



Blending Textbooks With Ai Supported Qr Codes: A Conceptual And Empirical Perspective On Personalized Assessment In Higher Education In India

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Abstract

Blended learning is an integration of textbooks along with digital platforms. This is of- late very much in need for higher education system as the learning behavior of the young minds is changing. The reading - learning practice is happening only from filtered content from AI tools. While the conventional reading practice enhances the in-depth knowledge in the topic learnt. So, this study will be a perspective study to solve the gap in learning between textbook reading, and AI generated study content. This is a perspective study based on exploration of AI supported QR code embedded in textbooks for personalized assessment and student engagement in learning and application of learnt material. This study investigates the integration of Artificial Intelligence (AI) supported QR codes embedded in printed textbooks to enable personalized assessment in higher education institutions in India, this study also gives hand to NEP 2020 on an account of digital inclusion. A survey was conducted among 136 students from BBA and MA HRM programs. Pearson correlation analysis reveals statistically significant positive relationships between perceived usefulness, readiness for personalized assessment, perceived assessment effectiveness, and teacher benefit perception. The strongest relationship was observed between perceived assessment effectiveness and teacher benefit ($r = 0.649$, $p < 0.01$). The findings indicate that AI-supported QR textbooks enhance engagement, formative assessment quality, learner autonomy, and teacher analytics efficiency from student perspective. The study aligns with NEP 2020 objectives promoting technology-enabled, learner-centric, and competency-based education.

Keywords: QR code AI supported textbooks, Personalized learning, Blended learning, Higher education alignment with NEP 2020

I. INTRODUCTION

Higher Education in India is undergoing a structural transformation due to Digital Integration and Artificial Intelligence adoption. Students increasingly depend on AI tools for quick answers and summarized explanations. While such tools improve accessibility and speed, they may reduce systematic textbook engagement and critical reading habits. Printed textbooks continue to provide peer-reviewed, structured, and curriculum-aligned academic content essential for deep learning.

This study proposes embedding AI-supported QR codes directly within textbook chapters. When scanned, the QR codes connect learners to adaptive quizzes, diagnostic assessments, case-based applications, and AI-generated personalized feedback systems. This approach ensures that textbook reading remains central while digital tools enhance continuous formative assessment.

The model promotes experiential learning, self-regulated learning, and continuous monitoring of academic progress. Teachers benefit from real-time analytics dashboards that track engagement, conceptual gaps, and performance patterns.

II. LITERATURE REVIEW

Blended learning integrated face-to-face instruction with digital resources which enhanced flexibility and engagement (Garrison & Vaughan, 2008). Constructivist theory emphasized active knowledge construction, while Connectivism highlighted digital networks as learning ecosystems (Siemens, 2005).

Research on QR codes in education demonstrated improved student motivation and contextual learning (Rikala & Kankaanranta, 2014). AI-based adaptive learning systems further personalized content based on learner performance and preferences (Pane et al., 2017).

Formative assessment theory suggested that immediate feedback significantly improved learning outcomes (Black & Wiliam, 2009). AI-driven assessment tools operationalized this principle by providing instant diagnostic feedback.

NEP 2020 emphasizes technology integration, personalized assessment, and competency-based learning. The integration of AI-supported QR textbooks directly aligns with these policy objectives.

III RESEARCH GAP:

Although existing studies have explored the role of Artificial Intelligence and digital tools in higher education, there is limited research on the integration of AI-supported QR codes within printed textbooks for personalized assessment. Most prior studies focus on standalone AI tools, e-learning platforms, or chatbots, rather than blending traditional textbooks with AI-driven interactive elements. Additionally, there is a gap in understanding student and teacher perceptions of AI-based personalized assessments embedded in textbooks, as well as concerns related to ethical issues, data privacy, and over-reliance on AI-generated content. Existing studies rarely examine how such blended models support competency-based education and continuous formative assessment. Therefore, this study addresses these gaps by investigating the effectiveness of AI-supported QR code textbooks as a blended learning and assessment model in higher education

III. OBJECTIVES OF THE STUDY

1. To examine perceived usefulness of QR–AI integration.
2. To analyze readiness for personalized assessment.
3. To evaluate perceived assessment effectiveness.
4. To assess teacher benefit perception.
5. To analyze relationships among the variables.

IV. CONCEPTUAL FRAMEWORK

This study is theoretically grounded in the Technology Acceptance Model (TAM), proposed by **Fred Davis**, which posits that perceived usefulness significantly influences users' acceptance and perceived benefits of technological systems. According to TAM, when individuals perceive a system as useful in enhancing their performance, they are more likely to adopt and derive value from it. In the context of AI-supported QR textbook integration, teachers' perception of usefulness determines the extent to which they experience instructional enhancement, assessment efficiency, and analytics-based support. Thus, perceived usefulness forms a foundational predictor of teacher benefit perception in digital pedagogical environments.

Further, the study draws upon Constructivist Learning Theory advanced by **Jean Piaget and Lev Vygotsky**. Constructivism emphasizes active engagement, collaborative interaction, feedback mechanisms, and learner-centred instructional processes. AI-supported QR codes embedded within textbooks facilitate interactive assessments, instant feedback, and adaptive learning pathways, thereby supporting knowledge construction and scaffolding processes. Such technology-enabled engagement enhances both teaching efficiency and assessment transparency, aligning with constructivist pedagogical principles.

Additionally, the framework integrates principles of Personalized Learning Theory, which underscore the importance of adaptive instructional design and learner-specific evaluation strategies. Readiness for personalized assessment reflects the preparedness of educators to adopt adaptive mechanisms, while perceived assessment effectiveness reflects the quality and impact of AI-driven evaluation systems. These dimensions collectively contribute to teachers' perception of pedagogical and professional benefit in technology-integrated classrooms.

By integrating technology acceptance and learning theories, the proposed framework provides a comprehensive explanation of how QR–AI textbook integration enhances teacher benefit perception in higher education settings. The theoretical integration ensures that the study is not merely technology-driven but pedagogically grounded, thereby strengthening its academic relevance and conceptual rigor.

Based on the above theoretical foundations, the present study proposes that teachers' perception of usefulness, readiness for personalized assessment, and perceived assessment effectiveness significantly influence teacher benefit perception in AI-supported QR textbook environments.

Implementation Flow Model:

Printed Textbook → Embedded QR Code → Student Scan → LMS Login → Diagnostic Quiz → AI Performance Classification (Beginner/Intermediate/Advanced) → Personalized Feedback → Student Dashboard → Teacher Analytics Dashboard → Continuous Improvement Loop.

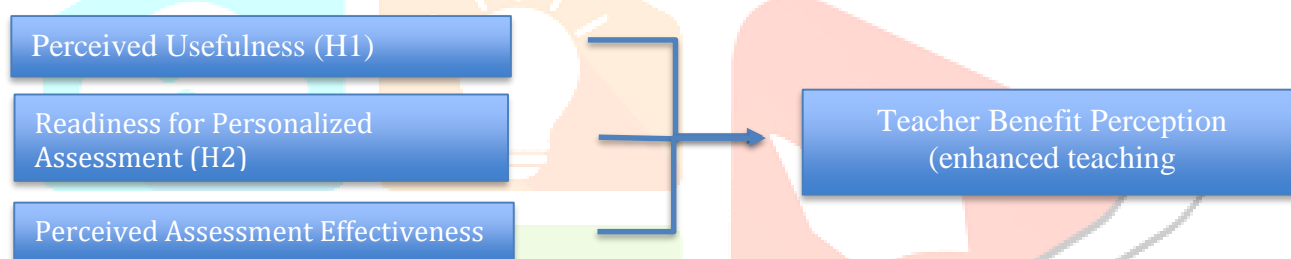


Figure 1: Conceptual Model of QR–AI Textbook Integration and Teacher Benefit Perception

V. RESEARCH METHODOLOGY

Population: Undergraduate BBA and Postgraduate MA HRM students.

Sample Size: 136 students.

Data Collection Tool: Structured Likert-scale questionnaire.

Statistical Technique: Pearson Correlation Analysis.

Data were analyzed using SPSS statistical software to determine relationships among variables.

VI. DATA ANALYSIS AND INTERPRETATION

H1: Perceived usefulness of QR-AI integration positively influences teacher benefit.

H2: Readiness of Personalized Assessment positively influences teacher benefit.

H3: Personalized Assessment effectiveness positively influences teacher benefit.

Variables	Correlation (r)	p-value
PAE & TB	0.649	0.000
PU & TB	0.524	0.000
ROPA & TB	0.518	0.000

The correlation results indicate statistically significant positive relationships at 1% level. The strongest relationship exists between perceived assessment effectiveness and teacher benefit, suggesting that AI-based personalized assessment substantially enhances instructional monitoring and teaching efficiency. This analysis shows that personalized assessment will enhance the students personally to understand the concepts

well. The outcomes of individual students will help the teachers to analyze students conceptual understanding at each level of the course.

VII. FINDINGS

- Students demonstrate strong digital readiness.
- QR–AI integration is perceived as useful and feasible.
- Personalized assessment significantly improves teacher benefit.
- AI dashboards enhance continuous performance monitoring.

VIII. SUGGESTIONS

1. Pilot implementation across multiple departments.
2. Conduct faculty training on AI analytics interpretation.
3. Ensure secure authentication and data privacy protocols.
4. Align AI-generated assessments with Bloom’s taxonomy.
5. Encourage policy-level funding for AI-textbook innovation.

IX. Limitations of the Study

1. The study was conducted with a limited sample of higher education students, which may restrict the generalizability of findings across diverse institutional and regional contexts.
2. The research relied on self-reported survey data, which may be influenced by response bias and subjective perception.
3. The cross-sectional design limits the ability to assess the long-term impact of AI-supported QR textbook integration.
4. The study focused primarily on student’s perceptions rather than incorporating objective student performance metrics.

X. Future Research Directions

1. Future studies may employ larger and more diverse samples to enhance generalizability and external validity.
2. Longitudinal or experimental research designs may be adopted to examine long-term effectiveness and causal relationships.
3. Advanced analytical techniques such as regression or structural equation modelling may be used to validate the proposed conceptual framework more rigorously

XI. CONCLUSION

The integration of AI-supported QR codes within textbooks transforms traditional static learning materials into intelligent adaptive systems. Significant correlations validate the effectiveness of personalized assessment models in enhancing teacher analytics and learner engagement. The proposed framework supports competency-based, learner-centric, and technology-enabled higher education aligned with NEP 2020.

XII. REFERENCES

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