONCLUSION AND RECOMMENDATION

This research shows that children's use of computer devices and educational applications can significantly support their learning. Children showed high interest and engagement during computer activities, which had a positive impact on the hands-on learning experience. The research also identified some challenges, such as children's lack of understanding of computer hardware and software, which teachers need to address to ensure effective use of technology in learning.

The implementation of ICT in early childhood education has great potential to improve children's understanding of STEAM (Science, Technology, Engineering, Arts and Math). The use of digital technology in learning has a significant impact on children's learning experience, enhancing their skills, creativity and independence. It not only helps children get familiar with computer devices but also encourages them to think critically and creatively through various educational apps and games. However, to maximize the benefits of these technologies, teachers must be equipped with sufficient skills and knowledge in using digital technology, and teaching methods must be tailored to meet children's individual needs. In addition, clearer and more interactive visual aids can help children better recognize application symbols and operate computer devices.

Based on the findings of this study, several recommendations can be made to improve the effective use of technology in early childhood education. Firstly, teachers need to get ongoing training on the latest technology and effective teaching methods. This training should include how to use computer hardware and software and strategies for integrating technology into the learning curriculum. Secondly, teaching methods should be tailored to children's individual needs. For example, children who have difficulty recognizing the symbols of computer applications can be helped by using visual aids such as posters or cards with pictures of frequently used symbols. Thirdly, interactive and engaging learning content should be developed to increase children's interest and engagement in computer activities. This could include educational games designed to teach STEAM concepts in a fun and engaging way. Fourth, teachers need to monitor each child's progress individually and provide hands-on evaluation to support more personalized learning. In this way, teachers can identify areas where children need additional help and adjust their teaching methods accordingly. Finally, regular evaluations of computer activities and teaching methods should be conducted to ensure that the approaches used remain effective and relevant to technological developments and children's needs.

By implementing these recommendations, it is hoped that computer activities in kindergartens can provide greater benefits in developing children's technical skills, independence and creativity. In addition, it will also help to overcome existing challenges in the learning process and ensure that every child has an optimal learning experience. These activities not only prepare children for a more tech-savvy future but also support their holistic development in social, cognitive and emotional aspects. This research provides valuable insights into how technology can be effectively integrated in early childhood education, as well as how challenges can be overcome to provide a better learning experience for children.

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