

SOCIAL MEDIA USAGE AND ACADEMIC PERFORMANCE OF SCIENCE EDUCATION UNDERGRADUATES IN PUBLIC UNIVERSITIES IN EBONYI STATE, NIGERIA: STUDENTS' PERSPECTIVES

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Abstract

This study investigated the influence of social media usage on the academic performance of undergraduate science education students in public universities in Ebonyi State, Nigeria. An ex-post facto survey research design was adopted for the investigation. Four research questions guided the study and two null hypotheses were tested at the 0.05 level of significance. The population comprised 2,876 undergraduate science education students drawn from the Faculty of Education in the two public universities in Ebonyi State Ebonyi State University (EBSU), Abakaliki, and Alex Ekwueme Federal University Ndufu-Alike (AE-FUNAI). Using the Taro Yamane (1967) formula, a sample of 364 students was drawn using proportionate stratified sampling and simple random sampling techniques, of which 354 instruments were retrieved and analysed. The instrument for data collection was a researcher-structured 18-item questionnaire (Social Media Usage and Academic Performance Questionnaire, SMAPQ) and an academic performance proforma. Face and content validity were established by three experts in Educational Measurement and Evaluation, Computer Education, and Science Education respectively. Internal consistency was determined using the Cronbach alpha method and yielded a reliability coefficient of 0.91. Data were analysed using frequencies, percentages, means, standard deviations, and independent samples t-test at the 0.05 alpha level. Findings revealed that: science education undergraduates were undecided on the influence of information overload from social media sites (SMS) on their academic performance; there was a significant gender difference in the mean ratings of male and female undergraduates regarding information overload influence ($p < 0.05$), with males reporting higher susceptibility; and both male and female students agreed that peer interactions through SMS positively influenced their academic performance with no significant gender difference. Based on the findings, it is recommended that science educators develop structured social media engagement protocols that leverage peer interaction benefits while implementing strategies to mitigate the adverse effects of information overload on student academic performance.

Keywords: Social Media Usage, Peer Interaction, Academic Performance, Science Education, Public Universities

Introduction

The accelerated diffusion of social media platforms across Nigerian higher education institutions has fundamentally transformed the communicative, social, and academic lives of undergraduate students (Abubakar & Ahmad, 2021). Platforms including WhatsApp, Facebook, Instagram, X (formerly Twitter), TikTok, and YouTube have become inseparable features of the undergraduate experience, shaping how students access information, interact with peers, and engage with academic content beyond the formal classroom (Chukwuere, 2020; Eze, Chinedu-Eze & Bello, 2020). In the context of science education, these platforms offer particular promise: collaborative laboratory group chats, shared access to science tutorial videos, peer-facilitated revision sessions, and real-time exchange of experimental data represent novel pedagogical affordances that supplement and in some cases rival traditional instructional approaches (Nwachukwu, Obi & Ugochukwu, 2023).

Social media is broadly conceptualised as internet-based applications and digital platforms that enable users to create, share, exchange, and consume information, ideas, multimedia content, and personal narratives within networked virtual communities (Abubakar & Ahmad, 2021; Okafor & Nwoye, 2022). Three defining characteristics cut across extant definitions: social media is technology-driven, inherently interactive, and premised on user-generated content (Chukwuere, 2020). These properties have made social media uniquely attractive to the millennial and Generation Z student cohorts that constitute the undergraduate population of Nigerian universities, a population characterised by extensive smartphone adoption and appetite for digital connectivity (Agbaeze, Udeh & Onwuegbu, 2021).

The adoption of social media platforms among Nigerian undergraduate students has grown at a remarkable rate over the past decade, driven by the expansion of mobile data infrastructure, the increasing affordability of smartphones, and the growing cultural embeddedness of digital connectivity among young Nigerians (Agbaeze et al., 2021; Nwachukwu et al., 2023). Studies conducted across Nigerian university contexts consistently report that the majority of undergraduates access social media platforms on a daily basis, with WhatsApp, Facebook, Instagram, and YouTube ranking among the most frequently used platforms for both academic and non-academic purposes (Abubakar & Ahmad, 2021; Okafor & Nwoye, 2022). Science education students, in particular, utilise social media for collaborative laboratory preparation, lecture note sharing, and access to science tutorial content (Eze et al., 2020).

The dual character of social media usage simultaneously as an academic resource and a recreational distraction is well documented in the Nigerian higher education literature (Chukwuere, 2020; Addo et al., 2022). Okafor and Nwoye (2022) found that while Nigerian undergraduates broadly acknowledged social media's educational utility, a substantial proportion also reported that non-academic social media engagement displaced significant time that would otherwise be devoted to academic study. This pattern is particularly pronounced among male students, who have been observed to engage with a wider range and greater volume of social media content than their female counterparts, rendering them more susceptible to the cognitive disruptions associated with information overload (Abubakar & Ahmad, 2021; Saleh et al., 2022).

Information overload in the social media context refers to the condition in which the volume, velocity, and variety of digital content received by a student exceeds their cognitive capacity for meaningful processing (Addo et al., 2022; Saleh et al., 2022). For science education undergraduates, who must engage in demanding cognitive tasks including mathematical reasoning, experimental design, and conceptual synthesis, information overload represents a particularly acute threat to academic performance. Olanrewaju et al. (2020) reported that students experiencing higher levels of social media information overload also exhibited reduced academic self-efficacy and lower examination scores in science subjects. These findings are consistent with Saleh et al. (2022), who identified cognitive fatigue, reduced concentration, and impaired memory consolidation as key mechanisms linking information overload to diminished academic outcomes.

Gender differences in information overload susceptibility are an important dimension of this relationship. Abubakar & Ahmad (2021) and Addo et al. (2022) both reported that male students tend to engage more broadly with social media content and are consequently more vulnerable to information overload-related academic disruption, while female students demonstrate greater selectivity and intentionality in their social media consumption. These gender differences have important implications for how universities design digital literacy and academic support programmes for science education students.

Social media-facilitated peer interaction has emerged as one of the most consistently positive dimensions of undergraduate social media usage in the educational literature (Oye et al., 2020; Eze et al., 2020). The capacity of social media platforms to extend and enrich peer academic interactions beyond the physical boundaries of the classroom and laboratory has been particularly noted in science education contexts (Nwachukwu et al., 2023). WhatsApp study groups, collaborative science problem-solving threads, peer tutoring via video calls, and shared access to laboratory pre-briefing materials are among the most frequently cited academically productive uses of social media peer interaction by Nigerian science education students (Okafor & Nwoye, 2022; Chukwuere, 2020). The evidence consistently indicates a positive association between academically oriented social media peer interaction and undergraduate academic performance (Olanrewaju et al., 2020; Agbaeze et al., 2021). Crucially, the gender dimension of peer interaction through social media appears considerably less differentiated than for information overload: both male and female students tend to report comparably positive experiences of academic peer interaction through social media platforms (Saleh et al., 2022; Nwachukwu et al., 2023). This gender-neutral pattern of peer interaction benefit has important equity implications for the deployment of social media-based collaborative learning strategies in science education.

This study draws on two complementary theoretical frameworks. The Information Overload Theory, originally developed by Toffler (1970) and subsequently applied to digital learning contexts by Addo et al. (2022), posits that when individuals receive more information than their cognitive processing systems can manage, the quality of their judgement, decision-making, and academic performance deteriorates. This framework directly informs the study's treatment of social media information overload as a potential academic performance inhibitor. The Social Learning Theory (Bandura, 1977, as applied by Olanrewaju et al., 2020) complements this by emphasising the role of

observational learning, social reinforcement, and peer modelling in shaping academic behaviour. Within the social media environment, peer interactions that expose students to academically motivated behaviour, shared study resources, and collective problem-solving can function as powerful learning reinforcement mechanisms (Chukwuere, 2020; Oye et al., 2020).

Despite the documented educational affordances of social media, its pervasive and often unregulated use among undergraduates raises serious questions about its net impact on academic performance (Addo, Chawinga & Bafuleka, 2022). Information overload the condition in which an individual is exposed to more information than their cognitive system can effectively process at a given time has emerged as a critical mediating variable between social media engagement and academic outcomes (Saleh, Abiddin & Hassan, 2022). Science education students, who are expected to engage in deep conceptual reasoning, mathematical problem-solving, and complex laboratory work, are particularly vulnerable to the cognitive disruptions that characterise information overload (Olanrewaju, Hossain & Whitfield, 2020).

Public universities in Ebonyi State, located in the South-East geopolitical zone of Nigeria, represent an educationally significant yet under-researched context for this investigation. Despite growing smartphone and internet penetration rates in the state (Agbaeze et al., 2021), empirical studies specifically examining the influence of social media usage on the academic performance of science education undergraduates at Ebonyi State institutions are conspicuously absent from the literature. Academic performance, as operationalised in this study, refers to the measurable demonstration of knowledge, skills, and competencies that students exhibit across the formal assessment activities of their science education programmes, as reflected in cumulative grade point averages (CGPAs) and examination scores (Oye, Iahad & Ab Rahim, 2020). Understanding the influence of social media on this outcome is essential for science educators, institutional policymakers, and students themselves, as it enables the development of evidence-based strategies for harnessing social media's educational potential while protecting students from its documented academic risks (Eze et al., 2020; Nwachukwu et al., 2023).

Purpose of the Study

The study specifically investigated the:

1. influence of information overload from social media sites (SMS) on the academic performance of undergraduate science education students in public universities in Ebonyi State;
2. influence of information overload from SMS on the academic performance of male and female undergraduate science education students in public universities in Ebonyi State;
3. influence of peer interactions through SMS on the academic performance of undergraduate science education students in public universities in Ebonyi State; and
4. influence of peer interactions through SMS on the academic performance of male and female undergraduate science education students in public universities in Ebonyi State.

Research Questions

1. What is the influence of information overload from social media sites (SMS) on the academic performance of undergraduate science education students in public universities in Ebonyi State?
2. What is the influence of information overload from SMS on the academic performance of male and female undergraduate science education students in public universities in Ebonyi State?
3. What is the influence of peer interactions through SMS on the academic performance of undergraduate science education students in public universities in Ebonyi State?
4. What is the influence of peer interactions through SMS on the academic performance of male and female undergraduate science education students in public universities in Ebonyi State?

Hypotheses

The following null hypotheses were tested at the 0.05 level of significance:

H₀₁: There is no significant difference in the mean ratings of male and female undergraduate science education students on the influence of information overload from SMS on their academic performance in public universities in Ebonyi State.

H₀₂: There is no significant difference in the mean ratings of male and female undergraduate science education students on the influence of peer interactions through SMS on their academic performance in public universities in Ebonyi State.

Methodology

This study adopted an ex-post facto survey research design. This design was appropriate because the independent variable social media usage had already occurred naturally among the target population prior to the conduct of the study, and could not be experimentally manipulated (Creswell & Creswell, 2022). The survey component facilitated systematic data collection from a large, geographically distributed sample of science education undergraduates. The target population comprised 2,876 undergraduate science education students enrolled in the Faculty of Education at the two public universities in Ebonyi State: Ebonyi State University (EBSU), Abakaliki (population = 1,634) and Alex Ekwueme Federal University Ndufu-Alike (AE-FUNAI) (population = 1,242). Applying the Taro Yamane (1967) formula at a 5% margin of error, a sample of 364 students was determined. Proportionate stratified sampling was used to ensure representative sampling from each university stratum and gender subgroup, while simple random sampling was employed to select individual respondents within each stratum. Of the 364 questionnaires distributed, 354 (97.3%) were successfully retrieved and used for data analysis. The sample comprised 166 male (46.89%) and 188 female (53.11%) students.

Data were collected using the researcher-developed Social Media Usage and Academic Performance Questionnaire (SMAPQ). The instrument was structured in two parts. Part One elicited demographic information including university of enrolment and gender. Part Two comprised two sections: Section A contained nine items measuring the influence of

information overload from social media on academic performance, while Section B contained nine items assessing the influence of peer interactions through social media on academic performance. Responses were anchored on a four-point Likert scale: Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). A decision threshold of Mean ≥ 3.50 = Agree; Mean 2.50–3.49 = Undecided; Mean < 2.50 = Disagree was applied in interpreting item and cluster means. An academic performance proforma was used to record students' cumulative grade point averages (CGPAs) as an objective measure of academic performance. The SMAPQ was face and content validated by three subject-matter experts: a specialist in Educational Measurement and Evaluation, a specialist in Computer Education, and a specialist in Science Education, drawn from Federal College of Education (Technical), Umuze, Anambra State, and Enugu State University of Science and Technology (ESUT). The Cronbach alpha reliability coefficient of 0.91 was obtained from a pilot study involving 30 students outside the main sample, confirming excellent internal consistency (Pallant, 2020).

Questionnaires were administered personally by the researchers with the assistance of two trained research assistants using a direct delivery approach. Data were analysed using the Statistical Package for the Social Sciences (SPSS, Version 26.0). Descriptive statistics — frequency counts, percentages, means, and standard deviations — were computed to answer the four research questions, while independent samples t-test was used to test the two null hypotheses at the 0.05 level of significance. Levene's test for equality of variances was applied prior to t-test interpretation to confirm the appropriate t-test variant.

Results

Research Question One: What is the influence of information overload from social media sites (SMS) on the academic performance of undergraduate science education students in public universities in Ebonyi State?

Table 1

Mean and Standard Deviation Scores on the Influence of Information Overload from Social Media Sites on the Academic Performance of Undergraduate Science Education Students in Public Universities in Ebonyi State (N = 354)

S/N	Item Statement (Information Overload)	Mean	SD	Decision
1	Excessive social media content creates online addiction that disrupts my science coursework and laboratory preparation	3.71	1.26	Agree
2	My academic grades in science subjects have not improved since I became actively engaged on social media platforms	2.91	1.33	Undecided
3	I spend more hours per day browsing social media platforms than studying or reviewing science course materials	3.63	1.27	Agree
4	Frequent social media notifications disrupt my concentration during personal study and examination revision	3.29	1.31	Undecided
5	Persistent use of social media for non-academic activities has negatively affected my science examination performance	3.06	1.36	Undecided
6	Participating in science-focused academic discussions on social media platforms (e.g., WhatsApp groups, YouTube) has enhanced my understanding	3.62	1.21	Agree
7	Using social media platforms to disseminate lecture materials and course notes to classmates has improved my academic	3.77	1.18	Agree

	performance			
8	When confronted with large volumes of unfiltered online information, I become cognitively overwhelmed and my academic performance suffers	3.31	1.30	Undecided
9	Information overload from social media causes mental fatigue that reduces my effectiveness in science laboratories and examinations	3.47	1.26	Undecided
	Cluster Mean / Overall SD	3.42	1.28	Undecided

Results in Table 1 reveal that students agreed with items 1, 3, 6, and 7, which addressed social media addiction disrupting academic activities, time displacement from studying science materials, academic discussions enhancing understanding, and peer sharing of lecture notes improving performance. Students were undecided on items 2, 4, 5, 8, and 9, which pertained to grade deterioration, study distraction, negative performance impact, cognitive overload, and mental fatigue. The cluster mean of 3.42 (SD = 1.28) falls within the Undecided range, indicating that science education undergraduates in public universities in Ebonyi State were collectively undecided on the influence of information overload from social media on their academic performance. The narrow SD range (1.18–1.36) confirms homogeneity in respondents' perceptions across the nine items.

Research Question 2: What is the influence of information overload from SMS on the academic performance of male and female undergraduate science education students in public universities in Ebonyi State?

Table 2

Gender-Disaggregated Mean and Standard Deviation Scores on the Influence of Information Overload from Social Media Sites on the Academic Performance of Male and Female Undergraduate Science Education Students in Public Universities in Ebonyi State

S/N	Item Statement	Male Mean	Male SD	Male Decision	Female Mean	Female SD	Female Decision
1	Excessive SM content creates addiction disrupting science coursework	3.82	1.28	Agree	3.57	1.20	Agree
2	Academic grades have not improved since SM engagement began	3.13	1.33	Undecided	2.71	1.27	Undecided
3	More hours on SM than studying science materials	3.71	1.30	Agree	3.49	1.27	Undecided
4	SM notifications disrupt science study concentration	3.62	1.20	Agree	3.01	1.26	Undecided
5	Persistent SM use has negatively affected science exam results	3.20	1.37	Undecided	2.94	1.32	Undecided
6	Science-focused SM discussions enhanced understanding	3.85	1.06	Agree	3.42	1.25	Undecided
7	SM sharing of notes improved academic performance	3.90	1.19	Agree	3.61	1.14	Agree
8	Cognitive overwhelm from online information impairs performance	3.29	1.39	Undecided	3.28	1.23	Undecided
9	Information overload causes fatigue affecting lab activities	3.50	1.26	Agree	3.46	1.22	Undecided

Cluster Mean	3.56	1.26	Agree	3.28	1.24	Undecided
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Table 2 shows that male students agreed with items 1, 3, 4, 6, 7, and 9, reflecting agreement that social media addiction, time displacement, study distraction, academic discussions, peer note-sharing, and information-induced fatigue all influence their academic performance. Male students were undecided on items 2, 5, and 8. Female students agreed only with items 1 and 7 social media addiction and peer note-sharing while remaining undecided on the remaining seven items. The cluster mean of 3.56 for male students falls in the Agree range, while the cluster mean of 3.28 for female students falls in the Undecided range. These results indicate a meaningful gender differentiation in perceptions of information overload influence, with male science education undergraduates perceiving a more pronounced influence on their academic performance than their female counterparts.

Research Question 3: What is the influence of peer interactions through SMS on the academic performance of undergraduate science education students in public universities in Ebonyi State?

Table 3

Mean and Standard Deviation Scores on the Influence of Peer Interactions through Social Media on the Academic Performance of Undergraduate Science Education Students in Public Universities in Ebonyi State (N = 354)

S/N	Item Statement (Peer Interaction)	Mean	SD	Decision
1	My engagement with science peers on social media platforms enriches my understanding of complex science concepts through collaborative dialogue	3.62	1.22	Agree
2	Social media interactions with classmates improve my access to motivational content and science-related study resources	4.11	0.96	Agree
3	Social media platforms significantly increase the frequency and quality of academic communication among science education students	4.31	0.77	Agree
4	My interaction with peers via social media facilitates timely sharing of science course updates, assignments, and academic announcements	4.09	0.89	Agree
5	Online peer group discussions on social media enhance collaborative learning for science practicals and group assignments	4.08	1.02	Agree
6	Peer discussions in class social media groups improve my performance in both theory and practical science examinations	4.14	0.95	Agree
7	Social media peer engagement keeps me informed about current developments in science education, research, and career opportunities	4.10	0.87	Agree
8	My social media presence has expanded my peer network in ways that positively contribute to my academic and personal development	3.79	1.06	Agree
9	Sharing ideas and study resources with science peers via social media platforms has supported my academic goal-setting and career orientation	3.90	1.21	Agree
Cluster Mean / Overall SD		4.02	0.99	Agree

Results in Table 3 show that science education undergraduates agreed with all nine peer interaction items (Items 10–18). The cluster mean of 4.02 (SD = 0.99) falls clearly within the Agree range. The highest mean scores were recorded for item 12 (increased communication quality and frequency, mean = 4.31) and item 15 (improved performance through class group discussions, mean = 4.14), highlighting academic communication enhancement and collaborative group learning as the most valued dimensions of social media peer interaction among science education students. The very narrow SD range (0.77–1.22) confirms exceptionally high response homogeneity, indicating strong and consistent agreement across the sample.

Question Four: What is the influence of peer interactions through SMS on the academic performance of male and female undergraduate science education students in public universities in Ebonyi State?

Table 4

Gender-Disaggregated Mean and Standard Deviation Scores on the Influence of Peer Interactions through Social Media on the Academic Performance of Male and Female Undergraduate Science Education Students in Public Universities in Ebonyi State

S/N	Item Statement	Male Mean	Male SD	Male Decision	Female Mean	Female SD	Female Decision
1	SM peer engagement enriches understanding of science concepts	3.63	1.36	Agree	3.64	1.04	Agree
2	SM interactions improve access to science resources & motivation	4.18	0.93	Agree	4.06	0.92	Agree
3	SM increases frequency & quality of academic communication	4.39	0.75	Agree	4.22	0.79	Agree
4	SM facilitates timely sharing of science academic information	4.22	0.70	Agree	4.03	1.01	Agree
5	Online peer discussions enhance collaborative science learning	4.14	0.97	Agree	4.07	1.06	Agree
6	Class SM groups improve science exam performance	4.24	0.86	Agree	4.02	1.08	Agree
7	SM keeps students informed on science education trends	4.16	0.86	Agree	4.00	0.91	Agree
8	SM presence expands science peer networks for academic growth	3.76	1.06	Agree	3.77	1.01	Agree
9	Idea-sharing via SM supports career & academic goal-setting	3.81	1.27	Agree	3.93	1.15	Agree
	Cluster Mean	4.06	0.97	Agree	3.97	1.00	Agree

Table 4 indicates that both male and female students agreed with all nine peer interaction items. The cluster means of 4.06 and 3.97 for male and female students respectively are both within the Agree range and are closely aligned, with a negligible inter-gender mean difference of 0.09. This convergence strongly suggests that the positive influence of social media peer interaction on academic performance is experienced comparably by male and female science education undergraduates in Ebonyi State, independent of gender.

Hypothesis One: There is no significant difference in the mean ratings of male and female undergraduate science education students on the influence of information overload from SMS on their academic performance in public universities in Ebonyi State.

Table 5

Independent Samples t-test Results on the Significance of Gender Difference in Perceptions of the Influence of Information Overload from Social Media on the Academic Performance of Science Education Undergraduates in Public Universities in Ebonyi State

Gender Group	n	Mean	SD	df	Calculated t-value	p-value (α)	Statistical Decision
Male	166	32.07	5.88	352	0.001	0.05	H_{01} Rejected – Significant
Female	188	29.54	6.69				

Table 5 shows that the calculated significance value ($p = .001$) is less than the alpha level of 0.05. The null hypothesis H_{01} is therefore rejected. There is a statistically significant difference in the mean ratings of male ($M = 32.07$, $SD = 5.88$) and female ($M = 29.54$, $SD = 6.69$) undergraduate science education students regarding the influence of information overload from social media on their academic performance. The direction of the difference confirms that male science education undergraduates experience and report a significantly greater influence of social media information overload on their academic performance than do their female counterparts.

Hypothesis 2: There is no significant difference in the mean ratings of male and female undergraduate science education students on the influence of peer interactions through SMS on their academic performance in public universities in Ebonyi State.

Table 6

Independent Samples t-test Results on the Significance of Gender Difference in Perceptions of the Influence of Peer Interactions through Social Media on the Academic Performance of Science Education Undergraduates in Public Universities in Ebonyi State

Gender Group	n	Mean	SD	df	Calculated t-value	p-value (α)	Statistical Decision
Male	166	36.62	3.53	352	0.152	0.05	H_{02} Retained – Not Significant
Female	188	35.74	5.21				

Table 6 shows that the calculated significance value ($p = .152$) exceeds the alpha level of 0.05. The null hypothesis H_{02} is therefore not rejected. There is no statistically significant difference in the mean ratings of male ($M = 36.62$, $SD = 3.53$) and female ($M = 35.74$, $SD = 5.21$) undergraduate science education students regarding the influence

of peer interactions through social media on their academic performance. Both male and female students perceived social media peer interactions as having a comparably positive influence on their academic performance, confirming gender equity in this dimension of social media's academic impact.

Discussion of Findings

The finding that science education undergraduates were collectively undecided about the influence of information overload from social media on their academic performance (cluster mean = 3.42) aligns with the ambivalent and context-sensitive findings reported in the recent literature (Addo et al., 2022; Chukwuere, 2020; Olanrewaju et al., 2020). This undecided posture may reflect the dual-edged nature of social media engagement in the science education context: students who primarily use social media for academic collaboration and resource sharing may not experience the same degree of information overload as those whose social media engagement is predominantly entertainment-driven. Indeed, items pertaining to academic discussion enhancement (item 6, mean = 3.62) and peer note-sharing (item 7, mean = 3.77) elicited Agree responses, suggesting that students recognise the positive informational dimensions of social media alongside the potentially disruptive ones. This finding partially contradicts Okafor and Nwoye (2022), who found a predominantly negative association between heavy social media usage and academic performance among Nigerian undergraduates. The divergence may be attributable to the specific disciplinary context of science education, where social media tools such as WhatsApp laboratory groups and YouTube science tutorial channels provide academically functional affordances that offset some of the negative information overload effects documented in non-STEM samples (Eze et al., 2020; Nwachukwu et al., 2023). This interpretation is consistent with Saleh et al. (2022), who argued that the net academic impact of social media information exposure depends critically on the degree to which that exposure is academically purposeful rather than incidental.

The statistically significant gender difference in information overload perceptions ($p = .001$), with male students reporting greater influence, corroborates findings by Abubakar and Ahmad (2021) and Addo et al. (2022). Male students' higher susceptibility to information overload may reflect their documented tendency to engage with a broader range of social media content — spanning entertainment, news, gaming, and academic material — compared to female students, whose social media engagement tends to be more selective and relationship-focused (Oye et al., 2020; Saleh et al., 2022). This differential consumption pattern exposes male students to higher volumes of unfiltered information, increasing their vulnerability to the cognitive overload and academic distraction documented in the information overload literature (Addo et al., 2022). These findings have practical implications for how science teacher education programmes in Ebonyi State design digital literacy interventions. Gender-differentiated approaches that specifically address male students' tendency toward broad and high-volume social media consumption — and that develop strategies for purposeful information filtering are likely to be more effective than gender-neutral programmes in reducing information overload-related academic performance deficits (Agbaeze et al., 2021; Nwachukwu et al., 2023).

The finding that science education undergraduates agreed that peer interactions through social media positively influenced their academic performance (cluster mean = 4.02), with all nine items reaching the Agree threshold, strongly corroborates the contemporary literature on technology-mediated collaborative learning (Chukwuere, 2020; Eze et al., 2020; Nwachukwu et al., 2023). The highest-rated items related to communication frequency and quality enhancement (item 12, mean = 4.31) and improved learning through peer group discussions (item 15, mean = 4.14), indicating that the most valued social media peer interaction benefits are those that directly extend and enrich collaborative academic engagement. These findings align with Olanrewaju et al. (2020) and Okafor and Nwoye (2022), who similarly found that when Nigerian undergraduates engage with peers on social media in academically purposeful ways, measurable academic performance benefits result. The absence of a significant gender difference in these perceptions ($p = .152$) is consistent with Saleh et al. (2022) and confirms that the positive academic effects of social media peer interaction are equitably distributed across gender in the science education context. This gender equity finding is educationally significant: it suggests that social media-based collaborative learning tools can be deployed in science education without risk of introducing or amplifying gender-based academic performance disparities (Agbaeze et al., 2021).

Conclusion

This study has established that undergraduate science education students in public universities in Ebonyi State were undecided on the influence of information overload from social media on their academic performance, while strongly agreeing that peer interactions facilitated through social media platforms positively influenced their academic performance. A statistically significant gender difference was found in perceptions of information overload influence ($p = .001$), with male undergraduates reporting greater susceptibility, while no significant gender difference was found in perceptions of peer interaction influence ($p = .152$). These findings affirm that the relationship between social media usage and academic performance in science education is multidimensional, context-specific, and gender-sensitive. The positive academic potential of social media peer interaction, when properly channelled and structurally supported, represents a significant and largely untapped educational resource for science teacher education programmes in Ebonyi State and comparable contexts across Nigeria.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Science education undergraduates should develop personalised, structured social media usage schedules that designate specific daily periods for academic social media engagement and strictly limit non-academic social media browsing during study hours, thereby reducing information overload and academic time displacement.
2. Science teacher educators at EBSU and AE-FUNAI should embed structured social media engagement activities including moderated WhatsApp study groups, YouTube science assignment tasks, and peer-teaching via social media platforms

into their course designs, thereby institutionalising and academically legitimising the peer interaction benefits identified in this study.

3. University authorities in Ebonyi State should design and implement science-education-specific digital literacy programmes that equip undergraduates especially male students with evidence-based strategies for managing information overload, critically evaluating online content, and deploying social media purposefully for academic advancement.
4. Given the significant gender difference in information overload perceptions, student affairs and academic support units should develop gender-responsive digital wellbeing interventions, providing male science education students with targeted support for managing the higher levels of social media information exposure and academic disruption they report.
5. Future research should employ longitudinal and mixed-method designs to trace the trajectory of social media's influence on science education academic performance across undergraduate career stages, and should examine the specific platforms, usage patterns, and disciplinary subfields (e.g., Biology Education, Chemistry Education, Physics Education) that most strongly mediate this relationship in the Ebonyi State university context.

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