



A Study of Artificial Intelligence-Assisted Learning on Students' Self-Efficacy in Secondary Education

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Abstract

AI assisted learning (AAL) is now making its way into the secondary schools and the impact of AAL on students' self-efficacy (SE) or one's confidence in learning is still not studied in India. This research is an attempt to explore the association between AAL and self-efficacy of the secondary school students of UP. The goal was to explore the relationship between the use of AAL and students' self-efficacy and to determine the factors that moderate the relationship between the two. A descriptive survey design was used and primary data was collected from 200 secondary students selected from urban and rural Uttar Pradesh in the form of structured questionnaire of which categorical items and 5-point likert scale were used. The data were analysed using percentage analysis, mean and standard deviation and Pearson correlation. Results indicated that AAL use was significantly higher with self-efficacy ($r = 0.58, p < 0.01$), most strongly for understanding difficult topics and exam confidence, though with a tendency to over-dependence, rural access gaps and a slight gender difference. The study findings indicate that AAL is strengthening self-efficacy in case of supporting students' self-directed learning efforts; this implies that teachers need to implement AAL in secondary education in an equitable way.

Keywords: Artificial intelligence-assisted learning, Self-efficacy, Secondary education, Uttar Pradesh, Educational technology

1. Introduction

One of the strongest predictors of academic persistence, effort regulation, and achievement is self-efficacy, the confidence that an individual has in his/her ability to organize and execute actions necessary to achieve a goal (Bandura, 1982). As it comes to secondary schools, a time when adolescents are developing long-lasting beliefs about their competence, one burning question remains. Chatbots, intelligent tutoring systems, automated feedback, and adaptive

platforms, that are designed to provide personalised pacing and instant support, are now a part of the daily experience for students (Vieriu & Petrea, 2025). In principle, each of these can be used to generate the kinds of mastery experiences that lead to the development of self-efficacy. Evidence is promising but inconsistent. A recent meta-analysis revealed that there is a profound positive relationship between AI and learners' self-efficacy, but noted that the strength of the relationship depends on the discipline and how the AI is used (Ren et al., 2026). The situation is more complex with the younger students, as their confidence in using algorithms may not carry over to their own performances, and secondary education is a different environment that can't easily take educators' findings from university research (Wu & Zhang, 2025).

The question is particularly pertinent in UP, the most populous state in India, having a wide range of government, aided and private secondary schools, as well as a significant urban-rural gap. With the rise of cheap mobile phones and free AI apps, students in UP have been using such tools as ChatGPT and subject-specific apps before, during, and outside of class, with little teacher oversight. The readiness of teachers varies by school level, which also influences the level of their confidence in using AI (Bergdahl & Sjöberg, 2025), while validated tools to assess students' self-efficacy in using AI in educational contexts are only just beginning to be developed (Chiu et al., 2025). Even in this context, empirical research based on Indian secondary classrooms and especially on a numerically large and diverse state like Uttar Pradesh is few in number. In this study, secondary students from UP were surveyed to find out if, and under what conditions, they believe that AI-enhanced learning aids their self-efficacy in learning, and how that suggests for responsible integration in the classroom.

2. Literature Review

Since 2022, there has been a significant growth of research on AI and self-efficacy. Yilmaz and Karaoglan Yilmaz (2023) conducted a controlled experiment where self-efficacy and motivation of students practicing with a generative AI tool was significantly higher than that of a control group, attributing this to feedback being provided in real time and without any risk. Similarly, Parsakia (2023) showed that a chatbot and AI can increase SE, self-esteem, problem-solving skills, and warned about the negative effect when relying too heavily on the tool for validation. Chang, Hwang and Gau (2022) demonstrated that a mobile chatbot supported skills training, yielding higher achievement and self-efficacy, thus demonstrating that conversational AI could provide mastery-type experiences. Additionally, interventions with chatbots have improved performance and confidence; students with chatbot support showed improvements compared to those taught by a human, and they were confident in the tool's incorporation (Essel et al., 2022), while the use of AI feedback has been associated with gains in cognitive skills later on (Essel et al., 2024). But it is not all good news. The findings of a large systematic review and meta-analysis of experimental studies showed that on average, ChatGPT boosts academic performance, affective-motivational states and higher-order thinking, but not more generally self-efficacy (Deng et al., 2024). There have been robust effects on achievement (Dong et al., 2025) and cognitive, competency and

affective outcomes (Ma & Zhong, 2025); the latter dimension that of self-efficacy reports the lowest gains.

More and more, self-efficacy is being used as a predictor as well as an outcome. Bewersdorff et al. (2025) discovered that the attitudes, interest, and use of AI by students correlate to students' AI self-efficacy, and identified student profiles. Jeilani and Abubakar (2025) demonstrated that the relationship between institutional support and positive attitudes about AI learning is moderated by technology self-efficacy. From primary and lower-secondary samples, we also have evidence of an equity concern girls have less self-efficacy to learn with digital media than boys (Baez et al., 2026). The literature as a whole lead to a conditional statement, that AI supported learning contributes to improving self-efficacy, which is dependent on the design, dependency and availability of the learning tool and the learners and not certain. Much of this is concentrated, however, in the context of higher education or in the West and East Asian contexts, with the classrooms of secondary education in India scarcely examined in the present study.

3. Objectives

- To examine the association between AI-assisted learning use and self-efficacy among secondary students in Uttar Pradesh.
- To identify the factors (access, dependency, gender) that moderate this association.

4. Hypotheses

H1: There is a significant positive association between AI-assisted learning use and students' self-efficacy.

H2: The association is moderated by learner and contextual factors such as locale (urban/rural) and dependency.

5. Research Methodology

The research design that was used in this research was descriptive survey research, which is appropriate to determine the perception and experience of a defined population at a certain time. Describing and testing the relationship between AI-assisted learning and self-efficacy among secondary students was the goal and not manipulation of variables in an experimental setting. The study was carried out in Uttar Pradesh with students of IX to XII classes in government, government-aided and private secondary schools in both urban and rural areas. The respondents were sampled using stratified sampling and convenience sampling with 200 respondents from the population of 2,074 respondents, stratified by locale and school type as a reflection of the diversity of the state. The unit of analysis was the secondary student as an individual. The data were gathered using a structured questionnaire that was divided into three sections: (1) Demographic profile, (2) AI-tool usage patterns, and (3) Self-efficacy section measured on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree) with items adapted from established self-efficacy theory to reflect academic confidence in an AI-assisted setting. Content and pilot testing were done to test the clarity of the instrument before administration to subject experts. Primary data were collected from the respondents directly through the questionnaire both on

paper and online. Peer-reviewed journals and reports were used to obtain secondary data, to frame the study and its interpretation of the findings. The responses were analysed through percentage analysis for categorical items, mean and standard deviation for Likert items, and Pearson's product-moment correlation was used to test the hypothesised relationship between AAL use and self-efficacy. Information is displayed graphically in tables. This mixed quantitative method enabled describing the usage patterns and conducting statistical tests of the study hypotheses.

6. Results and Interpretation

Table 1. Demographic profile of respondents (N = 100)

Variable	Category	%
Class	IX / X / XI / XII	22 / 28 / 26 / 24
Gender	Male / Female	54 / 46
Locale	Urban / Rural	58 / 42
School type	Government / Private / Aided	47 / 41 / 12

Source: Primary data.

The secondary stage was a balanced sample of students as shown in Table 1, where the classes IX to XII are fairly equally distributed and there is a slight male dominance (54%). The split between urban and rural schools (58:42) and between government and private schools (47:41) is indicative of the structural diversity of Uttar Pradesh, and the results for AI-assisted learning and self-efficacy reflect well-resourced schools as well as resource-constrained schools, rather than just a privileged subset of learners.

Table 2. AI tool usage and frequency

Item	Category	%
Use AI tools for studies	Yes / No	88 / 12
Frequency	Daily / Few times a week	18 / 33
	Occasionally / Rarely / Never	28 / 16 / 5
Tools used (multi-select)	ChatGPT / Gemini-Assistant	71 / 44
	Photomath / Grammarly / Others	31 / 23 / 38

Source: Primary data

As shown in Table 2, the use of AI tools is indicated as widespread but irregular, with 88% of students using AI tools, while only 18% uses them everyday, and 33% use them a few times a week. ChatGPT outperforms, at 71%, followed by Gemini/Assistant at 44% and Photomath at 31%. This pattern of high reach and moderate intensity is in line with national trends and indicates that exposure is sufficiently pervasive to reasonably support the notion that AAL has an impact on students' self-efficacy.

Table 3. Self-efficacy in AI-assisted learning (five-point Likert)

Statement	Mean	SD
AI tools help me complete difficult academic tasks	3.94	0.82
I feel more confident attempting new topics with AI support	3.81	0.88
AAL improves my belief that I can score well	3.72	0.91
I can learn independently after using AI to grasp a concept	3.45	1.02
I feel less confident solving problems without AI	3.38	1.07

Source: Primary data

Table 3 indicates that there is generally positive self-efficacy. The highest are related to concern about task completion (3.94) and confidence with new topics (3.81) indicating that AAL fosters mastery experiences. Independent learning scores lower, though (3.45), and the dependency item is notable (3.38), suggesting that a significant proportion of students feel less able to learn without AI a clear sign that perhaps confidence in the ability to learn with AI is more reliant on the tool than fully internalised.

Table 4. Self-efficacy areas most improved by AAL

Area	%
Understanding difficult topics	41
Confidence in exam preparation	24
Time management and planning	19
Writing and language	12
Problem-solving (independent)	4

Source: Primary data

Table 4 the dimension with the highest mean score from the students is related to comprehension (41%) followed by exam confidence (24%), the dimensions most closely related to academic self-efficacy. Independent problem-solving sits at 4% by comparison, reflecting a trend that is observed throughout the entire data set in Table 3: AI enhances the confidence of understanding and preparing but has a minimal role in the students' confidence in solving problems independently just the area most important to self-efficacy in the long term.

Table 5. Perceived challenges of AI-assisted learning

Challenge	%
Over-dependence / less confident without AI	27
Reduced effort and critical thinking	22
Limited access / connectivity (mainly rural)	19
Inaccurate or misleading answers	18
Privacy concerns	14

Source: Primary data

The moderators of the effect of AAL are identified in Table 5. The biggest concern is over-dependence (27%) and reduced effort (22%) which directly impact self-efficacy. The connectivity constraint (19%) is concentrated in rural areas indicating an equity constraint unique to Uttar Pradesh. These are combined challenges, which help to understand why the positive self-efficacy effect, although present, is limited and why unguided AAL can potentially widen rather than close gaps.

Table 6. Hypothesis testing (Pearson correlation and group means)

Test	Statistic	Result
AAL use × self-efficacy (H1)	$r = 0.58, p < 0.01$	Significant positive; H1 accepted
Urban vs rural mean self-efficacy (H2)	3.86 vs 3.41	Significant difference; H2 accepted
Male vs female mean self-efficacy	3.79 vs 3.55	Mild gender gap

Source: Primary data

The results of the two hypotheses are confirmed in Table 6. The relationship between the use of AAL and self-efficacy is moderately and significantly correlated ($r = 0.58$, $p < 0.01$), supporting the positive pooled effect found by Ren et al. (2026). The urban–rural gap (3.86 vs 3.41) accepts H2, demonstrating that the relationship is specific to context, and, the mild gender gap corresponds to experimental evidence that gains in AI self-efficacy are real, but not uniform (Yilmaz & Karaoglan Yilmaz, 2023).

7. Discussion

Results answer the research questions and support the hypothesised answers. A significant positive relationship between AI-assisted learning and self-efficacy ($r = 0.58$, $p < 0.01$) confirms H1 and aligns with previous meta-analytic evidence (Ren et al., 2026). This connection aligns with the concept of self-efficacy theory, as AI support provides mastery experiences and timely feedback, enhancing students' self-efficacy (Bandura, 1982). The significant gains were in understanding challenging concepts (41%) and exam confidence (24%), mirroring trends in previous research, where generative AI led to positive gains in self-efficacy in learning tasks (Yilmaz & Karaoglan Yilmaz, 2023; Parsakia, 2023). The results also indicate key caveats, however. There is a greater improvement in understanding and confidence with AI than with self-learning skills. The scores for independent learning (3.45) and problem-solving (4%) indicate that while AI support can boost confidence, it does not always result in independence, whereas dependency concerns (3.38) suggest that it can indeed add to dependency. This aligns with the previous studies demonstrating the benefits of AI on performance; however, "over-dependence" on AI tools must be mitigated with careful integration (Deng et al., 2024).

The findings also help in the support for H2 as they demonstrate contextual differences. Learners' self-efficacy with digital technology was higher in the urban context (3.86 compared to 3.41 in the rural context) and barriers to connectivity impacted 19% of learners. This implies that infrastructure, digital literacy, and institutional support are factors affecting the learning outcomes of AI (Zhao et al., 2025; Jeilani & Abubakar, 2025). The slight gender difference in relation to the Digital Learning Self-efficacy (3.79 v. 3.55) further reinforces the importance of inclusive use of AI in learning. Overall, AI-based learning should be used as an 'assisting' scaffold and not as a substitute for human scaffolding, emphasizing a focus on teacher mediation, AI literacy, ensuring equal access, and cultivating real learner independence.

8. Conclusion

This study reveals a positive association between Artificial Intelligence-Aided Learning and SCL of secondary students in Uttar Pradesh, but it is not a simple one. While AAL most increases students' confidence around understanding challenging topics and preparing for exams, it adds and causes less students to feel confident in solving problems on their own and a significant portion of students feel less confident without the use of AI. This benefit is tempered by the urban–rural access difference and the modest gender difference, suggesting the need to be careful with unguided adoption to prevent further exacerbating inequalities. Self-efficacy is enhanced

through AI assisted learning that scaffold, offers constructive feedback and enables students to achieve success at challenging tasks. This potential can be realized in secondary schools in Uttar Pradesh through teacher mediated integration, clear teaching of AI literacy, gender neutral rural connectivity, and AI skills development alongside human teachers, rather than replacing them, and fostering students' self-efficacy in learning.

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