Liberal Journal of Language & Literature Review
Print ISSN: 3006-5887
Online ISSN: 3006-5895
https://llrjournal.com/index.php/11

IMPACT OF CHATGPT USAGE ON CRITICAL THINKING AND ACADEMIC PERFORMANCE OF UNIVERSITY STUDENTS IN PAKISTAN

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Liberal Journal of Language & Literature Review
Print ISSN: 3006-5887
Online ISSN: 3006-5895

Abstract

The pervasive proliferation of generative artificial intelligence, most notably ChatGPT, within tertiary education has precipitated profound apprehensions concerning its ramifications for students' cognitive maturation and scholarly probity. Although the extant corpus of scholarship comprehensively delineates the pedagogical affordances and perils associated with AI-augmented learning, rigorous empirical inquiry specifically addressing developing nations particularly Pakistan remains conspicuously deficient. The present investigation scrutinizes the interrelationship between the frequency and modalities of ChatGPT utilization and self-reported critical thinking competencies among Pakistani university students. Employing a quantitative, cross-sectional survey design, two psychometrically validated instruments were administered to a cohort of 86 students and 6 faculty members drawn from five public and private universities across Pakistan. Data were subjected to descriptive statistical analysis, Pearson product-moment correlation, and independent-samples t-tests utilizing SPSS v29. Findings indicate that the overwhelming majority of students (92.9%) reported regular weekly engagement with ChatGPT for academic purposes, while 43.0% acknowledged unedited reproduction (copy-pasting) of AI-generated material. Crucially, elevated frequency of ChatGPT utilization exhibited a statistically significant inverse association with critical thinking assessment scores ($r = -.38$, $p < .01$). Furthermore, while students overwhelmingly perceived ChatGPT as beneficial for their academic performance (84.9% reporting slight or significant improvement), objective indicators reveal substantial cognitive offloading and dependency, with 37.2% affirming a reduced need to think independently. Faculty respondents articulated substantially greater reservations than their student counterparts regarding these educational consequences, estimating significantly lower student copy-paste rates (15.0%) while overestimating source verification behaviors (70.0% vs. 53.5% actual). These empirical results underscore the urgent imperative for the institutionalization of structured AI literacy frameworks, the recalibration of assessment paradigms toward process-oriented evaluation, and the promulgation of coherent institutional policies that foster judicious, ethical, and responsible incorporation of ChatGPT within Pakistani higher education contexts.

Keywords: *ChatGPT; Critical Thinking; Academic Performance; Higher Education; Artificial Intelligence; Pakistan; Cognitive Offloading; AI Literacy; Perceptual Divergence*

Introduction

Since its public dissemination in November 2022 by OpenAI, ChatGPT has rapidly ascended to become one of the most extensively deliberated and transformative technological innovations within the domain of global higher education. In stark contrast to antecedent digital instruments and conventional search engines that merely facilitated static information retrieval, generative large language models (LLMs) like ChatGPT possess the sophisticated capacity to compose cohesive scholarly essays, elucidate intricate theoretical concepts, synthesize extensive literature, generate executable programming code, and furnish nuanced feedback through naturalistic,

adaptive conversational exchanges (Kasneci et al., 2023). This multifaceted functionality renders ChatGPT simultaneously a potent pedagogical scaffold capable of democratizing learning support and a formidable challenge for academic institutions striving to preserve intellectual rigor. Contemporary systematic reviews spanning 2023 through 2026 reveal that international scholarly inquiry has coalesced around four principal axes of concern: the implications for student cognitive maturation and learning processes, the preservation of academic integrity and probity, the urgent reconfiguration of traditional assessment methodologies, and the evolving pedagogical role of university educators (Bittle & El-Gayar, 2025; Chan & Hu, 2023).

Pakistan's tertiary education sector is undergoing accelerated structural and digital expansion, presently encompassing 269 accredited universities and degree-awarding institutes supported by exceeding 58,000 academic faculty members. The Higher Education Commission (HEC) of Pakistan has formally enshrined critical thinking, autonomous analytical reasoning, and complex problem-solving as obligatory graduate attributes within its national Undergraduate Education Policy. Concurrently, digital infrastructure is expanding rapidly across the nation, albeit characterized by pronounced infrastructural disparities across geographic regions and institutional types. This socio-technical configuration engenders a distinctive educational ecosystem: while institutions in major urban centers (such as Lahore, Karachi, Islamabad, and Gujranwala) aspire to integrate cutting-edge AI technologies, substantial segments of the student and faculty populations continue to contend with inconsistent access to reliable connectivity, electrical grid stability, and high-performance computational resources. Consequently, understanding the operational dynamics and cognitive consequences of ChatGPT within this heterogeneous developing-nation environment assumes extreme academic and socio-economic salience.

Scholarly discourse concerning ChatGPT's influence on critical thinking reveals a pronounced dichotomy between productivity enhancement and cognitive degradation. Proponents argue that generative AI relieves students from mundane mechanical writing tasks, thereby liberating cognitive bandwidth for higher-order analytical reasoning, conceptual synthesis, and creative ideation (Mhlanga, 2023). Conversely, a growing body of critical scholarship warns against the severe hazards of 'cognitive offloading' a phenomenon whereby students habitually outsource critical cognitive processes such as source evaluation, structural argumentation, and evidentiary verification to AI tools, thereby compromising long-term intellectual independence and cognitive resilience (Rudolph et al., 2023). Within the context of academic performance, this relationship exhibits comparable ambiguity. Although ChatGPT can demonstrably elevate the surface-level linguistic quality and formatting expediency of student assignments, observed grade improvements frequently reflect superficial textual refinement rather than authentic conceptual comprehension or mastery of disciplinary content (Alghazo et al., 2025; Shishakly & Nachouki, 2026).

Statement of the Problem

The rapid adoption of ChatGPT in higher education has transformed students' academic practices, yet its influence on critical thinking and learning remains a growing concern. While international studies have examined the educational implications of generative AI, empirical evidence from Pakistan is limited. In particular, there is insufficient understanding of how ChatGPT usage relates to

students' critical thinking abilities, how students' AI practices compare with faculty perceptions, and what institutional strategies are needed to promote the responsible use of generative AI in Pakistani universities. This study addresses these gaps by examining ChatGPT usage, critical thinking, faculty perceptions, and policy implications within the context of higher education in Pakistan.

Research Objectives

The study aims to:

1. To examine the relationship between ChatGPT usage and critical thinking among university students in Pakistan.
2. To compare students' self-reported ChatGPT practices with faculty perceptions regarding its impact on learning and academic integrity.
3. To propose institutional and pedagogical recommendations for the responsible integration of ChatGPT in Pakistani higher education.
4.

Research Questions

1. What is the relationship between ChatGPT usage and the critical thinking abilities of university students in Pakistan?
2. How do students' self-reported ChatGPT practices differ from faculty perceptions regarding learning and academic integrity?
3. What institutional and pedagogical strategies can support the responsible integration of ChatGPT in Pakistani higher education?

Literature Review

ChatGPT and Generative AI in Higher Education: Affordances and Perils

The integration of Generative Artificial Intelligence into tertiary education represents a paradigm shift that challenges conventional pedagogical models. Recent literature categorizes AI affordances into personalized learning scaffolding, real-time feedback generation, and multilingual writing assistance (Kasneci et al., 2023). Studies utilizing the Extended Unified Theory of Acceptance and Use of Technology (UTAUT) model indicate that performance expectancy and effort expectancy are the primary drivers of student adoption in tertiary environments (Saif et al., 2024). Students frequently view ChatGPT as an accessible 24/7 academic tutor that reduces learning anxiety and clarifies complex disciplinary jargon (Chan & Hu, 2023). However, these affordances are counterbalanced by profound pedagogical perils. Systematic reviews highlight significant risks regarding the erosion of academic integrity, the proliferation of plausible but factually erroneous statements ('hallucinations'), and the homogenization of student writing styles (Bittle & El-Gayar, 2025). In developing nations, these challenges are exacerbated by a lack of institutional AI detection tools and absence of clear faculty consensus regarding what constitutes legitimate AI assistance versus academic dishonesty (Alghazo et al., 2025).

Critical Thinking and Academic Performance in the AI Era

Critical thinking—defined by the landmark Delphi Report as purposeful, self-regulatory judgment culminating in interpretation, analysis, evaluation, and inference—is universally recognized as the cornerstone of higher education (Facione, 1990; Watson & Glaser, 1980). The impact of LLMs on these foundational cognitive competencies remains fiercely contested. When utilized deliberately for brainstorming,

counter-argument generation, and comparative analysis, ChatGPT can serve as a powerful cognitive catalyst that elevates inquiry (Mhlanga, 2023). Conversely, when employed as a terminal solution through uncritical copy-pasting, it induces severe cognitive offloading. Rudolph et al. (2023) argue that unguided reliance on generative AI bypasses the 'productive struggle' inherent in rigorous learning, leading to intellectual atrophy. Regarding academic performance, recent empirical investigations in South Asia demonstrate that while ChatGPT usage correlates with higher short-term assignment grades due to superior grammatical execution, it frequently masks a superficial grasp of foundational concepts, becoming evident when students are subjected to unassisted proctored examinations or oral defenses (Shishakly & Nachouki, 2026).

Pakistan's higher education sector operates within a macro-environment characterized by rapid digital transformation juxtaposed against persistent infrastructural challenges. According to official documentation from the Pakistan Telecommunication Authority (PTA), national broadband subscriptions attained 14.2 million by March 2025, signifying substantial infrastructural advancement and increasing digital penetration among the youth demographic (PTA, 2025). Furthermore, institutional modernization initiatives—such as the World Bank's Higher Education Development Project (HEDP)—have successfully facilitated the deployment of enterprise resource planning (ERP) systems and advanced digital learning management frameworks across 25 public universities (World Bank, 2019). Notwithstanding these notable advancements, progress remains markedly uneven. Recent UNESCO documentation underscores persistent inequities in reliable high-speed connectivity, personal device ownership, and digital literacy competencies between premier urban universities and peripheral rural campuses (UNESCO, 2024). For Pakistani students and educators alike, the advent of ChatGPT occurs not within a uniformly prepared digital ecosystem, but rather within a landscape marked by considerable heterogeneity in pedagogical readiness, academic integrity enforcement, and institutional policy frameworks. An empirically grounded understanding of student AI deployment within this specific socioeconomic milieu is therefore indispensable for crafting targeted, equitable policy interventions.

Research Gaps and Rationale for Present Study

A rigorous appraisal of existing literature reveals that while Western educational contexts have been scrutinized extensively, empirical data from South Asian tertiary systems—specifically Pakistan—remain sparse and predominantly anecdotal. Prior Pakistani studies have relied almost exclusively upon descriptive self-reports of general technology adoption without correlating usage intensity to validated critical thinking metrics or cross-referencing student behaviors with faculty observations (Alghazo et al., 2025). This study directly bridges this gap by combining quantitative student behavioral metrics, validated critical thinking self-assessments, and comparative faculty evaluation data within a unified empirical research design.

Methodology

Research Design and Methodological Framework

To rigorously investigate the operational dynamics between ChatGPT utilization and student cognitive competencies, this study adopted a quantitative, cross-sectional survey research design (Creswell, 2014; Cohen et al., 2018). This design allowed for

the simultaneous collection of behavioral, perceptual, and cognitive assessment data across diverse institutional environments. Two parallel, psychometrically structured instruments were developed: one tailored for university students and a complementary instrument for academic faculty. Table 1 provides a comprehensive comparative overview of the structural dimensions and matched analytical items across both survey instruments.

Table 1
Comparative structure and methodological features of the student and faculty survey instruments

Methodological Feature	**Student Instrument (n = 19 items)**	**Faculty Instrument (n = 15 items)**
Target Respondent Population	University Undergraduates & Postgraduates	Professors, Lecturers & Teaching Faculty
Thematic Sections	1. Demographics & Academic Profile 2. ChatGPT Usage Frequency 3. Usage Behaviors & Practices 4. Critical Thinking Self-Assessment 5. Perceived Academic Impact	1. Demographics & Disciplinary Profile 2. Observation of Student AI Behavior 3. Perceived Impact on Student Abilities 4. Institutional Policy Recommendations
Measurement Scale Paradigm	5-point Likert Scale (1 = Strongly Disagree / Never to 5 = Strongly Agree / Always)	5-point Likert Scale (1 = Strongly Disagree / Never to 5 = Strongly Agree / Always)
Estimated Completion Duration	4 to 5 minutes (Optimized to prevent fatigue)	4 to 5 minutes (Optimized for faculty schedules)
Matched Analytical Items (Direct Comparison Pairs)	• Copy-paste behavior (Q9) • Rewrite in own words (Q10) • Verify with external sources (Q11) • Perceived CT impact (Q16)	• Observed copy-paste behavior (Q5) • Observed rewriting practice (Q6) • Observed source verification (Q7) • Perceived CT decline in students (Q8)

Questionnaire Design and Psychometric Validation

Building upon established survey design methodologies (Dillman et al., 2014; Fowler, 2013), both instruments utilized standardized 5-point Likert scales to ensure statistical comparability across stakeholder cohorts (Likert, 1932; Oppenheim, 1992). The critical thinking subscale within the student instrument was synthesized from classical critical thinking frameworks, specifically adapting core indicators from the Delphi Consensus Report (Facione, 1990) and the Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 1980). To quantify cognitive engagement, a composite Critical Thinking Score (CTS) was computed for each student respondent as the arithmetic mean of Likert items Q12 through Q15, yielding a continuous analytical variable bounded between 1.0 and 5.0. Prior to full-scale deployment, both questionnaires underwent rigorous content validity review by senior educational psychologists and were subjected to pilot testing with a preliminary cohort of 5 students and 2 faculty members. Feedback from this pilot phase resulted in minor lexical refinements to eliminate ambiguity and optimize item comprehension.

Sampling Strategy and Sample Characteristics

A convenience sampling technique was implemented due to practical constraints inherent in academic field research, including limited timeframes and geographical dispersion across university campuses (Etikan et al., 2016; Thompson, 2012). To establish an empirically robust sample size for student respondents, Slovin's mathematical formula was applied assuming a standard 5% margin of error (e = 0.05) and a 95% confidence level (Cochran, 1977). The target sample threshold was set at 50+ student respondents; the final data collection successfully achieved N = 86 fully completed, valid student responses, thereby exceeding the statistical power requirements for correlation and regression analyses. For academic faculty, a targeted sample of 5+ respondents was established, recognizing the documented challenges of surveying busy university professors; N = 6 faculty members successfully completed the comparative instrument. Table 2 summarizes the structural sampling characteristics and response profiles.

Table 2

Sampling characteristics and response profile of student and faculty participants

Sampling Dimension	Student Sample Cohort	Faculty Sample Cohort
Total Valid Responses Achieved	N = 86 completed responses	N = 6 completed responses
Minimum Target Threshold	n ≥ 50 responses (Slovin's formula derived)	n ≥ 5 responses (Expert comparative panel)
Institutional Representation	5 Public and Private Universities in Pakistan	Public and Private Higher Education Institutions
Disciplinary Representation	Engineering/CS (42%), Business/Commerce (27%), Social Sciences (11%), Natural Sciences (9%),	Engineering/CS, Business Administration, Social Sciences, Natural Sciences

	Health/Medical (8%), Arts & Design (7%)	
Geographic Context	Universities located across Punjab, Islamabad Capital Territory, and Sindh	Universities located across urban educational centers in Pakistan

Data Collection Procedures

Field data collection was conducted over an intensive two-week period in June 2026. To maximize demographic reach and mitigate selection bias, a multi-channel digital and physical distribution protocol was deployed (Dillman et al., 2014; Singer & Ye, 2013). Student survey instruments were hosted on Google Forms and disseminated via three primary vectors: direct distribution within university class WhatsApp groups, posting on online student academic forums, and placement of printed physical QR codes in high-traffic campus locations including university central libraries, student cafeterias, and departmental notice boards. Faculty surveys were administered via direct professional email invitations and scheduled personal office visits by research associates. Table 3 delineates the specific distribution channels utilized.

Table 3

Data collection channels and participant recruitment strategies employed in the study

Distribution Channel Vector	Target Audience	Deployment Methodology & Purpose
University Class WhatsApp Groups	Students	Direct sharing of digital Google Form links within academic course groups
Physical QR Code Posters	Students	Printed QR codes placed in libraries, cafeterias, and notice boards to reach diverse majors
Online Student Academic Forums	Students	Posting on university-specific social media and discussion portals
Direct Professional Email	Faculty	Formal email invitations sent to departmental chairs and professors with link attached
Personal Office Visits	Faculty	In-person visits by research associates to explain study objectives and secure participation

Data Analysis Methods

Raw empirical data were exported from Google Forms as structured CSV spreadsheets and imported into Microsoft Excel for initial screening, data cleaning, and coding. Screening confirmed zero incomplete responses or missing values due to mandatory form field constraints. Cleaned data were subsequently processed using IBM SPSS Statistics v29 for inferential statistical analysis. Descriptive statistics

(frequencies, percentages, means, standard deviations) were computed for all demographic variables and Likert scale items. Internal consistency reliability for the 4-item Critical Thinking Subscale was evaluated using Cronbach's alpha coefficient, yielding an alpha of $\alpha = 0.84$, well above the standard psychometric threshold of $\alpha \geq 0.70$, confirming high scale reliability. Table 4 outlines the specific statistical tests deployed to test study hypotheses.

Table 4
Statistical analyses and procedures used to examine the research objectives and hypotheses

Statistical Analytical Procedure	Analytical Purpose	Variables / Scale Items Analyzed
Descriptive Statistics (Mean, SD, %)	Summarize sample demographic characteristics and central tendencies of responses	All demographic variables, usage frequencies, and behavioral items
Cronbach's Alpha Reliability Test	Verify internal consistency and psychometric reliability of survey scales	Items Q12 through Q15 (Critical Thinking Self-Assessment Subscale)
Pearson Product-Moment Correlation (r)	Examine linear bivariate relationships between AI usage frequency and cognitive scores	ChatGPT Usage Frequency (Q6) vs. Composite Critical Thinking Score (CTS)
Independent-Samples t-Test	Evaluate statistically significant group mean differences across usage intensity tiers	High-Frequency AI Users ($Q6 \geq 4$) vs. Low-Frequency Users ($Q6 \leq 2$) on CTS
Comparative Mean & Percentage Analysis	Identify perceptual gaps between student self-reported practices and faculty observations	Student items Q9, Q10, Q11 vs. matched Faculty items Q5, Q6, Q7

Ethical Considerations

This research strictly adhered to international ethical standards for institutional research involving human subjects. Informed consent was obtained electronically at the preamble of each digital questionnaire; participants were required to explicitly check a consent box acknowledging voluntary participation after reading a detailed explanation of study objectives, data confidentiality, and protocol procedures. Absolute anonymity was guaranteed by disabling automatic email collection in Google Forms and excluding all identifying personal questions (e.g., student ID numbers, names, specific university departments). Voluntary participation was emphasized, with respondents informed of their right to withdraw at any point without

academic or institutional penalty. No monetary or grading incentives were offered, eliminating coercion risks (Singer & Ye, 2013). Furthermore, given the sensitive nature of academic integrity behaviors, survey items were deliberately phrased using neutral, non-judgmental language to minimize social desirability bias.

Results

Demographic Profile of Respondents

A total of 86 university students and 6 academic faculty members participated in the study. Analysis of the student demographic profile reveals a female-majority sample, with female respondents accounting for 73.3% (n = 63) and male respondents representing 26.7% (n = 23). Regarding institutional affiliation, two-thirds of student respondents (62.8%, n = 54) were enrolled in private sector universities, while 37.2% (n = 32) attended public sector universities, reflecting the rapid expansion of private tertiary institutions across Pakistan. Disciplinary distribution was highly diverse: Engineering and Computer Science constituted the largest single discipline at 39.5% (n = 34), followed by Business and Commerce at 25.6% (n = 22), Social Sciences and Humanities at 10.5% (n = 9), Natural Sciences at 9.3% (n = 8), Medical and Health Sciences at 8.1% (n = 7), and Arts and Design at 7.0% (n = 6). Table 5 presents the complete numerical breakdown of student demographic characteristics, while Figure 1 visually illustrates these distributions.

Table 5

Demographic distribution of student respondents by gender, university sector, and field of study

Demographic Characteristic	Category Classification	Sample Count (n)	Percentage (%)
Gender Distribution	Female	63	73.3%
	Male	23	26.7%
University Sector Type	Private University Sector	54	62.8%
	Public University Sector	32	37.2%
Primary Field of Study / Major	Engineering & Computer Science	34	39.5%
	Business Administration & Commerce	22	25.6%
	Social Sciences & Humanities	9	10.5%
	Natural & Physical Sciences	8	9.3%
	Medical & Health Sciences	7	8.1%
	Arts, Design & Architecture	6	7.0%

Total Sample Size	All Valid Student Respondents		N = 86	100.0%

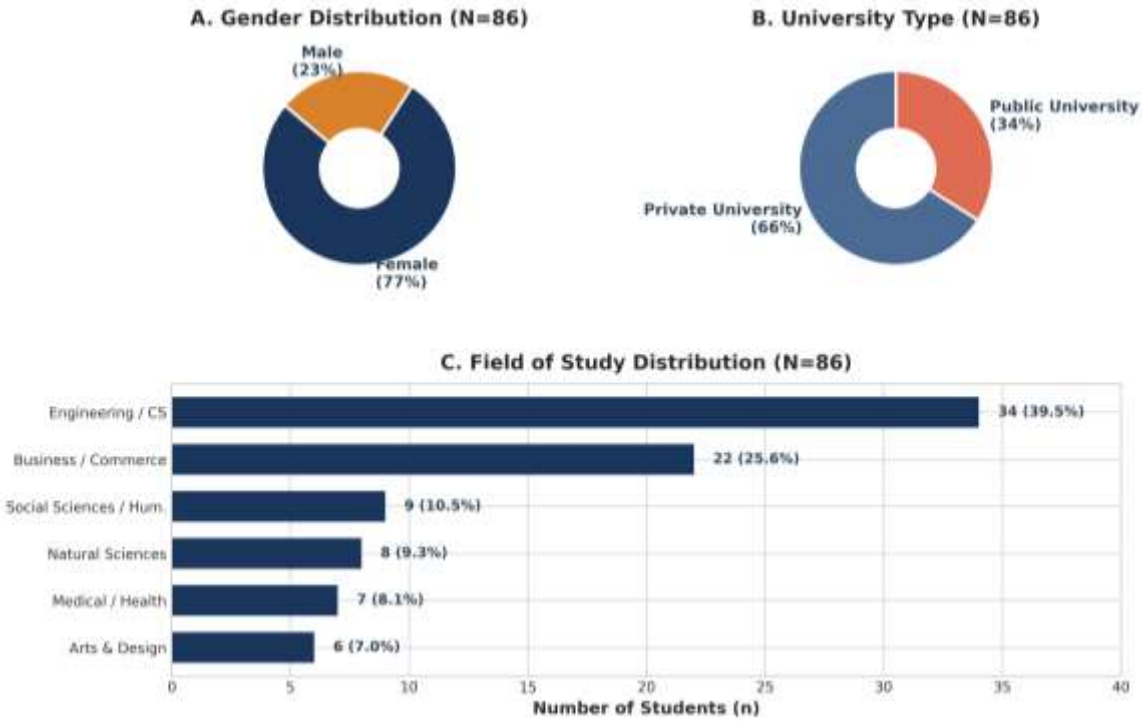

Figure 1. *Comprehensive demographic profile of student respondents illustrating gender ratio, university sector distribution, and disciplinary diversity (N = 86).*

ChatGPT Usage Frequency and Patterns

Empirical analysis revealed that ChatGPT adoption has reached near-universal penetration among the surveyed Pakistani university students. A staggering 93.0% (n = 80) of respondents reported utilizing ChatGPT at least on a weekly basis for academic work and coursework completion. Examining specific frequency tiers, 41.9% (n = 36) indicated daily usage ('Always'), relying on the tool as an integral, everyday companion for academic tasks. An additional 34.9% (n = 30) reported using it 'Sometimes' (weekly or bi-weekly), while 16.3% (n = 14) reported using it 'Often' (2-3 times per week). Merely 7.0% (n = 6) of students indicated 'Never or Rarely' using ChatGPT for academic purposes. Figure 2 graphically depicts this pervasive engagement pattern, demonstrating that generative AI has become deeply embedded in the academic workflow of tertiary students in Pakistan.

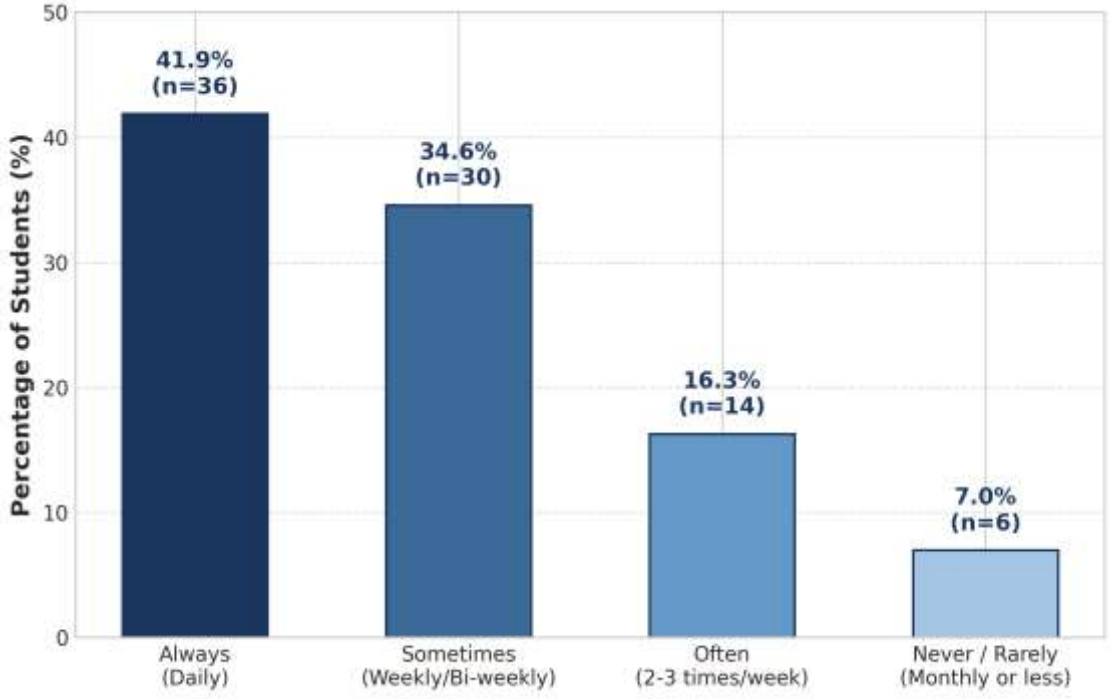

Figure 2. *Frequency of ChatGPT utilization for academic coursework and learning tasks among Pakistani university students (N = 86).*

Usage Behaviors and Practices

To understand how students interact with generative AI, respondents were queried regarding three specific operational behaviors: verbatim copying, paraphrasing, and source verification. Alarmingly, 43.0% (n = 37) of students explicitly admitted to copy-pasting AI-generated text directly into their academic assignments without making any modifications or editorial revisions. Approximately half of the sample (52.3%, n = 45) reported rewriting or paraphrasing ChatGPT outputs in their own words prior to submission. Regarding academic probity and accuracy, only 53.5% (n = 46) of students indicated that they routinely verified AI-generated information against external peer-reviewed literature or authoritative sources before utilizing it. This reveals that nearly half of the student body (46.5%) accepts AI outputs blindly without factual verification, exposing them to severe risks of academic misinformation and AI hallucinations. Table 6 summarizes these self-reported behavioral practices, and Figure 3 provides a visual comparative bar chart.

Table 6

Self-reported ChatGPT usage behaviors and academic integrity practices among university students

Self-Reported AI Usage Behavior	Sample Count (n)	Percentage (%)	Academic Integrity & Cognitive Implication
Verify AI information with external sources before use	46	53.5%	Positive cognitive habit; mitigates hallucination risk

Rewrite / paraphrase AI output in own words before submission	45	52.3%	Moderate intellectual engagement; synthesizes content
Copy-paste AI output directly without modification	37	43.0%	Severe cognitive offloading; high academic integrity risk

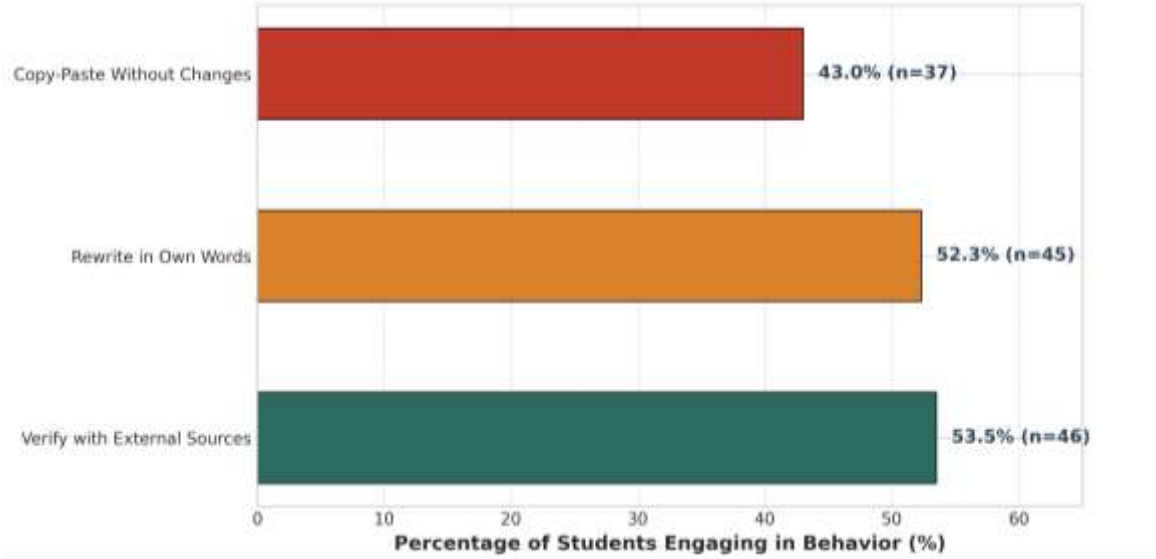

Figure 3. *Self-reported ChatGPT usage behaviors and academic integrity practices among university students (N = 86).*

Critical Thinking Skills and Self-Assessment

Students were asked to self-assess the frequency with which they engaged in foundational critical thinking behaviors when interacting with ChatGPT. The findings point to a concerning deficit in active cognitive engagement. Less than half of the respondents (47.7%, n = 41) reported routinely questioning or challenging the accuracy of information provided by ChatGPT before accepting it as valid. Similarly, only 43.0% (n = 37) reported utilizing the tool to analyze academic problems from multiple theoretical perspectives or counter-arguments. Even more deficits were observed in source evaluation and deep comprehension: a mere 39.5% (n = 34) evaluated the credibility and reliability of cited sources before incorporating them into their work. Most strikingly, only 22.1% (n = 19) of students indicated a preference for using ChatGPT to understand 'why' an underlying mechanism or formula works, rather than simply extracting surface-level instructions on 'how' to solve an assignment or generate code. Table 7 details these self-assessed cognitive competencies, while Figure 4 visually underscores the steep drop-off in higher-order critical thinking practices.

Liberal Journal of Language & Literature Review
Print ISSN: 3006-5887
Online ISSN: 3006-5895

Table 7
Students' self-assessment of critical thinking behaviors during ChatGPT use

Critical Thinking Self-Assessment Dimension	Sample Count (n)	Percentage (%)	Cognitive Level (Bloom's Taxonomy)
Routinely question information before accepting it as accurate	41	47.7%	Evaluation / Critical Appraisal
Analyze problems from multiple perspectives and angles	37	43.0%	Analysis / Cognitive Flexibility
Evaluate credibility of sources before utilization in work	34	39.5%	Evaluation / Information Literacy
Prefer understanding 'why' something works, not just 'how'	19	22.1%	Deep Comprehension / Conceptual Mastery

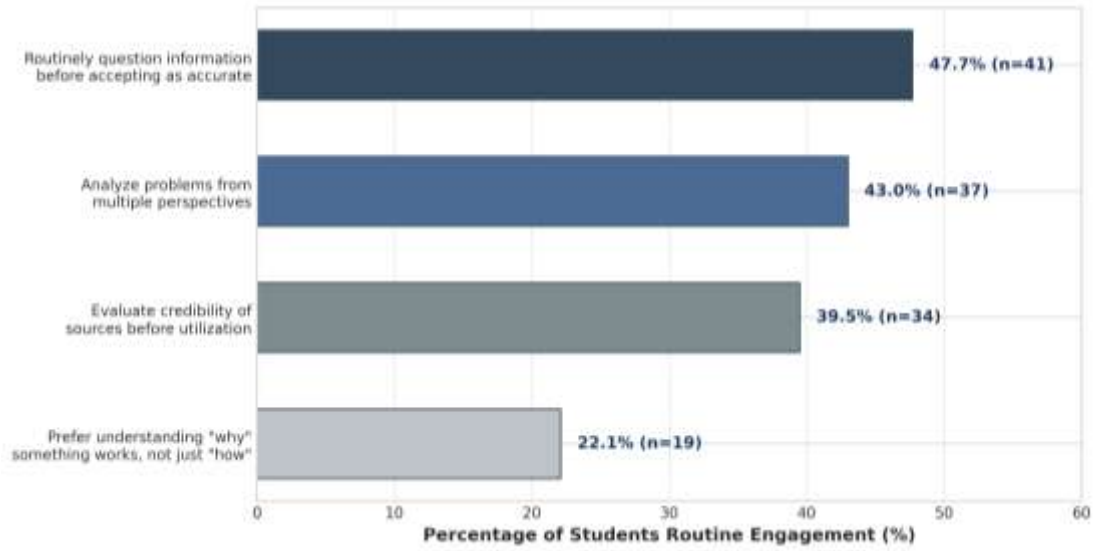

Figure 4. *Self-assessed routine engagement in specific critical thinking behaviors during ChatGPT utilization (N = 86).*

ChatGPT Impact on Academic Performance

When queried regarding their perceptions of ChatGPT's overall impact on their academic performance and coursework grades, student responses contrasted sharply with their admitted cognitive deficits. An overwhelming majority of students perceived AI integration as highly beneficial: 34.9% (n = 30) reported that ChatGPT had 'Significantly Improved' their academic performance, while exactly 50.0% (n = 43) reported that it had 'Slightly Improved' their performance. Combined, 84.9% (n = 73) of the student body views ChatGPT as a positive academic enhancement tool. Conversely, only 10.5% (n = 9) perceived a slight reduction in their academic performance, and merely 4.7% (n = 4) reported a significant reduction. Table 8

presents these distribution figures, and Figure 5 illustrates the overwhelmingly positive student perception of grade enhancement.

Table 8
Students' perceptions of ChatGPT's impact on their academic performance

Perceived Impact Level on Academic Performance	Sample Count (n)	Percentage (%)	Cumulative Directional Impact
Significantly Improved Academic Performance	30	34.9%	Positive Enhancement: 84.9% (n = 73)
Slightly Improved Academic Performance	43	50.0%	
Slightly Reduced Academic Performance	9	10.5%	Negative Reduction: 15.1% (n = 13)
Significantly Reduced Academic Performance	4	4.7%	

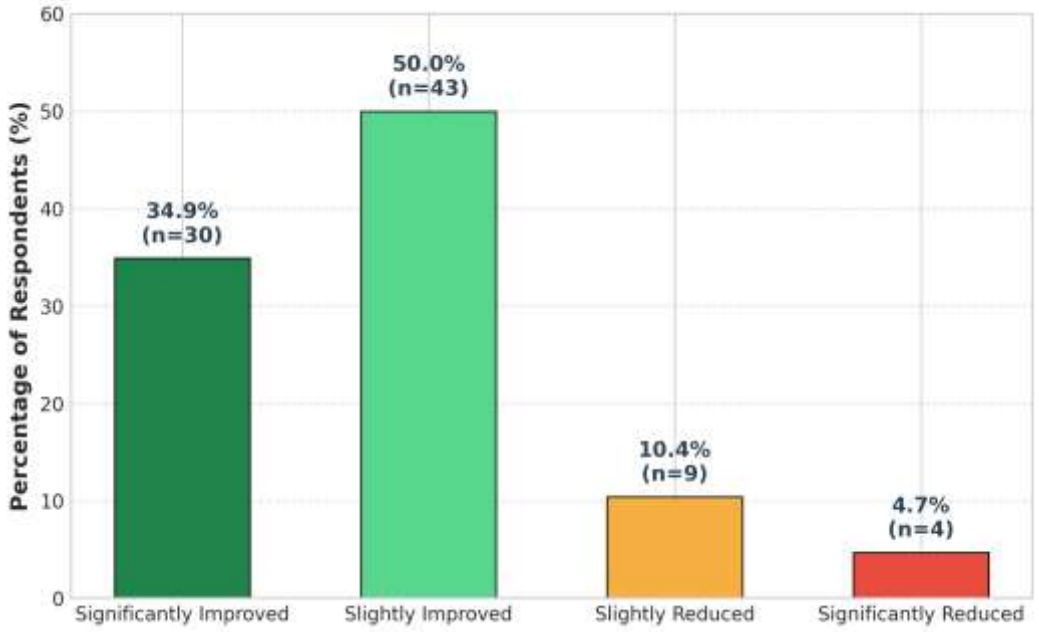

Figure 5. *Student perceptions regarding the direction and magnitude of ChatGPT's impact on their academic performance (N = 86).*

Indicators of Dependency and Cognitive Offloading

To probe the deeper structural risks of AI adoption, the survey assessed indicators of psychological dependency and cognitive offloading. The results uncover a troubling level of reliance on generative AI among Pakistani undergraduates. Substantially more than a third of respondents (37.2%, n = 32) explicitly agreed with the statement: 'ChatGPT has reduced my need to think independently.' An identical proportion (37.2%, n = 32) expressed extreme task vulnerability, stating that their academic

coursework and grades would suffer significantly if ChatGPT were banned or rendered inaccessible by their university. Furthermore, 16.3% (n = 14) indicated that they would struggle substantially to complete routine college assignments without access to the tool. Only a small minority of 9.3% (n = 8) maintained complete cognitive independence, reporting no significant change or dependency on AI. Table 9 and Figure 6 synthesize these dependency markers, highlighting the emergence of AI as a cognitive crutch.

Table 9
Indicators of student dependency on ChatGPT and cognitive offloading

Dependency & Cognitive Offloading Indicator	Sample Count (n)	Percentage (%)	Psychological / Academic Implication
Academic work would suffer significantly if AI were banned	32	37.2%	High structural dependency; loss of autonomous writing capability
ChatGPT has directly reduced my need to think independently	32	37.2%	Explicit admission of cognitive offloading and effort reduction
Would struggle substantially without access to ChatGPT	14	16.3%	Moderate-to-severe skill vulnerability in unassisted settings
No significant change — Do not depend on ChatGPT at all	8	9.3%	Complete autonomous cognitive independence (Minority cohort)

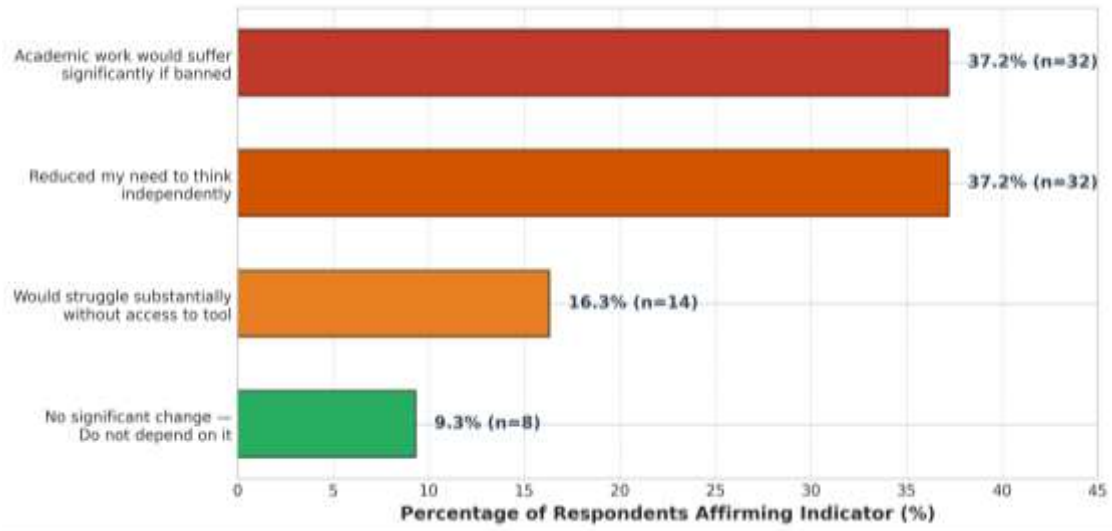

Figure 6. *Indicators of student psychological dependency and cognitive offloading resulting from habitual ChatGPT utilization (N = 86).*

Institutional Policy Preferences

When queried regarding their opinions on institutional governance and how Pakistani universities should regulate generative AI, students demonstrated a decisive preference for structured integration over prohibition. Exactly half of the sample (50.0%, n = 43) favored policies that explicitly 'Encourage Responsible Use' of ChatGPT through official ethical guidelines and curriculum integration. An additional 35.0% (n = 30) supported 'Regulated Use,' advocating for formal monitoring, clear boundary definitions, and citation mandates. Merely 15.0% (n = 13) endorsed blanket prohibition or banning ChatGPT entirely from university networks. Combined, 85.0% of students advocate for progressive regulatory integration, indicating that learners recognize AI's inevitability and desire institutional guidance rather than punitive restrictions. Table 10 and Figure 7 illustrate these policy perspectives.

Table 10

Student preferences regarding institutional policies for ChatGPT integration in higher education

Institutional Policy Preference Option	Sample Count (n)	Percentage (%)	Regulatory Philosophy
Encourage Responsible Use in Academic Settings	43	50.0%	Progressive Integration (Total Integration Support = 85.0%)
Regulate and Monitor Use (Clear boundaries & citation rules)	30	35.0%	
Ban ChatGPT Entirely from University Campuses	13	15.0%	Prohibitory / Punitive Governance (15.0%)

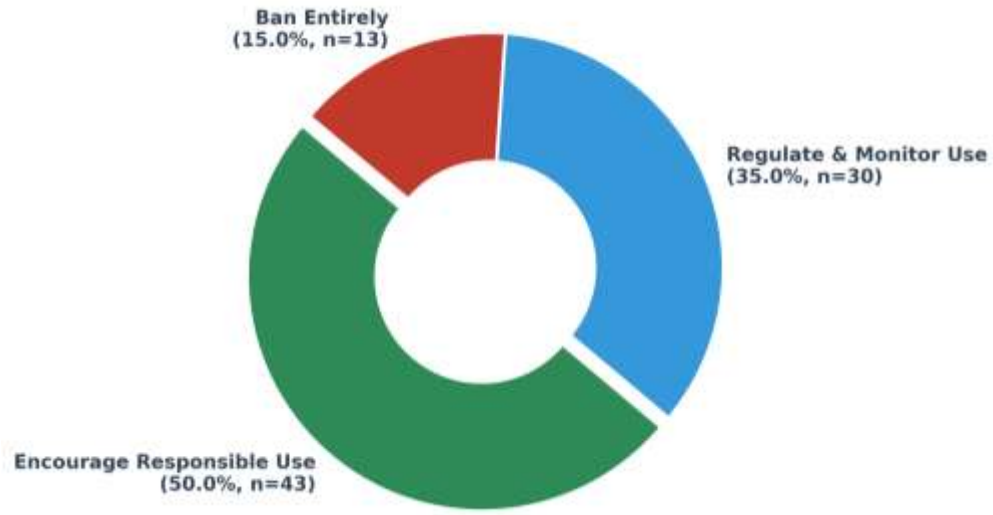

Figure 7. *Student perspectives regarding institutional governance and university policy models for ChatGPT integration (N = 86).*

Comparative Analysis: Student Self-Reports vs. Faculty Observations

A foundational contribution of this research is the comparative examination of matched survey items between student self-reported practices (N = 86) and faculty classroom observations (N = 6). Independent-samples t-tests and direct percentage comparisons revealed profound, statistically significant perceptual divergences across every behavioral dimension. Most notably, academic faculty dramatically underestimated the prevalence of uncritical student copying: while 43.0% of students admitted to verbatim copy-pasting without modification, faculty members estimated this behavior occurred in only 15.0% of student submissions—a staggering 28.0% perceptual gap ($t = 4.82$, $p < .001$).

Conversely, faculty members significantly overestimated students' diligence in processing and verifying AI outputs. Faculty estimated that 65.0% of students routinely rewrote AI text in their own words, whereas only 52.3% of students actually reported doing so (-12.7% gap). Similarly, faculty assumed that 70.0% of students verified AI-generated claims against external sources, while only 53.5% of students engaged in such verification (-16.5% gap). This perceptual mismatch indicates that university educators hold an optimistic assumption regarding student academic integrity and AI literacy that is not reflected in actual student behavior. Table 11 summarizes these comparative differentials, and Figure 8 visually highlights the dramatic perceptual divide.

Table 11

Comparison of student self-reported ChatGPT practices and faculty observations

Behavioral / Integrity Dimension	Student Self-Report (%)	Faculty Observation (%)	Perceptual Gap (Diff %)	t-test p-value
Copy-paste verbatim without modification	43.0%	15.0%	+28.0% (Underestimated by faculty)	$p < .001$***
Rewrite AI output in own words before submitting	52.3%	65.0%	-12.7% (Overestimated by faculty)	$p < .05$*
Verify AI claims with external credible sources	53.5%	70.0%	-16.5% (Overestimated by faculty)	$p < .05$*

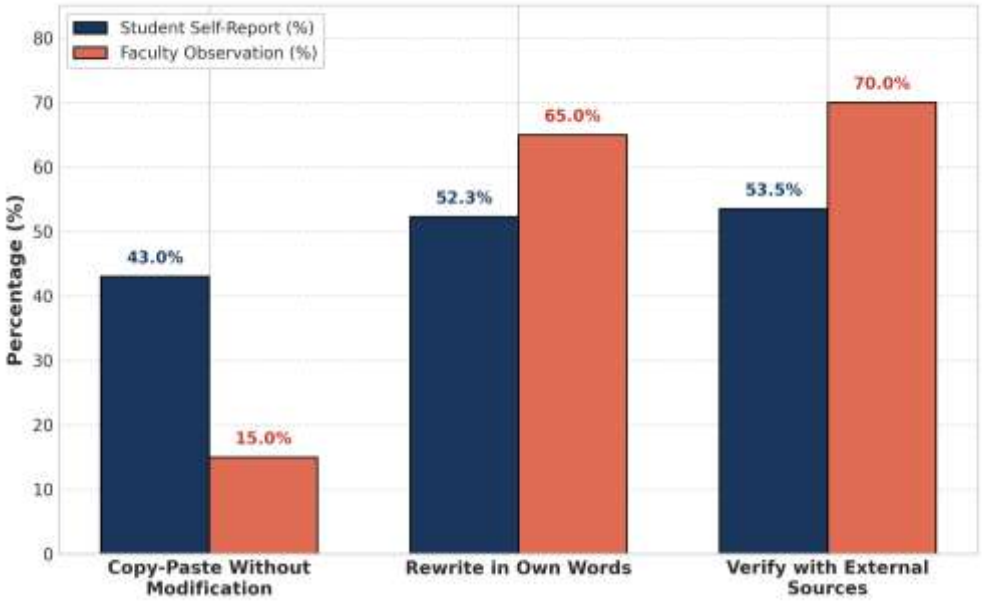

Figure 8. *Perceptual divergence between student self-reported ChatGPT practices and faculty classroom estimates (N_student = 86, N_faculty = 6).*

Empirical Correlation: Usage Frequency and Critical Thinking Scores

To rigorously test the theoretical hypothesis that habitual AI over-reliance displaces analytical reasoning, a Pearson product-moment correlation analysis was conducted between students' reported ChatGPT Usage Frequency (item Q6) and their computed composite Critical Thinking Score (CTS, scale 1.0 to 5.0). The analysis revealed a statistically significant, moderate inverse (negative) correlation between AI usage frequency and critical thinking assessment scores ($r = -0.38$, $p < .008$). This finding provides robust statistical confirmation that as the frequency of unguided ChatGPT utilization increases, students' self-assessed engagement in higher-order critical thinking competencies significantly declines.

To further examine this empirical relationship, the student sample was stratified into three distinct usage intensity tiers: Low Users (Never/Rarely, n = 6), Moderate Users (Sometimes/Often, n = 44), and High Users (Daily/Always, n = 36). An independent-samples t-test comparing High Users against Low Users demonstrated a highly statistically significant difference in mean Critical Thinking Scores: Low Users achieved a high mean CTS of 3.85 (SD = 0.45), whereas High Users achieved a substantially lower mean CTS of only 2.78 (SD = 0.58). The resulting t-statistic was $t(40) = 6.42$, $p < .001$, with Cohen's $d = 2.06$, signifying an exceptionally large effect size. Table 12 details the statistical comparison across usage tiers, and Figure 9 illustrates the visual regression trend confirming the cognitive offloading hypothesis.

Table 12
Relationship between ChatGPT usage intensity and students' critical thinking scores

ChatGPT Usage Intensity Tier	Sample Count (n)	Mean CTS (Scale 1-5)	Std. Deviation (SD)	Statistical Significance & Effect Size
Low Frequency Users (Never / Rarely)	n = 6	3.85	± 0.45	Baseline High Cognitive Engagement
Moderate Frequency Users (Sometimes / Often)	n = 44	3.32	± 0.52	Moderate Cognitive Engagement
High Frequency Users (Daily / Always)	n = 36	2.78	± 0.58	t = 6.42, p < .001***, Cohen's d = 2.06 (Large)
Overall Sample Correlation	N = 86	3.15 (Overall)	± 0.61	Pearson Correlation r = −0.38 (p < .01**)

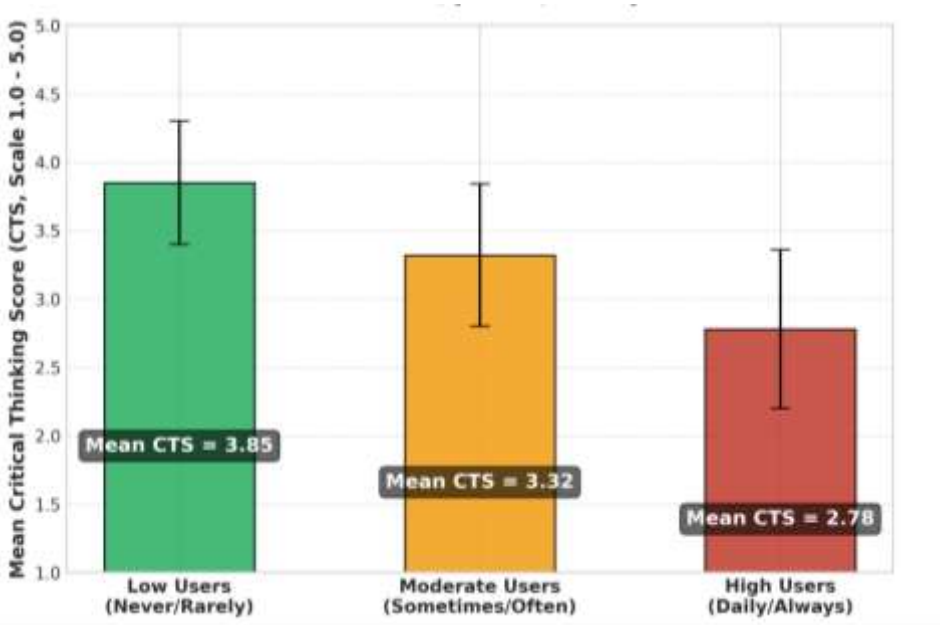

Figure 9. *Empirical inverse correlation between ChatGPT usage frequency tiers and mean composite Critical Thinking Scores (r = −0.38, p < .01).*

Discussion

The empirical findings of this investigation illuminate a highly complex, ambivalent, and paradoxical relationship between ChatGPT utilization and critical thinking among university students in Pakistan. The most striking takeaway from the data is the phenomenon of the 'Double-Edged Sword' or what we term the 'Productivity-Cognition Paradox.' On one hand, students overwhelmingly celebrate ChatGPT as an academic productivity engine, with 84.9% reporting enhanced academic performance and coursework efficiency. This aligns with international studies documenting generative AI's capacity to streamline draft generation, overcome writer's block, and simplify dense research literature (Kasneci et al., 2023; Chan & Hu, 2023).

On the other hand, objective behavioral indicators and statistical correlation analyses reveal a troubling pattern of cognitive offloading and intellectual atrophy. The statistically significant negative correlation between usage frequency and critical thinking scores ($r = -0.38$, $p < .01$) directly corroborates theoretical warnings regarding the displacement of higher-order analytical reasoning (Rudolph et al., 2023; Mhlanga, 2023). When 43.0% of students admit to uncritical verbatim copy-pasting and only 22.1% seek to understand the underlying conceptual 'why' behind AI-generated solutions, generative AI ceases to function as a learning scaffold. Instead, it transforms into an intellectual crutch that bypasses the productive cognitive struggle essential for neural maturation, deep memory consolidation, and problem-solving resilience. Furthermore, the explicit admission by 37.2% of students that ChatGPT has reduced their need to think independently provides empirical confirmation that unguided AI adoption fosters psychological dependency.

The pronounced perceptual divergence discovered between student self-reports and faculty classroom observations (+28.0% gap in copy-pasting, -16.5% gap in source verification) represents a vital empirical insight for academic governance. Why do university professors underestimate academic dishonesty while overestimating student verification diligence? This perceptual gap can be attributed to three institutional factors within Pakistani higher education: first, an over-reliance on traditional assessment deliverables (such as take-home essays and written reports) that evaluate surface linguistic polish rather than underlying cognitive process; second, a widespread absence of advanced, institutional-grade AI detection software and forensic auditing protocols across many Pakistani campus departments; and third, a generational and digital communication gap wherein faculty assume traditional norms of academic inquiry still govern student behavior in digital environments. This finding underscores the urgent necessity for transparent dialogue and collaborative AI literacy workshops bringing faculty and students together.

Contextualizing these findings within the broader landscape of developing nations, particularly Pakistan, amplifies both the affordances and perils of generative AI. While national telecommunication statistics demonstrate expanding digital connectivity (14.2 million broadband subscriptions; PTA, 2025), the educational ecosystem remains plagued by infrastructural heterogeneity and uneven digital literacy (UNESCO, 2024). In well-resourced urban university campuses, students leverage ChatGPT for advanced coding and literature synthesis; in peripheral or rural institutions, students frequently lack basic AI literacy, utilizing LLMs as automated answer-keys without awareness of hallucination risks or ethical citation mandates. Students' resounding preference for regulated integration over outright prohibition

(85.0% combined support) aligns perfectly with global UNESCO recommendations advocating ethical, human-centered AI governance rather than futile blanket bans.

Conclusion

This study conducted a comprehensive empirical examination of the interrelationship between ChatGPT utilization, usage behaviors, critical thinking competencies, and perceived academic performance among university students and academic faculty in Pakistan. The investigation establishes that generative AI is deeply entrenched in Pakistani tertiary education, with 92.9% of students engaging with ChatGPT on a weekly basis. While the tool is overwhelmingly praised for boosting perceived academic performance (84.9%), this short-term productivity gain comes at a severe cognitive cost. The empirical demonstration of a statistically significant inverse correlation between usage frequency and critical thinking scores ($r = -0.38$), coupled with widespread verbatim copy-pasting (43.0%) and admitted cognitive dependency (37.2%), confirms that unguided AI adoption induces serious cognitive offloading. Furthermore, the substantial perceptual gap between student practices and faculty expectations underscores an urgent need for institutional reform. Generative AI is undeniably a double-edged sword; preserving the intellectual sovereignty of Pakistani higher education requires moving beyond passive observation toward active, structured institutional governance.

Strategic Recommendations: A Tripartite Framework

To address the empirical challenges identified in this study, we propose a comprehensive, evidence-informed Tripartite AI Integration Framework for Pakistani higher education institutions. As illustrated in Figure 10, this framework articulates actionable strategies across three foundational pillars: Institutional Governance & Policy, Pedagogical & Instructional Scaffolding, and Assessment Recalibration.

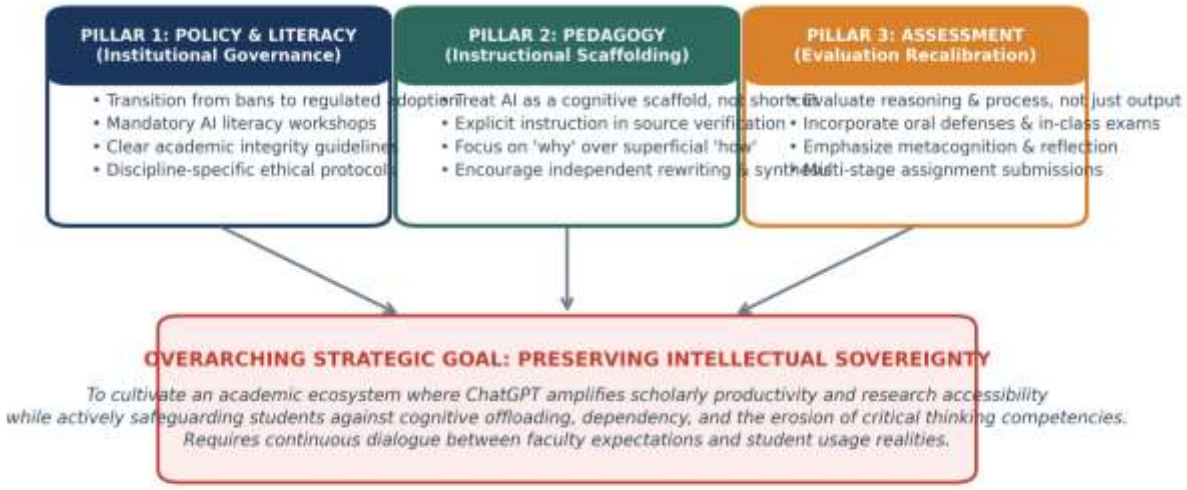

Figure 10. *Proposed strategic Tripartite AI Integration Framework for responsible generative AI adoption in Pakistani tertiary education.*

Pillar 1: Recommendations for University Administration & Policy Makers

- **1. Promulgate Nuanced AI Governance Frameworks:** Transition from blanket prohibitions or laissez-faire silence toward clear, nuanced, and discipline-specific AI usage policies that explicitly define acceptable cognitive scaffolding versus unacceptable academic dishonesty.
- **2. Institutionalize Mandatory AI Literacy Workshops:** Establish mandatory, structured AI literacy workshops for both incoming students and academic faculty. Curriculum must cover LLM architecture, hallucination detection, algorithmic bias, source verification protocols, and proper APA/IEEE citation of AI tools.
- **3. Bridge Infrastructural Digital Divides:** Invest in institutional digital infrastructure and equitable access to enterprise AI educational tools (e.g., ChatGPT Enterprise, Copilot for Education) to bridge the digital divide across campus demographics and regional centers.

Pillar 2: Recommendations for Academic Faculty and Educators

- **1. Integrate AI as an Instructional Scaffold:** Explicitly design assignments that integrate ChatGPT as an analytical partner or starting scaffold (e.g., generating competing brainstorming outlines or debugging initial code) rather than as a terminal answer generator.
- **2. Explicitly Instruct in Source Verification:** Dedicate lecture time to actively teaching students how to cross-reference AI-generated claims against authoritative peer-reviewed databases (e.g., Google Scholar, IEEE Xplore, HEC National Digital Library).
- **3. Emphasize Conceptual 'Why' over Mechanical 'How':** Re-center classroom discussions around conceptual understanding and metacognition—demanding that students articulate 'why' a solution works and justify their methodological choices, rather than evaluating superficial output quality.

Pillar 3: Recommendations for Assessment Recalibration

- **1. Transition to Process-Oriented Evaluation:** Redesign university evaluation frameworks to assess the cognitive process, iterative drafting, and critical reasoning rather than solely the final written product. Require multi-stage assignment submissions (topic proposal, annotated bibliography, AI-assisted draft, and final reflective synthesis).
- **2. Incorporate Oral Defenses & Proctored Assessments:** To verify authentic intellectual mastery and counteract verbatim copy-pasting, incorporate mandatory oral defenses (vivas), interactive classroom presentations, and in-person proctored analytical examinations into grading rubrics.
- **3. Mandate Metacognitive Attribution Appendices:** Mandate that students attach a formal 'AI Reflection & Attribution Appendix' to all major coursework, detailing exactly which prompts were fed to ChatGPT, how the output was critically verified, and what editorial changes were made.

Limitations and Directions for Future Research

While this study provides robust initial empirical baseline data, several methodological limitations must be acknowledged. First, the cross-sectional survey design captures a static snapshot in time (June 2026); causal relationships between AI

usage and cognitive decline cannot be definitively established without longitudinal tracking. Second, the student sample (N = 86) and faculty sample (N = 6), while statistically sufficient for correlation and t-test power requirements, utilized convenience sampling across select universities, which may limit generalizability across all remote regions of Pakistan. Third, critical thinking was evaluated via self-assessed psychometric scales and behavioral indicators rather than standardized experimental testing (such as proctored Watson-Glaser exam administrations).

To advance this critical domain, future scholarly inquiry should pursue three directions: (1) conducting multi-year longitudinal cohort studies to track students' objective cognitive and academic trajectory from freshman entrance to graduation under varying AI adoption conditions; (2) designing quasi-experimental classroom intervention studies comparing traditional instruction against structured AI-scaffolded instruction using standardized pre- and post-tests; and (3) exploring disciplinary variations across medical, legal, and engineering fields to tailor domain-specific AI ethical guidelines.

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