Jurnal Ilmiah Mandala Education (JIME)
Volume 11 No. 3 Agustus 2025
p-ISSN : 2442-9511, e-2656-5862
DOI: *10.58258/jime.v11i3.9176/http://ejournal.mandalanursa.org/index.php/JIME*

Integrating Digital Literacy in the Ecological Environment of Child Development

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Article Info

Article history:
Accepted: 11 July 2025
Publish: 01 August 2025

Keywords:
digital literacy,
child development,
ecological theory,
Bronfenbrenner

Abstract

Today, digital technology is developing very rapidly and has an impact on various aspects of life, both adults and children. Therefore, digital literacy is a skill that needs to be instilled from an early age. This research aims to examine in depth how digital literacy can be integrated in the context of the ecological environment of child development based on Bronfenbrenner's ecological theory. The method used is library research with a descriptive qualitative approach. Data were obtained from various sources of scientific literature, including books, journals, academic articles and educational policy documents. The results showed that digital literacy is not only influenced by individual factors, but also involves the entire system in the child's environment, ranging from microsystems to macrosystems and paying attention to the dynamics of the chronosystem. Each layer of the environment has an important role in shaping children's healthy, critical and responsible digital understanding, attitudes and skills.

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1. INTRODUCTION

The development of digital technology has brought changes in various aspects of life, including in the way children learn, interact and grow in their social environment. Today's children are not only users of technology, but also part of a complex digital ecosystem. According to UNICEF data, by 2023 a child in the world will access the internet for the first time every half second (Unicef, 2023). In Indonesia, the number of internet users has reached 221 million people or 79.5 percent of the total population, and about 9.17 percent of the total are under 12 years old (Komdigi, 2025). The Central Bureau of Statistics (BPS) released data that in 2024, 39.71% of children in Indonesia had used cell phones, while 35.57% had accessed the internet.

Based on this data, it can be concluded that the development of digital technology has touched the lives of today's children. Since birth, they have been accustomed to seeing digital media such as television and seeing their parents operate smartphones and laptops, so it is necessary to equip children with digital literacy skills. Digital literacy in the context of early childhood is the understanding, knowledge, and ability to utilize digital media available in their environment with the aim of seeking information, learning, playing, or entertaining themselves positively, which is always accompanied by guidance from adults around them (Trimuliana, 2022). Digital literacy can be said to be the ability to access,

understand, evaluate and create information through digital technology, becoming an important skill in supporting children's cognitive, social and emotional development.

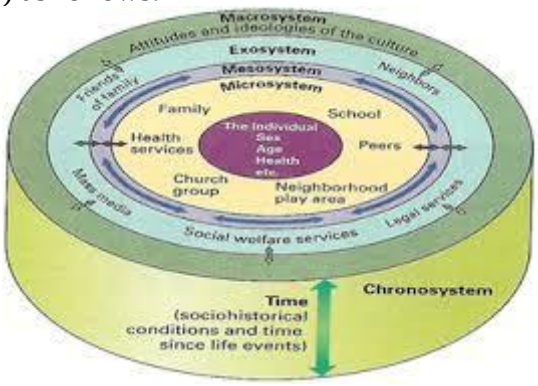
The development of digital technology is known to have two sides, namely the positive side and the negative side. The positive side of digital media is that it helps children improve their understanding of learning concepts and enrich their vocabulary (Čokor & Bernik, 2021). On the negative side, parents are concerned about exposure to negative content from digital media, such as violence, cyber bullying and pornography as well as the possibility of addiction. Therefore, it is important to equip early childhood with digital literacy skills, so that they can support their growth and development process.

To ensure that digital literacy develops in a healthy way, an ecological approach is particularly relevant as it considers the complex environmental influences on children's development. Digital literacy can serve as a bridge between technology and ecological awareness, so that children are not only technologically proficient, but also environmentally sensitive and responsible.

2. MATERIALS AND METHODS

Bronfenbrenner's ecological theory

Bronfenbrenner's ecological theory is a theory that discusses human development which consists of five environmental systems, namely the microsystem, mesosystem, exosystem, macrosystem and chronosystem. The interaction between humans and the environment will shape human behavior. In simple terms, the interaction is described by Bronfenbrenner (1986) as follows:



1. Microsystem, which is the environment closest to the child, such as family, caregivers, teachers, peers.
2. Mesosystem, is the interaction between systems such as parents and teachers.
3. Ecosystem, is an indirect environment but has an influence on the development of children, for example neighbors, friends brothers / sisters, television, mass media and gadgets.
4. Macrosystem, is the culture in the environment around the child, such as customs and traditions.
5. Chronosystem, which is the change in time, both in child development and social change

Digital Literacy

Digital literacy was first introduced by Gilster (1997), digital literacy is not just about the ability to use digital tools, but rather the ability to understand and use information in various formats from various sources when presented through a computer. Meanwhile, UNESCO (2018) defines digital literacy as the ability to use information and communication technology (ICT) to find, evaluate, use, share and create content using digital technology effectively, ethically and safely.

Furthermore, UNESCO (2018) suggests several important components of digital literacy which include:

1. Digital access, the ability to access technology and internet connections.
2. Digital communication, understanding how to communicate effectively and ethically in the digital world.
3. Digital ethics, awareness of norms and laws in the digital world.
4. Digital security, the ability to protect oneself from digital threats such as hacking, hoaxes, and data theft.
5. Digital critical thinking, evaluating the validity of information and digital resources.

In line with this, Kominfo (2020) also launched four pillars of digital literacy consisting of digital skills, digital safety, digital culture and digital ethics.

3. METHODS

This research uses a qualitative approach that aims to explore and understand the meaning that individuals or groups construct regarding a social or humanitarian issue. This research process involves emerging questions and procedures, data that is usually collected in participant settings, inductive data analysis, building from particles to general themes, and researchers make interpretations of the meaning of the data (Cresswell, 2017).

The method used in this research is descriptive analysis. Descriptive research is research intended to collect information about the status of an existing symptom, namely the state of the symptom according to what it is at the time the research is conducted (Arikunto, 2010). Data collection techniques were carried out with observation sheets, interviews, and literature studies. To reveal various theories that are relevant to the problems being faced or studied and as material for discussing the results of the study using data derived from various books, journals, articles and education policy documents.

4. RESULTS

The integration of digital literacy in the ecological environment of child development is a strategic step in responding to the challenges of the digital era while supporting children's overall growth and development. The ecological approach developed by Urie Bronfenbrenner (1986) is the main framework for understanding how various social systems affect adolescent development, starting from the microsystem, mesosystem, exosystem, macrosystem to chronosystem

A. Microsystem

Family is the first environment in shaping children's values and behavior, including the use of digital technology. Parents or family members have an important role as mentors in the use of digital devices. Children tend to imitate the behavior they see at home, so the role of the family in providing examples of healthy use of technology is very large. Parents who are digitally literate can also act as digital literacy role models. Parents can introduce the healthy use of digital devices, teach digital ethics, monitor the content that children access, direct children to access educational content and limit screen time (Livingstone, S., & Helsper, E. J., 2008).

A child's closest environment after family is the peer group. Peers play a role in the process of digital identity formation. Peers are often the place to ask questions or share information related to the use of technology, social media, or the internet. Children and adolescents often observe how their friends present themselves on social media, then imitate or modify the way they present their own identity in the digital world (Boyd, 2014), for example, the style of taking pictures, how to write captions or the type of content shared. Peers are not only partners in socializing, but can also be important partners in the digital literacy learning process. Because of the equal and close relationship, the process of sharing and learning becomes more effective and

enjoyable. Learning from peers often feels more comfortable and less intimidating. This can help children be more confident in trying new things in the digital world and not be afraid to ask questions when they don't understand.

Furthermore, school, which is often referred to as a 'second home', is the closest environment other than family, the amount of time spent at school is the reason for this nickname. Schools can be an ideal place to provide equal access to digital devices and internet connections, especially for children who have limited access at home (UNESCO, 2017), such as the use of computer labs, school Wi-Fi connections, or the loan of devices such as tablets/laptops. Schools are an important place to educate children about ethical internet use, personal data protection, and risks such as cyberbullying and digital fraud.

B. Mesosystem

The mesosystem is the interaction between microsystems, which can be the parent's relationship with the child's friends or the parent's relationship with the teacher. When parents know their child's friends and communicate with them, this creates a wider circle of social supervision (Livingstone, S., & Brake, D. R., 2010). Children tend to be more cautious about using digital media if they know their parents are connected, e.g. if a child wants to share a content/post on social media, he/she might think twice knowing that his/her friend's parents can also see it. By understanding who their children's friends are and how they use technology, parents can be better prepared to dialogue with their children about their friends' digital behaviors, both positive and negative.

Furthermore, teachers as part of the school microsystem interact with children's social microsystem (peers), which has an impact on children's digital skills and ethics, for example, teachers pay attention to the dynamics of student friendship groups in the classroom that share digital information and use it to design collaborative project-based digital literacy activities. The model of teaching internet literacy through the formation of peer groups shows that peers are the main reference for children and adolescents in using the internet due to the lack of parental assistance (Setiansah et al., 2021).

C. Exosystem

The exosystem is the external environment that does not directly affect children, namely the media or the policies of technology companies. Digital media plays an important role in expanding children's access to information and learning tools, which is the foundation of digital literacy (Livingstone & Helsper, 2008). Children who use digital media will learn to develop basic digital skills that are part of digital literacy, for example, operating technological devices such as tablets, computers, cellphones or using certain software/applications such as typing in Microsoft Word applications. In addition, digital media allows children to become content producers, not just consumers. Children can create educational videos, write blogs or digital stories as well as draw and edit digitally. These activities enhance their creativity and engagement in the digital world in an active and positive way. But media in children's digital literacy is like a double-edged sword, it can be a very powerful educational tool but also a source of danger if not accompanied wisely.

The policies of technology companies and internet content also have an impact on children's digital experiences, even though they do not directly control them. Tech companies such as Google, Meta (Facebook), Microsoft, Apple and TikTok have a social and ethical responsibility to support children's digital literacy development. Tech company policies that favor child safety are instrumental in supporting a healthy and educational digital environment (Unicef, 2017). Tech companies create 'parental control' and 'privacy settings' features to protect children while surfing the digital

world. These features help children learn about screen time limits, age-appropriate content filters and personal data security. Examples of policies include 'Google Family Link' which allows parents to manage their child's apps, usage time and location and 'YouTube Kids' which filters content to be age-appropriate for child users.

D. Macrosystem

Macrosystem refers to culture in the form of social values, community habits, norms and local traditions. Children's digital literacy is not formed in a vacuum but is shaped by the socio-cultural environment in which they grow up. Culture and social values determine how digital literacy is taught and valued. In a society that upholds digital ethics, children will get used to being critical and responsible online. The surrounding culture establishes norms about what is considered good or bad in using digital technology. These norms then influence how children access, produce and share digital content. Local language and culture also determine the extent to which children can access digital content. Children living in environments with limited access to local language content may struggle to understand the digital world (Warschauer, 2003) e.g. children from rural areas who are unfamiliar with formal Indonesian or English may struggle to access educational websites.

E. Chronosystem

Chronosystem refers to the time changes that occur in a child's development. This includes the technological revolution, social changes and cultural dynamics that occur over time. These changes have a major influence on children's digital literacy because technology and how it is used is constantly changing, as are the challenges and skills required. Because technology and social contexts are constantly changing, digital literacy cannot be taught once and then finished. Children must continue to adapt and relearn as digital tools, trends and challenges evolve (Buckingham, 2015). For example, today's children learn and socialize online and in real-time through the Zoom app, Google Classroom, and various online communities, unlike previous generations who relied on physical interaction. Today's children experience rapid technological development. Adapting to platform changes, social media trends, and new challenges such as disinformation and cyberbullying are part of the digital literacy learning process all the time.

5. CONCLUSION

Digital literacy does not only include the ability to use technological devices, but also includes critical thinking skills, ethics in the use of digital media, and digital safety. Integrating digital literacy in the ecology of child development is not just about teaching technology, but building an ecosystem that supports healthy and responsible digital use. Parents, educators, policymakers and communities have an important role in shaping a generation that is not only technologically proficient, but also wise and ethical in its use. With this ecological understanding, we can create an environment that supports children's growth as a smart, critical and ethical digital generation.

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