



Identifying the Effects of Online Gaming Addiction on Students' Academic Behavior in Biology Classes at SMA Negeri 5 Palu

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Abstract: This study aims to identify the impact of online game addiction on students' academic behavior in Biology learning at SMA Negeri 5 Palu. A descriptive qualitative method was employed. The research subjects consisted of four Grade X Merdeka 2 students, selected purposively, and a Biology teacher. Data were collected through interviews and documentation. This study addresses a gap in previous literature by examining students' subjective experiences regarding the effects of online game addiction on academic behavior in Biology classes at SMA Negeri 5 Palu. The findings indicate that online game addiction affects three aspects of students' academic behavior: decreased classroom participation, lack of discipline in submitting assignments, and potential disruption of academic achievement. Among these aspects, students' lack of discipline in completing assignments emerged as the most prominent and evident impact. This was supported by the consistency of interview responses from all informants, the normalization of rule violations, and confirmation from the Biology teacher that, without reminders, assignment submission could be delayed for up to one week. It can be concluded that interventions aimed at improving students' discipline, time management, and daily limits on online gaming are needed through collaboration among schools, teachers, and parents.

Keywords: Online game addiction; academic behavior; Biology Classes

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INTRODUCTION

The rapid advancement of digital technology has transformed many aspects of human life, including the education sector. In the era of Industry 4.0, technology has reshaped the dynamics of teaching and learning by expanding access to information, facilitating communication, and creating new forms of student interaction with digital media (Zainal et al., 2024). Digital technologies can support learning when they are used appropriately and when students' interests remain central to educational practice (UNESCO, 2023). However, the same technological environment also exposes students to various non-academic digital activities that may interfere with their learning routines.

One of the most prominent forms of digital activity among students is online gaming. The increasing accessibility of smartphones and internet networks has enabled students to engage in online games across time and geographical boundaries. Online games can be defined as internet-based multiplayer games that allow users to interact globally without being limited by location or time, supported by attractive visual features and connected through online networks (Masfiah & Putri, 2019). For many students, online games provide entertainment, pleasure, and temporary relief from academic stress. The internal motivation to play may create a sense of satisfaction and

enjoyment, which helps explain why students are often attracted to online gaming activities (Natasyah et al., 2024). From the perspective of compensatory internet use, individuals may engage in online activities to cope with stress, negative emotions, or unmet psychological needs (Kardefelt-Winther, 2014). Therefore, online gaming among students should not be understood merely as entertainment, but also as a digital behavior that may become embedded in their daily routines.

Although online games may offer recreational and psychosocial benefits, uncontrolled gaming can lead to problematic use and academic difficulties. The World Health Organization describes gaming disorder as a pattern of gaming behavior characterized by impaired control over gaming, increasing priority given to gaming over other activities, and continued gaming despite negative consequences (World Health Organization, 2019). Similarly, the American Psychiatric Association identifies internet gaming disorder as a condition requiring further study, particularly when gaming behavior causes clinically significant impairment or distress (American Psychiatric Association, 2013). In the educational context, students who experience online game addiction often find it difficult to regulate their gaming duration and may develop psychological dependence, marked by a strong desire to continue gaming (Anwar & Winingsih, 2021). Such students may become preoccupied with virtual achievements, neglect academic responsibilities, and show declining academic performance (Efraim et al., 2022). These behavioral changes are not always recognized by the students themselves but can often be observed by teachers, family members, and peers. Students with problematic gaming behavior may also fail to complete assignments, participate passively in classroom discussions, or miss lessons, all of which may negatively affect their academic achievement (Salimah & Zukdi, 2020).

Previous studies have reported various negative associations between online gaming and students' academic behavior. Fauzi et al. (2022) found that online games influence academic procrastination, while Syafi et al. (2023) and Wiguna et al. (2020) reported relationships between online gaming, learning concentration, and learning motivation. Sundara et al. (2020) further demonstrated that online games may negatively affect students' learning motivation. In addition, Ulya et al. (2021) reported that online games may have adverse effects on children's social personality development. At the broader level, a systematic review by Alzahrani and Griffiths (2024) showed that most reviewed studies reported a negative relationship between problematic gaming and academic performance, although the direction of causality remains methodologically uncertain. This indicates that further research is needed to examine not only whether online game addiction is associated with academic problems, but also how students experience and display these academic difficulties in specific school contexts.

Despite the growing body of research on online game addiction, several gaps remain. Many previous studies have focused primarily on statistical measurement and have not explored in depth students' lived experiences regarding the academic effects of online gaming. Moreover, the ways in which online game addiction may contribute to reduced classroom participation, assignment procrastination, and declining academic engagement have not been sufficiently described through qualitative evidence. In particular, there remains limited research that specifically examines the potential disruption of Biology learning achievement among students at SMA Negeri 5 Palu. Therefore, the novelty of this study lies in its qualitative exploration of how online game addiction is reflected in students' classroom participation, discipline in completing assignments, and academic achievement in Biology.

This study aims to identify the impact of online game addiction on students' academic behavior in Biology classes at SMA Negeri 5 Palu. Specifically, this study seeks to describe the forms of decreased classroom participation associated with online game addiction, analyze patterns of student indiscipline in completing assignments, and identify potential declines in students' Biology academic achievement related to high-frequency online game use.

METHOD

This study employed a qualitative research design with a descriptive approach to examine the impact of online game addiction on students' academic behavior in Biology learning at SMA Negeri 5 Palu. This approach was considered appropriate because the study aimed to obtain an in-depth understanding of how online game addiction influences students' academic behavior in a specific classroom context. The analysis focused on three main aspects: students' participation during classroom activities, their discipline in completing assignments, and the potential disruption of their academic achievement. Data were collected through interviews and direct observations. To strengthen the interpretation of the findings, the researcher used multiple sources of qualitative data, including observation records, interview transcripts, and narratives of personal experiences (Fiantika et al., 2022). The study was conducted in November during the odd semester of the 2025/2026 academic year.

The participants were selected using purposive sampling because the study required informants who had relevant knowledge, direct experience, and involvement in the phenomenon under investigation. The identification of students with indications of online game addiction was based on seven behavioral criteria proposed by Fiscarina et al. (2020), namely preoccupation, tolerance, loss of control, withdrawal, escape, deception, and disregard of family or school-related disruption. Additional criteria for student participants included active engagement in online gaming for at least two hours per day and willingness to participate as research informants. The Biology teacher who taught the selected class was also involved as an informant because of their direct knowledge of students' behavior during the learning process. The participants consisted of four students from Grade X Merdeka 2 at SMA Negeri 5 Palu who were identified as active online game players, along with one Biology teacher who taught the class. In qualitative research, data sources are selected purposively based on specific considerations, and the quality of the research is determined not by the number of participants but by the depth and relevance of the information provided by the informants (Sugiyono, 2019).

The primary instrument in this study was the researcher, as qualitative research positions the researcher as a human instrument. As the main instrument, the researcher played a central role in maintaining honesty, reflexivity, and transparency throughout the research process (Najib et al., 2026). Supporting instruments included interview and observation guidelines. Prior to data collection, the interview guidelines were validated to ensure that the questions were clear, relevant, and easily understood by the informants. Interviews were conducted directly and face to face to obtain comprehensive information about the informants' experiences, perceptions, and understanding of the phenomenon. Direct observations were carried out during Biology lessons to examine the academic behavior of students identified as active online game players. The observed aspects included students' classroom participation, their responses to the teacher, and their interactions during classroom discussions.

Data were analyzed using the interactive model proposed by Miles (2014), which consists of three stages: data reduction, data display, and conclusion drawing. Data

reduction was conducted by selecting, focusing, and organizing relevant information obtained from interviews and observations. The reduced data were then presented descriptively to facilitate interpretation. Finally, conclusions were drawn by identifying patterns and relationships related to the academic behavior of students identified as active online game players in Biology learning.

RESULTS AND DISCUSSION

Based on interviews conducted with students and the Biology teacher, online gaming was perceived to be associated with several negative patterns in students' academic behavior in Biology learning. These patterns were reflected in reduced classroom participation, delays in assignment completion, and potential disruption of students' academic achievement. Table 1 presents information on the students' gender, Biology scores, minimum mastery criterion (KKM), daily online gaming duration, and the types of online games played.

Table 1. Student information

Student	Gender	Score	KKM	Online Gaming Duration	Types of Games Played
Student 1	Male	75	65	6 hours/day	Call of Duty, Clash of Clans, Free Fire, Mobile Legends
Student 2	Male	75	65	2 hours/day	Mobile Legends, Free Fire
Student 3	Male	75	65	6 hours/day	Call of Duty, Clash of Clans, Free Fire
Student 4	Female	78	65	2 hours/day	Roblox

To further clarify the qualitative findings, the interview data were categorized into themes, subthemes, indicators, data sources, and supporting quotations, as presented in Table 2. This categorization provides a systematic overview of the academic behavioral patterns associated with students' online gaming activities in Biology learning.

Table 2. Data categorization

Theme	Subtheme	Indicator	Data Source	Quotation
Decreased classroom participation	Difficulty answering questions	Dependence on Google	Student 2	"It is difficult; I have to use Google."
Decreased classroom participation	Cognitive barriers	Difficulty understanding the material	Students 1 and 3	"I understand slowly"; "It is difficult to digest the material."
Decreased classroom participation	Passive participation in discussions	Rarely asks questions	Student 4	"No, not really; I rarely ask questions."
Decreased classroom participation	Disrupted concentration	Unstable understanding	Student 4	"When I am focused, I understand quickly, but when I cannot concentrate, I do not understand well."
Lack of discipline in completing assignments	Late assignment submission	Admitted submitting assignments late	Students 1, 2, 3, and 4	"Often. Often because of games"; "Past the deadline"; "I have been late, but not often."
Lack of discipline in completing assignments	Extreme procrastination	Assignments submitted several days after the deadline	Student 1	"Usually, we submit assignments on Friday even though the actual deadline is Monday."

Theme	Subtheme	Indicator	Data Source	Quotation
Lack of discipline in completing assignments	Normalization of academic non-compliance	Admitted academic unpreparedness	Student 2	"I have not completed any of the assignments yet."
Lack of discipline in completing assignments	Low awareness of academic responsibility	Assignments are delayed without reminders	Biology teacher	"If they are not reminded, they may submit the assignment the following week."
Potential disruption of academic achievement	Decreased understanding	The teacher stated that students' understanding declined	Biology teacher	"Their understanding clearly decreases, and their scores are not the same as those of students who pay attention in class."

The field data indicate that students who frequently engaged in online gaming showed several academic behavioral patterns that may interfere with Biology learning. The online games most frequently mentioned by the students were Mobile Legends, Free Fire, Call of Duty, Clash of Clans, and Roblox. Although all participants obtained Biology scores above the KKM, the interview data suggest that frequent online gaming may contribute to reduced learning concentration, delayed task completion, and weaker academic responsibility. To present the findings systematically, the discussion is organized into three main themes: decreased student participation in class, lack of discipline in completing assignments, and potential disruption of academic achievement.

Decreased Student Participation in Class

One of the main academic behavioral patterns identified in this study was decreased student participation in Biology classes. In this context, classroom participation refers to students' involvement in discussions, their willingness and ability to respond to questions posed by the teacher, and their attention to the teacher's explanation during learning activities. The interview findings suggest that students who frequently played online games tended to experience difficulties in these areas.

Student 2, for example, admitted having difficulty answering questions asked by the Biology teacher, stating, "It is difficult; I have to use Google." This response indicates that the student had difficulty recalling or understanding the material independently and tended to rely on digital assistance when responding to academic questions. Such dependence may reflect limited concentration during classroom instruction, which can reduce students' basic understanding of the lesson. This finding is in line with Alfaroji & Puriani (2026), who reported that the intensity of online gaming has a negative relationship with students' learning concentration. In other words, the higher the intensity of online gaming, the weaker the students' concentration during learning.

Similar difficulties were also reported by Students 1 and 3, who stated that they were "slow to understand" and found it "difficult to digest the material." These statements indicate cognitive barriers in receiving and processing Biology content. Student 4 also reported limited participation in class by stating, "No, not really; I rarely ask questions." In addition, she explained, "When I am focused, I understand quickly, but when I cannot concentrate, I do not understand well." This statement highlights the central role of concentration in students' comprehension. When students are unable to maintain concentration, their ability to understand the material may decline, which can subsequently reduce their willingness to ask questions, answer the teacher's questions, or express opinions during classroom activities.

These findings suggest that frequent online gaming may be associated with learning difficulties, particularly in relation to concentration, interest, and understanding. Waruwu et al. (2022) stated that motivation, interest, and understanding are key indicators of students' learning difficulties. In the context of this study, excessive engagement in online gaming may weaken these indicators by shifting students' attention away from academic activities. Similarly, Mustofa & Prasetyoaji (2026) stated that online game addiction can negatively affect students' cognitive processes. Students may experience difficulty receiving information, show reduced interest, become less active, and struggle to respond to feedback provided by teachers.

The importance of concentration in conceptual understanding is also supported by Martin et al. (2023), who found that students with high learning concentration demonstrate more systematic, accurate, and consistent conceptual understanding than students with lower concentration. Therefore, when students' concentration decreases, their understanding of Biology concepts may also decline. This condition can create barriers to active classroom participation, particularly in asking questions, answering questions, and engaging in discussions. Furthermore, Student 2's reliance on Google when answering questions indicates a potential dependence on digital technology. Didiana et al. (2025) found that, in the context of information analysis, digital technology such as AI ChatGPT may have negative effects when students accept information without critically reprocessing it. This condition may weaken students' critical thinking skills if digital tools are used as a substitute for independent reasoning rather than as a learning aid.

Lack of Student Discipline in Completing Assignments

The second major finding concerns students' lack of discipline in completing assignments. Frequent online gaming was associated with delays in assignment submission and signs of academic procrastination. Several students admitted that they often submitted assignments after the deadline because they prioritized playing online games over completing school tasks.

Student 2 openly stated, "Often. Often because of games," when asked about late assignment submission. Students 1 and 3 also reported similar experiences by stating that they submitted assignments "past the deadline." Student 1 further explained that when an assignment was due on Monday, it might be submitted several days later: "Usually, we submit assignments on Friday even though the actual deadline is Monday." This statement shows that assignment delays were not merely occasional but could extend several days beyond the deadline set by the teacher.

A more concerning statement was expressed by Student 2, who said, "I have not completed any of the assignments yet," even though the semester examination was approaching. This statement reflects academic unpreparedness and suggests that online gaming may interfere with students' ability to manage academic responsibilities. The Biology teacher also confirmed this pattern by stating, "If they are not reminded, they may submit the assignment the following week." This indicates that some students required repeated reminders before completing their assignments, suggesting a low level of academic responsibility and time-management ability.

These findings are consistent with Sandya & Ramadhani (2021), who found that high-intensity online gaming influences academic procrastination and that online gaming intensity has a positive relationship with academic procrastination. Similarly, Putri et al. (2023) reported a correlation between online game and smartphone addiction and students' academic procrastination. In this study, the students' own

statements support the view that frequent online gaming can contribute to delayed task completion and reduced academic discipline.

However, the findings also show that the effect of online gaming on assignment completion may vary among students. Student 4, for instance, demonstrated a more controlled pattern by stating, "I have been late, but not often." This suggests that self-control may play an important role in reducing academic procrastination. Astuti (2020) stated that self-control and online game addiction influence students' academic procrastination, and students with low self-control tend to experience greater difficulty making decisions. In addition, Natalia et al. (2023) explained that self-efficacy is another factor that affects academic procrastination. Students with low self-efficacy tend to show higher levels of procrastination because they may doubt their ability to complete school assignments effectively.

Thus, although online gaming may contribute to assignment delays, its impact is likely influenced by individual factors such as self-control, self-efficacy, time-management ability, and awareness of academic responsibility. Students who are able to regulate their gaming behavior and manage their learning time more effectively may be less likely to experience serious delays in completing assignments. Conversely, students with weaker self-control may be more vulnerable to academic procrastination when online gaming becomes a dominant daily activity.

Potential Disruption of Academic Achievement

The third theme concerns the potential disruption of students' academic achievement. Reduced classroom participation and lack of discipline in completing assignments may influence students' understanding of Biology concepts and, consequently, their academic performance. The Biology teacher stated that students who were highly engaged in online gaming tended to show decreased understanding of the material: "Their understanding clearly decreases, and their scores are not the same as those of students who pay attention in class." This statement suggests that students' academic performance may be affected when they do not pay sufficient attention during learning activities.

The students also admitted experiencing difficulty understanding Biology material. This difficulty may influence their academic performance because Biology requires conceptual understanding, sustained attention during explanation, and the ability to connect one concept with another. Based on Table 1, all four participants obtained scores above the KKM of 65. However, a closer examination shows a slight difference in achievement. Student 4, who reported a more controlled gaming duration of 2 hours per day, obtained the highest score, namely 78. Meanwhile, Students 1, 2, and 3 obtained the same score of 75. Students 1 and 3 reported playing online games for 6 hours per day, while Student 2 reported playing for 2 hours per day.

Although this difference is small and cannot be used to draw a causal conclusion, it suggests that gaming duration alone may not fully explain students' academic performance. Other factors, such as gender, interest in science, self-regulation, type of game played, learning environment, and parental support, may also contribute to students' academic outcomes. Zainal et al. (2026) stated that male students tend to have lower enjoyment of science learning than female students. In this context, lower enjoyment of Biology learning may encourage male students to seek activities perceived as more attractive, such as online gaming, which may indirectly influence their learning engagement and academic performance.

Shobih (2025) also emphasized that the effect of online games on students' academic achievement depends on several factors, including gaming duration, type of game, environmental support, and self-control. In line with this argument, Lee & Jeong

(2024) stated that self-regulation plays an important role in minimizing the negative effects of online gaming. Students who are able to regulate their behavior, including managing their playing time, may reduce the negative consequences of gaming on academic activities. In this study, Student 4 appeared to demonstrate better self-regulation, which may explain why her score was slightly higher than those of the other participants.

Nevertheless, the fact that all students' scores remained above the KKM should not lead to the conclusion that frequent online gaming has no academic consequences. Shobih (2025) argued that the effects of online gaming can be cumulative and long term. Therefore, although students may currently maintain scores above the minimum mastery criterion, they may still be at risk of declining academic achievement if excessive gaming habits continue and are not balanced with effective learning discipline.

Overall, among the three identified effects, the lack of discipline in completing assignments appeared to be the most visible and immediate academic behavioral problem. This was shown through repeated delays in assignment submission, consistent statements from students, and the normalization of submitting assignments beyond the deadline. This condition may become more serious when accompanied by low classroom participation and decreased concentration, as these factors can gradually affect students' understanding and academic achievement.

These findings highlight the importance of strengthening students' discipline, time-management skills, and responsible use of digital technology. Addressing the academic consequences of excessive online gaming requires the involvement of teachers, schools, and parents. Schools need to develop structured policies that do not only rely on confiscating students' mobile phones but also include digital literacy, academic discipline, and time-management education. Teachers need to provide consistent guidance, monitoring, and feedback, while parents need to support students by regulating online gaming time at home. Through coordinated efforts among schools, teachers, and families, the negative academic effects associated with excessive online gaming can be reduced more effectively.

CONCLUSION

Based on the findings of this study conducted at SMA Negeri 5 Palu, online game addiction negatively affects students' academic behavior in three main aspects: reduced classroom participation, decreased discipline in completing assignments, and potential disruption to academic achievement. Among these effects, lack of discipline in assignment completion emerged as the most evident and significant impact experienced by students. These findings suggest that excessive online gaming may interfere with students' learning responsibilities and weaken their engagement in academic activities.

The results of this study highlight the need for schools to strengthen digital literacy programs, encourage teachers to monitor students' assignment completion more systematically, and promote parental involvement in regulating students' online gaming time. However, this study has several limitations, particularly the small number of informants and the absence of a standardized instrument to measure the level of online game addiction. Therefore, the findings should be interpreted with caution and may serve as a basis for further research involving broader samples and more rigorous measurement tools.

RECOMMENDATION

Schools should integrate digital literacy initiatives, assignment monitoring, and restrictions on gadget use into their educational practices. In addition, regular communication among teachers, homeroom teachers, and students' parents or guardians is needed to support student discipline and academic engagement. Future research is recommended to expand the scope of respondents and develop validated quantitative research instruments to statistically measure the impact of online game addiction on students' academic behavior. Furthermore, longitudinal studies are recommended to examine the long-term effects of online game addiction. Through these efforts, future researchers are expected to make broader contributions to educational policy in addressing the challenges of the digital era.

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