EXPLORING TEACHERS' SELF-EFFICACY BELIEFS TOWARDS THE INTEGRATION OF ARTIFICIAL INTELLIGENCE TOOLS IN K–12 EDUCATION

Research Paper

ABSTRACT

This research examined teachers' self-efficacy beliefs about using Artificial Intelligence (AI) tools in K–12 education. A survey design was utilised with 120 teachers as the sample from the Theni district. Factors like grade level, type of AI tools utilised, accessibility of AI tools, experience in teaching, and subject area were the focus areas of the investigation. The findings indicated no substantial differences in self-efficacy based on these factors. Nonetheless, a significant difference was identified with school type (Government, Govt. aided and Private). These results indicated that the institutional context influences teachers' confidence in embedding AI in teaching.

Key Words : *Self-efficacy beliefs, Artificial Intelligence tools*

Introduction

Digital platforms that facilitate administration, instruction, and learning are known as Artificial Intelligence (AI) tools in education. They support content creation, student performance analysis, learner personalisation, and automated grading. Gradescope, Duolingo, and ChatGPT are a few examples. These resources lessen the strain for teachers, increase student involvement, and improve the effectiveness, accessibility, and customisation of education.The swift transformation of Artificial Intelligence (AI) technologies has had a wide-ranging influence across different fields, including education. In K–12 environments, AI tools offer fruitful potential for improving individualised instruction, automating administrative responsibilities, and facilitating differentiated instruction (Holmes et al., 2022). Nevertheless, the successful integration of AI tools within classrooms depends on the presence of technology and teachers' perceptions regarding their ability to utilise such tools vigorously. This belief system, also known as self-efficacy, is a significant factor in influencing teachers' propensity to take and implement new technologies (Bandura, 1997).

Teachers with high self-efficacy are likely to adopt educational innovations, persist in the face of adversity, and positively impact student outcomes (Tschannen-Moran & Hoy, 2001). Conversely, those with lower self-efficacy might feel apprehensive or resistant to using AI tools, viewing them as complicated or disruptive. As AI continues to emerge as a key component in educational change, knowing teachers' self-efficacy beliefs towards its implementation is crucial.

Despite increased interest in EdTech, there are limited studies of teachers' perceptions of AI in K–12 educational environments. This research hopes to investigate the degree to which teachers perceive optimism and readiness to implement AI tools in their classrooms and determine what factors affect these beliefs. By inquiring into these perceptions, educators and policymakers can more effectively develop professional development programs and support mechanisms to encourage effective technology implementation in schools.

Objectives of the study

1. To find out the teacher's self-efficacy beliefs towards the integration of Artificial Intelligence tools in K-12 education.
2. To find out the effects of grade level, type of school, type of AI tools used, accessibility of AI tools, teaching

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experience, subject area, and teacher's self-efficacy beliefs towards the integration of Artificial Intelligence tools in K–12 education.

Hypotheses

1. There is no significant difference in teachers' self-efficacy beliefs towards the integration of Artificial Intelligence tools in K-12 education, owing to differences in grade level.
2. There is no significant difference in teachers' self-efficacy beliefs towards the integration of Artificial Intelligence tools in K-12 education, despite differences in the type of school.
3. There is no significant difference in teachers' self-efficacy beliefs towards the integration of Artificial Intelligence tools in K–12 education, owing to differences in the type of AI tools used.
4. There is no significant difference in teachers' self-efficacy beliefs towards the integration of Artificial Intelligence tools in K-12 education, owing to differences in accessibility of AI tools.
5. There is no significant difference in teachers' self-efficacy beliefs towards the integration of Artificial Intelligence tools in K-12 education, owing to differences in teaching experience.
6. There is no significant difference in teachers' self-efficacy beliefs towards the integration of Artificial Intelligence tools in K–12 education, owing to differences in subject area.

Research design

Using a quantitative research approach, this study investigated teachers' self-efficacy regarding integrating Artificial Intelligence (AI) tools in K–12 education. Data were collected from 120 teachers in the Theni District of Tamil Nadu through a self-efficacy questionnaire. The questionnaire, which comprised 15 items, assessed teachers' perceptions of their efficacy in using AI tools in education. Each item was rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The researcher developed a questionnaire that demonstrated reliability, with a Cronbach's alpha coefficient of 0.782.

Statistical Techniques Used

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Arithmetic Mean, Standard Deviation, t-test and ANOVA (F-test) were used to analyse the data using the jamovi data analysis software.

Data Analysis and Interpretation

Hypothesis 1: There is no significant difference in teachers' self-efficacy beliefs towards the integration of Artificial Intelligence tools in K-12 education, owing to differences in grade level.

Table 1
Significant difference in teachers' self-efficacy beliefs towards the integration of Artificial Intelligence tools in K-12 education with reference to grade level

Source of Variation	Sum of Squares	df	Mean Square Variance	Calculated 'F' Value	Table Value	Remarks
Between	158	2	79.1	1.61	3.04	NS
Within	5757	117	49.2			

S-Significant; NS-Not Significant.

Table 1 reveals that the variation due to Grade Level has a calculated F-value of 1.61, which is smaller than the table value of 3.04 for the provided degrees of freedom. Hence, revealed that the variation between the two groups is not statistically significant. Thus, we conclude that there is no difference in the measured outcome between different grade levels.

Hypothesis 2: There is no significant difference in teachers' self-efficacy beliefs towards the integration of Artificial Intelligence tools in K–12 education, despite differences in the type of school.

Table 2
Significant difference in teachers' self-efficacy beliefs towards the integration of Artificial Intelligence tools in K-12 education with reference to the type of school

Source of Variation	Sum of Squares	df	Mean Square Variance	Calculated 'F' Value	Table Value	Remarks
Between	410	2	205.2	4.36	3.04	S
Within	5505	117	47.1			

S-Significant; NS-Not Significant.

Table 2 shows a significant difference according to the school type, as indicated by the computed F-value of 4.36, which is higher than the table value of 3.04 at the same degrees of freedom. The variation between groups has a sum of squares of 410 with 2 degrees of freedom, hence a mean square of 205.2. Conversely, the within-group variation has a sum of squares of 5505 on 117 degrees of freedom, giving a mean square of 47.1, supporting the conclusion that school type has a statistically significant impact.

Hypothesis 3: There is no significant difference in teachers' self-efficacy beliefs towards the integration of Artificial Intelligence tools in K–12 education, owing to differences in the type of AI tools used.

Table 3

Significant difference in teachers' self-efficacy beliefs towards the integration of Artificial Intelligence tools in K-12 education with reference to the type of AI tools used

Source of Variation	Sum of Squares	df	Mean Square Variance	Calculated 'F' Value	Table Value	Remarks
Between	66.5	2	33.2	0.665	3.04	NS
Within	5849.1	117	50			

S-Significant; NS-Not Significant.

Table 3 indicated no significant difference since the calculated value of F (0.665) was lower than the table value (3.04).

Hypothesis 4: There is no significant difference in teachers' self-efficacy beliefs towards the integration of Artificial Intelligence tools in K-12 education, owing to differences in accessibility of AI tools.

Table 4

Significant difference in teachers' self-efficacy beliefs towards the integration of Artificial Intelligence tools in K-12 education with reference to accessibility of AI tools

Source of Variation	Sum of Squares	df	Mean Square Variance	Calculated 'F' Value	Table Value	Remarks
Between	77.9	2	39	0.781	3.04	NS
Within	5837.7	117	49.9			

S-Significant; NS-Not Significant.

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The computed F-value (0.781) is smaller than the table value of 3.04, meaning that the variation between groups is not larger than the variation within groups. Therefore, the result is not significant.

Hypothesis 5: There is no significant difference in teachers' self-efficacy beliefs towards the integration of Artificial Intelligence tools in K-12 education, owing to differences in teaching experience.

Table 5

Significant difference in teachers' self-efficacy beliefs towards the integration of Artificial Intelligence tools in K-12 education with reference to teaching experience

Source of Variation	Sum of Squares	df	Mean Square Variance	Calculated 'F' Value	Table Value	Remarks
Between	20.1	2	10.1	0.199	3.04	NS
Within	5895.5	117	50.4			

S-Significant; NS-Not Significant.

The F-value (0.199), calculated is much smaller than the table value of 3.04. Because the F-value is less than the critical value for the specified degrees of freedom, the outcome is noted as not significant (NS), indicating that differences in teaching experience do not significantly affect the result.

Hypothesis 6 : There is no significant difference in teachers' self-efficacy beliefs towards the integration of Artificial Intelligence tools in K–12 education, owing to differences in subject area.

Table 6

Significant difference in teachers' self-efficacy beliefs towards the integration of Artificial Intelligence tools in K-12 education, with reference to the subject area

Source of Variation	Sum of Squares	df	Mean Square Variance	Calculated 'F' Value	Table Value	Remarks
Between	112	3	37.2	0.744	3.04	NS
Within	5804	116	50			

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The computed F-value (0.744) for the subject area is smaller than the table value (3.04) at the specified degrees of freedom. This indicates that there is no statistically significant difference between the groups with respect to subject area.

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Conclusion

Based on the findings of the study, it can be said that teachers' self-efficacy beliefs regarding the use of Artificial Intelligence (AI) tools in K–12 instruction are largely consistent across different factors like grade level instructed, nature of AI tools utilised, availability of these tools, teaching experience, and subject matter. This indicates that despite all these variables, teachers have equal confidence levels in applying AI tools in teaching. Yet, a strong difference exists with respect to school type, which means institutional context is instrumental in influencing teachers' self-efficacy beliefs. Schools can also vary regarding available resources, professional development opportunities, administrative support, and general technology readiness for integration, which can directly affect teachers' confidence in using AI within their classrooms. These results support the importance of school-level support and specific professional development in making teachers more confident and effective with AI tools for education.

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