ICETAR
THE 2nd INTERNATIONAL CONFERENCE ON EDUCATIONAL THEORIES, PRACTICES AND RESEARCH
TARBIYAH AND TEACHER TRAINING FACULTY, STATE ISLAMIC UNIVERSITY SYEKH ALI HASAN AHMAD ADDARY PADANGSIDIMPUAN ON 3TH - 4TH JULY, 2024
"Digital Media in Learning"

The Role of Digital Media in Stimulating Color Recognition to Improve Aspects of Cognitive Development in 4 Year Old Children

Ade Rabiah Nasution[1], Ima Mulyani[2], Ahmad Naasir[3]

[1,2,3] State Islamic University Ali Hasan Ahmad Addary Padangsidimpuan, Indonesia.

e-mail: [1]aderabiah01062003@gmail.com,[2]imamulyanihasibian@gmail.com,
[3]ahmadnaashir@uinsyahada.ac.id

Abstract In the current digital era, the use of digital media has become an integral part of everyday life, including in the context of early childhood education. This research aims to explore the influence of the role of digital media in stimulating color recognition and its impact on improving aspects of cognitive development in 4 year old children. This research used an experimental method involving a number of 4 year old children who were exposed to interactive digital media specifically designed to teach colors. Data was collected through direct observation and cognitive development tests carried out before and after the intervention. The research results show that digital media can significantly improve children's ability to recognize colors and provide positive stimulation to other aspects of cognitive development, such as memory, attention and problem-solving abilities. These findings suggest that the integration of digital media in color learning can be an effective tool to support cognitive development in early childhood

Keywords : digital media; color recognition; cognitive development; early childhood; education for children aged 4 years.

INTRODUCTION

In the digital era which is increasingly developing rapidly, digital media has become an integral part of everyday life, including in the field of early childhood education. The use of technology in the teaching and learning process not only makes it easier to access information but also opens up new opportunities in more interactive and interesting learning methods. One aspect of learning that can be optimized through digital media is the introduction of colors in children aged 4 years. Color recognition is an important foundation in children's cognitive development, which helps them understand the world around them and develop various basic skills.

Children aged 4 years are at a crucial stage of cognitive development, where they are starting to learn to identify and group objects based on color. Digital media, with its ability to provide engaging and interactive visualizations, provides a major advantage in this process. Educational apps and games designed specifically for children can offer a fun and effective learning experience. Through colorful images, videos and animations, children can learn to recognize colors in a more interesting way than traditional methods. The interactivity offered by digital media also allows children to actively participate in learning, which is important for improving retention and understanding. Apart from helping with color recognition, the use of digital media also has a positive impact on various aspects of children's cognitive development. The interactive activities contained in educational applications and games not only increase children's focus and concentration, but also hone their problem solving skills. For example, games that involve color matching or solving puzzles can stimulate children's critical and logical thinking abilities. The ability to repeat the same activity also allows children to learn at their own pace, strengthening their understanding of color concepts and improving memory skills(Blumberg & Brooks, 2017).

However, it is important for parents and educators to monitor and limit the use of digital media to maintain a balance with physical activity and social interaction. Although digital media offers many benefits, direct interaction with the environment and other people remains important for a child's holistic development. With the right approach, digital media can be a very effective tool in stimulating color recognition and improving aspects of cognitive development in 4 years old children, giving them a strong foundation for further learning. Through the integration of technology in education, we can create richer, more enjoyable and effective learning experiences for our children.

In this research, we used experimental methods to evaluate the effectiveness of digital media as a color learning tool for 4 years old children. We involved a number of participants divided into an experimental group and a control group. The experimental group was given access to an educational application specifically designed to teach color recognition through various interactive activities, while the control group used conventional learning methods. Data on children's cognitive development was collected through direct observation and standard tests measuring color recognition abilities before and after the intervention period. It is hoped that the results of this research will provide insight into the effectiveness of digital media in the context of early childhood education, as well as provide practical recommendations for parents and educators. Through analysis of the data obtained, we

hope to identify the extent to which digital media can improve color recognition and cognitive development in 4 year old children(Wilkinson et al., 2021).

This research also aims to provide a deeper understanding of how educational application design can be optimized to maximize educational benefits. Thus, this research not only contributes to the academic literature on early childhood education, but also provides practical guidance for application developers, educators, and parents in utilizing digital media effectively and responsibly. Ultimately, our ultimate goal is to ensure that digital technology can be used as a tool that supports children's optimal development at this important stage in their lives.

METHOD

This research uses an experimental method with a quantitative approach to measure the influence of digital media in stimulating color recognition and its impact on the cognitive development of 4 year old children. The research sample consisted of 50 children randomly selected from several kindergartens in urban areas. The children were divided into two groups, namely the experimental group which was given interactive digital media intervention for 8 weeks, and the control group which used conventional learning methods without the help of digital media. The digital media used is an educational application that teaches color recognition through interactive games, videos and visual activities specifically designed for young children. Data collection was carried out through direct observation by researchers and teachers, as well as standard cognitive tests that measured color recognition, memory, attention and problem solving abilities before and after the intervention period.

Apart from that, researchers also collected qualitative data through interviews with teachers and parents to gain a deeper perspective on changes in children's behavior and abilities after using digital media. Quantitative data analysis was carried out using the t test to test the average difference in cognitive test results between the experimental group and the control group. Qualitative data analysis was carried out using the thematic analysis method to identify the main patterns and themes that emerged from the interviews. It is hoped that the results of this research will provide insight into the effectiveness of using digital media in early childhood education, as well as its implications for children's cognitive development. This research also considers external factors such as the home environment and parental involvement that may influence the results, to provide a more comprehensive picture of the influence of digital media on children's development.

RESULT AND DISCUSSION

Digital Media in Early Childhood Education

The role of digital media in early childhood education has become an increasingly important topic in this modern era. Digital media, including educational apps, interactive games, and learning videos, offer a variety of innovative ways to enrich children's learning experiences. This technology is able to make learning more interesting and interactive, so that children are more motivated to learn. In the context of early childhood education, digital media can provide powerful visual and auditory stimulation, helping children understand basic concepts in a more fun and effective way than traditional methods. One of the main benefits of digital media in early childhood education is its ability to offer individualized learning. Each child has a different learning speed and learning style, and digital media can be adapted to each child's needs(Bediou et al., 2020). Educational apps and games often have varying levels of difficulty that can be adjusted to suit a child's abilities, allowing them to learn at their own pace. Thus, digital media not only makes the learning process more personal, but also helps children to reach their maximum potential(Plowman et al., 2012).

Additionally, digital media can introduce children to various topics that may not be easily explained through conventional methods. For example, abstract concepts such as numbers, letters and shapes can be explained through interesting animations and visualizations, making it easier for children to understand and remember the information. Well-designed videos and apps can provide real-life examples and simulations that help children connect theory with practice. This is very important in building a strong foundation of knowledge in the early stages of a child's development(Blumberg & Fisch, 2013).

Digital media also has great potential in developing children's cognitive and social skills. Many educational apps are designed to encourage problem solving, logic, and critical thinking. For example, puzzle games and riddles can help children develop problem-solving abilities and improve their fine motor skills. Additionally, some digital platforms allow interaction between users, which can help children develop social and teamwork skills. This interaction does not only occur in person, but also through virtual discussions and collaboration which can improve their communication skills(Donohue, 2014). However, it is important to remember that the use of digital media in early childhood education must be properly supervised and regulated. Parents and educators have an important role in

ensuring that children use digital media in a balanced and healthy way. This includes limiting screen time, selecting appropriate content, and accompanying children while they use digital devices. With proper supervision, digital media can be a very useful tool in supporting children's cognitive and emotional development without sacrificing important aspects of human interaction and physical activity(Wartella et al., 2018).

The role of digital media in early childhood education includes various digital technologies used to support children's learning and development from an early age. Digital media includes software applications, educational games, interactive videos, and other online resources designed specifically for children. In today's modern technological era, the use of digital media has become increasingly common in schools and informal educational environments such as homes and libraries. Digital media offers opportunities to enhance early childhood learning experiences through engaging visualization and interactivity that builds engagement. For example, learning applications can present educational content in a more dynamic and fun way, utilizing gamification elements to stimulate children's interest and motivation to learn. This not only helps strengthen the child's connection to the learning material but also stimulates various aspects of cognitive development such as problem solving and creativity(Paulus et al., 2021). Digital media also provides easy access to a variety of structured and varied educational content. Children can access educational videos, interactive stories and learning games on a variety of themes such as math, science, language and art. This convenience allows teachers and parents to provide richer and more varied learning experiences according to each child's individual interests and needs.

The use of digital media can improve children's technology skills from an early age. In an era where digital technology has become an integral part of everyday life, the ability to operate digital devices and understand various types of applications is very important. Children who are accustomed to using technology tend to be better prepared to face the demands of an increasingly connected and digital future. Digital media also facilitates self-directed and personalized learning. Children can learn at their own pace and repeat the material as many times as necessary to understand it. Some apps can even adjust the difficulty level or offer immediate feedback, allowing children to improve their skills progressively. The use of digital media encourages collaboration and positive social interactions among children. Some learning platforms provide features for sharing work results, discussing, or even competing in activities designed to improve teamwork and social skills. This helps children build communication, leadership and cooperation skills from an early age(Cannon, 2018).

Lastly, although digital media offers many benefits, it is also important to integrate it with traditional learning methods. Direct learning through interactions with parents, teachers and peers remains very important in early childhood development. The combination of digital media and conventional learning experiences can provide a more holistic and balanced approach. In this way, children can enjoy the benefits of both worlds—technological advances and traditional learning values—to support their all-round development.

Stimulating Color Recognition through Digital Media

The introduction of colors in early childhood is a vital component in their cognitive development, and in this digital era, the use of digital media has proven effective in stimulating color learning. Digital media, which includes educational apps, interactive videos and online games, provides an engaging and interactive platform for children to learn to recognize different colors. The main advantage of digital media is its ability to attract children's attention with bright visuals, lively animations, and fun sounds, making the learning process an interesting and enjoyable experience. Educational apps like Khan Academy Kids and ABCmouse.com, for example, are designed specifically for kids with kid-friendly interfaces and activities that encourage active participation. These apps often use simple games and challenges involving color recognition, where children must match or identify the correct color. This kind of activity not only teaches children to recognize and name colors but also improves their fine motor skills and problem-solving abilities(Arifin et al., 2023).

The use of digital media to stimulate color recognition in children has become an effective and interesting method in early education. Digital media such as interactive apps, educational games and animated videos offer interesting ways to introduce colors to children. Using a touch screen and colorful graphics, children can learn to recognize and associate different colors through fun and interactive activities. Research shows that rich and varied visual stimulation can help children understand color concepts more quickly and efficiently compared to traditional methods.

Interactive videos on platforms such as YouTube Kids also play an important role in stimulating color recognition. Channels like Super Simple Songs and Blippi use songs, stories and cartoon characters that children love to teach colors. Children tend to more easily remember information conveyed through music and attractive visuals. This teaching method helps strengthen children's memory and makes the learning process more effective.

Additionally, interactive videos allow children to re-watch content they enjoy, providing opportunities for repetition that is beneficial in mastering color concepts.

Online games on sites like PBS Kids and Starfall also offer fun and interactive learning experiences. This game is designed to teach colors through a variety of activities involving identifying and grouping colors. For example, games where children have to group objects based on their color not only teach them about colors but also help develop their logic and classification skills. The interactivity in these games encourages children to think critically and make decisions, which are important skills in cognitive development. Apart from that, digital media provides flexibility in learning. Children can learn anytime and anywhere, as long as they have access to digital devices. This allows children to learn at their own pace, giving them the freedom to repeat activities until they truly understand the concept of color. This flexibility is especially beneficial for children who may need more time to understand the material or who have different ways of learning(Nurzaini, 2021).

Apart from applications, animated videos are also an effective tool for color recognition. Well-designed videos can present colors in the context of an interesting story, so that children not only see colors but also understand how they are used in everyday life. For example, a video about the journey of a cartoon character traveling around the world and discovering various colors in the natural surroundings can make the concept of color more relevant and easy for children to understand. The advantage of video is its ability to present dynamic and memorable content, which can improve children's memory.

Color-based educational games have also been proven effective in teaching children about colors. These games often combine elements of competition and challenge, which can increase a child's motivation to learn. For example, games that ask children to search for and click on objects of a certain color within a certain time limit can train children's observation skills and response speed(Prastyaningrum et al., 2023). Additionally, the immediate feedback provided in the game can help children to correct their mistakes and understand color concepts better. Overall, digital media offers a variety of innovative tools and methods to stimulate color recognition in children. By combining engaging visual elements, interactivity, and relevant content, digital media can make learning about color a fun and immersive experience. However, it is also important for parents and educators to monitor and limit screen time, and ensure that the content used is appropriate for the child's age and developmental stage. With a balanced approach, digital media can be a very useful tool in supporting children's cognitive development and visual skills.

However, it is important to note that digital media use should be supervised by parents and educators. While digital media offers many benefits, there are also risks associated with excessive screen exposure. Therefore, it is important to ensure that children use digital media in a balanced way, with screen time limited and combined with other physical and creative activities. With proper supervision, digital media can be a very effective tool in stimulating color recognition and improving children's cognitive development.

The Positive Impact of Digital Media on Aspects of Children's Cognitive Development

In the increasingly advanced digital era, digital media has become an integral part of everyday life, including in the world of children's education. The positive influence of digital media on aspects of children's cognitive development is very significant, especially in terms of learning and developing basic skills. Digital media, such as educational applications, interactive games, and multimedia content, provide access to a variety of interactive and engaging knowledge sources. This allows children to learn in a more fun way and at their own pace. Using educational apps and games can help children develop cognitive skills such as problem solving, critical thinking, and pattern recognition(Blumberg et al., 2019).

Apart from that, digital media also plays an important role in improving children's language and literacy skills. Many apps and games are designed to enrich children's understanding, introduce them to new language concepts, and improve reading skills through interactive stories and text-based games. Children who use digital media with proper guidance often show progress in their literacy skills compared to those who do not. Multimedia content that combines sound, images and text helps children understand complex concepts more easily and quickly.

Not only that, digital media also facilitates the development of social and emotional skills. Through interactive platforms and collaborative games, children learn to cooperate, share and communicate with their peers, even virtually. Educational games that emphasize teamwork and completing tasks together can help children develop empathy and other social skills. Apart from that, digital media also provides space for children to express themselves and their emotions through various creative activities such as drawing, making music and telling stories.

However, to ensure the positive impact of digital media on children's cognitive development, it is important for parents and educators to accompany and guide its use.

Screen time should be limited and adjusted to the child's needs and age, and balanced with physical activity and direct interaction. Appropriate use of digital media can be a powerful tool to support children's cognitive, social and emotional development, as long as it is implemented wisely and controlled. Thus, digital media is not only entertainment, but also an effective educational tool in supporting children's overall development.

Digital media has shown a significant positive impact on children's cognitive development, especially in the context of interactive and fun learning. One of the main impacts is improved visual memory. Digital media, with its colorful graphics and engaging animations, helps children remember information better. Educational apps and interactive games often use visual repetition that strengthens children's memories of shapes, colors, and numbers. For example, apps that teach color recognition often use the same objects in different colors over and over again, which helps children remember and recognize those colors more quickly. Apart from that, digital media also improves problem solving skills in children. Many educational games and apps are designed to encourage children to complete tasks or puzzles, which involve logical thinking and strategy. Through these activities, children learn to plan, analyze and solve problems in creative ways. For example, games that ask children to match certain shapes or colors not only help them recognize colors, but also develop their analytical skills in finding the right solution(Singh & Singh, 2021).

The use of digital media also plays a role in developing language skills. Educational apps often introduce new vocabulary in an engaging and memorable context. Children who use this app regularly can enrich their vocabulary with new words related to colors, shapes and everyday objects. For example, videos that teach colors are often accompanied by narration or songs that explain the names of the colors, helping children associate the visuals with the words they hear.

The interactivity offered by digital media also plays an important role in keeping children's attention and focus. In contrast to traditional passive learning methods, digital media requires children to actively participate in learning activities. For example, apps that ask children to touch the screen to match colors or complete puzzles keep them engaged and focused on the task at hand. This active participation helps increase a child's attention span and concentration abilities, which are important aspects of cognitive development. In addition, digital media provides a flexible and personalized learning environment (Mehmood & Hassan, 2023). Children can learn at their own pace, repeating the material as many times as they need to truly understand it. Educational apps are usually designed to adjust the level of difficulty according to the child's abilities, thereby providing the right

challenge and motivating them to continue learning. This flexibility is very important because it allows each child to develop at their own pace without feeling left behind or pressured.

Finally, digital media also encourages collaboration and parental involvement in the child's learning process. Many educational apps are designed to be used in conjunction with parents, creating opportunities for them to be directly involved in their children's education. This collaboration not only strengthens the relationship between parents and children, but also provides important emotional and motivational support for children. Thus, digital media not only functions as a learning tool, but also as a means to enrich family interactions and support children's overall cognitive development(Lenhart & Richter, 2024).

CONCLUSION

The conclusion of the article "The Influence of the Role of Digital Media in Stimulating Color Recognition to Improve Aspects of Cognitive Development in 4 Year Old Children" highlights that digital media plays an important role in the education and cognitive development of early childhood. The use of educational applications and interactive games not only helps children know and identify colors better, but also strengthens other basic skills such as language skills, memory and problem solving. By utilizing digital media, children can learn through more interactive and interesting methods, which can increase their motivation and interest in the learning process.

In addition, digital media offers various advantages in learning that may be difficult to achieve with traditional methods. The interactivity and immediate feedback of educational apps and games allow children to correct their mistakes in real-time and strengthen their understanding of color concepts. The combination of visual, auditory and kinesthetic elements in digital content also helps accommodate children's various learning styles, so that learning becomes more effective and comprehensive. Research shows that children who use digital media to learn colors show significant improvements in their ability to recognize and name colors compared to those who do not use this media.

However, although the potential benefits of digital media in learning are enormous, it is important for parents and educators to ensure wise and balanced use. Screen time should be managed carefully and not replace the physical activity and social interactions that are essential for a child's overall development. With proper supervision and guidance, digital media can be a highly effective educational tool for improving color recognition and other aspects of cognitive development in four-year-old children. Combining technology with

traditional learning approaches can create a holistic and sustainable learning environment, which supports optimal child development.

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