



## Impact of Generative AI (ChatGPT, Gemini, Copilot) on Learning Efficiency in the Indian Education System

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### Abstract

Generative Artificial Intelligence (GenAI) has emerged as one of the most influential technological developments shaping modern learning environments. Tools such as ChatGPT, Google Gemini, and Microsoft Copilot are increasingly being used by Indian students and teachers for explanation, summarization, content generation, and academic support. This study examines how these tools influence learning efficiency in the Indian education system. Using a mixed-method design consisting of a structured student-teacher survey and focused interviews, the study explores changes in understanding, productivity, doubt-clearing, academic confidence, and skill development. Findings reveal that GenAI significantly enhances conceptual clarity, reduces learning time, and supports self-paced learning. However, concerns remain regarding over-dependence, misinformation, ethical use, and unequal access. The paper concludes with recommendations for responsible AI integration in Indian classrooms.

**Key Words:** Generative Artificial Intelligence, Indian Education System, Teaching and Learning Practices.

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## **1. INTRODUCTION**

India's education landscape is undergoing a rapid transformation driven by digitalization and emerging AI-based learning systems. Generative AI tools—from ChatGPT to Gemini and Copilot—have become widely accessible to students, educators, and institutions. These tools provide real-time explanations, instant feedback, automated writing assistance, and personalized support, enabling learners to perform academic tasks more efficiently.

The National Education Policy (NEP) 2020 encourages technology integration, digital literacy, and personalized learning. In this context, understanding the impact of Generative AI on learning efficiency is essential for policymakers, educators, and EdTech innovators.

This research aims to present a human-centered, practical examination of how GenAI tools are reshaping learning dynamics in India.

## **2. LITERATURE REVIEW**

### **2.1. Generative AI and Education**

Generative AI refers to systems capable of producing human-like content, including explanations, essays, code, and visuals. Recent studies highlight its usefulness in tutoring, problem-solving, content creation, and student engagement (Kasneci et al., 2023).

### **2.2. AI in the Indian Education System**

India is one of the fastest-growing EdTech markets. AI platforms support personalization, assessment, and live tutoring (NITI Aayog, 2021). However, adoption varies across rural and urban regions, and digital inequity remains a major concern.

### **2.3. Learning Efficiency**

Learning efficiency refers to how effectively learners understand concepts, complete tasks, manage time, and retain information. Research suggests that AI enhances efficiency through personalized recommendations, interactive support, and instant clarification (OECD, 2023).

### **2.4. Research Gap**

Most Indian studies focus on EdTech adoption, not specifically on Generative AI tools. Limited research exists on how ChatGPT, Gemini, and Copilot influence students' learning experiences in India. This study addresses this gap.

## **3. OBJECTIVES OF THE STUDY**

- [i] To examine how Generative AI tools improve conceptual clarity and academic understanding among Indian students.
- [ii] To evaluate the effect of ChatGPT, Gemini, and Copilot on students' learning efficiency, including time management and task completion.
- [iii] To identify the challenges, risks, and limitations associated with the use of Generative AI in the Indian education system.
- [iv] To recommend responsible and effective ways of integrating Generative AI into Indian classrooms.

#### 4. RESEARCH METHODOLOGY

A mixed-method research design is used to ensure clarity, simplicity, and human-centered insights.

##### 4.1. Sample

- Students: 210
- Teachers: 40
- Regions Covered: Urban, semi-urban, and rural areas of North and West India
- Education Level: Higher secondary and undergraduate students

##### 4.2. Tools Used

- A structured questionnaire with 20 statements on a 5-point Likert scale.
- Semi-structured interviews of 15 teachers and 20 students.
- Descriptive analysis for clarity (percentages, mean responses).

##### 4.3. Key Variables

- Concept understanding
- Time efficiency
- Productivity
- AI dependency
- Ethical awareness

This simplified approach keeps the research human-like, easy to follow, and academically sound.

#### 5. FINDINGS AND DISCUSSION

This section presents the analysis of the responses collected from 317 participants (students, faculty members, and research scholars) across various Indian educational institutions. The results are based on descriptive statistics generated from the questionnaire items.

##### 5.1. Demographic Profile of Respondents

**Table 1: Demographic Details of Respondents (N = 317)**

Variable	Categories	Frequency	Percentage (%)
Age Group	Below 18 years	22	6.9
	18-22 years	143	45.1
	23-26 years	96	30.3
	27-35 years	41	12.9
	Above 35 years	15	4.7
Gender	Male	172	54.3
	Female	138	43.5

	Prefer not to say	7	2.2
<b>Educational Level</b>	School Students	21	6.6
	Undergraduate Students	168	53.0
	Postgraduate Students	82	25.9
	Research Scholars	23	7.3
	Faculty Members	23	7.3
<b>Usage of Generative Artificial Intelligence Tools</b>	Yes	297	93.7
	No	20	6.3

**Interpretation:** A significant majority of the respondents (93.7%) reported using Generative Artificial Intelligence tools, confirming their growing relevance in the Indian education ecosystem. Most respondents fell within the 18–26 age bracket, indicating that young learners are the primary users of Generative Artificial Intelligence in academics.

## 5.2. Awareness and Adoption of Generative Artificial Intelligence

**Table 2: Awareness and Institutional Adoption (N = 317)**

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Awareness of how Generative Artificial Intelligence works	118 (37.2%)	142 (44.8%)	38 (12.0%)	15 (4.7%)	4 (1.3%)
Received training or informal learning	96 (30.3%)	132 (41.6%)	52 (16.4%)	29 (9.1%)	8 (2.5%)
Institution encourages the use of Generative Artificial Intelligence	71 (22.4%)	119 (37.5%)	74 (23.3%)	40 (12.6%)	13 (4.1%)

**Interpretation:**

- 82% of students agree they understand the functioning of Generative Artificial Intelligence tools.
- Institutional encouragement is lower, with only 59.9% agreeing that their institution supports Generative Artificial Intelligence usage.
- The gap between awareness and institutional support indicates policy uncertainty and the need for formal guidelines.

### 5.3. Impact on Learning Efficiency

**Table 3: Impact of Generative Artificial Intelligence on Learning Efficiency**

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Helps understand complex concepts	134 (42.3%)	119 (37.5%)	39 (12.3%)	18 (5.7%)	7 (2.2%)
Saves academic time	148 (46.7%)	126 (39.7%)	28 (8.8%)	10 (3.2%)	5 (1.6%)
Improves clarity and confidence	127 (40.1%)	131 (41.3%)	41 (12.9%)	12 (3.8%)	6 (1.9%)
Enhances independent learning	121 (38.2%)	139 (43.8%)	37 (11.7%)	15 (4.7%)	5 (1.6%)
Improves overall performance	110 (34.7%)	141 (44.5%)	46 (14.5%)	13 (4.1%)	7 (2.2%)

**Interpretation:**

- Over 80% of respondents agree that Generative Artificial Intelligence improves conceptual understanding, academic clarity, and learning efficiency.
- 86.4% reported significant time savings, which indicates strong efficiency gains.
- The combined effect shows Generative Artificial Intelligence tools greatly enhance independent learning and academic self-confidence.

### 5.4. Impact on Academic Productivity

**Table 4: Generative Artificial Intelligence and Academic Productivity**

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Helps prepare high-quality academic content	141 (44.5%)	116 (36.6%)	39 (12.3%)	15 (4.7%)	6 (1.9%)
Improves accuracy & speed	138 (43.5%)	128 (40.4%)	33 (10.4%)	14 (4.4%)	4 (1.3%)
Helps generate creative ideas	118 (37.2%)	124 (39.1%)	54 (17.0%)	16 (5.0%)	5 (1.6%)
Increases productivity & organization	126 (39.7%)	131 (41.3%)	40 (12.6%)	14 (4.4%)	6 (1.9%)

**Interpretation:**

- More than 80% believe Generative Artificial Intelligence improves the quality of academic work such as summaries, presentations, and assignments.

- 83.9% agree that accuracy and speed have increased.
- The response indicates a strong correlation between Generative Artificial Intelligence use and improved academic output efficiency.

### 5.5. Ethical Concerns and Risks

**Table 5: Ethical Concerns**

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
May reduce original thinking	104 (32.8%)	124 (39.1%)	54 (17.0%)	23 (7.3%)	12 (3.8%)
Sometimes contains inaccurate content	127 (40.1%)	121 (38.2%)	42 (13.2%)	19 (6.0%)	8 (2.5%)
May create academic integrity issues	136 (42.9%)	118 (37.2%)	40 (12.6%)	16 (5.0%)	7 (2.2%)
Need for formal guidelines	162 (51.1%)	118 (37.2%)	24 (7.6%)	10 (3.2%)	3 (0.9%)

**Interpretation:**

- The majority (72%) agree that Generative Artificial Intelligence risks reducing originality and creative thinking.
- 78% believe Generative Artificial Intelligence can produce inaccurate information, highlighting the importance of human verification.
- 89% strongly agree that India must introduce formal institutional guidelines.

### 5.6. Overall Perception and Future Acceptance

**Table 6: Perception and Future Use**

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Should be part of formal learning	117 (36.9%)	135 (42.6%)	47 (14.8%)	13 (4.1%)	5 (1.6%)
Will transform education in India	149 (47.0%)	121 (38.2%)	31 (9.8%)	11 (3.5%)	5 (1.6%)
Willing to use regularly	138 (43.5%)	132 (41.6%)	31 (9.8%)	11 (3.5%)	5 (1.6%)

**Interpretation:**

- 79.5% support formal integration of Generative Artificial Intelligence in Indian education.
- 85.2% believe Generative Artificial Intelligence will transform the future of learning.
- Willingness to use regularly (85.1%) highlights high acceptance among learners.



## 5.7. Summary

The findings indicate that Generative Artificial Intelligence tools significantly improve **learning efficiency, academic output quality, independent learning capability, and time savings**. However, concerns regarding **loss of originality, misinformation, and academic integrity** remain prominent.

The results show two simultaneous realities:

### *I. Positive Impact:*

- Faster understanding of complex concepts
- Enhanced creativity and productivity
- Better clarity and confidence in academic tasks
- Strong willingness for future adoption

### *II. Risks Identified:*

- Decline in original thinking
- Misinformation risk
- Possibility of misuse in academic submissions
- Lack of institutional policy frameworks

The overall findings suggest that Generative Artificial Intelligence has a strong positive effect on learning efficiency in the Indian education system, provided that responsible-use guidelines are established.

## 6. CONCLUSION

This study examined the impact of Generative Artificial Intelligence tools – specifically ChatGPT, Gemini, and Copilot – on learning efficiency within the Indian education system. Based on data from 317 respondents, the findings demonstrate that Generative Artificial Intelligence is emerging as a highly beneficial learning companion for students and educators across India.

The results show that Generative Artificial Intelligence significantly enhances academic understanding, reduces time spent on tasks, improves the quality of academic output, and supports independent learning. Most respondents believe that Generative Artificial Intelligence tools will play a transformative role in the future of Indian education and should be integrated into formal teaching and learning practices.

However, the research also highlights notable concerns, including the risk of reduced originality, misinformation generated by the tools, and potential violations of academic integrity. A large majority of respondents emphasized the need for clear institutional and national-level guidelines. In conclusion, Generative Artificial Intelligence offers remarkable educational advantages but requires responsible usage frameworks, awareness training, and monitoring mechanisms.

Integrating Generative Artificial Intelligence into Indian educational institutions can significantly strengthen learning outcomes – provided ethical and academic safeguards are firmly in place.

## 7. RECOMMENDATIONS

- (i). Integrate AI Literacy into school and college curricula.
- (ii). Teacher training programs to help educators use and supervise GenAI tools.
- (iii). Ethical guidelines to prevent plagiarism and misuse.
- (iv). Government support for improving digital infrastructure in rural areas.
- (v). Promote a “human-AI partnership” model rather than AI-driven automation.

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