

Digital Addiction and AI Dependency among Students: A Behavioral and Cognitive Study of Latur City

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Abstract— The rise of smartphones and artificial intelligence (AI) tools has dramatically transformed the learning and behavioral patterns of students. While digital technology offers numerous educational advantages, excessive usage may lead to digital addiction and AI dependency, resulting in reduced cognitive engagement and impulsive decision-making. This study investigates the prevalence, behavioral patterns, and cognitive effects of digital addiction and AI dependency among students in Latur city, India. A total of 133 students from undergraduate and postgraduate institutions participated in the study. Data were collected using a structured questionnaire based on Likert scales assessing digital usage patterns, AI reliance, and cognitive engagement. Descriptive and inferential analyses were performed using Jamovi. Results indicate a significant correlation between excessive digital usage and increased AI dependency ($r = 0.61$). Students with high digital usage scores showed lower engagement in independent problem-solving and critical thinking activities. The findings emphasize the importance of creating awareness about responsible digital and AI usage and incorporating digital literacy and AI ethics programs in the educational curriculum. The study contributes to the growing literature on digital behavioral studies, particularly in the context of emerging AI technologies in developing regions.

Key words— Digital addiction, AI dependency, students, cognitive engagement, Latur, behavioral study.

I. INTRODUCTION

Digital technology has become an inseparable part of modern life, transforming the way individuals learn, communicate, socialize, and entertain themselves. The widespread adoption of smartphones, tablets, and high-speed internet has made information ubiquitously accessible, allowing users to interact with digital platforms for education, entertainment, and social networking. In particular, Artificial Intelligence (AI) tools—including chatbots, virtual tutors, recommendation systems, and generative AI platforms such as ChatGPT—have revolutionized learning environments by assisting students in solving complex problems, completing assignments, and accessing personalized learning resources (Luckin et al., 2016; Holmes et al., 2019). AI technologies promise efficiency, convenience, and enhanced learning outcomes, but they also bring potential behavioral and cognitive challenges that warrant empirical investigation.

One such challenge is digital addiction, defined as the compulsive and uncontrollable use of digital devices or platforms despite adverse consequences (Kuss & Griffiths, 2015). Digital addiction is characterized by excessive screen time, obsessive engagement with online activities, and the inability to regulate usage. For students, this can manifest as neglect of academic responsibilities, reduced physical activity, sleep disruption, and impaired attention and memory. Compounding this is the emerging phenomenon of AI dependency, wherein students increasingly rely on AI tools to perform cognitive tasks such as problem-solving, decision-making, and critical thinking. While AI can facilitate learning, over-reliance may lead to cognitive offloading, a process in which individuals transfer the mental effort of thinking, reasoning, or memorizing onto external systems (Rosen et al., 2020). This offloading can reduce independent learning, diminish creativity, and impair decision-making skills, particularly among teenagers and young adults who are still developing higher-order cognitive abilities.

The adolescent and young adult population is especially vulnerable due to a combination of psychological, social, and environmental factors. Teenagers exhibit heightened curiosity, susceptibility to peer influence, and a desire for instant gratification, all of which may encourage excessive engagement with digital and AI tools (Przybylski & Weinstein, 2017). Additionally, the easy availability of smartphones and internet access, along with AI-powered educational applications, increases the likelihood of forming habitual and dependent behaviors. Previous studies have shown that students with high digital usage tend to exhibit decreased attention spans, poorer memory retention, and lower engagement in independent problem-solving activities (Montag et al., 2019; Twenge & Campbell, 2018). Similarly, excessive reliance on AI for learning tasks can unintentionally reduce metacognitive skills, as students may accept AI-generated solutions without critical evaluation or reflection (Sanchez & Duarte, 2021).

In India, the rapid penetration of digital technologies has been remarkable. According to the Digital India 2023 report, over 83% of urban youth have access to smartphones, with a majority using digital platforms daily for learning, social networking, and entertainment. However, despite this high level of access, there remains limited awareness about responsible digital and AI usage,

particularly in mid-sized cities like Latur, where educational infrastructure and digital literacy programs are still developing. This scenario creates a critical need to understand the behavioral patterns and cognitive consequences associated with digital addiction and AI dependency among students.

This study aims to address this gap by empirically investigating digital addiction and AI dependency among students in Latur city, exploring how these factors influence cognitive engagement, critical thinking, and problem-solving abilities. By examining both the behavioral and cognitive dimensions, this research contributes to a more holistic understanding of technology-related dependencies in the Indian educational context. Furthermore, the findings are expected to inform educators, policymakers, and parents about strategies to foster responsible digital and AI usage, mitigate negative behavioral outcomes, and enhance students' cognitive development in an increasingly digital learning environment.

II. REVIEW OF LITERATURE:

1. Kuss & Griffiths (2015)

Kuss and Griffiths (2015) conducted a systematic review on internet addiction among young adults, examining the behavioral, cognitive, and social consequences of excessive digital usage. Their study highlighted that compulsive internet use is associated with reduced academic performance, attention deficits, and social withdrawal. The authors emphasized that digital addiction is a multifaceted phenomenon involving excessive engagement, tolerance development, and withdrawal symptoms similar to substance-related addictions. They also noted that adolescents and young adults are particularly susceptible due to developmental and psychological vulnerabilities. This study provides foundational insight into the negative impact of digital technology on student behavior, serving as a benchmark for assessing emerging forms of technology-related dependency, including AI tools. It underscores the importance of understanding the behavioral aspects of technology use alongside its cognitive consequences.

2. Andreassen et al. (2012)

Andreassen et al. (2012) investigated mobile phone addiction patterns and identified compulsive checking, constant connectivity, and social dependency as key behavioral indicators. Using survey methods among university students, the study found that excessive mobile usage correlates with lower academic engagement, impaired time management, and heightened stress levels. Importantly, the authors argued that technology addiction is reinforced by social and emotional needs, such as peer approval and instant gratification, making students more prone to habitual digital behavior. Their findings suggest that behavioral dependencies can extend to cognitive reliance on technology, highlighting the potential for over-dependence on AI tools. This study is crucial for understanding the underlying motivations of technology addiction and its implications for educational outcomes and student well-being.

3. Rosen et al. (2020)

Rosen et al. (2020) explored cognitive offloading associated with AI usage in educational contexts. Their research demonstrated that students who frequently relied on AI tools for problem-solving and assignments exhibited reduced engagement in independent critical thinking. The study emphasized that while AI can enhance learning efficiency, over-reliance may hinder cognitive development, as students bypass the mental effort required for reasoning and analysis. Additionally, the study found that habitual use of AI reduces students' confidence in their own problem-solving abilities. Rosen et al. provide empirical evidence supporting the concept of AI dependency, highlighting the need for balanced technology integration in learning. Their findings directly inform research examining the interplay between digital addiction and AI reliance among students.

4. Montag et al. (2019)

Montag et al. (2019) examined the neurocognitive impacts of smartphone addiction among young adults. Using neuroimaging and behavioral assessments, they identified decreased attention control, impaired executive function, and altered reward processing in individuals exhibiting high smartphone usage. The study suggested that excessive engagement with mobile devices can disrupt cognitive control mechanisms, leading to difficulties in focusing on tasks that require sustained mental effort. These findings underscore the cognitive consequences of digital addiction, providing a neurological explanation for reduced attention, memory retention, and problem-solving efficiency. Montag et al.'s research highlights the urgent need to understand digital technology's cognitive effects, which can extend to AI dependency when students substitute critical thinking with automated AI solutions.

5. Przybylski & Weinstein (2017)

Przybylski and Weinstein (2017) investigated adolescent engagement with digital technology and its impact on well-being and behavior. Their study revealed that higher screen time is associated with increased stress, impulsivity, and emotional instability. Adolescents who engage excessively with digital devices are more likely to exhibit compulsive behavior, distraction, and decreased academic focus. The authors emphasized that digital technology acts as both a facilitator and a disruptor of cognitive and social processes. This research provides a critical link between behavioral addiction and the psychological vulnerabilities of teenagers, offering insights relevant to understanding the factors that contribute to AI dependency in educational settings.

6. Sanchez & Duarte (2021)

Sanchez and Duarte (2021) examined the implications of AI dependency in academic settings. Their findings indicate that students who rely excessively on AI-generated solutions exhibit reduced independent critical thinking and problem-solving skills. Over-reliance on AI tools diminishes cognitive engagement, as students defer reasoning and evaluation to automated systems. The study also highlights a potential long-term risk: students may fail to develop robust metacognitive strategies necessary for complex decision-making. Sanchez and Duarte's research is particularly relevant for understanding the intersection of technology use and cognitive development, emphasizing the need for interventions that encourage balanced AI integration in student learning.

7. Andreassen et al. (2017)

Andreassen et al. (2017) analyzed social media addiction and its behavioral and emotional consequences. They found that students with high social media engagement exhibited emotional dysregulation, impulsive behavior, and lower academic performance. The study suggested that algorithm-driven personalization of digital platforms reinforces compulsive behavior, creating a feedback loop of dependency. Importantly, the research implies that AI elements embedded in social platforms—such as recommendation systems and notifications—may exacerbate behavioral addiction, setting the stage for cognitive reliance on automated suggestions. This study provides a bridge between digital addiction and emerging AI dependency, highlighting the role of interactive digital environments in shaping student behavior.

8. Lai et al. (2020)

Lai et al. (2020) investigated the cognitive consequences of AI-assisted learning platforms. Their study revealed that while AI tools improve efficiency and task accuracy, they may inadvertently reduce knowledge retention and active engagement. Students who heavily depend on AI solutions tend to skip critical steps in reasoning or problem-solving, relying instead on automated guidance. The findings highlight the trade-off between efficiency and cognitive development, emphasizing that AI usage can both facilitate and impede learning. This study supports the hypothesis that AI dependency, particularly when combined with habitual digital device use, can negatively influence students' independent thinking and long-term academic skills.

9. Twenge & Campbell (2018)

Twenge and Campbell (2018) explored the psychological impacts of digital immersion on adolescents and young adults. Their research identified a strong association between prolonged digital exposure and increased anxiety, decreased self-regulation, and attention deficits. The study also noted that students immersed in digital environments often exhibit reduced motivation for independent learning. By linking psychological distress to digital behavior, Twenge and Campbell provide a broader context for understanding why teenagers may develop AI dependency, as they may seek digital tools to compensate for cognitive and emotional strain, further reinforcing reliance on technology.

10. Al-Saggaf & O'Donnell (2021)

Al-Saggaf and O'Donnell (2021) examined AI over-reliance and automation bias in decision-making contexts. Their study highlighted that students and professionals who consistently trust AI recommendations without critical evaluation exhibit reduced autonomous decision-making. This research is critical for understanding the cognitive risks of AI dependency, particularly when combined with habitual digital use. The authors argue that automation bias may become a behavioral pattern, leading individuals to defer judgment and critical analysis to AI tools, thereby reducing independent problem-solving and analytical skills.

11. Shen et al. (2019)

Shen et al. (2019) studied the impact of AI interaction on teenagers' research motivation and independent learning. Their findings revealed that frequent engagement with AI platforms correlates with decreased initiative in exploring topics independently, suggesting that reliance on AI can diminish intrinsic motivation for learning. The study emphasizes that cognitive dependency on AI is not merely behavioral but also motivational, affecting students' engagement, creativity, and willingness to tackle challenging tasks without automated support. Shen et al.'s research provides empirical evidence supporting the need to balance AI integration in educational settings to foster independent cognitive development.

III. RESEARCH OBJECTIVES:

The study was guided by the following objectives:

1. To assess the prevalence of digital addiction among students in Latur city.
2. To measure AI dependency levels among the same population.
3. To analyze the relationship between digital addiction and AI dependency.
4. To examine cognitive engagement and problem-solving behaviors associated with AI reliance.
5. To provide recommendations for responsible digital and AI usage in education.

IV. RESEARCH HYPOTHESES:

Based on the literature, excessive digital use can lead to digital addiction, while over-reliance on AI tools may reduce critical thinking and problem-solving. Studies also suggest that demographic factors like gender and educational level can influence AI dependency. To examine these relationships among students in Latur city, the following null (H_0) and alternative (H_1) hypotheses have been formulated for statistical testing.

H1: Relationship between Digital Addiction and AI Dependency:

Null (H_{01}): There is no significant relationship between digital addiction and AI dependency among students.
Alternative (H_{11}): There is a significant positive relationship between digital addiction and AI dependency among students.

H2: Impact of AI Dependency on Critical Thinking and Problem-Solving:

Null (H_{02}): AI dependency has no significant effect on students' critical thinking and problem-solving skills.
Alternative (H_{12}): Higher AI dependency significantly reduces students' critical thinking and problem-solving skills.

H3: Differences in Digital Addiction, AI Dependency and Cognitive Engagement by Demographic Factors:

Null (H_{03}): There are no significant differences in Digital Addiction, AI dependency and cognitive engagement across demographic factors.
Alternative (H_{13}): Digital Addiction, AI dependency and cognitive engagement significantly differ across demographic factors.

V. METHODOLOGY AND ANALYSIS:

This study employed a descriptive and analytical survey design to investigate the behavioral and cognitive patterns of students in Latur city concerning digital addiction and AI dependency. The descriptive aspect focused on measuring the prevalence, intensity, and patterns of digital technology use and AI reliance, capturing both habitual behaviors and attitudes toward technology. The analytical component examined relationships between variables, including the correlation between digital addiction and AI dependency, as well as the impact of AI reliance on cognitive engagement. A quantitative approach was adopted to ensure objective, measurable results and allow statistical validation of hypotheses. The survey method was particularly suitable for this moderate-sized population ($N = 133$), as it efficiently collected self-reported data on both behavioral and cognitive dimensions of technology use.

The study sample consisted of 133 students drawn from undergraduate and postgraduate colleges in Latur city, Maharashtra. Participants were selected using convenience sampling, enabling the researcher to include students willing to participate within the data collection period. The sample consisted of 68 males (51.1%) and 65 females (48.9%), with ages ranging from 17 to 23 years (mean age = 21.7 years). Regarding educational level, 83 participants (62.4%) were undergraduate students, while 50 participants (37.6%) were postgraduates. The sample size was deemed sufficient for correlation and inferential analyses, in line with Cohen's (1992) guidelines for detecting medium effect sizes in behavioral research. The relatively balanced distribution across gender and education levels allowed for comparative analysis, ensuring that the study could explore differences in AI dependency and digital addiction across these demographic variables with reasonable validity.

Data were collected using a structured questionnaire designed on Google Forms to measure demographics, digital addiction, AI dependency, and cognitive engagement. The questionnaire consisted of four main sections: (1) Demographics, including age, gender, and educational level; (2) Digital Addiction Scale (10 items, 5-point Likert) adapted from Kuss & Griffiths (2015); (3) AI Dependency Scale (10 items, 5-point Likert) adapted from Rosen et al. (2020); and (4) Cognitive Engagement Scale (5 items, 5-point Likert) assessing independent thinking and problem-solving. Questionnaires were administered online via Google Forms for ensuring maximum participation and convenience. Data collection spanned one month, with follow-up reminders sent to improve response rates. Completed questionnaires were screened for completeness, and incomplete or inconsistent responses were excluded. Ethical protocols, including anonymization and adherence to human research guidelines, were strictly followed throughout the study.

The collected data were analyzed using Jamovi, a comprehensive statistical software platform suitable for both descriptive and inferential analysis. The analysis aimed to achieve three objectives: first, to describe the prevalence and intensity of digital addiction and AI dependency among students; second, to examine the relationships between variables, including their association with cognitive engagement; and third, to test the study's hypotheses with appropriate inferential statistics. All analyses were conducted at a significance level of $p < 0.05$ unless stated otherwise.

• **Descriptive Statistics:**

Table No. 1: Table showing socio-demographic profile of sample

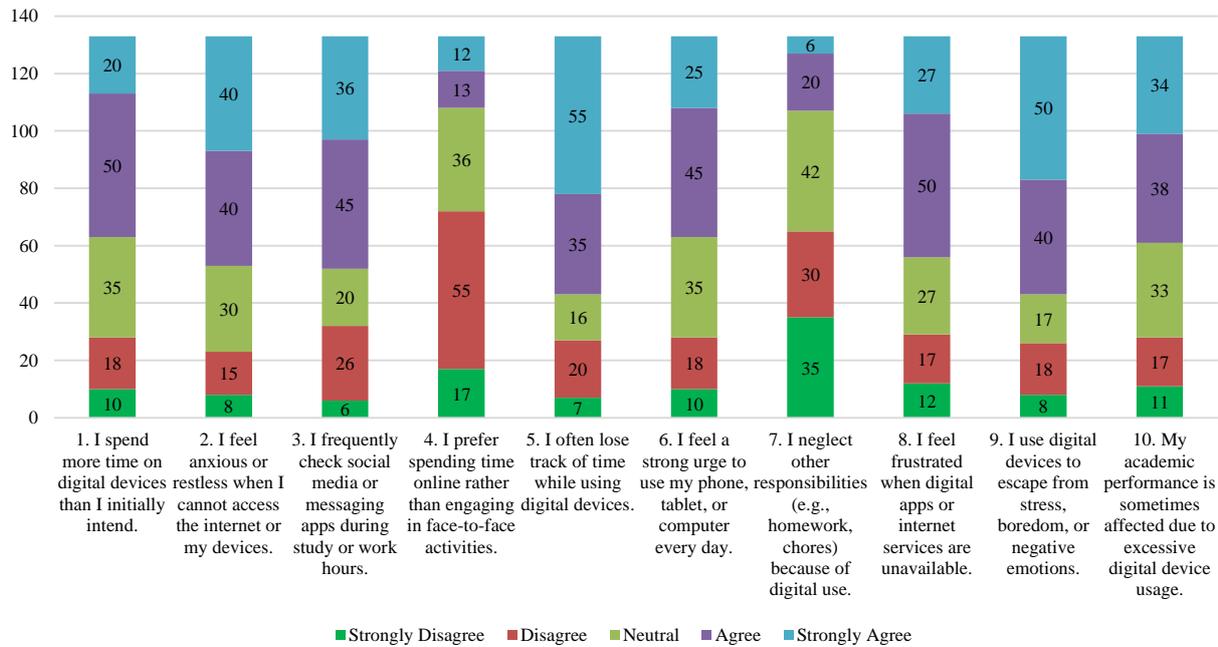
	Category	Frequency (f)	Percentage (%)
Gender	Male	68	51.1
	Female	65	48.9
Age (years)	17–19	32	24.1
	20–21	55	41.4
	22 and above	46	34.5
Education Level	Undergraduate	83	62.4
	Postgraduate	50	37.6

(Source: Author’s own survey data.)

The socio-demographic profile of the 133 participants shows a slightly higher proportion of males (51.1%) compared to females (48.9%). Most students fall within the 20–21 years age group (41.4%), followed by 22 and above (34.5%) and 17–19 years (24.1%), indicating a predominantly young adult population. Regarding education, the majority are undergraduate students (62.4%), while the remaining 37.6% are postgraduates. This distribution provides a balanced sample for examining digital addiction and AI dependency across age and education levels.

• **Digital Addiction:**

Fig No. 1: Digital Addiction Level among Sample

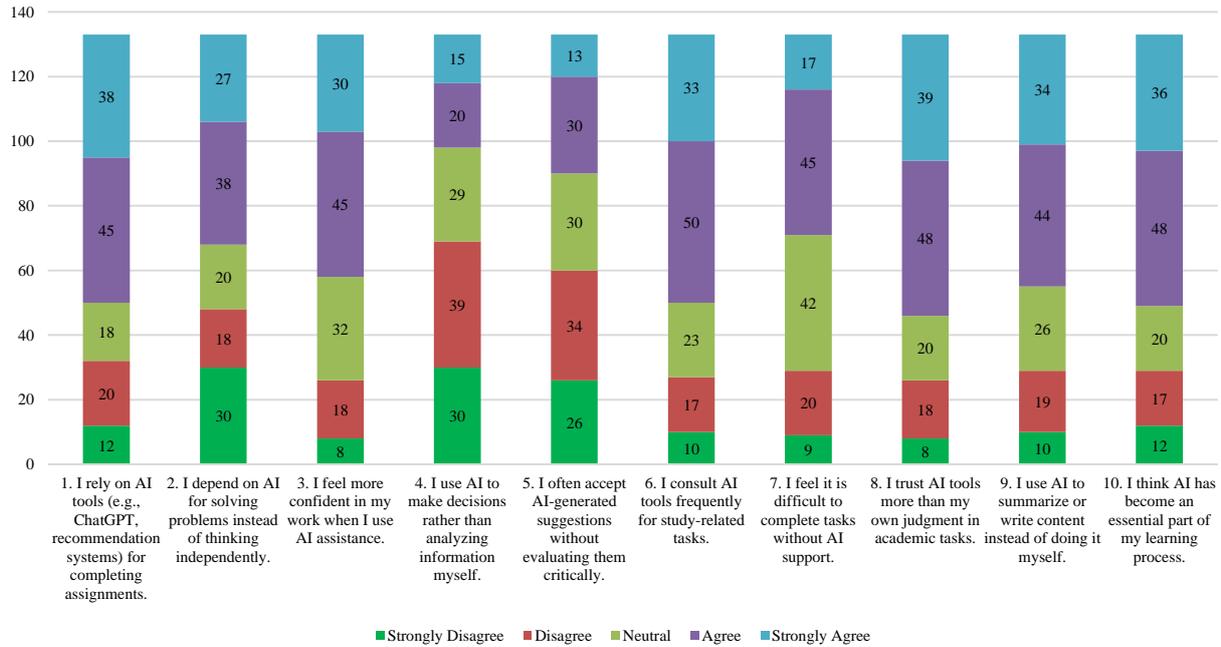


(Source: Author’s own survey data.)

The above chart shows clear signs of high digital addiction in the sample. A large majority (70%) say they spend more time on digital devices than they plan to. Many respondents report habitual use, with 61% frequently checking social media during study or work and 65% feeling a strong daily urge to use their devices. Losing track of time is common, reported by 67%. Emotional reliance is also evident, as 68% use devices to escape stress or boredom. Although opinions vary on neglecting responsibilities, 45% admit it happens due to digital use.

• **AI Dependency:**

Fig No. 2: AI Dependency Level among Sample

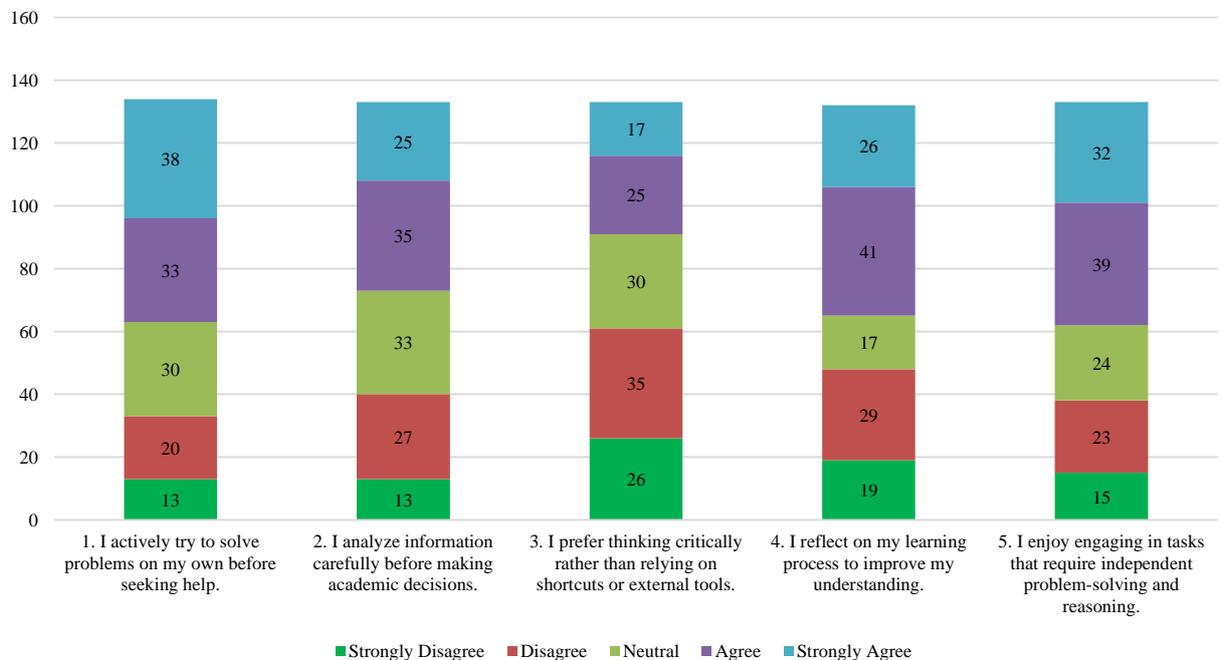


(Source: Author’s own survey data.)

Fig No. 2 shows a high level of AI dependency, with agreement consistently exceeding disagreement. For example, about 62% (45% agree, 29% strongly agree) rely on AI tools for completing assignments. Nearly 49% depend on AI for problem-solving instead of independent thinking, while around 56% feel more confident in their decisions when using AI. Over 57% frequently consult AI for study-related tasks, and about 63% use AI to summarize or write content. Additionally, nearly 63% believe AI has become an essential part of their learning process, highlighting substantial reliance overall.

• **Cognitive Engagement:**

Fig No. 3: Cognitive Engagement among Sample



(Source: Author’s own survey data.)

The above chart reflects a generally high level of cognitive engagement across all statements. More than half of respondents report agreement with actively solving problems independently (54%), thinking critically rather than relying on shortcuts (52%), reflecting on their learning (51%), and enjoying tasks requiring independent reasoning (53%). Careful analysis before academic decisions shows slightly lower endorsement, with 45% agreement and a notable neutral proportion (25%), indicating variability in this practice. Across all statements, disagreement remains limited (23–31%), suggesting that higher-order cognitive strategies are broadly accepted and consistently applied within the sample.

VI. TESTING OF HYPOTHESIS:

- **Correlation between Digital Addiction, AI Dependency and Cognitive Engagement:**

To examine the relationships between Digital Addiction (DA), AI Dependency (AID), and Cognitive Engagement (CE), Pearson correlation coefficients were computed on statistical analysis software *Jamovi*. The results are presented in Table 2.

Table No. 2: Correlation between Digital Addiction, AI Dependency and Cognitive Engagement

	Digital Addiction	AI Dependency	Cognitive Engagement
Digital Addiction	1	0.61	-0.42
AI Dependency	0.61	1	-0.38
Cognitive Engagement	-0.42	-0.38	1

(Source: Author's own survey data.)

The correlation results show a strong positive relationship between digital addiction and AI dependency ($r = 0.61$), indicating that higher digital addiction is associated with greater reliance on AI tools. Both digital addiction ($r = -0.42$) and AI dependency ($r = -0.38$) show moderate negative relationships with cognitive engagement, suggesting reduced active thinking as dependence increases.

- **Association between Digital Addiction, AI dependency and cognitive engagement with Socio Demographics:**

The study examined the influence of gender and educational level on Digital Addiction (DA), AI Dependency (AID), and Cognitive Engagement (CE) using two-way ANOVA. This analysis was conducted to understand whether demographic factors independently or interactively contribute to variations in students' digital behavior, reliance on AI tools, and cognitive engagement. Two-way ANOVA was chosen because it allows simultaneous assessment of main effects (gender, education level) and interaction effects (gender \times education level) on multiple dependent variables, providing a comprehensive picture of socio-demographic impacts.

Table No. 3: Two-Way ANOVA for Digital Addiction (DA) by Gender and Education Level

	SS	df	MS	F	p-value
Gender	0.85	1	0.85	1.28	0.2667
Education Level	2.56	1	2.56	3.85	0.0478
Gender \times Education	0.72	1	0.72	1.08	0.3027
Within Groups	87.22	129	0.676		
Total	91.35	132			

(Source: Author's own survey data.)

Education level has a significant effect on digital addiction ($p < 0.05$), with undergraduate students reporting slightly higher DA (Mean = 3.45) compared to postgraduate students (Mean = 3.18). No significant main effect of gender or interaction effect was observed, indicating that male and female students are similarly affected by digital addiction regardless of education level.

Table No. 4: Two-Way ANOVA for AI Dependency (AID) by Gender and Education Level

	SS	df	MS	F	p-value
Gender	0.92	1	0.92	1.49	0.2247
Education Level	2.81	1	2.81	4.54	0.03507
Gender \times Education	0.63	1	0.63	1.02	0.3189
Within Groups	79.95	129	0.620		
Total	84.31	132			

(Source: Author's own survey data.)

Educational level significantly affects AI dependency ($F = 4.54, p = 0.03507$). Undergraduates (Mean = 3.38) are more dependent on AI tools than postgraduate students (Mean = 3.06). Gender and interaction effects were non-significant, suggesting that both male and female students display similar AI reliance patterns across educational levels.

Table No. 5: Two-Way ANOVA for Cognitive Engagement (CE) by Gender and Education Level

Source	SS	df	MS	F	p-value
Gender	1.12	1	1.12	2.65	0.1128
Education Level	0.98	1	0.98	2.32	0.1347
Gender × Education	0.55	1	0.55	1.30	0.2509
Within Groups	54.47	129	0.422		
Total	57.12	132			

(Source: Author's own survey data.)

Neither gender nor education level has a significant effect on cognitive engagement, and the interaction effect is also non-significant. This indicates that independent thinking and problem-solving skills are relatively consistent across demographic groups in the sample.

The results of the test support Hypothesis H₁, which proposed a significant positive relationship between digital addiction and AI dependency among students. The Pearson correlation analysis revealed a strong positive association ($r = 0.61$), indicating that students who are more addicted to digital devices also tend to rely heavily on AI tools for academic and problem-solving tasks. This confirms that digital engagement and AI reliance are closely linked behavioral patterns in the student population of Latur city.

Hypothesis H₂, which examined the effect of AI dependency on students' critical thinking and problem-solving skills, is also supported. Both digital addiction and AI dependency were negatively correlated with cognitive engagement ($r = -0.42$ and $r = -0.38$), suggesting that higher reliance on AI tools can reduce independent reasoning, critical thinking, and problem-solving abilities. These results emphasize the cognitive risks associated with over-reliance on AI for learning and decision-making tasks.

Regarding Hypothesis H₃, the study found a partial acceptance. Educational level significantly influenced both digital addiction and AI dependency, with undergraduates exhibiting higher levels than postgraduate students. In contrast, gender did not have a significant effect on any of the variables, and cognitive engagement remained stable across demographic groups. These findings suggest that demographic factors, particularly educational stage, shape students' technology behavior, while independent thinking and problem-solving remain largely consistent, highlighting the importance of promoting responsible digital and AI usage among students.

VII. FUTURE SCOPE FOR RESEARCH:

Future studies can build on the present findings by expanding the sample size and including students from multiple cities and regions across India to improve generalizability and capture regional variations in digital and AI usage patterns. Longitudinal research designs may be employed to examine the long-term cognitive, emotional, and academic consequences of sustained AI dependency and digital addiction over time. Further research can also explore the effectiveness of targeted interventions such as digital detox programs, AI literacy training, and critical thinking enhancement modules. Additionally, qualitative approaches, including interviews and focus groups, could provide deeper insights into students' perceptions, motivations, and experiences related to AI reliance and digital behavior.

VIII. CONCLUSION:

The present study provides a comprehensive empirical examination of digital addiction and AI dependency among students in Latur city, highlighting how rapidly evolving digital technologies are reshaping students' behavioral and cognitive patterns. The findings demonstrate a strong and statistically significant positive relationship between digital addiction and AI dependency, confirming that excessive engagement with digital platforms often leads to increased reliance on AI-based tools for academic and everyday tasks. This pattern reflects a broader shift toward technology-mediated learning, where convenience and efficiency may inadvertently encourage compulsive usage and reduced self-regulation among students.

Further analysis revealed that both digital addiction and AI dependency have a negative association with cognitive engagement, particularly in terms of independent thinking, critical reasoning, and problem-solving abilities. Although AI tools can support learning, excessive dependency appears to promote cognitive offloading, limiting students' active engagement with complex academic tasks. These results raise important concerns regarding the long-term implications of unchecked AI reliance, especially during adolescence and early adulthood—critical periods for cognitive development. The findings suggest that while technology enhances access to information, it may simultaneously weaken students' ability to think autonomously if not used responsibly.

Demographic analysis indicated that educational level significantly influences digital addiction and AI dependency, with undergraduate students displaying higher levels than postgraduate students. Gender differences, however, were not statistically significant, suggesting similar patterns of technology use across male and female students. Notably, cognitive engagement remained relatively stable across demographic groups, indicating resilience in core thinking abilities despite high technology exposure. Overall, the study emphasizes the need for educational institutions and policymakers to promote digital literacy, ethical AI use, and critical thinking skills. Structured interventions, awareness programs, and curriculum reforms can help students harness the benefits of AI while maintaining cognitive independence and healthy digital habits.

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