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Impact of AI-Powered Learning Platforms on Academic Achievement of Secondary School Students in Pune

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Introduction

Artificial Intelligence (AI) has emerged as a transformative force in modern education, offering personalized learning pathways, adaptive assessments, and data-driven instructional support. AI-powered learning platforms such as intelligent tutoring systems, recommendation-based learning apps, and automated feedback systems are increasingly being integrated into school-level instruction in India. Pune, as an educational and technological hub, has witnessed widespread adoption of such platforms in secondary schools. This study investigates the impact of AI-enabled learning systems on the academic achievement of secondary school students in Pune.

Theoretical Background

Artificial Intelligence in Education (AIED)- AIED frameworks emphasize individualized learning, real-time analytics, and automated pedagogical decisions. AI systems can analyze student performance, detect patterns in learning behaviour, and provide tailored interventions.

- Constructivist Learning Theory- AI platforms often support constructivist learning by enabling exploratory, self-paced, interactive learning environments.
- Adaptive Learning Models- AI-driven adaptivity allows dynamic modification of content difficulty, ensuring alignment with students' cognitive levels, leading to optimized academic outcomes.

Significance of the Study

- Provides empirical evidence on the effectiveness of AI tools in enhancing student achievement.
- Supports school administrators and policymakers in making informed decisions on EdTech investments.
- Assesses whether AI serves as a supplement or a significant enhancer to traditional teaching.
- Contributes contemporary data from an Indian metropolitan educational context.

Statement of the Problem

Despite extensive adoption of AI-based learning tools in Pune's secondary schools, there is insufficient systematic evidence on whether these platforms meaningfully improve academic achievement. This study examines whether AI-powered systems lead to measurable academic gains when compared to traditional instruction alone.

Operational Definitions

- **AI-Powered Learning Platforms:** Digital systems that use algorithms to personalize learning, provide adaptive feedback, and automate content delivery (e.g., BYJU'S AI modules, Khanmigo, Embibe, Knewton).
- **Academic Achievement:** The performance scores of students in standardized tests, term assessments, or subject-specific evaluations.
- **Secondary School Students:** Learners enrolled in Grades 9 and 10 in Pune district schools.

Variables

- Independent Variable- Use of AI-powered learning platforms

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- Dependent Variable- Academic achievement scores of students

Objectives of the Study

1. To assess the level of AI-platform usage among secondary school students in Pune.
2. To evaluate differences in academic achievement between users and non-users of AI platforms.
3. To analyze the relationship between AI-based learning engagement and academic outcomes.
4. To determine predictive variables within AI usage patterns affecting academic achievement.

Research Questions

1. What is the extent of AI platform utilization among secondary school students?
2. Does the use of AI-powered learning tools significantly affect academic achievement?
3. What is the strength of the relationship between AI engagement and performance scores?
4. Which AI engagement factors (frequency, duration, content type) predict academic outcomes?

Scope of the Study

The study includes both private and government secondary schools in Pune district and focuses solely on AI-driven digital learning tools.

Delimitations

- The study excludes non-AI digital learning tools (e.g., simple LMS, video lectures without AI adaptivity).
- Academic achievement is measured using school-provided assessment scores.
- The study relies on self-reported and teacher-reported data on platform usage.

Review of Related Literature

- Woolf et al. (2013)- Showed that intelligent tutoring systems significantly improve learning efficiency through personalised feedback.
- Knewton Research Lab (2016)- Found that AI adaptive learning environments lead to higher student retention and achievement.
- Holmes & Porayska-Pomsta (2018)- Reported that AI-based assessment tools improve learning analytics and support differentiated instruction.
- Luckin et al. (2020)- Highlighted the potential of AI in addressing individual learning gaps in school-level education.
- Nair & Menon (2022)- Indian study showing increased academic performance among students regularly using AI-driven learning apps.

Research Gap

Studies in Western contexts are abundant; however, limited empirical research exists on the impact of AI tools in Indian secondary schools. Particularly in urban centers such as Pune, the differential impact of AI engagement has not been fully examined.

Research Methodology

- Research Design- Descriptive, comparative, and correlational research design.
- Population- Secondary school students (Grades 9–10) in Pune district.
- Sample- 300 students selected from eight schools (both private and government).
- Sampling Technique- Stratified random sampling based on school type and gender.
- Data Sources
  - Primary data: Structured questionnaires, school records

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- Secondary data: Platform analytics, previous research studies

Research Instruments

1. AI Learning Engagement Scale (developed for the study)
2. Academic Achievement Test Scores (school records)
3. Student Digital Habits Questionnaire

Data Collection Procedure

Data collected through institutional permissions, student questionnaires, teacher interviews, and review of performance records.

Statistical Techniques

- Descriptive statistics (mean, SD)
- Independent sample t-test (AI users vs. non-users)
- Pearson correlation (AI engagement & achievement)
- Multiple regression analysis
- ANOVA for comparing schools and gender groups

Findings

- Students using AI-powered platforms will demonstrate statistically higher academic scores.
- Strong positive correlations are expected between AI engagement intensity and achievement.
- Predictors such as frequency of use, adaptive feedback utilization, and completion of AI-recommended tasks may significantly forecast academic gains.
- Achievement differences may vary by school type and socio-economic background.

Summary, Conclusions & Recommendations

The study suggests that AI-powered learning platforms play a significant role in enhancing students' academic achievement by offering personalized learning experiences and continuous feedback.

Recommendations include:

- Integrating AI tools into regular pedagogy as supplementary learning aids.
- Training teachers to interpret AI-based analytics.
- Ensuring equitable access to AI platforms for government school students.
- Encouraging parents to support structured AI-based home learning.

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