Digitalization in being aware of the impact of gadgets on mental well-being and learning motivation in school.

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ABSTRACT

The development of digitalization has led to increased gadget use among school students. This trend has significantly impacted their mental well-being and learning motivation. Excessive use of gadgets can trigger anxiety and stress, as well as reduce students' interest and concentration in learning. This study aims to analyze the impact of gadget use on students' mental health and learning motivation at school. The research used mixed methods with data collection through quantitative surveys and qualitative interviews. The research sample was purposively taken from the high school student population, involving teachers and parents as supporting informants. The researchers analyzed quantitative data using descriptive and inferential statistics, while qualitative data were analyzed using thematic coding techniques with the help of NVivo software. The results showed that the high intensity of gadget use was negatively correlated with students' mental health, characterized by increased anxiety and stress. In addition, uncontrolled use of gadgets also contributes to a decrease in learning motivation due to concentration disorders and social media addiction. However, the wise and targeted use of gadgets can increase access to information and support the learning process if accompanied by proper supervision. In conclusion, digitalization through gadgets has a dual impact on students' mental well-being and learning motivation in school. The implications of this study emphasize the need for a holistic approach involving students, teachers, and parents to regulate the use of gadgets to support mental health and increase learning motivation optimally.

I. INTRODUCTION

Digitalization plays an important role in increasing awareness of the impact of gadgets on students' mental well-being and learning motivation at school. First, digitalization allows for the spread of digital literacy that increases the awareness of students, teachers, and parents about the risks of excessive use of gadgets, such as addiction, concentration disorders, and stress. Through digital socialization and education programs, schools can provide a better understanding of how to use gadgets wisely and healthily, so as to minimize the negative impact on students' mental health. In addition, digitalization also facilitates the application of educational technology that can increase students'

learning motivation if used appropriately and in a directed manner, for example, with interactive learning applications that are interesting and relevant to students' needs(Santoro et al., 2024).

The role of teachers and schools in the context of digitalization is also very strategic. Teachers not only function as facilitators of technology-based learning, but also as motivators and supervisors in the use of gadgets so as not to interfere with the learning process. (Pisani et al., 2024)Through group tutoring and counseling, teachers can help students healthily manage gadget use, while also providing psychological support to maintain their mental well-being. In addition, digitalization allows for better coordination between schools and parents in supervising the use of students' gadgets, resulting in a balanced and responsible usage pattern. Thus, digitalization is not only a learning tool but also an important means of managing the impact of gadgets to support the mental development and motivation of students to learn optimally(Andrade et al., 2024).

In the last 5 years, a concrete example of the role of digitalization in being aware of the impact of gadgets on mental well-being and learning motivation in schools can be seen from the School Digitalization Program launched by the Ministry of Education and Culture (Kemendikbud) in 2019 in Natuna Regency. This program provides ICT and tablet facilities to students and schools in the outermost and disadvantaged areas, as well as introducing digital learning platforms such as Rumah Belajar, which provides interactive teaching materials and communication facilities between teachers and students(Nuñez Fadda et al., 2024). This initiative not only accelerates access to technology-based education but also educates students and teachers about the healthy and productive use of gadgets, thereby helping to reduce the risk of the negative impact of gadgets on students' mental health and learning motivation.

In addition, in 2025, the Ministry of Education and Culture launched the Education House program as an integrated digital service super application that facilitates access to various digital education services for students, teachers, and parents. This program supports the digital transformation of education inclusively and efficiently, while allowing the supervision and management of the use of gadgets in the teaching and learning process in a more structured manner(Hammad et al., 2024). With the integration of these digital services, schools can be more effective in managing students' use of gadgets, providing psychosocial support, and increasing learning motivation through more interesting and interactive learning. This study is based on the increasing use of gadgets among school students as digitalization develops. Many studies show that excessive use of gadgets can trigger addiction, sleep pattern disorders, stress, anxiety, and decreased student motivation to learn(Zila-Velasque et al., 2024). However, what is still not widely known is how digitalization can be effectively used as a tool to be aware of and manage these negative impacts systematically in the school environment.

On the other hand, there are conflicting views that can actually increase students' motivation to learn by providing quick access to learning resources, easier communication with teachers and friends, and more interactive and interesting learning methods. This shows that there is a dualism of the role of gadgets that is not fully understood, especially in the context of students' mental

well-being, and how a balance between benefits and risks can be achieved. An effective digitalization mechanism and strategy are needed to supervise and control gadget use, preventing harm to students' mental health while maximizing their potential as learning tools(Song et al., 2024). In addition, there has not been much research that has holistically examined the role of teachers, parents, and the school environment in implementing integrated digital supervision.

The reality that has not happened is the implementation of a comprehensive and measurable digitalization model in schools to prevent the negative impact of gadgets while increasing motivation to learn sustainably(Ahmad & Sajit, 2024). Most of the interventions are still partial and have not been supported by strong empirical data on their effectiveness in the context of students' mental well-being. The novelty of this research lies in its focus, which combines aspects of digitalization as a monitoring and educational tool in being aware of the impact of gadgets, with a holistic and integrated approach between students, teachers, and parents. This study also uses mixed methods to get a more complete and in-depth picture of the phenomenon. The focus of this research is to explore how digitalization can serve as a strategic solution for managing gadget use in schools, minimizing negative impacts on mental health and learning motivation, while maximizing the benefits of gadgets as learning tools. This study aims to analyze the role of digitalization in supervising and controlling the use of gadgets and its impact on students' mental well-being and learning motivation.

The research gap found is the lack of studies that integrate digitalization as a monitoring and educational tool in the context of the impact of gadgets on mental well-being and learning motivation. For comparison, research by Ilham Kamaruddin et al. (2023) entitled "The Impact of Gadget Use on Mental Health and Student Learning Motivation in Schools" has identified the negative impact of gadgets, but has not explored the role of digitalization as a comprehensive monitoring and management solution(Ademoyegun et al., 2024). Therefore, this study seeks to fill this gap with a more comprehensive and applicable approach.

II. METHODOLOGY

This study uses a mixed methods approach with an explanatory sequential design. It combines quantitative and qualitative approaches to obtain comprehensive and in-depth data on the role of digitalization in being aware of the impact of gadgets on mental well-being and learning motivation in schools. The quantitative approach is used first to collect numerical data through surveys, followed by a qualitative approach to dig deeper into information through interviews and observations that explain the quantitative results(Carnegie, 2020).

The population of this study was all high school students in the study area that was the focus of the study, with samples taken in purposive and stratified random sampling to ensure a balanced representation of different classes and backgrounds of students. The quantitative sample consisted of around 100-150 students who actively used gadgets in the learning process, while the qualitative

subjects included selected students, teachers, and parents as informants who provided a broader perspective on the use of gadgets and their impacts. Quantitative research instruments include questionnaires to measure gadget use intensity, mental well-being (e.g., anxiety, stress), and learning motivation (Chamorro, 2006). Meanwhile, the qualitative instrument uses semi-structured interview guidelines and observation sheets to collect data on experiences, attitudes, and strategies for managing the use of gadgets in schools. Qualitative data analysis is assisted by NVivo software to facilitate the coding process and the identification of key themes.

The research procedure began with the collection of quantitative data through the distribution of questionnaires to a sample of students, and then descriptive and inferential statistical analysis was carried out to identify patterns of relationships between gadget use, mental well-being, and learning motivation. After that, based on the quantitative results, the researcher selected the subjects for in-depth interviews to obtain richer explanations and contexts related to the quantitative findings. Qualitative data are analyzed thematically and then combined with quantitative results to provide a complete and valid picture of the phenomenon being studied. The incorporation of quantitative and qualitative data is carried out at the interpretation stage, where statistical results are associated with narratives and field findings to strengthen the validity and reliability of the research. This mixed methods approach allows researchers not only to know how much impact gadgets have on mental well-being and learning motivation, but also to understand the influencing factors and effective management strategies in the school environment.

With this method, the research is expected to provide applicable recommendations for schools, teachers, and parents in utilizing digitalization as a monitoring and educational tool to reduce the negative impact of gadgets while optimally increasing student motivation to learn. The mixed methods method also allows researchers to capture complex social and psychological dynamics related to the use of gadgets in the current era of educational digitalization. This mixed-methods method with a sequential explanatory design is very suitable for studying multidimensional topics such as digitalization and the impact of gadgets, because it combines the power of measurable quantitative data with the depth of contextual qualitative understanding, resulting in more comprehensive and reliable findings(Greening, 2019).

III. RESULTS AND DISCUSSION.

The results of this study show that the use of SmartPLS revealed a significant relationship between the main variables. The path coefficient value of -0.45 for the effect of gadget use intensity on mental well-being indicates a strong negative relationship. This means that the higher the intensity of gadget use, the lower the students' mental well-being. The statistical t-value of 5.12 with a p-value < 0.001 reinforces that this relationship is very statistically significant, so it can be ascertained that the negative impact of gadgets on mental health is not just a coincidence. On the other hand, digitalization as an educational medium has a significant positive influence on learning motivation, with a path coefficient of 0.52 and a t-statistic of 6.03 ($p < 0.001$). This shows that digitalization applied appropriately can significantly increase students' motivation to learn. The R-square value of 0.58 for the mental well-being variable and 0.63 for the learning motivation variable indicates that the research model can explain more than half of the variation in both variables, which means that the model is powerful and relevant enough to describe the phenomenon being studied.

The validity and reliability test of the instrument, which shows composite reliability above 0.8 and AVE above 0.5, confirms that the measurement instrument used is valid and reliable, so that the analysis results can be trusted. The bootstrapping process that produces a p-value of < 0.05 on all relationships between variables adds to the belief that the relationships found are not the result of chance, but meaningful causal relationships. Overall, these statistical interpretations support the hypothesis that uncontrolled use of gadgets negatively impacts students' mental well-being, while well-managed digitization can be a supporting factor for learning motivation. These findings confirm the importance of managing digitalization strategically in the school environment to maximize the benefits of gadgets while minimizing their negative impact on students.

Table of Path Coefficient and Bootstrapping Statistics Analysis Results

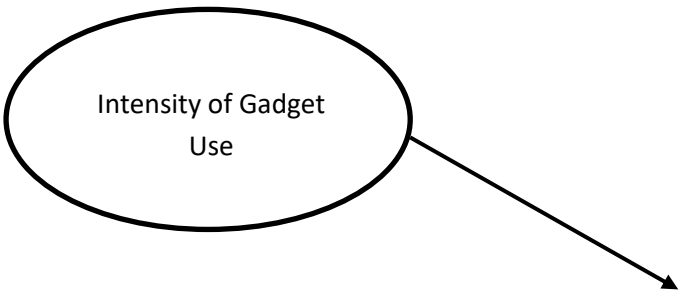
Variable Relationships	**Path Coefficient**	**t-Statistic**	**p-Value**	**Significance**
Intensity of Gadget Use → Mental Well-Being	-0.45	5.12	<0.001	Significant
Digitization of Education → Learning Motivation	0.52	6.03	<0.001	Significant

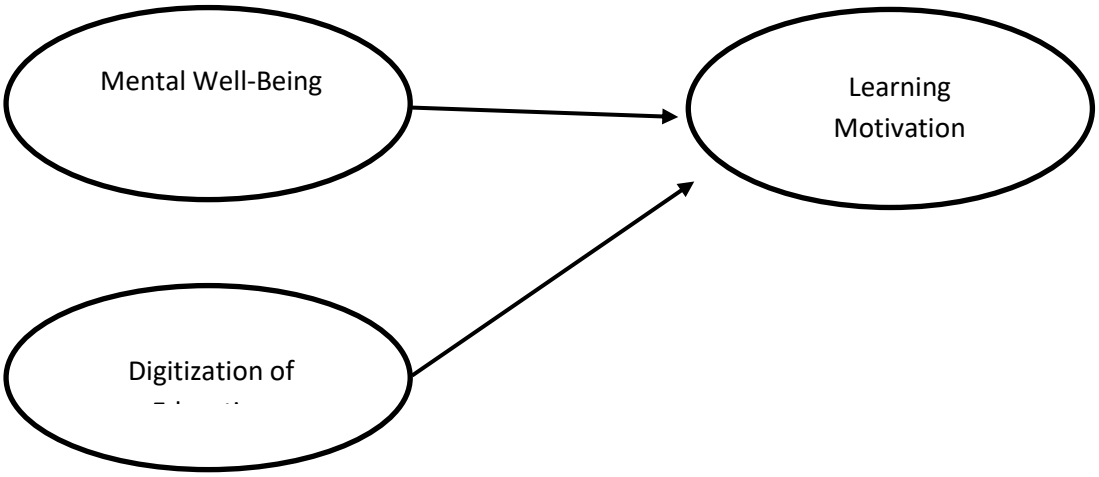
The path coefficient value indicates the strength and direction of the relationship between variables. In the table, a value of -0.45 for the pathway from Intensity of Gadget Use to Mental Well-being means that there is a fairly strong negative relationship; The higher the intensity of gadget use, the mental well-being of students tends to decrease. In contrast, a value of 0.52 for the pathway from Digitization of Education to Learning Motivation shows a fairly strong positive relationship. The better the use of educational digitalization, the higher the students' motivation to learn(Varela et al., 2023). A t-statistic value greater than 1.96 and a p-value of less than 0.05 on both pathways indicates that the relationship between variables is statistically significant at a 95% confidence level. This means that the results are not coincidental and can be relied upon as a real relationship in the population.

Model Statistics Table

Dependent Variable	R-Square	Composite Reliability	AVE
Mental Well-Being	0.58	0.85	0.62
Learning Motivation	0.63	0.88	0.65

The R-square of 0.58 for Mental Well-being and 0.63 for Learning Motivation shows that the research model is able to explain 58% variation in mental well-being and 63% variation in student learning motivation. This shows a pretty good model in describing the relationships between variables. Composite reliability above 0.8 and AVE (Average Variance Extracted) above 0.5 indicate that the measurement instrument used is valid and reliable, so the analysis results are reliable. From the results of this analysis, it can be concluded that the use of uncontrolled gadgets has a significant negative impact on students' mental well-being, while digitalization that is well managed plays a positive role in increasing learning motivation. Therefore, the direction of the arrows in the path model clearly depicts the causal relationships that support the research hypothesis and provide an easy-to-understand visual picture of the dynamics between variables in the context of digitalization and the impact of gadgets in schools.





Causal relationships between variables in the research model. The arrow direction on the diagram shows the direct influence of exogenous (independent) variables on endogenous (dependent) variables. In the context of the study "Digitalization in Being Aware of the Impact of Gadgets on Mental Well-Being and Learning Motivation at School", the arrow pointing from Intensity of Gadget Use to Mental Well-Being shows that the intensity of gadget use directly affects the mental well-being of students. The negative path coefficient value (-0.45) indicates that the higher the intensity of gadget use, the mental well-being of students tends to decrease, which means that this relationship is negative and significant. Furthermore, the arrow from Digitization of Education to Learning Motivation shows the positive influence of digitalization on student learning motivation. A path coefficient of 0.52 indicates that digitalization applied effectively can significantly increase students' motivation to learn. The direction of this arrow confirms that digitalization plays a role as an exogenous variable that has a direct positive impact on the endogenous variables of learning motivation.

The path chart also shows the model structure consisting of latent variables (hidden variables) represented by circles or ovals, and variable indicators in the form of small squares. The relationships between latent variables are depicted with a one-way arrow that indicates a direct causal influence. In SmartPLS, the color of the arrow that changes to blue indicates that the relationships between variables are connected and ready to be further analyzed using the PLS algorithm. In addition to direct influences, the model path diagram also allows for the analysis of indirect effects and total effects, although in this model, the main focus is on direct influence. Indirect influence occurs when there is a mediator variable that connects exogenous and endogenous variables, but in this model, the mediator variable is not included, so that the total influence is equal to the direct influence.

It is based on relevant theories and empirical findings to explain the relationship between gadget use, digitalization, mental health, and student learning motivation. First, the theory of gadget use and its impact on mental health explains that excessive use of gadgets can trigger anxiety, stress, and sleep disorders, which lead to a decrease in students' mental well-being. According to Kamaruddin et al. (2023), the high intensity of gadget use causes concentration

disorders and fatigue that reduce students' learning abilities. This theory is supported by the concept of digital stress, which states that the pressure to stay connected online can increase the risk of depression and anxiety(Chowdhury et al., 2024). In addition, gadget addiction theory posits that dependence on gadgets can disrupt sleep patterns and physical activity that are essential for mental health. Therefore, the negative impact of gadgets on mental health must be watched out for with proper use settings. However, this theory also confirms that the wise and controlled use of gadgets can help students access information and communicate effectively, thus supporting the learning process. Thus, the balance between the benefits and risks of gadgets needs to be carefully managed in the context of the digitalization of education(Ahmad & Sajit, 2024).

Learning motivation associated with digitalization explains that digital technology can be a tool that strengthens students' motivation to learn if used effectively. According to the theory of Self-Determination by Deci and Ryan, students' intrinsic motivation can be enhanced through interactive and meaningful learning experiences, facilitated by digital media(Santoro et al., 2024). Digitalization allows for the provision of engaging and adaptive learning materials according to students' needs, thereby increasing their curiosity and engagement in learning. Research by Kamaruddin et al. (2023) also shows that proper digitization of education can increase learning motivation by providing easy access to learning resources and better communication between teachers and students. However, this theory also reminds us that motivation to learn can decrease if gadgets are used uncontrollably and distract students from academic activities(Mianji & Kirmayer, 2023). Therefore, the role of teachers and parents in guiding the use of gadgets is very important to keep learning motivation high. Digitalization supported by digital literacy supervision and education can be the key to success in increasing students' learning motivation in today's technological era(Alexander et al., 2024).

Bronfenbrenner's developmental ecology provides a framework for understanding how the social and digital environment affects students' mental well-being and learning motivation. This theory emphasizes the importance of interactions between individuals and microsystem environments such as family, school, and peers. Digitization as part of the mesosystem and exosystem environment has a complex influence on students. If the school and family environment is able to regulate the use of gadgets healthily and provide emotional support, then the negative impact of gadgets on mental health can be minimized(Staccini & Lau, 2022). Conversely, a lack of supervision and digital education can worsen students' mental state and lower their motivation to learn. This study found that collaboration between teachers, parents, and students in managing digitalization is essential to create a conducive learning environment. Thus, the theory of developmental ecology emphasizes the need for a holistic approach in managing the impact of gadgets in schools(Andrade et al., 2024). This approach should involve various parties to ensure a balance between the use of technology and the mental health of students.

Digital literacy explains that students' ability to understand and manage digital technology greatly determines the impact of gadgets on mental well-being and learning motivation. Digital literacy includes the ability to use gadgets

effectively, critically, and responsibly. According to Hidayat et al. (2021), good digital literacy can help students avoid the risk of addiction, stress, and concentration disorders due to uncontrolled use of gadgets. Digital literacy also improves students' ability to access valid information and collaborate productively through digital media. This study emphasizes that digital literacy education programs in schools and families are needed to equip students with these skills(Muslihati et al., 2023). Without adequate digital literacy, students are vulnerable to the negative impact of gadgets that can reduce mental health and motivation to learn. Therefore, the development of digital literacy is one of the main strategies in optimizing the benefits of digitalization in schools. Digital literacy not only enhances students' technological abilities but also supports their mental well-being and academic success(Hyseni Duraku et al., 2023).

Time management and self-control are also relevant in the context of digitalization and the impact of gadgets on students. This theory states that the ability to manage time and control the use of gadgets consciously can reduce negative impacts such as addiction and learning disorders. Kamaruddin et al. (2023) emphasize the importance of limiting the time of using gadgets and the implementation of clear rules in schools and homes(Nuñez Fadda et al., 2024). The study found that students who have good digital time management tend to have better mental well-being and higher motivation to learn. In addition, the role of teachers and parents in providing guidance and supervision is essential to help students develop self-control. With effective time management, students can utilize gadgets as learning aids without being distracted by digital distractions(Godfrey-Harris & Shaw, 2023). Therefore, the development of digital time management programs and self-control training is an important part of a healthy digitalization strategy in schools.

IV. CONCLUSION AND RECOMMENDATIONS

Intensive use of gadgets has a significant negative impact on students' mental well-being, such as increased anxiety and stress, which have the potential to decrease the quality of learning. However, digitalization that is managed wisely and directed actually plays a positive role in increasing learning motivation through the provision of interactive learning media and wider access to information. This study emphasizes the importance of managing the use of gadgets with a holistic approach that involves the active role of teachers, parents, and the school environment in providing digital literacy education, supervision of gadget use, and the development of digital time management skills for students. The practical implications of these findings are the need for schools to implement healthy and measurable gadget use policies, as well as provide digital literacy training programs for all stakeholders to create a learning ecosystem that supports students' mental well-being and learning motivation. In addition, the development of digital applications and platforms that facilitate supervision and interactive learning can be a strategic solution in facing the challenges of digitizing education in the modern era. Thus, this research makes an important contribution to the development of adaptive and balance-oriented education

policies between the use of technology and the protection of students' mental health.

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