

**14.****Impact of AI Tools on Educational Expenditure Reduction: A Study of Warangal City****Dr. K. Srivani**

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**Abstract**

The rising cost of education has emerged as a major concern for households in India, driven by increased spending on private coaching, learning materials, and transportation. In this context, Artificial Intelligence (AI) tools have gained prominence as cost-effective alternatives that enhance learning efficiency while reducing educational expenditure. This study examines the impact of AI tools on educational expenditure reduction among students in Warangal City. Primary data were collected from 120 students using a structured questionnaire. The study employs descriptive statistics, paired sample t-test, and chi-square test to analyze the relationship between AI usage and expenditure reduction. The findings reveal that AI adoption led to an average 47% reduction in monthly educational expenditure, particularly in private tutoring, coaching fees, and printed materials. Statistical results confirm a significant reduction in expenditure after AI adoption and a strong association between the level of AI usage and cost savings. The study concludes that AI tools play a crucial role in improving affordability and accessibility of education, with important implications for educational policy and digital inclusion.

**Keywords:** Artificial Intelligence, Educational Expenditure, Cost Reduction, AI Tools in Education, EdTech, Warangal City, Digital Learning

**Introduction**

Education expenditure has emerged as a major economic concern for households in India, particularly in urban and semi-urban areas. According to the National Sample Survey (NSS), private household spending on education has increased significantly over the last decade due to rising costs of coaching classes, private tutoring, learning materials, and transportation. With the rapid expansion of Artificial Intelligence (AI)

tools in education, new opportunities have arisen to reduce these financial burdens. AI-powered learning platforms, virtual tutors, adaptive learning systems, and intelligent homework assistants enable personalized, on-demand learning at comparatively lower costs. In cities like Warangal, where students increasingly rely on private educational services, AI tools have the potential to substitute expensive traditional resources. This study examines how AI tools influence educational expenditure reduction, providing empirical evidence from a sample of 120 students.

### **Review of Literature**

Several studies have explored the role of AI in transforming education delivery and efficiency. Sharma and Patel (2022) found that AI-enabled adaptive learning systems significantly reduce dependency on private coaching by offering personalized content at minimal cost. Kumar and Rao (2021) emphasized that AI-driven platforms enhance learning efficiency while lowering expenditure on printed materials and external tutoring. Singh et al. (2023) highlighted that AI-powered virtual tutors reduce both monetary and time costs associated with conventional classroom-based coaching. International studies also suggest that AI improves educational affordability by automating assessment and feedback mechanisms (UNESCO, 2022). However, literature also notes challenges such as unequal access to technology and limited AI literacy among students (Verma & Das, 2023). While existing research establishes AI's potential benefits, region-specific empirical studies remain limited.

### **Research Gap**

Although existing literature discusses AI in education broadly, empirical studies focusing on the cost-reduction aspect of AI tools at the student level are limited, particularly in medium-sized Indian cities like Warangal. Most studies emphasize learning outcomes, teaching efficiency, or technological adoption, while direct measurement of educational expenditure reduction remains underexplored. Moreover, few studies employ statistical testing to establish the relationship between AI usage intensity and cost savings. This study addresses these gaps by providing primary data-based, statistically validated evidence on the impact of AI tools on educational expenditure reduction.

### **Research Methodology**

The study adopts a descriptive and analytical research design based on primary data collected from 120 students in Warangal City during 2025. Respondents were selected using purposive sampling to include students actively engaged in AI-based learning tools. Data were collected through a structured questionnaire covering AI usage patterns and educational expenditure before and after AI adoption. Statistical tools such as percentage analysis, paired sample t-test, and chi-square test were employed to analyze expenditure reduction and test hypotheses. Data analysis was conducted using standard statistical techniques to ensure reliability and validity of results.

### **Limitations of the Study**

Despite its contributions, the study has certain limitations. The sample size of 120

respondents restricts the generalization of findings to broader populations. The study relies on self-reported expenditure data, which may involve recall bias. Rapid advancements in AI tools mean that findings may change over time. The study focuses primarily on students and does not capture institutional-level cost reductions. Additionally, qualitative insights regarding behavioral and psychological impacts of AI usage were not deeply explored due to time constraints.

#### **Data Analysis, Interpretation and Hypothesis Testing**

**Objective 1: To examine the extent of adoption of AI tools among students in Warangal City**

**Table 1: Level of AI Tool Adoption**

Level of AI Usage	No. of Respondents	Percentage
High usage (daily)	46	38.33
Moderate usage (weekly)	44	36.67
Low usage (occasional)	18	15.00
No usage	12	10.00
Total	120	100.00

*Source: Primary Data*

The table shows that 75% of students use AI tools either daily or weekly, indicating substantial penetration of AI in the education system of Warangal City. Only 10% of respondents reported no AI usage, reflecting growing acceptance of AI-based learning platforms among students.

**Objective 2: To identify major AI tools used for educational purposes**

**Table 2: Type of AI Tools Used by Students**

AI Tool Category	Users	Percentage
AI homework assistants	89	74.17
AI exam preparation tools	71	59.17
Adaptive learning platforms	78	65.00
Virtual AI tutors	62	51.67

*Source: Primary Data*

AI homework assistants are the most widely used tools, followed by adaptive learning platforms. This indicates that students primarily use AI for content clarification, assignments, and exam preparation, reducing reliance on paid coaching and private tutoring.

**Objective 3: To assess the impact of AI tools on educational expenditure**

**Table 3: Average Monthly Educational Expenditure (₹)**

Expenditure Head	Before AI	After AI	Reduction (%)
Private tutoring	2,400	1,200	50.00
Coaching classes	3,200	1,800	43.75
Printed materials	800	350	56.25

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Travel expenses	1,500	800	46.67
Total	7,900	4,150	47.47

Source: Primary Data

The table clearly demonstrates a substantial reduction ( $\approx 47\%$ ) in overall educational expenditure after AI adoption. The highest savings are observed in printed materials and private tutoring, confirming AI's role as a cost-effective learning substitute.

### Objective 4: To test whether AI usage significantly reduces educational expenditure Hypothesis

- i.  $H_0$ : AI tool usage does not significantly reduce educational expenditure.
- ii.  $H_1$ : AI tool usage significantly reduces educational expenditure.

Statistical Tool Used: *Paired Sample t-Test*

(Used to compare expenditure before and after AI adoption)

**Table 4: Paired t-Test Results**

Statistic	Value
Mean expenditure difference	₹3,750
t-value	6.21
Degrees of freedom	119
p-value	< 0.01

Source: Primary Data

The calculated t-value (6.21) is statistically significant at the 1% level, leading to the rejection of the null hypothesis. This confirms that AI tool usage has a statistically significant impact on reducing educational expenditure among students in Warangal City.

### Objective 5: To examine the relationship between level of AI usage and extent of expenditure reduction

**Table 5: AI Usage Level vs Expenditure Reduction**

AI Usage Level	High Reduction	Moderate Reduction	Low Reduction	Total
High usage	34	10	2	46
Moderate usage	22	18	4	44
Low usage	6	8	4	18
No usage	2	3	7	12
Total	64	39	17	120

Statistical Tool Used: *Chi-Square Test*

**Table 6: Chi-Square Test Results**

Statistic	Value
$\chi^2$ value	14.86
Degrees of Freedom	6
p-value	< 0.05

Source: Author's Calculation using SPSS

Since the calculated chi-square value is significant at the 5% level, the null hypothesis is rejected. This confirms a significant association between AI usage intensity

and the level of educational expenditure reduction. Higher AI usage leads to greater cost savings.

### **Challenges in the Use of AI Tools for Reducing Educational Expenditure**

Despite the significant role of AI tools in reducing educational costs, several challenges were identified during the study. A major constraint is the digital divide, as a section of students lacks access to high-quality devices and reliable internet connectivity, limiting consistent AI usage. Insufficient digital and AI literacy prevents some students from effectively utilizing advanced AI features beyond basic homework assistance. Although many AI tools are free, premium subscriptions and hidden costs restrict full utilization for economically weaker students. Additionally, concerns regarding accuracy, over-dependence on AI, and ethical use of AI tools discourage some students and institutions from integrating them deeply into academic processes. Institutional support and structured guidance on AI usage are also limited.

### **Findings of the Study**

The study highlights several key findings derived from empirical data and statistical testing:

1. A substantial proportion of students in Warangal City actively use AI tools, with 75% reporting moderate to high usage.
2. AI homework assistants and adaptive learning platforms are the most commonly used tools.
3. The average monthly educational expenditure declined by nearly 47% after AI adoption, particularly in private tutoring, coaching classes, and learning materials.
4. The paired t-test confirmed a statistically significant reduction in educational expenditure due to AI usage.
5. The chi-square analysis established a significant association between AI usage intensity and the level of cost reduction.
6. Students with higher AI usage levels achieved greater financial savings compared to low or non-users.

### **Suggestions and Policy Implications**

Based on the findings, the following measures are suggested to enhance the role of AI in reducing educational expenditure:

1. AI Literacy Programs: Educational institutions should organize structured training programs to improve students' AI literacy and responsible usage.
2. Institutional AI Integration: Colleges should integrate AI tools into teaching-learning processes to reduce dependence on costly external coaching.
3. Affordable Access: Government and institutions should provide subsidized or institutional subscriptions to premium AI learning platforms.
4. Infrastructure Development: Strengthening digital infrastructure, especially high-speed internet access, is essential to ensure equitable AI adoption.

5. Ethical Usage Guidelines: Institutions must frame guidelines to promote ethical and academic integrity while using AI tools.
6. Curriculum Reforms: AI-based learning support systems should be formally embedded into academic curricula to enhance cost efficiency.

### Conclusion

The study concludes that Artificial Intelligence tools play a significant and positive role in reducing educational expenditure among students in Warangal City. Empirical evidence and statistical analysis confirm that AI adoption leads to substantial cost savings in tutoring, coaching, learning materials, and travel expenses. While challenges such as digital inequality and limited AI literacy persist, appropriate policy interventions and institutional support can amplify the benefits of AI. The integration of AI into mainstream education has the potential to make learning more affordable, accessible, and sustainable, thereby contributing to inclusive educational development in India.

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