

Digital Hygiene as a Preventive Strategy to Address the Brain Rot Phenomenon among Students in the Era of Digital Disruption

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ABSTRACT

The rapid growth of algorithm-driven digital platforms such as TikTok and Instagram has significantly transformed students' cognitive engagement patterns. This transformation has led to the emergence of the brain rot phenomenon, characterized by reduced attention span, weakened critical thinking skills, and diminished information retention. This study aims to explore digital hygiene as a preventive strategy to mitigate the cognitive impacts of excessive digital consumption among elementary school students. Employing a qualitative case study design, the research was conducted at an elementary school in Sumedang Regency, Indonesia, over approximately two to three months. Data were collected through in-depth interviews, classroom observations, and document analysis involving students as the main participants and teachers as supporting informants. Data were analyzed using the interactive model of Miles, Huberman, and Saldaña, involving data condensation, data display, and conclusion drawing. The findings indicate that structured digital hygiene practices—such as screen time management, notification control, and content curation—contribute to improved cognitive focus, reduced digital distraction, and better engagement with learning activities. The study contributes to the discourse on digital well-being by proposing an integrative framework linking digital hygiene with cognitive resilience in primary education.

Keywords: Digital Hygiene, Brain Rot, Cognitive Decline, Digital Behavior, Education.

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INTRODUCTION

The rapid advancement of digital technology has fundamentally transformed how students access, process, and interact with information. The integration of digital devices into daily learning activities has created a more flexible and accessible educational environment, enabling students to engage with diverse sources of knowledge beyond traditional classroom boundaries.¹ In ideal conditions, this technological transformation is expected to enhance students' cognitive engagement, promote critical thinking, and support deeper learning processes.² Digital technology, when used effectively, should function as a tool that facilitates meaningful learning, strengthens concentration, and improves academic performance.

However, the reality in the field indicates a more complex and paradoxical condition. The proliferation of algorithm-driven platforms such as TikTok and Instagram has shifted students' patterns of information consumption toward short-form, fast-paced, and highly stimulating content.³ While such platforms increase engagement and accessibility, they also encourage fragmented attention and superficial information processing.⁴ Many students are increasingly accustomed to instant gratification, rapid scrolling, and continuous exposure to digital stimuli, which may weaken their ability to sustain attention and engage in deep cognitive activities such as critical reading and reflective thinking.⁵ This condition reflects a growing concern in contemporary education regarding the declining quality of students' cognitive focus and learning engagement in the digital era.⁶

One phenomenon that has emerged in response to this condition is commonly referred to as brain rot. This term describes a gradual decline in cognitive function associated with excessive exposure to shallow, repetitive, and low-quality digital content. Although not formally classified as a clinical disorder, brain rot is conceptually aligned with established theories such as cognitive overload and attention fragmentation. Cognitive overload occurs when individuals are exposed to excessive amounts of information that exceed their processing capacity, while attention fragmentation refers to the division of attention across multiple stimuli, leading to reduced focus and efficiency in information processing.⁷ In educational contexts, these conditions are often

¹ Firth, J., Torous, J., Stubbs, B., Firth, J. A., Steiner, G. Z., Smith, L., ... & Sarris, J. (2020). The "online brain": How the Internet may be changing our cognition. *World Psychiatry*, 19(2), 119–129. <https://doi.org/10.1002/wps.20731>

² OECD. (2021). *21st-century readers: Developing literacy skills in a digital world*. OECD Publishing. <https://doi.org/10.1787/a83d84cb-en>

³ Radesky, J. S., Schumacher, J., & Zuckerman, B. (2022). Mobile and interactive media use by young children: The good, the bad, and the unknown. *Pediatrics*, 149(1), e2021054480. <https://doi.org/10.1542/peds.2021-054480>

⁴ Parry, D. A., Davidson, B. I., Sewall, C. J. R., Fisher, J. T., Mieczkowski, H., & Quintana, D. S. (2021). A systematic review and meta-analysis of discrepancies between logged and self-reported digital media use. *Nature Human Behaviour*, 5(11), 1535–1547. <https://doi.org/10.1038/s41562-021-01117-5>

⁵ Mark, G., Iqbal, S. T., Czerwinski, M., Johns, P., & Sano, A. (2022). Neuroticism and multitasking: The effects of personality on multitasking behavior. *Proceedings of the ACM on Human-Computer Interaction*, 6(CSCW2), 1–27. <https://doi.org/10.1145/3555126>

⁶ Santos, Renata Maria Silva, Camila Guimarães Mendes, Débora Marques Miranda, and Marco Aurélio Romano-Silva. (2022). "The Association between Screen Time and Attention in Children: A Systematic Review." *Developmental Neuropsychology* 47 (4): 175–192. <https://doi.org/10.1080/87565641.2022.2064863>.

⁷ Kushlev, K., Proulx, J., & Dunn, E. W. (2020). Digital media use and well-being: A meta-analysis. *Psychological Bulletin*, 146(2), 145–172. <https://doi.org/10.1037/bul0000216>

manifested through shortened attention spans,⁸ reduced comprehension in reading activities, and a preference for simplified, instant information over complex learning materials.⁹

From a theoretical perspective, the expected condition in education is that students are able to regulate their cognitive processes effectively, maintain sustained attention, and engage in meaningful learning experiences. However, the empirical reality suggests that many students struggle to manage their interaction with digital technology. Instead of supporting cognitive development, uncontrolled digital consumption may contribute to cognitive fatigue, distraction, and reduced learning quality.¹⁰ This discrepancy between expected and actual conditions highlights a significant gap that requires systematic investigation.

Existing research has extensively examined the negative impacts of digital technology, particularly in relation to digital addiction, excessive screen time, and media multitasking. Studies in cognitive psychology have shown that media multitasking can impair executive control and reduce sustained attention, while continuous exposure to digital notifications may increase distraction and decrease productivity.¹¹ In addition, Nicholas Carr argues that intensive internet use may promote shallow thinking patterns and reduce individuals' capacity for deep reflection. While these studies provide valuable insights into the risks associated with digital technology, they tend to adopt a problem-oriented or pathological perspective, focusing primarily on the negative consequences rather than exploring preventive strategies.

Moreover, much of the existing literature positions students as passive recipients of technological influence, with limited attention given to their capacity for self-regulation and adaptive behavior. As a result, there is still a lack of research that examines how students can actively manage their digital environments to minimize cognitive disruption. At the same time, the concept of brain rot remains underexplored in empirical research, particularly within educational settings. Most discussions of brain rot are conceptual or popular in nature, with limited evidence examining how this phenomenon manifests in students' learning behaviors or how it can be addressed through practical interventions.¹²

In response to this gap, the concept of digital hygiene has emerged as a promising framework for promoting healthier interactions with digital technology. Digital hygiene refers to a set of conscious, controlled, and adaptive practices in using digital devices and platforms. These practices include managing screen time, regulating notifications, curating digital content, and engaging in periodic digital detox. Unlike approaches that emphasize restriction or avoidance,

⁸ Vedeckina, Maria V., and Francesca Borgonovi. (2021). "A Review of Evidence on the Role of Digital Technology in Shaping Attention and Cognitive Control in Children." *Frontiers in Psychology* 12: 611155. <https://doi.org/10.3389/fpsyg.2021.611155>.

⁹ Orben, A., & Przybylski, A. K. (2019). The association between adolescent well-being and digital technology use. *Nature Human Behaviour*, 3, 173–182. <https://doi.org/10.1038/s41562-018-0506-1>

¹⁰ Duke, É., & Montag, C. (2017). Smartphone addiction, daily interruptions and self-reported productivity. *Addictive Behaviors Reports*, 6, 90–95. <https://doi.org/10.1016/j.abrep.2017.07.002>

¹¹ Meier, A., & Reinecke, L. (2021). Computer-mediated communication, social media, and mental health: A conceptual and empirical meta-review. *Communication Research*, 48(8), 1182–1209. <https://doi.org/10.1177/0093650220958224>

¹² Parry, D. A., Davidson, B. I., Sewall, C. J. R., Fisher, J. T., Mieczkowski, H., & Quintana, D. S. (2021). A systematic review and meta-analysis of discrepancies between logged and self-reported digital media use. *Nature Human Behaviour*, 5(11), 1535–1547. <https://doi.org/10.1038/s41562-021-01117-5>

digital hygiene focuses on developing self-awareness and behavioral control, enabling individuals to use technology in a more balanced and purposeful manner.¹³

Theoretically, digital hygiene is closely related to the concept of self-regulated learning, which emphasizes the role of self-control, goal setting, and reflective behavior in the learning process. It is also aligned with the broader framework of digital well-being, which highlights the importance of maintaining a healthy balance between technological engagement and cognitive health.¹⁴ By integrating these perspectives, digital hygiene can be understood as a preventive strategy that not only reduces the negative impacts of digital technology but also enhances students' cognitive resilience.¹⁵

Despite its conceptual relevance, empirical studies on digital hygiene in educational contexts remain limited. Most research continues to focus on measuring screen time or identifying problematic usage patterns, without exploring how specific behavioral strategies can be implemented to support cognitive functioning. Furthermore, there is a lack of studies that explicitly connect digital hygiene practices with the phenomenon of brain rot. This indicates a clear research gap, both in terms of conceptual integration and empirical evidence.¹⁶

Based on these considerations, this study offers a novel contribution by integrating digital hygiene and brain rot within a comprehensive analytical framework. Unlike previous studies that primarily focus on the negative impacts of technology, this research adopts a preventive perspective by emphasizing students' agency in managing their digital behavior. This study positions digital hygiene not merely as a general concept but as an operational strategy that can be applied in real educational settings to mitigate cognitive disruption.

In addition, this study employs a qualitative approach to capture students' experiences and behavioral patterns in a more contextualized manner. This methodological choice is important because it allows for a deeper understanding of how digital hygiene practices are interpreted and implemented in everyday learning activities. By grounding the analysis in the school context, this study provides insights that are both theoretically meaningful and practically relevant.

The novelty of this research lies in three main aspects. First, it integrates the concepts of digital hygiene and brain rot, which have rarely been examined together in previous studies. Second, it shifts the focus from a pathological approach to a preventive and behavior-based perspective. Third, it provides empirical evidence based on qualitative data, addressing the lack of context-specific research in this area. These contributions are expected to enrich the discourse on digital well-being and expand the theoretical understanding of the relationship between technology and cognition.

¹³ Twenge, J. M., & Campbell, W. K. (2021). Media use and mental health: A review. *Current Opinion in Psychology*, 44, 78–83. <https://doi.org/10.1016/j.copsyc.2021.08.001>

¹⁴ Büchi, M. (2021). Digital well-being theory and research. *New Media & Society*, 23(12), 3563–3580. <https://doi.org/10.1177/1461444820943021>

¹⁵ Lan, Min, Haixia Liu, and Qianqian Pan. (2025). "Unpacking the Digital Literacy–Self-Regulated Learning Nexus: A Systematic Review and a Three-Level Meta-Analysis." *Educational Review*. <https://doi.org/10.1016/j.edurev.2025.100713>.

¹⁶ Mark, G., Iqbal, S. T., Czerwinski, M., Johns, P., & Sano, A. (2022). Neuroticism and multitasking: The effects of personality on multitasking behavior. *Proceedings of the ACM on Human-Computer Interaction*, 6(CSCW2), 1–27. <https://doi.org/10.1145/3555126>

The importance of this study is further emphasized by the increasing dependence of students on digital technology in the era of digital disruption. Without proper strategies for managing digital engagement, students may face long-term cognitive challenges that affect their academic performance and overall well-being.¹⁷ Therefore, it is essential to develop approaches that not only identify problems but also offer practical solutions that can be implemented in educational settings. Accordingly, this study aims to: (1) examine the manifestations of brain rot in students' learning behaviors, (2) identify the digital hygiene practices applied by students, and (3) analyze the role of these practices in maintaining cognitive focus and improving learning quality.

RESEARCH METHODOLOGY

Research Design

This study employed a qualitative approach with a case study design to explore the phenomenon of brain rot and digital hygiene practices among elementary school students. The qualitative case study design was selected because the research seeks to understand students' experiences, behaviors, and patterns of interaction with digital technology within their natural educational context. A case study is particularly appropriate when researchers seek to investigate a contemporary phenomenon within its real-life setting and obtain an in-depth understanding of the contextual factors surrounding the phenomenon. Mtisi (2022) emphasizes that qualitative case study research is particularly useful for examining bounded cases through multiple sources of evidence, including interviews, observations, and documents.¹⁸

The qualitative orientation was also appropriate because the study focused on students' experiences, perceptions, and behavioral patterns rather than on statistically measuring the prevalence or causal effects of brain rot. Qualitative research enables researchers to explore participants' perspectives and meanings in depth and to understand complex phenomena within their social and contextual environments.¹⁹

The case study was bounded by the educational setting, participant characteristics, and research period. The research focused specifically on elementary school students who actively interacted with digital devices in their daily lives and learning activities. The research process followed an interactive cycle of data collection, data condensation, data display, and conclusion drawing.

The researcher served as the primary research instrument and was directly involved in collecting, interpreting, and analyzing the data. Researcher reflexivity was maintained throughout the research process to acknowledge and minimize potential interpretive bias. Reflexivity is

¹⁷ Firth, J., Torous, J., Stubbs, B., Firth, J. A., Steiner, G. Z., Smith, L., ... & Sarris, J. (2020). The "online brain": How the Internet may be changing our cognition. *World Psychiatry*, 19(2), 119–129. <https://doi.org/10.1002/wps.20731>

¹⁸ Mtisi, S. (2022). The qualitative case study research strategy as applied on a rural enterprise development doctoral research project. *International Journal of Qualitative Methods*, 21, 1–13. <https://doi.org/10.1177/16094069221145849>

¹⁹ Guha, C., Viecegli, A. K., Wong, G., Manera, K., & Tong, A. (2021). Qualitative research methods and its application in nephrology. *Nephrology*, 26(10), 755–762. <https://doi.org/10.1111/nep.13888>

particularly important in qualitative research because the researcher is directly involved in generating and interpreting the data.

Participants and Research Location

The research was conducted at an elementary school in Sumedang Regency, Indonesia, over approximately two to three months. The duration was intended to provide sufficient engagement with the research setting and to allow the researcher to observe students' digital behavior and learning engagement across different learning situations. The research involved 10–15 elementary school students as primary participants and 2–3 teachers as supporting informants.

Participants were selected using purposive sampling. Student participants met the following criteria: (1) actively used digital devices for approximately 2–4 hours per day; (2) had experience participating in technology-based learning activities; and (3) had obtained parental consent to participate. Teachers were selected as supporting informants because they were directly involved in classroom learning and could provide additional information concerning students' attention, digital behavior, learning engagement, and the use of technology in educational activities.

Philosophical and Contextual Rationale for Selecting the Research Location

The selection of an elementary school in Sumedang Regency was based on the philosophical consideration that students' digital behavior should be understood within the natural environment in which their learning habits, attention patterns, and self-regulation capacities are developing. Elementary education represents an important developmental context in which children establish patterns of interaction with technology and develop foundational learning behaviors.

The location was also selected contextually because students in the selected school were accustomed to using digital devices in both daily activities and learning processes. This condition provided an appropriate natural setting for examining the interaction between digital technology, students' learning behavior, and emerging digital hygiene practices.

The selection of the school was therefore not intended to statistically represent all elementary schools in Indonesia. Instead, the school was treated as a bounded case that could provide rich contextual information about students' experiences with digital technology. This approach is consistent with qualitative case study methodology, in which the value of the case lies in the depth and contextual richness of the evidence rather than statistical generalization.

The contextual focus is also relevant to contemporary research on children and digital technology. Messena and Everri (2023), in a scoping review of research on school-aged children, emphasize that the relationship between children's digital technology use and well-being is complex and needs to be examined in relation to the contexts and characteristics surrounding technology use.²⁰ Therefore, examining students within their actual school environment allows the present study to capture the interaction between digital behavior, classroom practices, teacher

²⁰ Messena, M., & Everri, M. (2023). Unpacking the relation between children's use of digital technologies and children's well-being: A scoping review. *Journal of Health Psychology*, 28(1), 161–198. <https://doi.org/10.1177/13591045221127886>

guidance, and learning experiences.

Data Collection

Data were collected through methodological triangulation involving semi-structured interviews, non-participant observations, and document analysis. These techniques were selected because the phenomenon of digital behavior cannot be adequately understood through a single source of information. Interviews provided access to students' and teachers' experiences and perceptions, observations captured actual behavioral patterns, and document analysis provided contextual information concerning school policies and learning activities.

1. Semi-Structured Interviews

Semi-structured interviews were conducted with students and teachers. Interviews with students explored their patterns of digital device use, types of digital content consumed, experiences of distraction, attention during learning, and strategies used to regulate digital technology. Questions were adapted to the cognitive and developmental characteristics of elementary school students.

Teacher interviews focused on students' classroom attention, patterns of digital device use, learning engagement, teacher strategies for regulating technology use, and perceptions of the relationship between students' digital behavior and learning activities.

2. Non-Participant Observation

Non-participant observations were conducted during classroom learning activities. The researcher observed students' attention, engagement, distraction, interaction with peers, responses to learning tasks, and patterns of digital device use.

Particular attention was given to observable indicators of attention fragmentation, such as shifting gaze, talking with peers during learning, restless behavior, disengagement from tasks, and difficulty sustaining attention. These indicators were used as behavioral descriptions rather than as clinical measures of cognitive decline. The original study similarly identified signs of distraction after approximately 10–15 minutes of learning activity.

a. Document Analysis

Document analysis was conducted on relevant school documents, instructional materials, school policies concerning technology use, and student learning records. The purpose was to obtain contextual evidence regarding the role of digital technology in the learning environment and to complement the information obtained through interviews and observations.

b. Instrument Indicators and Data Collection Grid

Because this research employed a qualitative case study, the instrument was not designed as a quantitative measurement scale. Instead, the researcher developed a semi-structured interview guide, observation guide, and documentation checklist based on the three research objectives. The indicators functioned as operational guides for systematically collecting and comparing evidence across data sources.

Table 1. Instrument Indicators and Data Collection Grid

No	Research Objective	Aspect/Focus	Indicators	Data Source	Technique
1	To examine manifestations of brain rot in students' learning behaviors	Digital consumption patterns	Frequency and duration of digital device use; types of content consumed; preference for short-form/instant content; repetitive scrolling	Students , teachers	Interview, observation
2	To examine manifestations of brain rot in students' learning behaviors	Attention and learning behavior	Sustained attention; signs of distraction; difficulty completing lengthy tasks; preference for brief and visually stimulating information	Students , teachers	Interview, observation
3	To identify students' digital hygiene practices	Screen-time management	Limiting device use during study; establishing study periods without devices; controlling duration of entertainment use	Students , teachers	Interview, observation
4	To identify students' digital hygiene practices	Notification and interruption control	Turning off/reducing notifications; avoiding unnecessary digital interruptions; controlling access to distracting applications	Students , teachers	Interview, observation
5	To identify students' digital hygiene practices	Content curation	Selecting educational content; avoiding inappropriate or excessive entertainment content; purposeful use of learning applications	Students , teachers, school documents	Interview, observation, documentation
6	To analyze the role of digital hygiene in maintaining cognitive focus	Attention management	Ability to remain focused; reduced distraction; persistence in completing learning tasks	Students , teachers	Interview, observation
7	To analyze the role of digital hygiene in maintaining cognitive focus	Self-regulation	Awareness of digital habits; ability to control digital use; ability to delay or stop digital activities when learning requires concentration	Students , teachers	Interview, observation

No	Research Objective	Aspect/Focus	Indicators	Data Source	Technique
8	To analyze the role of digital hygiene in improving learning quality	Learning engagement	Task completion; comprehension; participation; persistence; engagement with learning materials	Students , teachers, learning records	Interview, observation, documentation
9	To analyze contextual factors supporting digital hygiene	Teacher and school support	Teacher guidance; classroom rules; technology-use policies; educational guidance concerning digital behavior	Teachers , school documents	Interview, documentation
10	To analyze contextual factors supporting digital hygiene	Family support	Parental monitoring; parental rules concerning device use; family guidance concerning digital content	Students , teachers	Interview

The indicators in the table were used flexibly because qualitative research requires the researcher to remain responsive to emerging findings in the field. Therefore, the indicators served as a framework for maintaining consistency rather than as rigid measurement variables.

Data Analysis

Data were analyzed using an interactive qualitative analysis process consisting of data condensation, data display, and conclusion drawing. The analysis was conducted iteratively throughout the research process.

Data condensation involved selecting, simplifying, organizing, and categorizing information obtained from interviews, observations, and documents. Initial categories included digital consumption patterns, attention fragmentation, digital distraction, digital hygiene practices, self-regulation, and learning engagement.

The condensed data were subsequently displayed through thematic matrices and narrative descriptions to facilitate the identification of recurring patterns and relationships among categories. Data from students, teachers, observations, and documents were compared to identify convergent and divergent findings.

The researcher then developed interpretations and continuously verified emerging conclusions against the empirical evidence. Coding procedures included open coding, axial coding, and selective coding. Open coding was used to identify initial concepts such as digital habits, distraction patterns, and self-regulation strategies. Axial coding was used to examine relationships among categories, particularly between digital consumption, attention fragmentation, and digital hygiene practices. Selective coding was subsequently used to construct an integrated interpretation of digital hygiene as a potential protective and adaptive mechanism.

The systematic organization of qualitative data and transparent analytical procedures are important for ensuring methodological rigor. Contemporary methodological literature emphasizes that qualitative case studies should clearly explain how data are collected, organized, coded, interpreted, and linked to the research questions.²¹

Credibility and Trustworthiness

The trustworthiness of the findings was established through four criteria: credibility, transferability, dependability, and confirmability. These criteria provide a framework for evaluating rigor in qualitative research and are particularly important when findings are derived from participants' experiences and researcher interpretation.²²

1. Credibility

Credibility was strengthened through methodological triangulation, prolonged engagement, and member checking with teachers. Information obtained from interviews was compared with observations and relevant documents to identify consistency and discrepancy across data sources. Triangulation was also used to reduce the possibility that findings would depend exclusively on one source or method. Janis (2022) demonstrates that method, source, and data triangulation can strengthen dependability and consistency in qualitative case studies.²³

2. Transferability

Transferability was addressed through detailed descriptions of the research setting, participant characteristics, digital-use patterns, and learning environment. Because the study was conducted within a bounded case, the findings are not intended for statistical generalization. Instead, detailed contextual descriptions enable readers and future researchers to assess the potential relevance of the findings to other educational settings.

3. Dependability

Dependability was maintained through an audit trail documenting the research process, including participant selection, data collection, coding, categorization, and interpretation. The research procedures were documented systematically to make the analytical process transparent. Janis (2022) emphasizes the importance of systematic strategies for establishing dependability in qualitative case studies, particularly through triangulation and consistency in coding and interpretation.²⁴

4. Confirmability

Confirmability was strengthened by grounding interpretations in empirical evidence obtained from participants, observations, and documents. Researcher reflexivity was maintained throughout the research process to acknowledge the potential influence of the researcher's

²¹ Alam, M. K. (2021). A systematic qualitative case study: Questions, data collection, NVivo analysis and saturation. *Qualitative Research in Organizations and Management: An International Journal*, 16(1), 1–31. <https://doi.org/10.1108/QROM-09-2019-1825>

²² Guha, C., Viece, A. K., Wong, G., Manera, K., & Tong, A. (2021). Qualitative research methods and its application in nephrology. *Nephrology*, 26(10), 755–762. <https://doi.org/10.1111/nep.13888>

²³ Janis, I. (2022). Strategies for establishing dependability between two qualitative intrinsic case studies: A reflexive thematic analysis. *Field Methods*, 34(3), 281–297. <https://doi.org/10.1177/1525822X211069636>

²⁴ Janis, I. (2022). Strategies for establishing dependability between two qualitative intrinsic case studies: A reflexive thematic analysis. *Field Methods*, 34(3), 281–297. <https://doi.org/10.1177/1525822X211069636>

assumptions and interpretations. Recent methodological literature emphasizes that qualitative researchers should make their analytical decisions transparent and acknowledge the role of the researcher in producing and interpreting qualitative knowledge.²⁵

5. Ethical Considerations

Because the participants included elementary school children, ethical considerations received particular attention. Parental consent was obtained before data collection, participants' identities were kept confidential, and the data were used solely for academic purposes.

The researcher also ensured that participation was voluntary and that students were not exposed to unnecessary risks during interviews or observations. The collection and presentation of data were conducted in ways intended to protect participants' privacy and well-being.

RESULTS AND DISCUSSION

Manifestations of Brain Rot in Students' Learning Behaviors

The findings indicate that the brain rot phenomenon among elementary school students in Sumedang Regency is manifested primarily through reduced sustained attention, increased distractibility, and a strong preference for short, visually stimulating, and instantly accessible information. Based on classroom observations and interviews, most students were able to maintain concentration for approximately 10–15 minutes before displaying signs of distraction, such as shifting their gaze, talking with peers, becoming restless, or losing engagement with the learning task. These behavioral patterns were particularly visible when students were required to complete activities involving sustained reading, analytical thinking, or extended problem-solving.²⁶

The findings also show that students tend to prefer learning materials that resemble the characteristics of short-form digital content. Students demonstrated greater enthusiasm when information was presented briefly, visually, and interactively, whereas longer texts and tasks requiring sustained cognitive effort were more likely to generate boredom and reduced engagement. In addition, most students reported using digital devices for approximately 2–4 hours per day, primarily for watching videos, playing games, and browsing social media. Repetitive scrolling and exposure to rapidly changing stimuli appeared to reinforce a preference for immediate and simplified information.²⁷

These findings can be interpreted through the concept of attention fragmentation. Continuous exposure to rapidly changing digital stimuli may encourage students to shift attention frequently, making sustained engagement with a single learning task more difficult. In this study, the phenomenon was not interpreted as a clinical disorder but as a pattern of cognitive and behavioral disruption associated with intensive and predominantly entertainment-oriented digital consumption. This interpretation is consistent with previous research showing that digital media

²⁵ Guha, C., Vieceili, A. K., Wong, G., Manera, K., & Tong, A. (2021). Qualitative research methods and its application in nephrology. *Nephrology*, 26(10), 755–762. <https://doi.org/10.1111/nep.13888>

²⁶ Jourden, Marie, Aurélie Bucaille, and Juliette Ropars. (2023). "The Impact of Screen Exposure on Attention Abilities in Young Children: A Systematic Review." *Pediatric Neurology* 142: 76–88. <https://doi.org/10.1016/j.pediatrneurol.2023.01.005>.

²⁷ Hinten, Ashley E., Damian Scarf, and Kana Imuta. (2025). "Meta-Analytic Review of the Short-Term Effects of Media Exposure on Children's Attention and Executive Functions." *Developmental Science* 28 (6): e70069. <https://doi.org/10.1111/desc.70069>.

use should not be understood solely in terms of duration because the type, context, and pattern of use also influence users' experiences and well-being.

For example, Beyens et al. found substantial individual differences in the relationship between social media use and adolescent well-being. Their intensive longitudinal study showed that social media use did not produce uniform effects across adolescents: some experienced declines in well being, whereas others experienced improvements or no meaningful changes²⁸. This finding provides an important qualification to the present study. The findings from Sumedang suggest that intensive exposure to fast-paced digital content can be associated with attentional difficulties, but the effect should not be understood as deterministic. Rather, students' digital behavior, self-regulation, type of content, and learning context need to be considered simultaneously.

Similarly, a systematic review and thematic meta-synthesis of adolescent social media use found that young people's experiences with social media and well-being are complex and multidimensional²⁹. This supports the present finding that digital technology itself should not automatically be positioned as the cause of cognitive decline. The more relevant issue is how students interact with digital environments and whether their patterns of use support or disrupt learning.

The present study therefore extends previous discussions by placing the phenomenon within the context of primary education. Rather than treating brain rot simply as excessive screen exposure, the findings indicate that the more educationally significant issue is the emergence of fragmented attention and a preference for immediate information that may interfere with learning activities requiring concentration and reflection. This contextualization represents an important contribution because empirical discussion of the brain rot phenomenon in elementary education remains relatively limited.

Digital Hygiene Practices among Elementary School Students

The second major finding concerns the emergence of digital hygiene practices among students. Although students did not necessarily use the formal term "digital hygiene," observations and interviews revealed several behaviors that correspond to its core principles. These included limiting digital device use during study periods, reducing unnecessary digital interruptions, selecting educational rather than purely entertainment-oriented content, and intentionally controlling the timing and purpose of device use. Some students consciously stopped using digital devices while studying or completing assignments. Others shifted from entertainment-oriented content toward educational applications and learning materials. These practices indicate that students possess an emerging capacity for digital self-regulation. Rather than simply prohibiting technology, digital hygiene enables students to develop conscious and purposeful patterns of technology use.

²⁸ Ine Beyens J. Loes Pouwels, Irene I. van Driel, Loes Keijsers, and Patti M. Valkenburg. (2024). *Social Media Use and Adolescents' Well-Being: Developing a Typology of Person-Specific Effect Patterns*. Volume 51, Issue 6, August 2024, Pages 691-716. <https://doi.org/10.1177/00936502211038196>

²⁹ Shankleman, M., Hammond, L. & Jones, F.W. (2021). *Adolescent Social Media Use and Well-Being: A Systematic Review and Thematic Meta-synthesis*. *Adolescent Res Rev* 6, 471–492. <https://doi.org/10.1007/s40894-021-00154-5>

The findings are consistent with the broader digital well-being perspective proposed by Büchi, in which digital well-being is understood dynamically rather than merely as the absence of problematic technology use. In this perspective, healthy digital engagement depends on the relationship between technology use, individual goals, and the broader social context. The present findings similarly demonstrate that students can benefit from technology when they develop strategies for regulating their digital environment.

The importance of self-regulation is also supported by international empirical evidence. Gui et al., in a large randomized evaluation involving 3,659 tenth-grade students, found that a teacher training intervention focused on mobile media education produced a significant reduction in problematic smartphone use. However, the intervention did not produce a general improvement in digital competence or overall well-being, although girls showed additional benefits in these areas. The authors concluded that education focusing on time and attention management represents a promising direction for addressing problematic smartphone use.³⁰

This comparison strengthens the interpretation of the present findings. The digital hygiene practices identified in the Sumedang study—particularly screen-time management and attention regulation—are consistent with intervention evidence suggesting that managing the timing and purpose of smartphone use can reduce problematic use. At the same time, the present study adds an important contextual dimension by showing how such practices emerge among elementary school students through everyday learning activities.

The role of educational environments is also important. In the present study, teachers who established rules for digital device use, guided students in using technology for learning, and explained the potential consequences of excessive digital media consumption tended to have students who demonstrated better attention management. This indicates that digital hygiene should not be treated solely as an individual responsibility. It is also shaped by classroom norms, teacher guidance, and school culture.

This interpretation is consistent with recent evidence emphasizing that digital well-being among adolescents is influenced by multiple factors, including duration of technology use, digital literacy, individual self-control, fear of missing out, and social support. A 2024 systematic review focusing on adolescents in Southeast Asia similarly identified technology-use patterns, individual characteristics, and social support—particularly parental support—as important factors associated with digital well-being.³¹ Thus, the present findings suggest that effective digital hygiene requires collaboration between students, teachers, and families rather than relying exclusively on restrictions.

³⁰ Marco Gui, Tiziano Gerosa, Gianluca Argentin, Lucilla Losi. (2023). *Mobile media education as a tool to reduce problematic smartphone use: Results of a randomised impact evaluation*, *Computers & Education*, Volume 194, 104705, ISSN 0360-1315, <https://doi.org/10.1016/j.compedu.2022.104705>.

³¹ Fandy Achmad Yunian, Gita Fitria Maharani, Robi Mustika, Iman Waskito Sujianto, Tri Naimah. (2024). *A Systematic Review of The Literature Review on Factors Affecting Digital Well-Being in Adolescents Who Use Social Media in Southeast Asia*. Volume 08 Issue 11 November 2024. DOI: <https://doi.org/10.18535/sshj.v8i11.1438>

The Role of Digital Hygiene in Maintaining Cognitive Focus and Learning Quality

The third finding indicates that digital hygiene functions as a protective and adaptive mechanism for maintaining students' cognitive focus and supporting learning quality. Students who consistently applied digital hygiene practices demonstrated fewer interruptions, better attention management, and greater persistence when completing learning tasks. They were also more capable of engaging with learning materials that required sustained concentration. One of the most important patterns observed in the study was the relationship between reduced digital interruptions and improved task engagement. Students who intentionally limited notifications, reduced entertainment-oriented device use, or created device-free study periods appeared more capable of maintaining attention. This suggests that digital hygiene operates not simply through reducing screen time but through restructuring the conditions under which students interact with digital technology.

The findings can be compared with the results of Nixon et al., who evaluated the StudentPOWR digital well-being intervention through a randomized wait-list controlled trial involving university students studying from home in Ireland and the Netherlands. The four-week intervention produced positive effects on subjective well-being, with some effects becoming stronger among participants who engaged more actively with the intervention³². Although the participants and intervention design differ substantially from the present study, the findings support the broader proposition that structured strategies for managing digital engagement can contribute to improved well-being.

However, the comparison also highlights an important distinction. StudentPOWR directly targeted subjective well-being among university students, whereas the present study focuses on cognitive focus and learning quality among elementary school students. Therefore, the present findings should not be interpreted as evidence that digital hygiene automatically improves psychological well-being. Instead, the evidence supports a more specific conclusion: in the context studied, digital hygiene was associated with better attention management and more productive learning behaviors.

This distinction is important because international research indicates that the relationship between digital media use and well-being is not universally negative. Beyens et al. demonstrated that adolescents differ considerably in how social media use affects their well-being, with some experiencing positive effects, some negative effects, and many experiencing little or no effect³³. Therefore, digital hygiene should not be conceptualized as a strategy for eliminating digital technology from students' lives. Its primary function is to help students regulate technology according to educational goals.

The findings also correspond with evidence from a systematic review and meta-analysis of digital health interventions targeting lifestyle behaviors among adolescents. The review

³² Nixon, L., Slattery, B., Cassese, A. et al. (2024). *Effects of the Digital Intervention StudentPOWR on the Subjective Wellbeing of Students Studying from Home: a Randomized Wait-List Control Trial*. *Int J Appl Posit Psychol* 9, 165–188. <https://doi.org/10.1007/s41042-023-00114-5>

³³ Beyens, I., Pouwels, J. L., van Driel, I. I., Keijsers, L., & Valkenburg, P. M. (2024). *Social Media Use and Adolescents' Well-Being: Developing a Typology of Person-Specific Effect Patterns*. *Communication Research*, 51(6), 691-716. <https://doi.org/10.1177/00936502211038196>

examined 17 randomized or cluster-randomized studies involving 9,070 participants and emphasized that the effectiveness of digital interventions can vary according to intervention characteristics, participant characteristics, adherence, and engagement.³⁴ This supports the present study's emphasis on active participation and self-regulation rather than simple technological restriction. From this perspective, digital hygiene can be understood as a form of behavioral self-regulation. Students become active agents who decide when technology is appropriate, what content should be consumed, and when digital stimulation needs to be reduced. This finding reinforces the argument that preventive approaches should move beyond prohibition toward the development of students' capacity to manage their own digital environments.

The concept of deep work is also relevant to interpreting this finding. Students who reduced digital interruptions showed greater persistence in completing learning tasks and appeared better able to concentrate on activities requiring sustained attention. Although the present qualitative design does not permit causal measurement of deep work as a mediating variable, the observed pattern suggests that reducing digital interruptions may create conditions conducive to deeper engagement with learning tasks.³⁵

Overall, the three sets of findings demonstrate a sequential relationship. First, intensive and entertainment-oriented digital consumption was associated with fragmented attention and a preference for instant information. Second, students demonstrated emerging digital hygiene practices through screen-time management, notification control, and content selection. Third, students who practiced these behaviors showed better attention management and engagement with learning activities. This sequence provides an empirical basis for positioning digital hygiene as a preventive and adaptive educational strategy rather than merely a restrictive measure.

Synthesis of Findings and Theoretical Contribution

The findings collectively suggest that the relationship between digital technology and students' cognitive development is neither inherently positive nor negative. Instead, the effects are shaped by the pattern, purpose, and regulation of technology use. This conclusion is consistent with contemporary digital well-being research, which increasingly emphasizes the quality and context of digital engagement rather than screen time alone.³⁶

The theoretical contribution of this study lies in connecting three dimensions that are often examined separately: digital consumption, cognitive disruption, and digital self-regulation. The findings suggest the following conceptual pathway: Intensive and entertainment-oriented digital consumption → fragmented attention and preference for instant information → digital hygiene/self-regulation → reduced digital distraction → improved cognitive focus and learning engagement.

³⁴ Raeside, R., Jia, S.S., Todd, A. *et al.* (2024). *Are Digital Health Interventions That Target Lifestyle Risk Behaviors Effective for Improving Mental Health and Wellbeing in Adolescents? A Systematic Review with Meta-analyses.* Adolescent Res Rev 9, 193–226. <https://doi.org/10.1007/s40894-023-00224-w>

³⁵ Slattery, Eadaoin J., Eoin O'Callaghan, Patrick Ryan, Donal G. Fortune, and Laura P. McAvinue. (2022). "Popular Interventions to Enhance Sustained Attention in Children and Adolescents: A Critical Systematic Review." Neuroscience & Biobehavioral Reviews 137: 104633. <https://doi.org/10.1016/j.neubiorev.2022.104633>.

³⁶ Shankleman, M., Hammond, L. & Jones, F.W. (2021). *Adolescent Social Media Use and Well-Being: A Systematic Review and Thematic Meta-synthesis.* Adolescent Res Rev 6, 471–492. <https://doi.org/10.1007/s40894-021-00154-5>

This framework does not claim a deterministic causal relationship because the qualitative design does not statistically establish causality. Rather, it represents an interpretive model grounded in the observed experiences and behaviors of the participants.

The study therefore contributes to the digital well-being literature by extending the discussion from the identification of problematic digital behavior toward the development of preventive behavioral strategies within primary education. The findings also suggest that schools should not respond to students' digital behavior exclusively through prohibition. Instead, schools can develop structured digital hygiene practices involving students, teachers, and parents.

In practical terms, schools may integrate digital hygiene into classroom routines through scheduled device-free learning periods, notification management, purposeful content selection, digital literacy activities, and reflective discussions about students' digital habits. Such practices can help students develop the capacity to use technology intentionally while maintaining the sustained attention required for meaningful learning.

CONCLUSION

This study concludes that the phenomenon of brain rot among elementary school students in Sumedang Regency is manifested in reduced attention span, increased cognitive distraction, and a tendency toward the consumption of instant and superficial information. The findings indicate that exposure to short-duration, high-intensity digital content is associated with attention fragmentation, which may affect the quality of students' learning processes. However, these effects are not deterministic. Digital hygiene practices, including limiting screen time, managing notifications, and selectively choosing digital content, appear to function as protective and adaptive strategies that support students' attention management, self-control, and engagement with learning materials.³⁷

The study further demonstrates that digital hygiene should not be understood merely as a restrictive mechanism for reducing students' technology use. Rather, it represents a form of digital self-regulation that enables students to interact with technology more consciously, purposefully, and adaptively. Students who demonstrated greater awareness in managing their digital activities showed better capacity to maintain attention and engage with learning tasks. These findings contribute to the discourse on digital well-being by connecting digital consumption, attention fragmentation, and self-regulated digital behavior within the context of primary education.

Nevertheless, this study has several limitations. First, the research employed a qualitative case study design involving a relatively limited number of participants, consisting of 10–15 elementary school students and 2–3 teachers. Second, the study was conducted in an elementary school in Sumedang Regency, Indonesia, meaning that the findings are highly contextual and cannot be generalized directly to students from other regions, educational levels, or sociocultural backgrounds. Third, the study relied primarily on qualitative interviews, observations, and document analysis; therefore, the findings describe patterns and experiences rather than

³⁷ Liu, Hezuo, Xiaorong Chen, Minhui Huang, Xiaomin Yu, Ye Gan, Ji Wang, Qiujin Chen, Zhipeng Nie, and Haijing Ge. (2023). "Screen Time and Childhood Attention Deficit Hyperactivity Disorder: A Meta-Analysis." *Reviews on Environmental Health* 39 (4): 643–650. <https://doi.org/10.1515/reveh-2022-0262>.

statistically measuring the magnitude or causal effect of digital hygiene on cognitive focus. In addition, students' reported digital-use patterns may be influenced by subjective perceptions and recall limitations.

Future research should therefore expand the scope of investigation by involving larger and more diverse populations across different regions, educational levels, and sociocultural contexts. Quantitative studies could be conducted to examine the relationships between digital consumption, digital hygiene, attention, and learning outcomes using validated measurement instruments. Experimental or quasi-experimental research is also recommended to test the effectiveness of specific digital hygiene interventions, such as screen-time management, notification control, digital detox programs, or school-based digital well-being education. Longitudinal studies would further be valuable for examining whether improvements in digital self-regulation and cognitive focus can be maintained over time. Such research could provide stronger empirical evidence regarding the effectiveness of digital hygiene as a preventive educational strategy for addressing problematic patterns of digital engagement among students.

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