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Original Article

The Effectiveness of AI-Supported Formative Assessment under NEP 2020

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Abstract

Under the National Education Policy (NEP) 2020, there is a growing emphasis on continuous and formative assessment supported by technology to enhance student learning, and the present study attempts to examine the effectiveness of AI-supported formative assessment practices in this context. The primary objectives of the study were to analyse the impact of AI-supported formative assessment on students' learning outcomes under NEP 2020 and to examine students' perceptions toward the use of such assessment practices. The study is significant as it provides valuable insights for educators, policymakers, and educational institutions regarding the integration of artificial intelligence in assessment processes and supports the effective implementation of NEP recommendations. A descriptive survey method was adopted for the study, and data were collected from students using a structured Likert-scale questionnaire designed to capture both learning outcomes and perception-related variables. The collected data were analysed using descriptive and inferential statistical tools to ensure accurate interpretation of results. The major findings of the study revealed that AI-supported formative assessment has a positive and significant influence on students' learning outcomes by providing timely feedback, personalised learning support, and continuous monitoring of progress. Additionally, the findings indicated that students hold favourable perceptions toward AI-supported formative assessment practices, recognising their usefulness, ease of use, and effectiveness in enhancing learning experiences under the NEP framework.

Keywords: *NEP 2020, Formative assessment, AI, effective learning.*

Introduction

- **Formative assessment:**

Unlike summative assessment, formative assessment refers to an ongoing, continuous process of evaluating learners' learning outcomes during the instructional period with the primary purpose of improving. This is specially designed to monitor learners' progress and to find out the learning gaps so that timely constructive feedback can be shared with the learners and parents, and accordingly, the method of teaching can be changed. In this assessment, instead of evaluating learners at the end of an instructional unit, daily or regularly, they are evaluated through classroom activities and support learning as it happens. Under this assessment, the tools used are quizzes, assignments, observations, peer assessment, self-assessment, discussion and digital assessment. Under the New Education Policy, it is strongly emphasised to promote competency-based learning and to encourage critical thinking for the holistic development of the learners. It is becoming more effective with the help of AI today, being supported by technology. Some features are personalised feedback, adaptive learning pathways and real-time tracking of students' performance. The role of formative assessment in the student's development cannot be overlooked.

- **AI-supported formative Assessment**

Todays is the era of AI and modern technologies that is supporting in the evaluation process, and formative assessment is one of the most benefited aspect in teaching and learning. AI-supported formative assessment refers to the use of AI to design, administer, analyse and enhance the assessment process to improve learners' learning outcomes.

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It helps in continuous monitoring of students' progress through data-driven tools such as sch automated feedback, learning analytics, personalised feedback, and tutoring systems. It helps learning in finding out the strength and overcoming their weaknesses. It actually helps teachers by automating routine assessment tasks and reducing their manual assessment work. It helps in informed instructional decisions. Today, the competency-based education demands this AI-supported formative assessment for better educational outcomes. By fostering engagement, self-regulated learning and timely interventions, this kind of assessment can enhance the effectiveness of the teaching and learning process, making it more timely, precise and qualitative.

Review Of Literature

- **Bennett (2011)** carried out FS for learning with attention to measurement and system level constrains with a major objective to critically examine key issues related to system impact. For this, they used critical and narrative reviews. They argued that not always does this kind of assessment actually claim improvement in strength.
- **Berry et al. (2020)** studied government schools to assess continuous and comprehensive evaluation with a major objective of testing whether CCE improves math and language achievement teaching practices. For this, they used Randomised Controlled Trials (RCT) on 500 public schools in Haryana with 400 lower primary and 100 upper primary randomly assigned to CCE. They found that no significant score impact and argued that CCE increased the evaluation of paperwork.
- **Black & Wiliam (1998)** carried out classroom-based formative assessment in K-12 across different subjects with the major objective of reviewing the literature on the same to find out if it strengthens and improves learning of the learners. For this, they used a narrative research review. This study was more qualitative. They concluded that there is strong evidence that improving formative assessment can produce substantial learning gains.
- **Brown, Chaudhry & Dhamija (2015)** studied secondary and upper secondary private schools in India with a major objective of examining how teachers' beliefs about the purpose of assessment related to reported assessment practices by using large-scale surveys on teachers of classrooms 9-12 from private schools. They found that teachers in these schools show a positive attitude towards assessment.
- **Chakraborty, Kaushik & Ramachandran (2024)** studied inclusive schooling and how teachers adapt formative assessment for students with disabilities. They used the case study method for this study, consisting of semi-structured interviews. They studied 9 female general educators with purposive and snowball sampling. They found that FS is genuinely inclusive, consisting of many educational parameters.
- **Kanjee & Bhattacharjea (2019)** studied government schools in India for classroom assessment and use of evidence for learning improvement by using mixed method study on sampling of teachers from multiple government primary and upper primary schools across Indian states. They found that while teachers collected frequent assessment data and highlighted the need for assessment literacy and professional support.
- **Kingston & Nash (2011)** studied the impact of formative assessment practices on K-12 students' achievement to estimate the average achievement effect of formative assessment and test moderators. For this, they used Meta-analysis and moderative analysis methodology. The studied 300 students. They found that this approach was more promising for subjects like English.
- **Patidar (2013)** studied higher secondary classrooms in Kerala, showing the relationship between formative assessment practices and summative exam outcomes by using documentation analysis on 100 science stream students from two schools. They found that there is a relationship between formative and summative performance
- **Rao & Mehta (2018)** studied secondary school science education and formative assessment practices in classroom teaching by using quasi experimental design on 120 grade 9 students from two secondary schools. They found that students exposed to formative assessment strategies, questioning showing significant higher achievement and conceptual clarity.
- **Schildkamp et al. (2020)** studied the effectiveness of formative assessment to identify critical teacher prerequisites for formative assessment use in classroom practice. For this purpose, they followed a systematic review studying 54 case studies. They found that knowledge, skills and psychological and social factors do play an important role in FS.
- **Shute (2008)** studied the area of formative feedback as a core mechanism without FS with a major objective of synthesising research on what makes feedback formative and more effective, providing guidelines for delivery. They found that it helps in modifying learner thinking and improving learning.
- **Singh & Samad (2021)** studied teacher educational institutions in India and formative assessment for professional learning to explore how FS influence reflective practices and pedagogical skills among teachers. They used a descriptive survey method on 150 pre-service teachers from three colleges by using convenience sampling.

Statement Of The Problem

Under NEP 2020, continuous and technology-enabled formative assessment is strongly emphasised to enhance student learning. However, limited empirical evidence exists on the effectiveness of AI-supported formative assessment practices. Hence, the present study seeks to examine their impact on students' learning outcomes and perceptions within the NEP framework.

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Objectives Of The Study

1. To examine the effectiveness of AI-supported formative assessment in improving students' learning outcomes under NEP.
2. To study students' perceptions of AI-supported formative assessment practices as promoted by NEP.

Hypotheses

1. **H_{01}:** There is **no significant effect** of AI-supported formative assessment on students' learning outcomes under the National Education Policy (NEP).
2. **H_{02}:** There is **no significant difference** in students' perceptions towards AI-supported formative assessment practices as promoted by the National Education Policy (NEP).

Significance Of The Study

The study will help educators, policymakers, and institutions understand the role of AI in formative assessment and support the effective implementation of NEP recommendations. AI-supported formative assessment would help teachers to save their time and get engaged with smart teaching and evaluation.

Methodology Of The Study

- **Research design:**
  This study is descriptive in nature, and a quantitative method is used to collect the data through surveys.
- **Data Collection and Sampling method:**
  The data is collected from 135 learners by using purposive and convenience sampling on the criteria that they are being evaluated by formative assessment. Secondary data is also used for additional information on NEP 2020 implications.
- **Data collection tool:**
  Data is collected through a structured questionnaire consisting closed ended and Likert scale questions on five scale covering questions based on the objectives of the study.

Data Analysis And Discussion

- **Demographic Profile**
  This table describes the characteristics of the 135 participants.

Category	Group	Frequency (N)	Percentage (%)
Gender	Female	88	65.19%
	Male	47	34.81%
Academic Class	Undergraduate (UG)	70	51.85%
	Postgraduate (PG)	65	48.15%
Age Group	16 - 18	14	10.37%
	19 - 21	65	48.15%
	22 - 24	40	29.63%
	25 - 27	16	11.85%

The sample is predominantly female (65.19%)**.** Participants are almost evenly split between undergraduates (51.85%) and postgraduates (48.15%)**.** Most respondents fall in the 19–21 age group (48.15%)**,** followed by 22–24 years (29.63%)**,** indicating that the majority are young adults in their early twenties. Smaller proportions are aged 16–18 (10.37%) and 25–27 (11.85%)**.**

- **Item-wise Descriptive Statistics**
  This table shows which specific benefits of AI were rated highest by students.

AI Assessment Benefit Items	Mean Score	Std. Deviation
Motivate me to improve my performance.	3.36	1.28
Improves my overall learning outcomes.	3.34	1.40

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The feedback provided was clear and useful.	3.32	1.22
Help me understand my learning progress better.	3.31	1.34
Help identify my strengths and weaknesses.	3.19	1.28
Note: Scores are based on a 5-point Likert scale (1=Strongly Disagree, 5=Strongly Agree).		

Overall, respondents show a moderate positive perception of AI-based assessment benefits, with mean scores ranging from **3.19 to 3.36** on a 5-point Likert scale. The strongest perceived benefit is that AI assessments **motivate students to improve performance** (M = 3.36), followed closely by **improved learning outcomes** and **clear, useful feedback.** Perceptions are slightly lower **for identifying strengths and weaknesses** (M = 3.19). The relatively **high standard deviations (≈1.22–1.40)** indicate noticeable variation in students' experiences and opinions.

H_{01}: *There is no significant effect of AI-supported formative assessment on students' learning outcomes under the National Education Policy (NEP).*

Hypothesis 1 Testing

Hypothesis	Test Applied	Median Score	Test Stat (W)	p-value	Decision
Hypotheses: H_{01}	One-Sample Wilcoxon	4.00	3249.0	0.0252	**Reject Hypothesis** H_{01}
Level of significance: 0.05. Since $p < 0.05$, the effect is statistically significant.					

The test yielded a p-value of 0.025 ($p < 0.05$\$), with a median response score of 4.0 (Agree).

Based on the results of the One-Sample Wilcoxon Signed-Rank Test, the null hypothesis (H_{01}), which stated that there is no significant effect of AI-supported formative assessment on students' learning outcomes, is rejected. The analysis yielded a p-value of 0.0252, which is below the threshold for statistical significance (alpha = 0.05). Furthermore, the calculated median score of 4.0 (representing 'Agree' on the Likert scale) indicates that student responses are significantly skewed toward positive perception rather than neutrality or disagreement.

This finding provides strong empirical evidence that AI-supported formative assessment is an effective tool for enhancing academic outcomes. Students specifically identified that these AI-driven systems provide clearer feedback and help them better understand their learning progress. In the broader context of NEP 2020, this conclusion validates the policy's push for technology-integrated evaluation, confirming that AI tools serve as a statistically significant intervention in promoting a more personalised and effective learning environment.

H_{02}: *There is no significant difference in students' perceptions towards AI-supported formative assessment practices as promoted by the National Education Policy (NEP).*

The second hypothesis (**H_{02}**) of this study focuses on the demographic consistency of students' perceptions regarding AI-supported formative assessment. A primary goal of the National Education Policy (NEP) 2020 is to ensure equity and inclusivity in the digital transformation of education. Therefore, it is vital to examine whether students' attitudes toward these emerging technologies are influenced by their demographic backgrounds, such as gender or academic level (Undergraduate vs. Postgraduate). This hypothesis tests whether there is any significant variance in how different groups perceive the utility and implementation of AI assessment tools. To evaluate this, the study utilises non-parametric comparative tests, specifically the Mann-Whitney U test for gender and the Kruskal-Wallis test for academic class to determine if perception remains uniform across the diverse student population surveyed.

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Hypothesis 2 Testing

Variable	Test Applied	Statistic	p-value	Result
Gender (Male vs Female)	Mann-Whitney U	2185.50	0.5813	No Significant Difference
Academic Class (UG vs PG)	Kruskal-Wallis H	0.54	0.4624	No Significant Difference
Level of significance: 0.05. Since p > 0.05, there are no demographic differences in perception.				

Following the statistical evaluation, the null hypothesis (H_{02}), which stated that there is no significant difference in students' perceptions towards AI-supported formative assessment practices, is accepted (failed to reject). The analysis revealed that there was no statistically significant difference in perception based on Gender (p = 0.5813) or Academic Class (p = 0.4624). Since all p-values were well above the 0.05 significance threshold, the study concludes that students' views on AI-supported assessment are remarkably consistent across different demographic groups.
This finding suggests that the perceived benefits and challenges of AI in education are shared universally by students, regardless of their gender or stage of study. From a policy perspective, this uniformity is highly encouraging for the objectives of NEP 2020, as it indicates that the digital shift in assessment is being received in a standardised manner. This lack of demographic disparity simplifies the implementation process for educational institutions, allowing for a broad, inclusive rollout of AI-supported assessment tools without the immediate need for demographic-specific adaptations.

❖ **Summary of Hypotheses testing:**

Hypothesis	Objective	Test Applied	Key Result	p-value	Decision	Conclusion
H_{01}	To examine the effect of AI-supported formative assessment on students' learning outcomes	One-Sample Wilcoxon Signed-Rank Test	Median = 4.0 (Agree)	0.0252	Rejected	AI-supported formative assessment has a statistically significant positive effect on students' learning outcomes under NEP 2020
H_{02}	To examine differences in students' perceptions towards AI-supported formative assessment based on demographics	Mann-Whitney U (Gender); Kruskal-Wallis H (Academic Class)	No significant group differences	Gender: 0.5813 Class: 0.4624	Accepted (Failed to Reject)	Students' perceptions towards AI-supported formative assessment do not differ significantly by gender or academic class.

Conclusion Of The Study

This study provides robust empirical evidence that AI-supported formative assessment acts as a significant driver for improving student learning outcomes (p=0.0252), effectively fulfilling the National Education Policy (NEP) 2020's mandate for continuous, personalised evaluation. By rejecting the first null hypothesis, the research highlights that

students find AI-driven feedback and progress tracking essential for identifying their academic strengths and weaknesses, leading to a median agreement score of 4.0. Furthermore, the acceptance of the second null hypothesis indicates a remarkable consistency in perception across demographic lines, as no significant differences were found based on gender (p=0.5813) or academic class (p=0.4624). These findings suggest that AI tools are perceived as equitable and accessible by a diverse student body, offering a clear pathway for institutions to implement technology-centric assessment models that are both effective and universally well-received in the modern educational landscape.

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