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EX-POST FACTOR ANALYSIS OF SOCIAL MEDIA USAGE ON MATHEMATICAL ACHIEVEMENT AMONG JUNIOR SECONDARY SCHOOL STUDENTS IN MINNA METROPOLIS, NIGER STATE

Bashir Ahmad Usman[1*], Mohammed Umar Masalachi[2], Olayinka Yusuf Nurudeen[3]

[1,2,3]Science Education Department, School of Science and Technology Education, Federal University of Technology Minna, Niger State

Corresponding Author: bashir.au@futminna.edu.ng

ABSTRACT

The increasing use of social media among students has generated concerns and opportunities regarding its impact on academic performance, particularly in Mathematics. This study therefore investigated the influence of social media usage on mathematical achievement among junior secondary school students in Minna Metropolis, Niger State, Nigeria. The study adopted an ex-post facto research design because the variables under investigation could not be manipulated. The population comprised junior secondary school students, while a sample of 50 students was purposefully selected and used for the study. Data were collected using a structured Social Media and Mathematics Questionnaire (SMMQ) and students' cumulative mathematics achievement records. The instrument measured students' social media platform preference, frequency of use, time spent, and social media usage behaviours. Descriptive statistics of frequency counts, percentages were used to answer the research questions, while Pearson Product Moment Correlation, one-way Analysis of Variance (ANOVA), and simple linear regression were used to test the hypotheses at the 0.05 level of significance. The findings revealed that Facebook (42%) and WhatsApp (36%) were the most commonly used social media platforms among the students. The majority of the students (78%) used social media daily, while 46% spent between one and two hours on social media per day. The study further revealed a significant positive relationship between social media usage and mathematics achievement ($r = .33$, $p < .05$). Regression analysis showed that social media usage significantly predicted mathematics achievement, accounting for 10.8% of the variance ($R^2 = .108$, $p < .05$). However, frequency of usage and time spent on social media had no significant influence on students' mathematics achievement. The study concluded that social media usage has a significant positive influence on students' mathematical achievement when used purposefully for academic engagement. It was recommended that mathematics teachers, parents, and school administrators should guide students toward productive and educational use of social media to enhance academic performance.

KEYWORDS: Social Media Usage, Mathematical Achievement, Junior Secondary School Students, Academic Performance, Mathematics Education.

I. INTRODUCTION

Mathematics is an essential subject among the natural science, engineering, medicine, finance, computer science, and other social science subject. It involves the use of deduction, abstraction and mathematical proofs to develop mathematical theories, structure and models (Keith,2018). Mathematics offer more opportunity beyond grade school, middle school, and high school. Its application to real-life scenario is vast. Though, many students sit in mathematics class wondering

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when they will apply the mathematics knowledge they are learning. Solving mathematic problems and improving mathematics skills gives students a good workout ability and improves their cognitive skills. Many studies have shown that routinely practicing mathematics keeps students' brain healthier and well-functioning in this digital era. particularly, when social media has revolutionized the way students interact, communicate, and share information among each other or between them and teachers. Social media allow users to interact, share ideas, create content, information with other users in the same virtual environment, facilitating global communication, and community buildings (Kezia,2021). The widespread adoption of social media platforms such as Facebook, Twitter, Instagram, YouTube, Telegram, Snapchat, WhatsApp and other social media sites has transformed the landscape of Education, presenting both opportunities and challenges for students, educators, and institutions (Daniel & Mohammed, 2025). As social media continues to play an important role in shaping students' experiences, it is essential to investigate its impact on the academic achievement toward learning Mathematics. Also, It was observed that students devote more attention to social media than they do to their studies. Students' addictiveness to social networks, students' frequency of exposure to social network, social media network that the students are more exposed to and the influence of social media as a medium of interaction between students has been part of discussion in recent times and which have imparted on their academic achievement. Instead of students reading their books, they spend their time chatting and making friends via the social media and this might have influence on their academic. It is a common sight to see a student chatting in sensitive and highly organized places like church, mosque and lecture venues. Some are so carried away that even as they are walking along the high way, they keep chatting.

Additionally, the manufacturing and distribution of sophisticated mobile devices has complicated the situation, as students no longer need to visit a cybercafé before they send and receive messages. Attention has been shifted from visible to invisible friends, while important ventures like study and writing might be affected in the process. This phenomenon has become a source of worry to many who believe in knowledge and skill acquisition. Also, social media have been a major stay in the minds of students and the world at large thereby causing a lot of drastic measure by students, teacher and even educational administrators at large. It is therefore of great importance to explore some of the trending issues facing students' academic achievement as a result of social media. Students at all levels of learning now have divided attention to studies, as a result of available opportunities to be harnessed from social media. Whether these opportunities promote studies is a question that needs to be answered. Social media platforms can serve as valuable resources for learning, providing access to educational content, online resources, and connectivity with peers and educators. Contrarywise, excessive social media usage can lead to distractions, decreased focus, and reduced academic achievement. According to Al-Shuaibi et al. (2018), social media improve students' interest and academic achievement, it may also distract the students from studies and indulge them in other non-academic activities. Numerous studies have been conducted to investigate the causes of lack of interest and poor academic achievement among undergraduate mathematics students, surprisingly, to the best knowledge of the researcher, none have specifically addressed the impact of social media usage on the mathematical achievement of junior secondary school students in Minna, Niger State. Therefore, this study tends to fill such gap. Since, many students continue to utilize these social media sites on a daily basis. Hence, this study is to investigate the influence of social media usage on mathematical achievement among junior secondary school students in Minna metropolis, Niger State.

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II. RELATED WORKS

Social media refers to internet-based applications that enable users to create, share, and exchange user-generated content within interactive platforms (Kaplan & Haenlein, 2010). Unlike traditional media, social media facilitates bidirectional communication, allowing individuals and communities to co-create and discuss content in real time (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011). While various definitions exist in the literature, scholars consistently emphasize three core features: interactivity, user-generated content, and platform-mediated social interaction (Davus, 2016; Varinder & Priya, 2012). For the purpose of this study, social media is operationalized as the set of online platforms (e.g., WhatsApp, Facebook, YouTube) that junior secondary school students report using for communication, content sharing, and academic or non-academic activities. What distinguishes social media from the conventional means of communication is their interactive nature which allows the audience to participate in it from any part of the world they reside (McQuaid, 2010). Social media by their nature have the capabilities of educating, informing, entertaining and inflaming the audience. Above all, they possess a contagious and outreaching influence which the conventional media lack (Maurer et al, 2019). Research on the relationship between social media usage and academic achievement has produced mixed findings, often depending on the nature, frequency, and purpose of use. Some studies indicate that social media can enhance academic outcomes when used deliberately for educational purposes. Fatokun (2019) examined undergraduate chemistry students in north-central Nigeria and reported that 60.8% used social media mainly for education-related activities, while 67.5% agreed that social media boosted their interest in learning. Additionally, 52.9% believed it helped raise their GPA. Aisyah et al. (2024) found that social media has significant potential to increase elementary students' motivation in mathematics, though they cautioned that use must be aligned with learning objectives to avoid disrupting effective instruction. Oguguo et al. (2020) observed that frequent social media use had a significant influence on senior secondary students' academic achievement in accounting, but the direction of that influence was not uniformly negative.

Conversely, several studies report that excessive or indiscriminate social media use detracts from academic performance. Iorliam and Ode (2014) surveyed 1,596 university students and found that time spent on social media, frequency of visits, and number of online friends were each significantly correlated with lower cumulative grade point averages (CGPA). Similarly, Stanley et al. (2023) reported a significant negative correlation between overall social media usage and academic achievement among college students ($r = -0.34$, $p < .01$), suggesting that high engagement displaces study time. In a Nigerian secondary school context, Otaru and Nwankwo (2021) found that teachers perceived social media as a major source of distraction, leading students to spend excessive time online instead of reading, and exposing them to negative peer influences.

A recurring theme is that even when social media offers educational benefits, its addictive design often undermines academic focus. Akinware and Adeosun (2022) surveyed Nigerian tertiary institution students and found that 87.0% used social media very often; among them, 40.5% admitted that social media caused distractions while studying, and 54.0% reported facing related challenges such as cyberbullying and misinformation. The authors concluded that high prevalence of social media use can become a net negative for academic pursuits if not regulated. Despite the importance of mathematics as a foundational subject, relatively few studies have specifically examined social media's influence on mathematics achievement. The only study identified in this review that directly addresses mathematics is Aisyah et al. (2024), which focused on elementary

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school students' motivation rather than actual achievement. That study found great potential for social media to increase motivation, but it did not measure performance outcomes. No study was found that investigates junior secondary school mathematics students in a Nigerian metropolis, nor one that quantitatively correlates social media usage patterns with standardized mathematics test scores. This constitutes a significant gap, given that mathematics achievement at the junior secondary level is a critical predictor of future STEM participation.

Several studies have explored whether the influence of social media on academic achievement varies by demographic characteristics. Oguguo et al. (2020) found no significant difference between male and female students' mean academic achievement in accounting as a result of social media use. Similarly, Otaru and Nwankwo (2021) reported no gender-based difference in their sample of secondary school teachers' perceptions. However, Otaru and Nwankwo (2021) did find a significant difference based on age, suggesting that older students may be more susceptible to social media distraction than younger ones. These findings imply that while gender may not moderate the relationship, developmental stage warrants attention. The present study therefore includes age as a descriptive variable but focuses primarily on the overall influence of social media on mathematics achievement, regardless of gender. Despite the growing body of research on social media and academic achievement, several gaps remain. Most existing studies have focused on undergraduate or senior secondary school students in subjects such as chemistry, accounting, or general academic performance (Fatokun, 2019; Iorliam & Ode, 2014; Oguguo et al., 2020). Only one recent study examined social media in the context of mathematics learning, and that was conducted at the elementary school level (Aisyah et al., 2024). Furthermore, no study has specifically investigated junior secondary school students in Minna Metropolis, Niger State. Therefore, this study aimed to fill that gap by examining the influence of social media usage on mathematical achievement among junior secondary school students in Minna Metropolis.

III. METHODOLOGY

Ex-post facto resign design was adopted to investigate the impact of social media usage on students' academic achievement in Mathematics. According to Nworgu (2015), an es-post facto research design tries to establish cause-effect relationship between variable of interest that cannot be manipulate. The population for this study was all the junior secondary school mathematics students 2024/2025 academic section. From which, 50 JSS II students in Minna Metropolis Niger state were purposively sampled. A research Instrument titled social media & Mathematics Questionnaire (SMMQ) was used to collect data from the student together with Student Mathematics Cumulative Achievement. The SMMQ consists of 17 items. The items are rated on a 5-point Likert scale, ranging from Strongly Agree to strongly Disagree. To ensure the validity of the instruments used in this research, the instrument was validated by two experts. The experts assess the adequacy, effectiveness and relevance of the test items, and provided valuable feedbacks and suggested corrections. The recommended corrections were incorporated in the final copy of the instrument before administered. The instrument yielded the reliability index of 0.78 using Crumbach Alpha Formula and was considered reliable to investigate the influence of social media usage on mathematics achievement among junior secondary school students in Minna Metropolis, Niger State. The following research questions and hypothesis were used to evaluate the proposed methodology.

Research Questions

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The following questions were raised and guided this study.

(a). What are the most commonly used social media platform among junior secondary school mathematics students in Minna Metropolis, Niger state?
(b). How frequently do students use social media?
(c). How much time do students spend on social media daily?

Research Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance.

H_{01}: There is no significant relationship between social media usage and mathematics achievement.
H_{02}: Frequency of social media usage has no significant influence on mathematics achievement.
H_{03}: Time spent on social media has no significant influence on mathematics achievement.

Data collected were analyysed using Descriptive statistics of frequency counts, percentages, Product Moment Correlation, one-way Analysis of Variance (ANOVA), and linear regression methods.

IV. RESULTS & DISCUSSION

Research Question One: What are the most commonly used social media platforms among junior secondary school students?

From figure 1, it was revealed that Facebook (42%) and WhatsApp (36%) were the most commonly used social media platforms among junior secondary school students. This suggests that students' social interactions are concentrated around platforms that promote instant communication, information sharing, and collaborative engagement. This finding is consistent with the study by Akinwalere and Adeosun (2022), which reported that Facebook, Instagram, and WhatsApp were the most preferred social media platforms among students in Nigerian tertiary institutions.

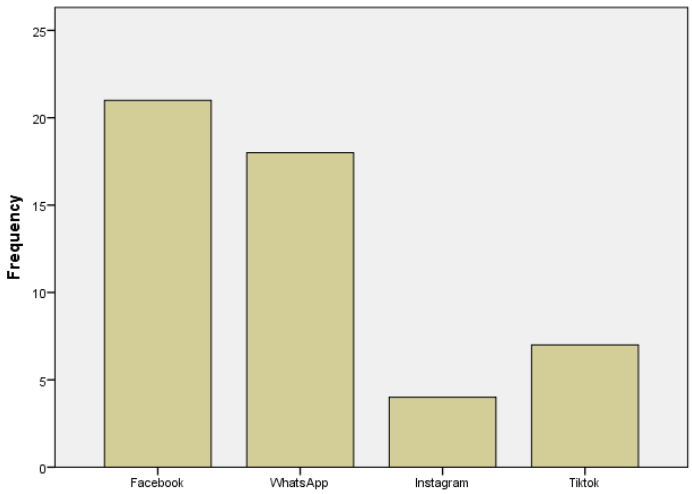

Figure 1: Commonly Use Social Media Platforms

Similarly, Fatokun (2019), found that Facebook was the most frequently used platform among students for educational interaction and academic support. The finding is further supported because of their ease of access and collaborative features.

Research Question Two: How frequently do students use social media?

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From Figure 2, the study found that 78% of the students use social media every day. This indicates a high level of digital engagement among junior secondary school students. This finding agrees with Iorliam and Ode (2014), as cited in the attached paper, who found that 47% of students were always active on social media and regularly visited social networking sites. The finding also supports Akinwalere and Adeosun (2022), who reported that 87% of Nigerian students used social media very often.

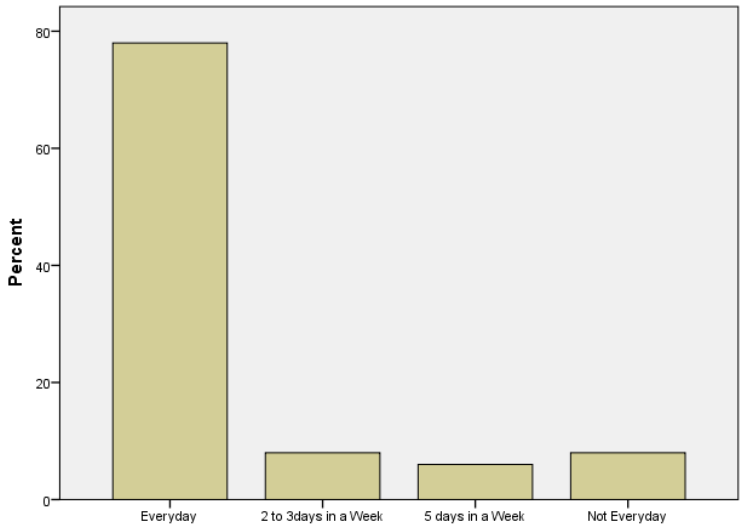

Figure 2: Frequency of Social Media Usage among Students

Similarly, Asanga et al. (2023), in a study conducted among senior secondary school students in Uyo, Nigeria, found that a large proportion of students were addicted to social media and engaged with it daily, indicating strong dependence on digital communication platforms. The agreement between the present study and previous studies suggests that frequent social media usage has become a normal part of students' everyday activities across different educational levels in Nigeria.

Research Question Three: How much time do students spend on social media daily?
Figure 3 showed that most students spend between 1–2 hours daily on social media, while a substantial proportion spend 6–8 hours. This finding agrees with Iorliam and Ode (2014), who found that many students spent between one to two hours daily on social media. The result also aligns with Olebara et al. (2021), who found that time spent on social media significantly affects students' time management and academic routines in Nigeria. However, the present finding differs slightly from the previous studies' concern that excessive time spent online could reduce study time. In the present study, time spent did not significantly affect mathematics achievement. This suggests that time alone may not be the determining factor; rather, the purpose of usage may be more important.

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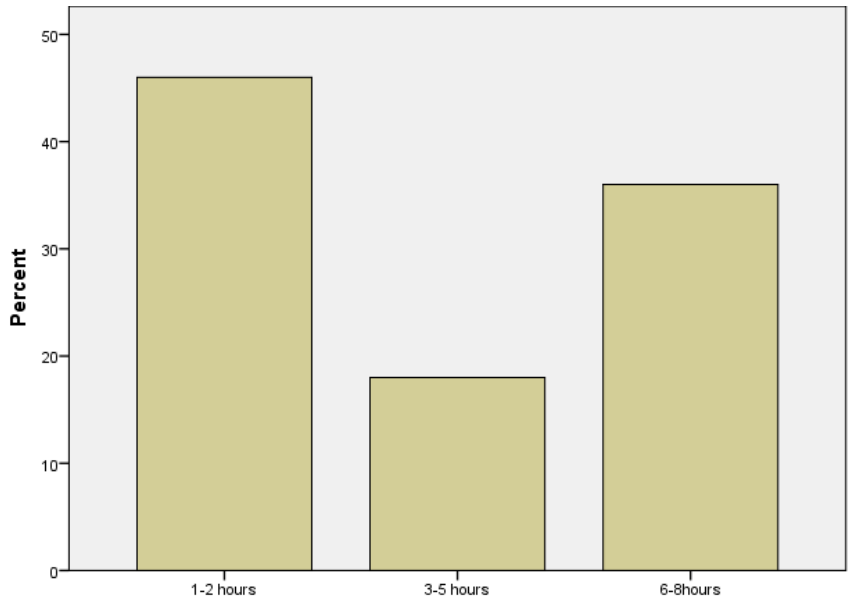

Figure 3: Time Spent on Social Media Daily

Testing of Null Hypotheses

H_{01}: There is no significant relationship between social media usage and mathematics achievement. To test this hypothesis, Pearson Product Moment Correlation was used because both variables are continuous as presented in Table 1. Table 1 revealed a significant positive relationship between social media usage and mathematics achievement ($r = .33$, $p < .05$). Since $p < .05$, the null hypothesis was rejected. This indicates that social media usage, when properly utilized, may contribute positively to students' mathematics performance. This finding supports Fatokun (2019), cited in the attached study, who found that 52.9% of students agreed that social media improved their grade point average and boosted their interest in learning.

Table 1: Relationship between Social Media Usage and Mathematics Achievement

		Pearson Correlation	p-value	Decision
Social Media Usage	Mathematics Achievement	0.33	0.020	significant

It also agrees with Aisyah et al. (2024), cited in the attached study, who found that social media increased students' motivation toward mathematics learning. Similarly, a recent study in Edo State found that social media positively supported mathematics learning through access to tutorial videos, collaborative discussions, and instant academic feedback. However, this finding contrasts with Stanley et al. (2023), cited in the attached study, who reported a significant negative relationship between excessive social media usage and academic achievement. The difference may be due to differences in age group, purpose of usage, and learning environment.

H_{02}: Frequency of social media usage has no significant influence on mathematics achievement. To test this hypothesis, One-way ANOVA was used because frequency groups are categorical while achievement is continuous as presented in Table 2.

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Table 2 shows that frequency of social media usage had no significant influence on mathematics achievement. The result indicates no statistically significant difference, F (3,46) = 1.01, p = .397 and the null hypothesis was retained. This finding partially disagrees with Oguguo et al. (2020), who found that frequent social media use significantly influenced academic achievement among senior secondary school students.

Table 2: ANOVA Summary on Frequency of Usage and Mathematics Achievement

	Sum of Squares	df	Mean Square	F	p-value	Decision
Between Groups	290.276	3	96.759	1.009	.397	Not significant
Within Groups	4411.724	46	95.907			
Total	4702.000	49				

However, it supports the argument of Stanley et al. (2023), who noted that it is not frequent access itself that matters, but whether the use is educational or distracting. The present finding suggests that frequency of use alone is insufficient to predict academic performance.

H_{03}: Time spent on social media has no significant influence on mathematics achievement. To test this hypothesis, One-way ANOVA was used.

From Table 3, it showed that time spent on social media had no significant influence on students' mathematics achievement. The result was not statistically significant, F (2,47) = 1.23, p = .300, and the null hypothesis was retained. This contradicts Otaru and Nwankwo (2021), who found that spending too much time online reduced students' reading time and academic focus.

Table 3: ANOVA Summary on Time Spent and Mathematics Achievement

	Sum of Squares	df	Mean Square	F	p-value	Decision
Between Groups	234.522	2	117.261	1.234	.300	Not significant
Within Groups	4467.478	47	95.053			
Total	4702.000	49				

It also differs from Olebara et al. (2021), who reported that social media negatively affected students' academic activities due to poor time management. The possible explanation for this difference is that junior secondary students may use social media in shorter, more focused ways compared to older students. To determine predictive influence, simple linear regression was conducted as presented in Table 4.

Table 4: Regression analysis Model Summary of social media usage predicting mathematics achievement

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F	B	t	p-value	Decision
1	.329[a]	.108	.090	9.346	5.825	3.368	2.414	.020	significant

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a. Predictors: (Constant), social media usage

The regression analysis showed that social media usage significantly predicted mathematics achievement, accounting for 10.8% of the variance. The p-value (.020) indicates that the predictive effect of social media usage is statistically significant at the 0.05 level. This supports the position of Fatokun (2019), who found that social media helped improve students' academic performance and increased their interest in learning. Similarly, Aisyah et al. (2024), found that social media significantly improved students' motivation toward mathematics learning. However, the relatively low R^2 also suggests that 89.2% of the variation in mathematics achievement remains unexplained by social media usage. This indicates that social media is only one among many factors influencing academic performance. The finding contrasts with Stanley et al. (2023), who reported a negative relationship between excessive social media use and academic achievement. The difference may be because the present study focuses specifically on junior secondary school mathematics achievement, whereas earlier studies often examined broader academic performance or older students.

V. CONCLUSION

Based on the findings of this study, it was established that social media usage has become an integral part of the daily lives of junior secondary school students and plays a significant role in their academic experiences. The study established that Facebook and WhatsApp are the most commonly used social media platforms among the students, indicating that these platforms dominate students' digital interactions. It was also found that the majority of the students engage with social media on a daily basis and spend between one and two hours online, showing a high level of social media exposure. Furthermore, the study revealed that social media usage has a significant positive relationship with students' mathematical achievement, suggesting that when properly utilized, social media can serve as an academic support tool for improving learning outcomes in mathematics. However, the frequency of use and time spent on social media did not significantly influence students' mathematical achievement, implying that the quality and purpose of engagement are more important than the quantity of time spent online. Therefore, the findings disagree with the traditional perception that social media usage is entirely detrimental to students' academic performance. Rather, the study provides evidence that strategic, purposeful, and academically oriented use of social media can contribute positively to students' achievement in mathematics. Hence, social media should be viewed as a complementary educational tool rather than merely a source of distraction. Based on the findings of this study, the following recommendations are made:

(a). Mathematics teachers should integrate social media platforms into teaching and learning activities by creating online discussion groups, sharing instructional videos, and providing mathematics-related learning resources to students.
(b). School administrators should organize digital literacy programmes to guide students on the productive and educational use of social media for academic improvement.
(c). Parents and guardians should monitor and regulate students' social media activities to ensure balanced usage and encourage academic-focused engagement.
(d). The Niger State Ministry of Education should develop policies that promote the educational use of social media in secondary schools as part of digital learning strategies.

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(e). Students should be encouraged to join educational groups and academic communities on social media platforms where mathematics problems, tutorials, and learning materials are regularly shared.
(f). Guidance counsellors should educate students on effective time management to prevent excessive or unproductive social media engagement.

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