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PERCEPTION ON ADAPTIVE TEACHING-LEARNING SYSTEMS WITH AI-POWERED PEDAGOGICAL APPROACHES AMONG B.ED STUDENT TEACHERS

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KEYWORDS

Perception, Adaptive, Teaching-Learning, Systems, AI-Powered, Pedagogical, Approaches, B.Ed student-teachers.

ABSTRACT

This article investigates the perception of B.Ed student teachers regarding adaptive teaching-learning systems integrated with AI-powered pedagogical approaches. As technology continues to reshape education, understanding how future educators perceive and accept such innovations is critical in teaching-learning. The integration of AI-powered pedagogical approaches into the educational site offers possibilities for personalized learning, real-time assessment, enhanced engagement, and broader accessibility. This is a descriptive survey method and involved 274 student-teachers from different B.Ed colleges in Coimbatore, Tamil Nadu. The self-constructed Likert-scale questionnaire was administered to gather data on dimensions such as awareness, usefulness, readiness, challenges, and willingness to use AI in pedagogy. The findings revealed a generally positive perception towards AI-enabled adaptive learning tools. The statistical analysis indicated the significant difference in perception on adaptive teaching-learning systems with AI-powered pedagogical approaches based on the demographic variables (their gender, age, marital status, year of study, location of college, qualification and subject specialization. However, a significant difference was found based on prior knowledge of AI, suggesting that exposure to AI tools contributes to higher acceptance levels. These insights emphasize the need to include AI-related modules in teacher education curricula and to provide targeted training that enhances digital literacy in teaching-learning. This paper helps in educational innovation and calls for systemic integration of AI tools in teacher training to foster future-ready classrooms. The findings support the development of policies and programs that prepare B.Ed student teachers for technology-enhanced teaching and learning.

INTRODUCTION

Education is the powerful tool in the society which can bring a massive change in the emerging systems. The education makes the society undergoes numerous changes that are indeed for the today's scientific world. In that sense, technology is a very useful and exciting field that is currently growing. Additionally, technology is enhancing the manner that education is taught and learned. The educators are very much interested to bring new technological based teaching learning ideas for effective educational settings. The use of

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adaptive learning teaching-learning systems with AI-pedagogical approaches in regular pedagogical approaches are fascinating and promising developments for effective teaching-learning. Today, the digital knowledge is causing enormous upheaval in every industry, including the labour market and company models. The present educational adhering must also change rapidly in the modern day to keep up with the shift in skill sets.

SHAPING THE CLASSROOM WITH AI-POWERED PEDAGOGICAL APPROACHES

Personalised Learning

The biggest advantages of AI-enabled adaptive learning are personalized learning systems. The students were treated equally under traditional classroom methods, which presume that they all learn in the same way and at the same rate. We are conscious that this is untrue. Thus, every child has a different learning style, speed, and comprehension level. The adaptive teaching-learning systems with AI-powered pedagogical approaches can assist students to learn at their own style and their own learning preferences. The technologies enhance students learning outcomes and increase students' engagement by analysing their performance data and providing personalized comments.

Conversational AI

The technology recognized the conversational, that AI makes it possible for computers to communicate with people using natural language. By providing students and teachers with real-time feedback and assistance, the AI conversational has the potential to improve educational teaching-learning. The Chatbots can assist students in navigating challenging course content, respond to their inquiries, and offer comments on their work.

Virtual Reality and Augmented Reality

The virtual reality and augmented reality technologies can be used for immersive learning experiences and it engage students for effecting teaching-learning through interacting with 3D objects. With the help of these tools, the students can explore new environments, visualize complex concepts, and practice practical skills like engineering or surgery in a safe context.

Better Assessment

The most important part in the learning process is the assessment. The educators can find the effectiveness of their teaching methods and identify areas for improvement with the help of the better assessment. The multiple-choice exams and other conventional evaluation techniques, however, can be restrictive. There are more advanced methods of evaluations are provided by AI and adaptive learning, which enables teachers to monitor students' progress in real time, pinpoint their areas where they lack behind and need real assist. This makes it easier to guarantee that every student is making the proper development and getting the aid they require to be successful.

Improved Engagement

The essential content for learning to be effective is engagement. The pupils who actively participate in their education are more likely to remember material and perform better academically. The virtual reality, gamification, and interactive content

are just a few of the tools and technologies that AI and adaptive learning provide to assist increase engagement. These resources can make the students be motivated for more enjoyable and engaging, in the educational process.

Enhanced Accessibility

The accessibility is one of the biggest advantages of AI and adaptive teaching-learning systems. Regardless of a student's location, technology-based solutions can assist remove obstacles to education by giving them access to top-notch teaching-learning resources. For instance, these technologies can help students and teachers for effective inclusive education, to avoid teaching-learning difficulties, and students in long distance can access online courses and resources.

Effective Teacher Support

These difficulties, are the evident that technologies like artificial intelligence (AI) and adaptive teaching-learning are having a high impact on education for the future endeavours. The personalized learning, greater evaluation, expanded accessibility, improved engagement, and improved teacher assistance are just a few advantages that these technologies provide for the effective teacher support. There will probably be even more innovation in this area as the world grows more digital, which will help to guarantee that education is still available, interesting, and successful for all students.

LITERATURE REVIEW

Elize C. Du Plessis (2020), this study examined the perception of student teachers' experiences, and challenges related to learner-centred teaching. The data were gathered through written reflections in teaching practice notebooks. The participants were B.Ed students placed in a variety of school settings, ranging from well-resourced institutions to underprivileged schools lacking teaching materials. Representing diverse cultural backgrounds, these student teachers operated under the constructivist learning framework. The findings revealed that although they recognize the concept, their understanding of learner-centred teaching is still limited. They face three major challenges in implementing it, highlighting the need for increased lecturer guidance, reflective practice, and stronger mentorship support.

Vithoba Sawant (2021), the study investigated student teachers' perceptions of inclusive education, emphasizing the importance of embracing diversity, ensuring equity, and preparing socially responsible educators. As future teachers will interact with children with special needs, their attitudes toward inclusion are crucial. Using a normative survey method, the researcher conducted action research with 50 B.Ed student-teachers from a College of Education. The study aimed to assess and compare their perceptions of inclusion based on gender, faculty, and qualification.

Garcia-Noblejas et, al (2023), this study explored student teachers' perceptions about the benefits of their teaching practicum. A cross-sectional survey was conducted with 455 Early Childhood and Primary Education (ECPE) students from university in Madrid, using data collected between 2017 and 2022, excluding 2019/2020. Quantitative analysis showed that perceptions varied most

according to the practicum stage, with lower satisfaction during the intermediate phase. Gender also influenced responses, while degree type showed consistent results. The study suggests improvements to practicum design to better meet student needs.

Maria Josephine (2024), The study investigated student teachers' perceptions of the Self-Blended Model (SBM) within the Blended Learning Approach (BLA). Using the EDMODO platform, an eight-week intervention combined online and classroom-based learning, allowing flexible access to resources with teacher support. Fifty-four student teachers participated using an experimental design. Their perceptions were assessed through dimensions such as interactivity, content design, material usage, technology support, and overall satisfaction. The results indicated a positive perception of BLA, with the experimental group and the control group. The findings revealed that blended learning can fosters better engagement and performance, recommending its wider adoption in teacher education.

RESEARCH GAP

Despite the increasing integration of technology in education, particularly through AI-powered systems, limited research has explored the perceptions of B.Ed student teachers toward adaptive teaching-learning approaches driven by artificial intelligence. Existing studies have primarily focused on learner-centred teaching, inclusive education, blended learning, and practicum experiences. While other studies emphasize pedagogical innovation and the role of technology in general, they do not specifically address how future teachers perceive AI-driven adaptive learning systems in terms of personalization, interactivity, and instructional support. This leaves a notable gap in understanding the preparedness, acceptance, and expectations of teacher trainees toward AI-enhanced education. This study helps to bridge this gap by examining B.Ed student teachers' perceptions of adaptive teaching-learning systems integrated with Artificial Intelligence, thereby contributing to the design of future-ready teacher education programs.

NEED AND SIGNIFICANCE OF THE STUDY

The current conventional pedagogical approaches are rapidly converting with the integration of Artificial Intelligence (AI) powered pedagogy and adaptive teaching-learning systems for effective teaching-learning. This paper, helps to know the perception of B.Ed student-teachers on adaptive teaching-learning systems with AI-powered pedagogical approaches is significant as it explores how future educators understand and accept technology-driven instruction. As AI tools increasingly support personalization, differentiated instruction, and immediate recovery, understanding about preparedness and attitudes of B.Ed trainees becomes essential. This help to equipe the student teachers to be the key ambassadors who will carry these new learning and teaching technologies among school students in the future. Their perceptions can influence how effectively these innovations are adopted in classrooms. The findings of this study will provide many ideas that can inform curriculum development, teacher

training programs, and policy decisions can help the future teachers with the competences which are necessary for 21st-century education.

STATEMENT OF THE PROBLEM

As educational environments increasingly integrate artificial intelligence to personalize learning, automate assessment, and enhance student engagement, it becomes crucial to understand how future educators view these technological advancements. The purpose of the study is to find the perception of B.Ed student-teachers on the way to adaptive teaching-learning systems that utilize AI-powered pedagogical approaches. Their attitudes, understanding, and readiness to adopt such tools can significantly impact their teaching effectiveness and student outcomes. This also helps to finds the levels of awareness, acceptance, and perceived challenges or benefits of AI in education among B.Ed trainees, thereby contributing to teacher education practices and policies in the digital age.

OBJECTIVES

1. To investigate how B.Ed. student instructors' perceptions of adaptive teaching-learning systems with AI-powered pedagogical approaches varies significantly depending on their gender.
2. To find out the significant difference between the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to their year of study.
3. To investigate how B.Ed. student instructors' perceptions of adaptive teaching-learning systems with AI-powered pedagogical techniques fluctuate significantly depending on their marital status.
4. To determine whether B.Ed. student teachers' perceptions of adaptive teaching-learning systems using AI-powered pedagogical techniques differ significantly depending on where their college is located.
5. To investigate how B.Ed. student instructors' perceptions of adaptive teaching-learning systems with AI-powered pedagogical techniques varies significantly depending on their educational background.
6. To investigate how B.Ed. student instructors' perceptions of adaptive teaching-learning systems with AI-powered pedagogical approaches varies significantly depending on their age group.
7. To examine how B.Ed. student instructors' perceptions of adaptive teaching-learning systems with AI-powered pedagogical approaches varies significantly depending on their topic expertise.
8. To investigate the notable variations in B.Ed. student instructors' perceptions of adaptive teaching-learning systems using AI-powered pedagogical techniques in relation to their prior understanding of AI-based tools.

HYPOTHESES OF THE STUDY

1. B.Ed. student teachers' opinions of adaptive teaching-learning systems using AI-powered pedagogical approaches do not significantly differ based on their gender.
2. B.Ed. student instructors' perceptions of adaptive teaching-learning systems using AI-powered pedagogical approaches do not significantly differ based on their year of study.
3. B.Ed. student teachers' opinions of adaptive teaching-learning systems using AI-powered pedagogical approaches do not change much based on their marital status.
4. Regarding the location of their institution, B.Ed. student teachers' perceptions of adaptive teaching-learning systems using AI-powered pedagogical approaches do not significantly change.
5. Regarding their educational background, B.Ed. student instructors' perceptions of adaptive teaching-learning systems with AI-powered pedagogical approaches do not differ significantly.
6. Regarding their age category, B.Ed. student instructors' perceptions of adaptive teaching-learning systems using AI-powered pedagogical approaches do not significantly differ.
7. B.Ed. student teachers' opinions of adaptive teaching-learning systems with AI-powered pedagogical approaches do not significantly change based on their topic expertise.
8. With regard to their prior knowledge of AI-based technologies, B.Ed. student instructors' perceptions of adaptive teaching-learning systems with AI-powered pedagogical techniques do not differ significantly.

METHODOLOGY

This study adopts a survey method for collecting the data, about the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers. It enables the researcher to collect data systematically and to analyse quantitative data from a defined sample to draw conclusions about the larger population. The study population represents the B.Ed student teachers enrolled in recognized teacher education institutions. The sample includes **274** B.Ed student teachers from selected colleges of Coimbatore. The sampling techniques use here to collect data is simple random sampling technique. The self-constructed tool named ‘perception scale’ used to collect data. The tool used here is five-point Likert scale (Strongly Agree to Strongly Disagree).

DATA ANALYSIS

H1: There is no significant difference between the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to their gender.

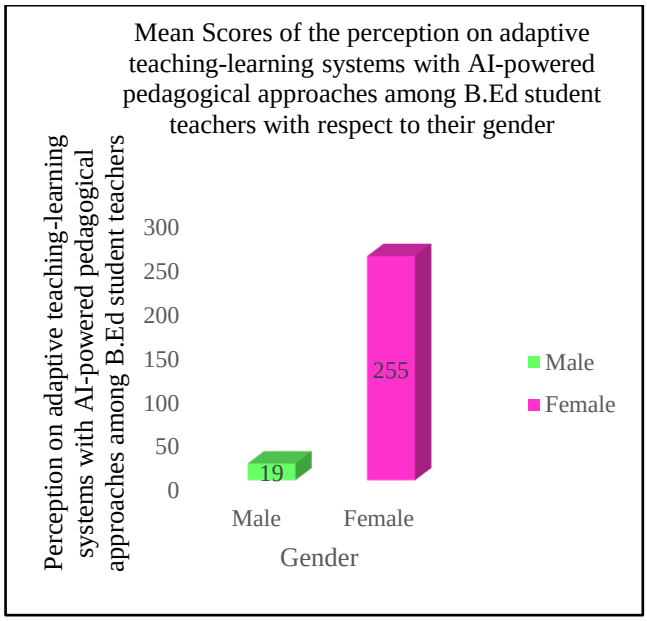
Table:1

Variable	Gender	N	Mean	SD	‘t’ - Value	sig	Level of Significant
EWS	Male	19	130.84	18.09	0.912	0.363	NS*
	Female	255	133.88	13.67			

*NS- Not Significant

The above table 1, reveals that the calculated t-

value in the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student-teachers with respect to their gender is (0.912) which is less than that of the tabulated t-value 1.962 for df (272) at 0.05 level of significance and also it is observed from the calculated significant value (0.363), which is greater than 0.05. So, the statistics fails to reject the null hypothesis. Hence there is no significant difference between the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to their gender.

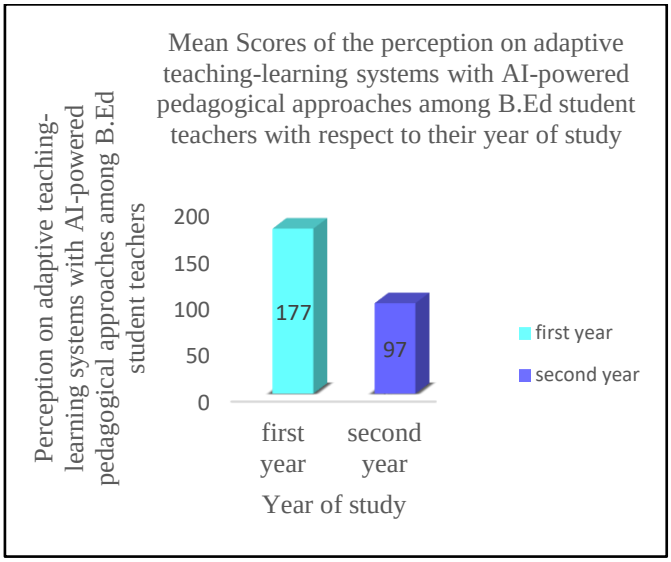


H2: There is no significant difference between the perception on adaptive teaching-teaching systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to their year of study.

Table:2

Variable	Year of Study	N	Mean	SD	't' - Value	sig	Level of Significant
EWS	1st Year	177	133.19	15.01	0.773	0.440	NS
	2nd Year	97	134.56	12.03			

The above table 2, reveals that the calculated t-value in the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to their year of study is (0.773) which is less than that of the tabulated t-value 1.962 for df (272) at 0.05 level of significance and also it is observed from the calculated significant value (0.440), which is greater than 0.05. So, the statistics fails to reject the null hypothesis. Hence there is no significant difference between the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to the year of study.

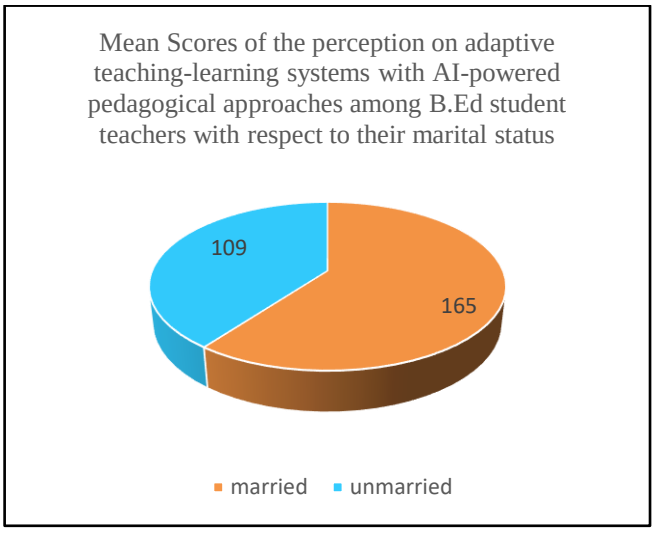


H3: There is no significant difference between the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to their marital status.

Table:3

Variable	Marital Status	N	Mean	SD	't' - Value	sig	Level of Significant
EWS	Married	165	134.19	14.05	0.750	0.454	NS
	Un Married	109	132.89	13.99			

The above table 3, reveals that the calculated t-value in the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to their marital status is (0.750) which is less than that of the tabulated t-value 1.962 for df (272) at 0.05 level of significance and also it is observed from the calculated significant value (0.454), which is greater than 0.05. So, the statistics fail to reject the null hypothesis. Hence there is no significant difference between the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student-teachers with respect to their marital status.

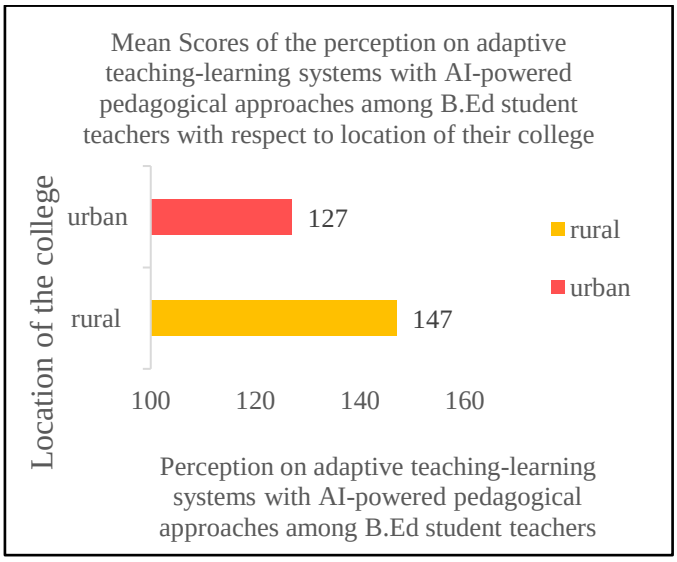


H4: There is no significant difference between the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to the location of their college.

Table:4

Variable	Location of the college	N	Mean	SD	't' - Value	sig	Level of Signif-icant
EWS	Rural	147	133.38	12.967	0.369	0.713	NS
	Urban	127	134.01	15.186			

The above table 4, reveals that the calculated t-value in the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to the location of their college is (0.369) which is less than that of the tabulated t-value 1.962 for df (272) at 0.05 level of significance and also it is observed from the calculated significant value (0.713), which is greater than 0.05. So, the statistics fails to reject the null hypothesis. Hence there is no significant difference between the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to the location of their college.

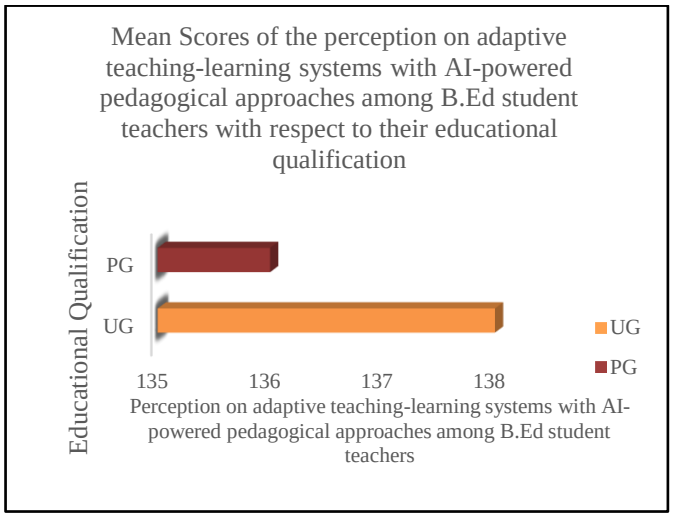


H5: There is no significant difference between the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student-teachers with respect to their educational qualification.

Table:5

Variable	Qualifi-cation	N	Mean	SD	't' - Valu e	sig	Level of Signific-ant
EWS	UG	138	133.10	13.519	0.678	0.499	Not significa-nt

The above table 5, reveals that the calculated t-value in the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to their educational qualification is (0.678) which is less than that of the tabulated t-value 1.962 for df (272) at 0.05 level of significance and also it is observed from the calculated significant value (0.499), which is greater than 0.05. So, the statistics fails to reject the null hypothesis. Hence there is no significant difference between the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to their educational qualification.

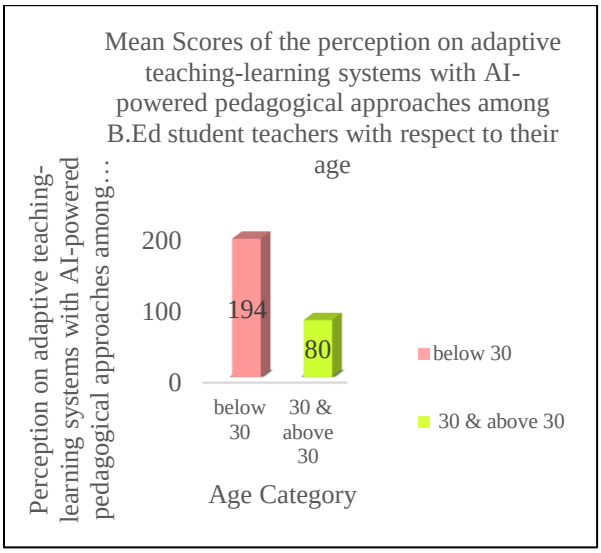


H6: There is no significant difference among the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student-teachers with respect to their age category.

Table: 6

Variable	Age Category	N	Mean	SD	't' - Value	sig	Level of Significant
EWS	Below 30 years	194	132.85	13.590	1.523	0.129	Not significant
	30 years and above	80	135.66	14.897			

The above table 6, reveals that the calculated t-value in the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student-teachers with respect to their age category is (1.523) which is less than that of the tabulated t-value 1.962 for df (272) at 0.05 level of significance and also it is observed from the calculated significant value (0.129), which is greater than 0.05. So, the statistics fail to reject the null hypothesis. Hence there is no significant difference in the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to their age category.



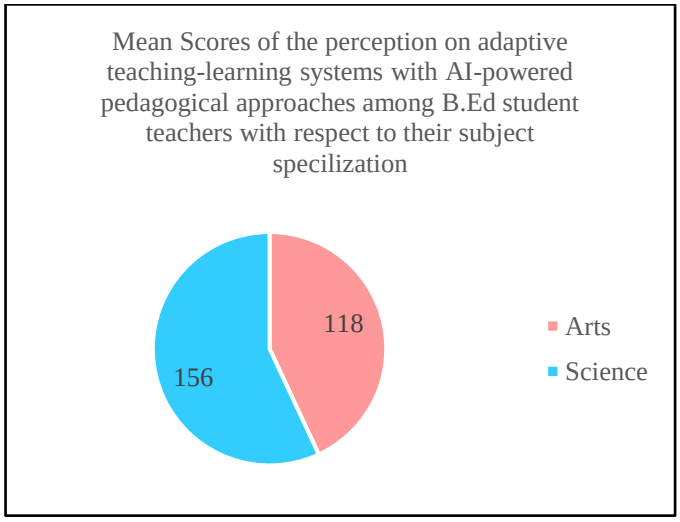
H7: There is no significant difference between the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to their subject specialization.

Table: 7

Variable	Subject Specialization	N	Mean	SD	't' - Value	sig	Level of Significant
EWS	Arts	118	132.58	14.550	1.117	0.265	NS
	Science	156	134.49	13.588			

The above table 7, reveals that the calculated t-

value in the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to their subject specialization is (1.117) which is less than that of the tabulated t-value 1.962 for df (272) at 0.05 level of significance and also it is observed from the calculated significant value (0.265), which is greater than 0.05. So, the statistics fail to reject the null hypothesis. Hence there is no significant difference in the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student-teachers with respect to their subject specialization.

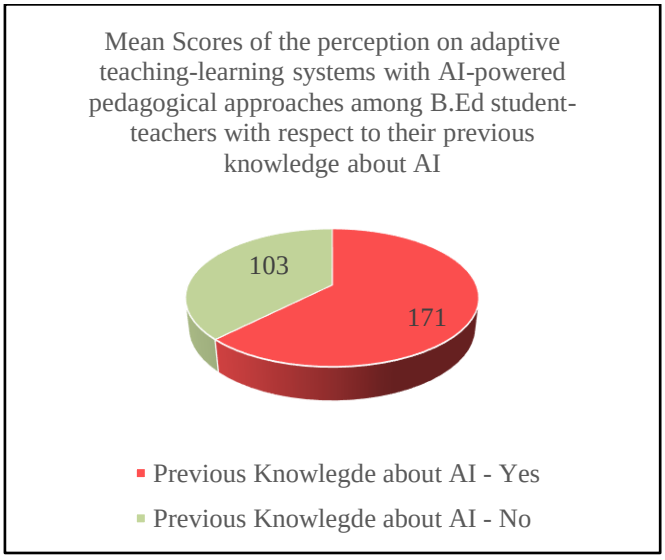


H8: There is no significant difference between the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to their previous knowledge about AI-based tools.

Table: 8

Variable	Previous Knowledge about AI	N	Mean	SD	't' - Value	sig	Level of Significant
EWS	Yes	171	136.47	13.659	4.396	0	Significant
	No	103	129.03	13.417			

The above table 8, reveals that the calculated t-value in the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to their previous knowledge about AI is (4.396) which is greater than that of the tabulated t-value 1.962 for df (272) at 0.05 level of significance and also it is observed from the calculated significant value (0), which is less than 0.05. So, the statistics fails to accept the null hypothesis. Hence there is significant difference in the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to their previous knowledge about AI.



Findings of the Study

1. The majority of B.Ed student teachers demonstrated a positive perception towards the adaptive teaching-learning systems integrated with AI-powered pedagogical approaches. Most respondents agreed that AI tools can personalize learning experiences, improve engagement, and support differentiated instruction.

2. The independent samples t-test revealed that there is no statistically significant difference in perception scores between male and female student teachers ($p > 0.05$), indicating that gender does not influence their attitudes toward the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers.
3. There is no significant difference between the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student-teachers scores based on the locality of the college (urban vs. rural).
4. There is no significant difference between the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers with respect to their year of study.
5. There is no significant difference between the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers based on their subject specialization (Arts vs. Science), suggesting that openness to AI tools transcends disciplinary boundaries among B.Ed students teachers.
6. There was no significant difference among the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers based on their age (below 30 years or 30 years and above 30 years).
7. There was no significant difference between the perception on adaptive teaching-learning systems with AI-powered pedagogical approaches among B.Ed student teachers based on their marital status.
8. The B.Ed student teachers significantly differ in their perception on adaptive teaching-learning systems with AI-powered pedagogical approaches with respect to the prior knowledge about AI. Those who had previous exposure to AI concepts or tools exhibited more positive and informed attitudes. It suggests that familiarity with AI technologies enhances confidence, openness, and readiness among future educators to adopt innovative digital methodologies in their professional practice for better teaching-learning.

EDUCATIONAL IMPLICATIONS OF THE STUDY

1. This insight provides for teacher education programs to integrate AI-related pedagogical training within the B.Ed curriculum, ensuring that future teachers are equipped to handle adaptive and technology enhanced earning environments in teaching-learning.
2. The significant role of prior AI knowledge suggests that pre-service teacher training workshops and orientation programs should include practical exposure to AI-powered

tools and applications in education to serve this society with equipped digital tools in the field of teaching-learning.

3. Educational policy makers and institutions should consider the findings to frame guidelines that promote AI literacy among student teachers for better teaching-learning, regardless of their specialization, location, or demographic background.
4. Since perceptions were not influenced by locality or subject stream, institutions in both rural and urban areas should be equally encouraged and supported in adopting AI-driven systems, bridging the digital divide into the educational settings.
5. Institutions should encourage ongoing research and feedback mechanisms to monitor how adaptive AI-based learning tools are perceived and utilized in practice over time with all aspects of educational systems.

CONCLUSION

The findings revealed an overall positive outlook among student teachers regarding the benefits of AI in education, particularly in enhancing personalization and learner engagement. Importantly, the analysis showed that gender, age, marital status, subject specialization, year of study, and college locality did not significantly affect perceptions indicating a broad acceptance of AI across diverse learner backgrounds. However, student teachers with prior knowledge of AI demonstrated significantly more favourable perceptions, highlighting the importance of awareness and exposure in shaping attitudes toward educational technology. These results underscore the requirements for structured AI training in teacher education and advocate for the thoughtful integration of AI tools to better prepare future educators for digitally enriched classrooms.

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