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The Influence of Gadget Utilization on the Cognitive Progression of Elementary School-Aged Individuals: A Comparative Analysis From Parental and Educator Standpoints

Pengaruh Penggunaan Gadget Terhadap Perkembangan Kognitif Anak Usia Sekolah Dasar: Analisis Komparatif Dari Sudut Pandang Orang Tua dan Pendidik

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Abstract

The pervasive use of gadgets among elementary school-aged children has sparked concerns regarding its impact on cognitive development. This qualitative study delved into this issue by examining the experiences and perspectives of students at Cahaya Hati Islamic Elementary School through in-depth interviews over two months. Thematic analysis of the interviews shed light on the types and frequency of gadget use, contexts of usage, activities engaged in, and observed impacts on cognitive abilities. The findings revealed a significant reliance on gadgets for educational and leisure purposes, with implications for attention span and task focus. Drawing on theories of cognitive development, such as Piaget's constructivist perspective, Vygotsky's Zone of Proximal Development, and Bandura's Social Cognitive Theory, the discussion navigated the intricate interplay between gadget use and cognitive growth. Recommendations were formulated to optimize the benefits of gadget use while mitigating potential drawbacks, aiming to foster balanced cognitive development in children amidst the digital age.

Keywords: *Cognitive progression, gadgets, islamic elementary school.*

Abstrak

Penggunaan gadget yang meluas di kalangan anak-anak usia sekolah dasar telah menimbulkan kekhawatiran terkait dampaknya terhadap perkembangan kognitif. Penelitian kualitatif ini bertujuan untuk mengkaji isu tersebut dengan meneliti pengalaman dan perspektif siswa di Sekolah Dasar Islam Cahaya Hati melalui wawancara mendalam selama dua bulan. Analisis tematik dari wawancara ini mengungkap jenis dan frekuensi penggunaan gadget, konteks penggunaannya, aktivitas yang dilakukan, serta dampak yang diamati terhadap kemampuan kognitif. Hasil penelitian menunjukkan ketergantungan signifikan pada gadget baik untuk tujuan pendidikan maupun hiburan, dengan implikasi pada rentang perhatian dan fokus tugas. Dengan mengacu pada teori perkembangan kognitif seperti perspektif konstruktivis Piaget, Zona Perkembangan Proksimal Vygotsky, dan Teori Kognitif Sosial Bandura, diskusi ini mengeksplorasi keterkaitan kompleks antara penggunaan gadget dan pertumbuhan kognitif. Rekomendasi disusun untuk mengoptimalkan manfaat penggunaan gadget sekaligus mengurangi potensi dampak negatifnya, dengan tujuan mendorong perkembangan kognitif yang seimbang pada anak-anak di era digital.

Kata Kunci: Perkembangan kognitif, gadget, sekolah dasar islam.

1. Introduction

The digital age has introduced a significant transformation in education that is changing the way we learn, teach, and interact with knowledge. Digital transformation, as described by (Mhlanga, 2022), is the widespread use of various technological tools and methods aimed at improving teaching and learning outcomes in every aspect of the education system. This comprehensive transformation entails the incorporation of digital resources, online platforms, and learning software, which collectively enrich the educational experience for students. Well-known examples of educational technologies include online education, virtual classrooms, e-books, and educational apps.

In recent years, technological advances have drastically changed many aspects of daily life, including education. Technology, including education, has an important role in human life (Harsyah, 2022). Devices such as smartphones, tablets and laptops have become commonly used tools in the classroom. These gadgets provide a wide variety of applications and resources to support learning and enhance cognitive growth. However, the widespread use of these devices by children, especially those in primary school, has raised concerns among educators, parents and researchers about their possible impact on cognitive development.

The primary school years are an important time for cognitive development, characterized by developing key skills such as problem-solving, logical thinking, memory and attention. According to Jean Piaget's theory of cognitive development, this stage is known as the concrete operational stage, where children begin to think logically about tangible events (Piaget, 1952). Piaget's work emphasizes the importance of hands-on activities and direct manipulation of objects for cognitive development. The increasing reliance on digital gadgets, which often provide virtual rather than physical interaction, necessitates a reassessment of their impact on this developmental process.

Lev Vygotsky's Zone of Proximal Development (ZPD) theory highlights the important role of social interaction and guided learning in cognitive development (Lev Vygotsky, 1978). Vygotsky argued that children learn most effectively when supported by more knowledgeable people, such as teachers or parents, working within their ZPD. This zone defines the difference between what a child can do alone and what they can achieve with help, emphasizing the value of collaborative learning in promoting cognitive growth. This concept highlights the potential benefits of using educational technology under supervision, which can provide scaffolding and support to optimize learning. However, undirected and excessive gadget use can lead to missed opportunities for critical social interactions and cognitive development.

Albert Bandura's Social Cognitive Theory highlights the importance of observational learning, imitation, and modelling in shaping cognitive and behavioural skills (Bandura, 1986). His research revealed that children can learn effectively by interacting with digital content on various devices. Educational videos, interactive games, and multimedia resources can play an important role in demonstrating positive behaviours and promoting cognitive development. However, the effectiveness of these tools depends mainly on the quality of the content and the context in which it is used.

In addition, John Sweller's Cognitive Load Theory provides insight into how the amount of information presented to learners can affect their ability to process and retain information (Sweller, 1988). Excessive or poorly designed digital content can overload a child's cognitive capacity, leading to decreased learning efficiency and potential cognitive overload. This theory highlights the importance of carefully designing educational technology to align with students' cognitive abilities.

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Research has emphasized the advantages and disadvantages of gadget use. On the positive side, educational apps and interactive games can create an engaging and stimulating environment that encourages active learning. These tools contribute to cognitive development by providing personalized learning experiences, instant feedback and repeated practice opportunities. Well-crafted educational apps can significantly improve language and literacy skills in children (Hirsh-Pasek et al., 2015).

In contrast, excessive gadget use has been associated with various negative consequences, including shorter attention spans, higher cognitive load and potential dependence on digital devices. As Twenge and Campbell revealed, the use of digital media, including gadgets, has a significant association with mental health problems, such as depression and anxiety, which can affect children's cognitive development (Twenge, 2019). Prolonged screen time can cause attention problems in children (Christakis, 2009). Similarly, research by Przybylski and Weinstein revealed that while moderate screen use is generally not harmful, excessive use can adversely affect cognitive health and function (Przybylski & Weinstein, 2017).

Previous research shows mixed results regarding the impact of gadgets on children. Gadget-based educational applications can improve literacy and language skills (Hirsh-Pasek et al., 2015). However, other studies have shown that excessive screen time has the potential to cause attention problems in children (Christakis, 2009). Recent studies suggest moderate screen time has a neutral impact, but excessive use can harm mental health (Przybylski & Weinstein, 2017). Obsession with digital technology and excessive gadget use can impair children's cognitive development, impacting their concentration and critical thinking skills (Anthony, 2013). This study differs by exploring the relationship between gadget use and the cognitive abilities of elementary school children comparatively from the perspective of parents and educators.

The role of parental and teacher guidance in mediating the impact of gadget use cannot be overstated. Research has shown that active mediation by parents and educators can enhance the educational benefits of technology while reducing potential risks (Plowman et al., 2010). Parental mediation of children's internet use can influence the effects of gadgets on their cognitive development, with appropriate supervision enhancing the educational benefits while reducing potential risks (Livingstone & Helsper, 2008).

The increasing integration of technology in education and widespread access to gadgets at home calls for a thorough evaluation of its impact on young learners. Gaining a deeper understanding of the effects of screen time on cognitive development is essential for crafting effective educational strategies and policies (Brown, 2018). These should harness the advantages of technology while addressing and minimizing its potential disadvantages.

This study sought to examine the effects of gadget use on the cognitive development of elementary school-aged children. It aims to shed light on how technology shapes important cognitive functions and provide practical recommendations for parents, educators, and policy makers to promote balanced and healthy gadget use in children's daily lives.

2. Literature Review

2.1. Cognitive Development in Elementary School-Age Children

Significant advances in memory, reasoning, problem-solving and information-processing skills characterize cognitive development during the primary school years. Grounded theories such as Piaget's stages of cognitive development and Vygotsky's sociocultural theory offer valuable insights into these changes. Piaget states that children in this age group are typically in the concrete operational

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stage, developing the ability to think logically about concrete events. However, they may still struggle with abstract reasoning (Piaget, 1952). , Vygotsky underlined the role of social interaction and cultural tools, such as language and technology, in facilitating cognitive growth. His perspective highlights the importance of external influences and collaborative learning in shaping children's cognitive abilities (Vygotsky, 1978).

2.2. Gadgets as Cognitive Tools

Gadgets have a dual impact on cognitive development, serving as both an asset and a hindrance. On the positive side, educational apps and interactive games offer engaging and hands-on opportunities to reinforce academic concepts, enhancing the learning experience (Gee, 2003). These tools can support problem-solving, memory retention and spatial reasoning. Conversely, excessive screen time and exposure to non-educational content can have negative consequences, including reduced attention span, reduced social engagement, and inhibited development of critical thinking skills (Anderson & Subrahmanyam, 2000). Thus, the usefulness of gadgets as cognitive aids is highly dependent on the content, duration of use, and context.

2.3. The Role of Parental Perception

Parents play an important role in shaping how children interact with technology. Their perceptions and attitudes towards gadget use significantly influence the type and level of exposure their children receive. Some parents consider gadgets valuable educational tools that complement traditional learning methods. In contrast, others are concerned about their potential downsides, such as addiction, reduced physical activity and over-dependence on technology (Livingstone & Helsper, 2008). The degree of balance parents strike between permissiveness and regulation often reflects their experiences with technology and their beliefs about its impact on cognitive growth. This highlights the need for informed parental guidance to ensure that gadget use contributes positively to children's development.

2.4. Educators' Perspectives on the Use of Gadgets in the Classroom

Digital literacy plays an important role in supporting effective online learning, which can directly influence children's cognitive development through more structured gadget use and appropriate guidance (Irpan et al., 2023). Educators, however, often face the challenge of integrating gadgets into the learning environment in a way that enhances, rather than detracts from, educational outcomes. While some educators embrace technology to foster interactive learning and creativity, others express concerns about distractions, equity issues, and difficulty monitoring appropriate use in the classroom (Ertmer & Ottenbreit-Leftwich, 2010). The availability of resources, training and institutional support also influences the effective use of devices in education.

2.5. Comparative Analysis of Parents' and Educators' Viewpoints

A comparative analysis reveals convergent and divergent viewpoints between parents and educators regarding the role of gadgets in cognitive development. While both groups recognized the potential benefits of gadgets, their concerns often differed. Parents primarily focused on the potential for gadgets to disrupt family dynamics and impede physical health, while educators were more concerned with maintaining academic integrity and equitable access to technology (Clark, 2009); (Plowman, 2010). Understanding these perspectives is critical to developing strategies that optimize gadget use to support cognitive development.

3. Methods

This study used a qualitative approach to explore students' experiences and perspectives regarding the impact of gadget use on their cognitive development. The research was conducted at *Cahaya Hati Islamic Elementary School* for two months, focusing on an in-depth exploration of how technology affects the cognitive skills of elementary school-aged children. The research sample consisted of 30 students selected using a purposive sampling technique. This technique ensured the representation of children with various patterns of gadget use, thus providing a diversity of relevant data. The research instrument used was an in-depth interview guide designed to explore the types of gadgets used, the duration of their use, and the context of use in daily life. Data was collected through structured interviews involving students, teachers and parents to gain a comprehensive perspective. During the data collection process, interviews were recorded, transcribed, and systematically analyzed using the thematic analysis method. This analysis involved coding the data to identify recurring patterns and themes and relating the findings to the research variables.

4. Result and Discussion

4.1. Research Result

This study reveals how children's use of gadgets at *Cahaya Hati Islamic Elementary School* affects their cognitive development. Based on interviews, children use various technological devices, including cell phones, tablets, personal computers (PCs), game consoles and smartwatches. Most children use these devices for 5 to 6 hours daily, especially after completing homework. They also use their free Time to play games or watch movies, while at school, some lessons are taught using computers or tablets.

Technology's rampant presence has changed how children interact with the world, both in educational and recreational settings. It has become an integral part of everyday life and significantly influences the cognitive development of primary school-aged children. This research explores the dynamic between the opportunities offered by technology and the challenges that arise from its use, to understand how these devices shape children's mindsets.

Using devices offers various positive benefits, including supporting interactive learning through educational applications such as simulations and knowledge-based games. However, unsupervised device use also has negative impacts, such as distraction, reduced social interaction, and disrupted sleep patterns. Intensive device use patterns for relaxation, entertainment or education raise questions about their impact on children's cognitive function.

The research also reveals the digital divide experienced by children in less developed regions. Limited access to quality devices and the internet hinders their opportunities to make the most of digital educational resources, creating inequalities in cognitive development.

The theoretical approaches used in this study include Piaget's theory, which emphasizes the importance of direct interaction with objects, and Vygotsky's and Bandura's theories, which underscore the role of social interaction in cognitive development. With proper supervision, devices can be an effective tool to support children's learning and development.

This research provides important insights for parents and educators on how to balance the benefits of technology with its challenges and encourage the judicious use of devices to support children's optimal development.

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4.2. Research Result

The combined insights of parents and educators offer a comprehensive perspective on the complex relationship between children's cognitive development and gadget use. Devices such as smartphones, tablets and gaming consoles are now an integral part of children's daily routines, as confirmed by the observations of parents and educators. Parents reported that children typically use devices to relax at home, with an average screen time of around 2-3 hours daily. In contrast, educators observed much higher levels of engagement, with usage often reaching 5-6 hours daily, especially outside of structured academic environments. This gap points to the need for a deeper understanding of the factors underlying children's interactions with digital technologies and their impact on their cognitive development.

Table.1. Average Time of Gadget Use

Types of Gadgets	Average Time (hour)
Smartphone	3
Tablet	2
PC/Laptop	1.5
Game Console	2.5

Bronfenbrenner's ecological systems theory offers a valuable lens through which to view the various factors that influence children's use of technology (Bronfenbrenner, 1979). According to this theory, children's development is influenced by a variety of interrelated systems, including micro-systems immediate family and school), meso-systems (relationships between micro-system contexts), macro-systems (external influences that are not directly part of the child's immediate environment), and macro-systems (broader social and cultural norms). This conceptual framework provides a comprehensive view of how various influences, from parental guidance and school practices to societal norms, shape how children use devices and interact with technology.

Motivational factors that drive children's engagement with technology. This theory emphasizes the role of intrinsic motivation driven by autonomy, competence, and relatedness in encouraging individuals to engage in activities voluntarily and with persistence. When applied to children's gadget use, intrinsic motivation can stem from a sense of autonomy during digital exploration, feelings of competence gained by mastering technology, and opportunities for meaningful social interactions through online platforms. Conversely, extrinsic motivators, such as parental rewards or coercion, can reduce intrinsic motivation, resulting in less meaningful and more superficial engagement with technology.

Critical insights into the inequities associated with access to digital technologies. These gaps refer to disparities in access to technological devices and digital literacy, especially among socioeconomically disadvantaged children (Warschauer, 2003). The gap can hinder educational opportunities by limiting access to quality educational content and learning platforms. Addressing these gaps is, therefore, critical to ensure that all children can benefit from the educational potential of gadgets and promote inclusivity in learning opportunities.

At home, gadgets provide entertainment and relaxation, especially after doing homework or during leisure time. While gadgets provide fun and stress relief moments, excessive screen time remains a concern. This excessive use can replace important activities such as physical play and face-to-face social interactions, crucial for children's holistic development.

The digital divide in less developed regions results from children's limited access to quality technology devices and a stable internet network. Children in these areas often do not have

smartphones, tablets or personal computers to access educational apps and other digital resources. In addition, even where devices are available, they are often of inadequate quality, preventing them from using technology to its full potential for learning.

Another issue is limited access to fast and stable internet, which makes it difficult for children to access online learning platforms and search for information. This prevents them from optimally utilizing digital educational resources, which could support more flexible and practical learning. This inability to access technology exacerbates the education and digital skills gap between children in developed and less developed regions.

In educational settings, gadgets are powerful tools to enhance learning by providing access to online resources, interactive educational games and collaborative learning platforms. These technological tools can enrich academic instruction and encourage interactive and innovative learning experiences. Nevertheless, careful monitoring and integration are essential to ensure that their use positively impacts cognitive performance without becoming a distraction.

The widespread use of gadgets such as smartphones, tablets, and computers has changed the way children interact with and learn from them. These devices are now ever-present in children's daily lives, affecting various aspects of their cognitive, social, and emotional development. This discussion has explored the potential advantages and disadvantages associated with gadget use, especially about cognitive development.

Research interviews reveal that children use a wide variety of gadgets, such as smartphones, tablets, computers, smartwatches, and gaming consoles, with some children engaging in very high levels of use for 5-6 hours a day. Such intense use usually occurs during leisure time or after completing homework. Typical activities include playing games, watching videos and using gadgets in free Time. In the school environment, tablets and computers are used as instructional tools for specific lessons and learning activities, highlighting their role as recreational and educational aids.

These findings further emphasize the dual nature of device use: while they can be a gateway to knowledge and creativity, they can pose challenges such as overexposure, reduced physical activity and potential cognitive impairment. Understanding how children interact with these devices in educational and non-educational contexts is critical to encouraging healthier and more productive patterns of use.

The pervasiveness of gadgets in children's lives, including smartphones, tablets, and computers, has revolutionized their interactions with the world around them. These devices, which are ubiquitous in both educational and leisure contexts, profoundly influence the cognitive development of primary school-aged children. Delving into this domain, we explore the complex interactions between gadget use and cognitive growth, navigating a diverse landscape of benefits and challenges.

In analyzing the types of gadgets commonly used by children, ranging from smartphones to gaming consoles, it is clear that their use covers various dimensions of daily life. However, the intensity of use, which often reaches 5 to 6 hours a day, prompts us to reflect on the implications for cognitive processes. This pattern of use, coupled with the context of use - relaxation after homework, enjoying leisure time, and even educational endeavours - provides the basis for a nuanced study.

Drawing from well-known theories of cognitive development, such as Jean Piaget's constructivist perspective, we see similarities between patterns of gadget use and foundational principles. Piaget underscored the importance of hands-on activities and direct engagement with tangible materials in promoting cognitive growth. In this digital age, the tactile exploration

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advocated by Piaget finds its virtual counterpart in children's interactions with touchscreen devices and immersive digital environments. However, translating Piaget's theory into the digital world requires critical research to ascertain whether virtual experiences can replicate the richness of physical exploration.

Following Lev Vygotsky's Zone of Proximal Development (ZPD), the supervisory role parents and educators assume in guiding children's use of devices is vital. Vygotsky argued that cognitive development occurs through social interaction and guided learning within the child's zone of proximal development, supervised gadget use, characterized by structured engagement with educational content and mediated exploration, emerges as a channel to optimize cognitive growth. However, the extent to which these scaffolds effectively transcend digital barriers and promote holistic development requires further investigation.

Referring to Lev Vygotsky's Zone of Proximal Development (ZPD), the role of supervision by parents and educators in guiding children's use of devices is vital. Vygotsky argued that cognitive development occurs through social interaction and guided learning within the child's zone of proximal development, where the child can complete tasks with the help of adults or more skilled peers. In the context of technology use, the role of parents and educators as "scaffolds" is vital to support children in optimizing their cognitive development potential.

In everyday practice, supervision of device use can be done by engaging children in structured activities, such as using educational apps designed to develop specific skills or guiding purposeful digital exploration. Parents can create dedicated Time for learning to use technology educationally at home. At the same time, educators can integrate technology into the learning process at school with approaches that blend social interaction, collaboration and direct instruction. Nonetheless, the effectiveness of these scaffolds in overcoming digital barriers and promoting holistic cognitive development still requires further research to understand the extent to which these supervisions can be effectively applied in school and home environments, considering the speed of technological development and the challenges involved.

Albert Bandura's Social Cognitive Theory offers a lens to examine children's observational learning and behavioural modelling in the digital world. Bandura argues that individuals learn by observing others and imitating their actions, a phenomenon manifested in children's imitation of digital behaviours they witness on gadgets. As such, the proliferation of educational apps, interactive games and multimedia resources has significance as repositories of knowledge and as platforms for modelling cognitive skills and desired behaviours. Nevertheless, the efficacy of such digital modelling in fostering enduring cognitive competencies remains an area ripe for exploration.

Sweller's cognitive load theory states that the design and presentation of digital content impact children's cognitive processing (Sweller, 1988). This underscores the importance of optimizing educational technology to align with children's cognitive capacities, ensuring that digital tools enhance rather than impede learning. Integrating these theoretical perspectives provides a nuanced understanding of the findings, which include ecological influences, motivational dynamics and socioeconomic disparities. This holistic approach to analyzing gadget use broadens the scope of inquiry and underscores the complex interactions between factors that shape children's cognitive development in digital environments. Addressing the challenges of gadget use requires a multifaceted approach, promoting digital literacy usage practices and providing adequate support and guidance. By utilizing technology as a scaffold for cognitive growth and encouraging a well-rounded developmental experience, stakeholders can empower

children to harness the transformative potential of gadgets while mitigating their potential drawbacks.

Tracing the landscape of the impact of gadget use on cognitive abilities reveals dichotomous results. On the one hand, the influx of technology enriches children's technological literacy, provides greater access to educational resources, and develops problem-solving skills through learning experiences coupled with play. On the other hand, excessive device use can reduce attention span, disrupt sleep patterns, and reduce Time allocated for physical activity and face-to-face social interaction. For example, sleep disturbances caused by device use are associated with a reduction in children's sleep quality, which can negatively affect their concentration and cognitive performance during the day. In addition, dependence on technology can reduce the quality of children's social relationships, as they prefer interacting with devices over having face-to-face conversations with peers or family.

Observations gleaned from parent and teacher insights further underscore the dynamics at play. While children demonstrated commendable proficiency in navigating digital interfaces and assimilating new applications, challenges arose in sustaining attention on cognitively demanding tasks without digital stimuli. These findings align with the theoretical principles outlined by Piaget, Vygotsky and Bandura, which underscore the intricate relationship between gadget use and cognitive development within a sociocultural framework. For example, recent research suggests that overexposure to gadgets may contribute to attention disorders (ADHD) and sleep problems in children, impacting their ability to focus on more complex and in-depth tasks.

The proliferation of gadgets in children's lives presents opportunities and challenges in cognitive development. By anchoring our exploration in established theories of cognitive growth and sociocultural learning, we explore this terrain with heightened sensitivity to the multiple dimensions at play. To provide a deeper understanding, it is important to include references or current research that empirically addresses the negative impact of screen time, particularly in terms of sleep disturbance and reduction of face-to-face social interactions, to provide a more comprehensive picture of its effects on children's development.

5. Conclusion

The widespread integration of gadgets into children's lives calls for a deeper understanding of their impact on cognitive development. This study highlights the multifaceted effects of gadget use among primary school-aged children, revealing both benefits and potential drawbacks. While gadgets offer valuable learning opportunities and enhance technological literacy, excessive use may affect attention span and task focus. This study underscores the importance of promoting balanced gadget use by examining the types of gadgets used, frequency of use, context of use, and observed impact on cognitive abilities.

Grounded in theories of cognitive development and sociocultural learning, the findings highlight the critical role of parental and educator guidance in managing the complexities of gadget use. This guidance is essential to maximize the benefits of technology while minimizing its potential downsides, thereby promoting well-rounded cognitive development in children.

This study reveals the dual impact of gadget use on children's cognitive development. The findings emphasize the importance of parental and teacher guidance to optimize the benefits of technology while minimizing its potential negative impacts. With the right strategies, gadgets can be an effective tool to support healthy cognitive development in children.

Going forward, there is an urgent need for further research to investigate other factors that influence gadget use and its impact on cognitive growth. Such research can provide deeper insights

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into the dynamics of technology interactions and inform evidence-based policy and practice. These efforts aim to support the development of strategies that effectively nurture children's cognitive abilities in an increasingly digital world.

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