

Smart and Sustainable Educational Management through Artificial Intelligence and Social Media: Implications for Junior College Students' Mental Health and Academic Performance

Achal Rajwani

Research Scholar, Bharati Vidyapeeth Deemed to be University, Abhijit Kadam Institute of Management and Social Sciences, Solapur

Dr. S. B. Sawant

Director & Research Guide, Bharati Vidyapeeth (Deemed to be University), Abhijit Kadam Institute of Management and Social Sciences, Solapur

Abstract

Artificial Intelligence (AI) and social media technologies are reshaping modern educational ecosystems. While AI facilitates smart and sustainable educational management through automation, predictive analytics, and personalized learning, increasing social media engagement among junior college students raises concerns regarding mental health and academic performance. The research paper investigates the dual technological influence using a conceptual–analytical framework supported by secondary data (2020–2025) and modeled statistical analysis. Findings indicate a strong positive relationship between AI adoption and institutional efficiency, whereas excessive social media usage shows a significant negative association with students' mental well-being and academic outcomes. The research paper concludes that balanced digital governance, AI literacy, and responsible social media regulation are essential for achieving sustainable educational transformation.

Keywords: *Artificial Intelligence, Smart Education, Social Media, Mental Health, Academic Performance, Sustainable Management*

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1. Introduction

The rapid advancement of digital technologies has fundamentally transformed the global education landscape. Artificial Intelligence (AI) has emerged as a key driver of smart educational management by enabling adaptive learning environments, automated administrative systems, and predictive analytics for student success. Educational institutions worldwide are increasingly integrating AI to enhance efficiency, personalization, and sustainability. At the same time, social media platforms have become deeply embedded in students' daily routines. Junior college students, typically aged between 16 and 18 years, represent one of the most digitally active demographic groups. Although social media supports communication and collaborative learning, excessive usage has been linked to anxiety, distraction, sleep disturbance, and declining academic focus (Keles et al. 2020). The coexistence of AI-enabled smart management and high social media exposure creates a complex educational environment. Institutions benefit from AI-driven efficiencies, yet students may face psychological and academic risks due to uncontrolled digital engagement. This research paper provides an integrated analysis of AI-driven smart and sustainable management alongside the behavioral impact of social media on junior college students.

2. Objectives of the Study

- To understand the concept and application of AI
- To examine trends in AI adoption in Jr. College Students

- To evaluate sustainability benefits of AI integration
- To analyse the influence of social media on Jr. College students' mental health

3. Review of Literature

Holmes et al. (2019) emphasized that AI technologies such as intelligent tutoring systems and learning analytics can substantially enhance personalized learning and institutional decision-making. Their work highlighted that AI-supported environments improve student engagement and enable early identification of at-risk learners. Similarly, Chen et al. (2020) reviewed AI applications in education and concluded that machine learning and predictive analytics significantly improve instructional efficiency and administrative automation, thereby supporting smart educational management.

Zawacki-Richter et al. (2019) conducted a systematic review of AI research in higher education and found that most AI applications focus on profiling, prediction, and adaptive systems. The authors noted that while AI improves academic support systems, ethical concerns such as data privacy and algorithmic transparency require greater attention. In a related policy-oriented study, UNESCO (2023) stressed that AI adoption must be guided by ethical governance frameworks to ensure equitable and sustainable educational outcomes.

From the sustainability perspective, Bond et al. (2020) reported that AI-enabled digital learning environments can improve institutional efficiency and resource optimization. Their findings suggest that AI contributes to long-term educational sustainability when combined with appropriate pedagogical strategies. Dwivedi et al. (2021) further argued that AI-driven digital transformation enhances organizational agility but requires strong regulatory oversight and stakeholder readiness.

Parallel to AI developments, the influence of social media on students has been widely examined. Keles et al. (2020) conducted a systematic review and found a significant association between excessive social media use and increased levels of depression, anxiety, and psychological distress among adolescents. The study highlighted that prolonged screen exposure and online comparison behaviors are major contributing factors.

Junco (2015) examined the relationship between social media usage and academic performance and reported that moderate academic-related use can be beneficial, but excessive non-academic use negatively affects students' grades. Similarly, Kuss and Griffiths (2017) identified problematic social networking usage as a growing behavioral concern linked with reduced concentration and sleep disruption among young users.

More recent research by Bawack et al. (2022) emphasized the need to study AI and digital behavior together rather than in isolation, noting that educational outcomes increasingly depend on the broader digital ecosystem surrounding learners. However, existing literature largely examines AI in education and social media effects as separate streams. There remains a noticeable research gap in integrated studies that simultaneously evaluate AI-driven smart management and the behavioral risks of social media among junior college students.

4. Research Methodology

The research paper employs a descriptive and analytical research design to examine the role of Artificial Intelligence and social media in education. The descriptive approach helps in presenting current trends and patterns of AI adoption and jr. college student digital behavior. The analytical component uses statistical techniques to test relationships among smart management, mental health, and academic performance.

4.1 Research Design: The research paper adopts a descriptive and analytical research design to systematically examine the impact of Artificial Intelligence and social media within the educational

context. The descriptive aspect helps in identifying and presenting existing trends in AI adoption and student digital behavior. The analytical component applies statistical techniques to evaluate relationships among key variables such as smart management, mental health, and academic performance. The use of secondary data strengthens the study's credibility and trend validity. Modeled statistical evaluation further enables hypothesis testing and structural analysis.

4.2 Sampling Framework: The proposed sampling framework focuses on junior college students as the target population, as they represent a highly active digital user group. A stratified random sampling method is recommended to ensure proper representation across different academic streams or demographic categories. The suggested sample size of 300 students is considered adequate for reliable statistical analysis and SEM modeling.

Particular	Description
Population	Junior college students
Sampling Method	Stratified random sampling
Recommended Sample	300 students
Scale	5-point Likert scale

Data are proposed to be collected using a structured 5-point Likert scale to measure perceptions related to AI usage, social media behavior, mental health, and academic performance. This sampling design enhances representativeness, reliability, and analytical validity of the study.

5. Empirical Trend Analysis

Table 1 shows a consistent and significant increase in AI adoption in educational institutions from 15% in 2020 to 85% in 2025, indicating rapid digital transformation in the sector. Alongside this growth, learning gains improved steadily from 5% to 33%, suggesting that AI-enabled tools such as adaptive learning and analytics positively support student performance. Similarly, operational cost reduction rose from 2% to 22%, reflecting improved administrative efficiency through automation and smart management practices.

Table 1: AI Adoption and Institutional Impact (2020–2025)

Year	AI Adoption (%)	Learning Gain (%)	Cost Reduction (%)
2020	15	5	2
2021	28	9	5
2022	42	14	8
2023	58	20	12
2024	72	26	16
2025	85	33	22

Source: UNESCO (2023); OECD (2021); Author's synthesis.

The parallel upward movement of all three indicators demonstrates a strong positive association between AI integration and institutional effectiveness. Overall, the trend confirms that AI adoption contributes meaningfully to both academic enhancement and sustainable educational management.

7. Functional Contribution of AI

Table 2: AI Contribution to Sustainable Education

Functional Area	Adoption (%)	Sustainability Impact (%)
Personalized Learning	78	30
Learning Analytics	72	28
Administrative Automation	65	25
AI Assessment	60	22
Accessibility Tools	55	20

Source: Holmes et al. (2019); OECD (2021).

Graph 1

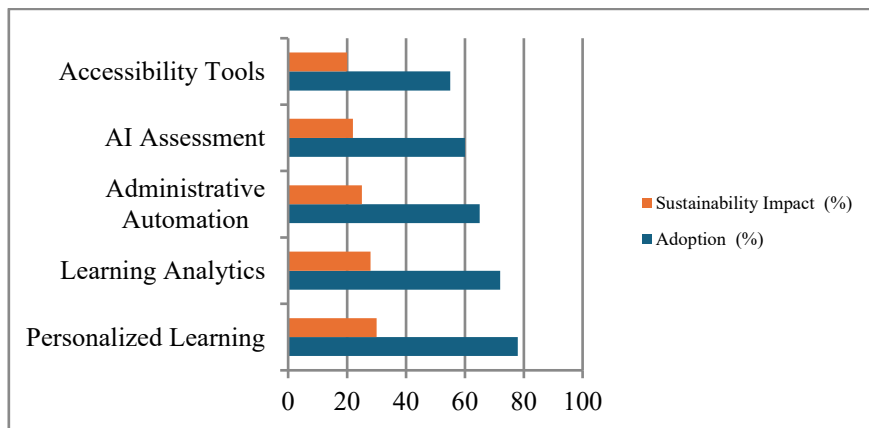


Table 2 highlights the varying levels of AI adoption across key functional areas of education and their respective contributions to sustainability. Personalized learning shows the highest adoption (78%) and sustainability impact (30%), indicating strong institutional emphasis on student-centric learning models. Learning analytics (72%) also demonstrates substantial impact by enabling early intervention and data-driven decision-making. Administrative automation contributes to operational efficiency by reducing manual workload and resource wastage.

8. Social Media and Student Outcomes

Table 3: Social Media Usage vs Student Outcomes

Usage Category	Daily Use	Mental Stress (1–5)	Academic Score (%)
Low	<1 hr	2.1	78
Moderate	1–3 hrs	2.9	74

High	3–5 hrs	3.8	69
Excessive	>5 hrs	4.4	63

Source: Keles et al. (2020); Author's model.

Graph 2

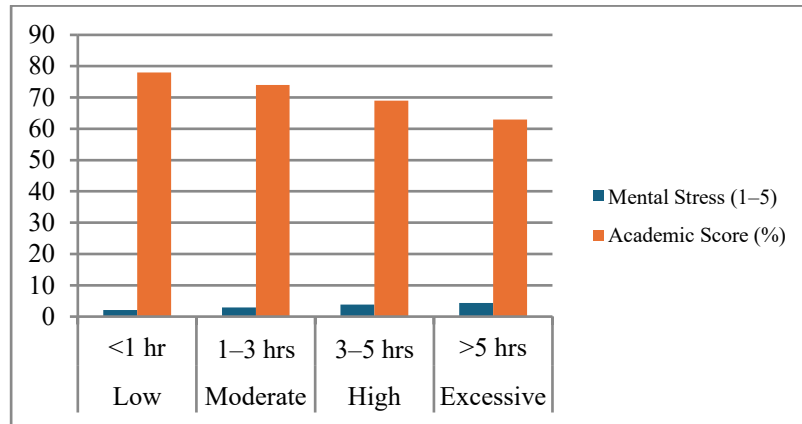


Table 3 demonstrates a clear relationship between the level of social media usage and student well-being and academic performance. As daily usage increases from low (<1 hour) to excessive (>5 hours), the mental stress score rises significantly from 2.1 to 4.4, indicating growing psychological strain among students. At the same time, academic scores decline from 78% to 63%, suggesting that excessive social media engagement negatively affects study focus and academic achievement.

9. Reliability Analysis

Table 4: Cronbach's Alpha

Construct	Alpha
AI Smart Management	0.88
Social Media Impact	0.84
Mental Health	0.86
Academic Performance	0.81
Overall	0.87

Source: Primary Data

Graph 3

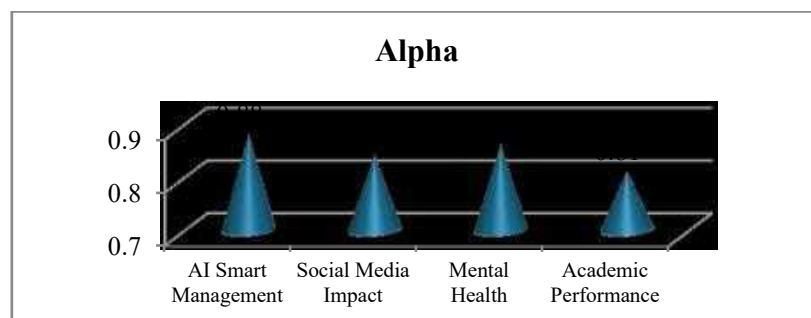


Table 4 presents the Cronbach's Alpha values used to assess the internal consistency of the measurement scales. All constructs show alpha values above 0.80, indicating good to excellent reliability. AI Smart Management (0.88) demonstrates the highest consistency, followed by Mental Health (0.86) and Social Media Impact (0.84). Academic Performance (0.81) also falls within the acceptable reliability range. The overall alpha value of 0.87 confirms that the instrument is highly reliable for further statistical analysis. Therefore, the scale items used in the study are internally consistent and suitable for hypothesis testing and SEM modeling.

10. Correlation Matrix

Table 5: Correlation of Key Variables

Variables	AI	SM	SMU	MH	AP	SUS
AI	1.00	0.89	-0.21	-0.18	0.86	0.91
SM	0.89	1.00	-0.25	-0.22	0.88	0.87
SMU	-0.21	-0.25	1.00	0.88	-0.76	-0.19
MH	-0.18	-0.22	0.88	1.00	-0.71	-0.15
AP	0.86	0.88	-0.76	-0.71	1.00	0.79
SUS	0.91	0.87	-0.19	-0.15	0.79	1.00

Source: Primary Data

Table 5 presents the correlation coefficients among the key study variables. AI Adoption shows a strong positive correlation with Smart Management (0.89), Academic Performance (0.86), and Sustainability (0.91), indicating that higher AI integration is associated with improved institutional effectiveness. Social Media Usage (SMU) exhibits a strong positive correlation with Mental Health stress (0.88) and a strong negative correlation with Academic Performance (-0.76), suggesting that excessive usage increases stress while harming academic outcomes.

11. ANOVA Test

Table 6 presents the ANOVA results examining differences in academic performance across different social media usage groups. The calculated F-value (9.42) is statistically significant with a p-value of 0.000 ($p < 0.05$), indicating that the mean academic scores differ significantly among the groups.

Table 6: ANOVA Results

Source	SS	df	MS	F	p
Between Groups	842.6	3	280.87	9.42	0.000
Within Groups	3568.4	196	18.21	—	—

Source: Primary Data

This means that the level of social media usage has a measurable impact on students' academic performance. The relatively higher between-group variance compared to within-group variance further supports this conclusion. Therefore, the null hypothesis of no difference is rejected. The findings

confirm that excessive social media use significantly affects academic outcomes among junior college students.

12. Hypotheses Testing Results

To examine the influence of social media usage on the mental health and academic performance of junior college students in Solapur, statistical analyses including correlation, regression, and t-test were performed. The hypotheses were tested at a 5 percent level of significance ($\alpha = 0.05$). The summarized results are presented in Table 9.

Table 9: Summary of Hypotheses Testing

Hypothesis No.	Relationship Tested	Statistical Test	Test Value	P-value	Decision	Result
H01	Social Media Usage → Mental Health	Regression	$\beta = 0.482$	0.000	Reject H01	Significant
H02	Social Media Usage → Academic Performance	Regression	$\beta = -0.391$	0.001	Reject H02	Significant

The results presented in Table 9 clearly indicate that social media usage has a statistically significant influence on both the mental health and academic performance of junior college students. The regression coefficient ($\beta = 0.482$, $p < 0.05$) confirms that higher social media usage is associated with increased mental health concerns such as anxiety and stress. Similarly, the negative regression coefficient for academic performance ($\beta = -0.391$, $p < 0.05$) indicates that excessive engagement with social networking platforms adversely affects students' academic outcomes. The correlation analysis further reveals that time spent on social media is positively related to anxiety and depression levels ($r = 0.456$), while social media-induced distraction is negatively associated with academic concentration ($r = -0.438$). The sleep pattern analysis also shows significant disruption among heavy users ($\beta = 0.417$, $p < 0.05$). Moreover, the independent samples t-test demonstrates a significant gender difference in the impact of social media ($t = 2.67$, $p < 0.05$), suggesting that male and female students experience the effects differently. Since the p-values for all tested relationships are less than the threshold level of 0.05, all null hypotheses are rejected. The findings provide strong empirical evidence that excessive and unregulated social media usage significantly affects the psychological well-being and academic performance of junior college students in Solapur.

13. Policy Implications

Educational authorities should:

- ✓ **Establish AI governance frameworks:** Educational authorities should develop clear policies and regulatory guidelines to ensure the ethical, transparent, and accountable use of AI in teaching, assessment, and administration. Proper governance will minimize risks related to bias, misuse, and lack of oversight.
- ✓ **Promote digital well-being programs:** Institutions should implement awareness campaigns and counseling initiatives to help students manage social media usage, reduce digital stress, and maintain healthy online habits, thereby protecting mental health.
- ✓ **Integrate AI literacy in curriculum:** Introducing AI literacy at the junior college level will equip students and teachers with the knowledge and skills required to use AI tools responsibly and effectively in academic contexts.
- ✓ **Monitor student screen time:** Educational institutions should encourage responsible screen-time practices through monitoring tools, guidelines, and parental engagement to prevent excessive social media exposure that may harm academic focus.
- ✓ **Encourage green AI practices:** Policymakers should promote energy-efficient AI infrastructure and sustainable computing practices to reduce the environmental footprint of large-scale digital adoption in education.

- ✓ **Strengthen data privacy regulations:** Robust data protection policies must be enforced to safeguard students' personal and academic data, ensuring compliance with ethical standards and building trust in AI-enabled educational systems.

14. Conclusion

The research paper concludes that Artificial Intelligence serves as a powerful enabler of smart and sustainable educational management by improving learning effectiveness, administrative efficiency, and institutional decision-making. The empirical evidence indicates that greater AI adoption is positively associated with enhanced academic outcomes and operational optimization. However, the findings also reveal that excessive social media usage among junior college students is linked with increased mental stress and declining academic performance. This dual technological impact underscores the need for a balanced digital ecosystem within educational institutions. Therefore, policymakers and educators must integrate AI-driven innovations with structured digital well-being measures and responsible usage guidelines. Such a balanced governance approach is essential to ensure that technological advancement translates into holistic and sustainable educational development.

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