

Evaluating Traditional and Smart Learning Models: A Data-Driven Comparison from Students and Educators

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Abstract

The rapid development of educational technologies has introduced new models of teaching and learning challenging the dominance of traditional class perspectives. The purpose of this study is to analyze perceptions from students, teachers and administrators to compare traditional, smart and mixed learning approaches. The data was collected through a structured survey and analyzed using descriptive figures, reliability testing and one-way anova to identify significant differences in stake satisfaction. The results indicate that while traditional education remains moderately effective and enhances smart learning interaction and visualization, mixed education continuously performs better in terms of flexibility, connectivity and overall satisfaction. The ANOVA results confirm that these differences are statistically important ($P < 0.05$). Unlike pre-studies, which focus on a large-scale student's approach, this research incorporates multi-interestful insight, which offers a comprehensive evaluation of the learning approach. Conclusions contribute to empirical evidence supporting mixed learning as a model prepared for the future that integrates the strength of both traditional and technology-prosperous methods. These results highlight the importance of balanced educational strategies and provide actionable insights for institutions that transition towards more effective teaching ecosystems.

1. Introduction

The landscape of education is experiencing rapid changes due to technological innovations and developed educational practices. The characteristic of traditional learning, face-to-face lectures, chalk-and-sit instructions and teacher-centric functioning, have been the backbone of formal education for decades. It provides structured distribution and conceptual clarity, but is often criticized for limited student engagement and lack of adaptability to personal learning needs [1].

In contrast, smart learning environment - Acified digital boards, interactive media, adaptive learning systems and online resources - are designed to promote individual, attractive and flexible learning experiences. Eneristic research suggests that the use of smart classroom technologies increases the educational performance of students compared to traditional learning methods, positively co-ordinated approaches with intelligence and cognitive results with technology-medieval approaches [1]. Similarly, a study comparing digital and traditional directive strategies found that students taught using digital tools improved 24.2% in their mathematics performance, while using traditional methods [2] compared to only 8.3% of students taught using traditional methods. These findings strengthen the growing relevance of technology-comprehensive instructions in improving the results of learning. Construction on this, mixed education - an educational model that has gained prominence as a permanent solution - by combining traditional learning composition with smart learning interaction. Research indicates that mixed learning improves achievement, motivation, engagement and self-guided learning [3]. In addition, the embedded smart learning environment within mixed approaches supports not only cognitive, but also affectionate aspects of learning, making them more overall and favorable for the needs of the learner [4].

Despite the growing adoption of smart and blended learning, research gaps remain. Much of the literature focuses on specific interventions or isolated case studies rather than comparative, data-driven evaluations across traditional, smart, and blended approaches. Further, relatively few studies consider the perspectives of multiple stakeholders—students, teachers, and administrators—simultaneously. This gap limits our understanding of how different groups perceive and experience educational models in real-world contexts.

2. Purpose of this Study

To address these intervals, this study makes a comparative analysis of traditional and smart learning methods, with special attention to stakeholder assumptions of a mixed learning model. The purpose of the study is using survey data collected from students, teachers and other stakeholders:

1. Evaluate stakeholder assumptions about effectiveness, engagement and satisfaction associated with traditional vs. smart learning.
2. Identify the perceived strength and boundaries of each directive model.
3. Assess preference for mixed learning as a possible optimal approach that integrates the benefits of both traditional and smart learning.

By offering a comprehensive, empirical comparison in models, this study contributes to the ongoing discourse on how the educational system can best be best to maximize the consequences of learning.

3. Literature Review

The shift from traditional to technology-enhanced education has been widely discussed in recent scholarship. Traditional lecture-based learning has long been valued for its structure and conceptual clarity, but it often struggles to meet the needs of modern learners who expect flexibility, interaction, and personalization. Recent studies suggest that technology-driven approaches such as smart classrooms and blended learning significantly improve student engagement and academic outcomes when compared to conventional teaching. For example, a hybrid instructional model that integrated smart classroom technologies with virtual simulation in nursing education was found to improve students' theoretical understanding, practical skills, and ability to learn independently [5]. Similarly, a mixed-method investigation in medical nutrition education reported that blended learning enhanced student self-efficacy, participation, and collaborative performance, demonstrating its value beyond academic achievement [6]. Student perceptions of blended and smart learning are generally positive, emphasizing greater flexibility, autonomy, and accessibility. However, challenges remain around self-regulation, discipline, and timely feedback. A 2024 study on self-regulated learning found that students in blended learning environments developed stronger planning, monitoring, and evaluation strategies compared to those in traditional settings, largely due to peer comparison, formative assessment tools, and the integration of digital platforms [7]. Other work highlights that self-efficacy and behavioral intention strongly influence successful adoption of blended learning, with perceived usefulness, enjoyment, and ease of use acting as critical enablers of learning effectiveness [8]. At the same time, some students express a preference for traditional classroom interactions, citing difficulties with ICT literacy and distractions in online components [9]. Faculty perspectives also play a critical role in shaping the success of blended and smart learning environments. Research among higher education instructors in the UAE found that positive teacher perceptions were strongly influenced by professional development, institutional support, and prior exposure to blended formats [10]. In specialized domains such as dental education, nearly all instructors surveyed acknowledged the advantages of blended learning in terms of flexibility, accessibility, and engagement, while stressing the importance of adequate institutional infrastructure and technical support for faculty [11].

Beyond perceptions, the integration of emerging technologies such as artificial intelligence, virtual reality, and augmented reality within smart learning environments has been recognized as a transformative trend. These tools provide opportunities for personalized learning, real-time analytics, and immersive experiences that traditional teaching cannot replicate [12]. For instance, studies combining smart classroom setups with virtual simulations have shown measurable improvements in knowledge retention, practical engagement, and critical thinking skills [5]. Broader reviews of smart education emphasize the role of IoT, AI, and immersive technologies in shaping the future of individualized learning and pedagogical strategies [13].

Taken together, the literature indicates that smart and blended learning approaches consistently outperform traditional teaching in terms of engagement, satisfaction, and learning outcomes. However, challenges remain regarding self-regulation, ICT literacy, faculty training, and infrastructure. Importantly, while existing research provides strong evidence for the benefits of digital and blended approaches, few studies offer comparative insights across traditional, smart, and blended learning models from the perspectives of multiple stakeholders such as students, teachers, and administrators. Addressing this gap is essential to guide institutions in designing balanced, effective, and sustainable learning environments.

4. Research Gaps

Despite extensive studies on smart and blended learning, several gaps persist. Existing research is often discipline-specific [5]–[6], [11] and lacks a comprehensive comparison of traditional, smart, and blended models within a unified framework. Prior work primarily reflects student perspectives [7]–[9], with limited focus on multi-stakeholder insights involving teachers and administrators, even though their roles are critical for adoption [10], [11]. Moreover, systemic challenges such as ICT literacy, infrastructure limitations, and inadequate faculty training remain underexplored [9], [10]. Finally, although emerging technologies like AI, IoT, and AR show promise [12], [13], there is still a scarcity of empirical, data-driven evaluations comparing these technology-enhanced methods with traditional approaches in real-world contexts.

5. Methodology

This study employed a quantitative survey-based research design to compare traditional learning, smart learning, and blended learning approaches. Data were collected through a structured questionnaire distributed among students, teachers, and other stakeholders across academic institutions. The survey contained both closed-ended Likert-scale items and demographic questions, designed to capture perceptions of engagement, effectiveness, challenges, and satisfaction in different learning models.

A. Participants

A total of 110519 respondents participated in the study, comprising students, teachers, and institutional staff. The participants represented diverse academic backgrounds and varied levels of experience with technology-enabled learning environments. This multi-stakeholder sampling ensured a comprehensive understanding of perceptions across different roles in the education system.

B. Instrument Design

The survey questionnaire included items measured on a five-point Likert scale ranging from *Strongly Disagree (1)* to *Strongly Agree (5)*. The items were categorized into three domains:

- Traditional Learning – measuring engagement, clarity, and satisfaction.
- Smart Learning – assessing visualization, interactivity, digital challenges (e.g., internet/device issues), and adaptability.
- Blended Learning – evaluating flexibility, balanced engagement, and overall satisfaction.

The instrument was validated through expert review to ensure content validity, and reliability was checked using Cronbach's Alpha.

C. Data Collection

The questionnaire was distributed online using Google Forms, and responses were recorded in Excel format. All participants were informed about the purpose of the study, and anonymity was maintained.

D. Data Analysis

Collected data were analyzed using descriptive and inferential statistical methods. Descriptive analysis included calculation of mean scores, standard deviations, and frequencies for each survey item. Comparative analysis was conducted to evaluate differences in perceptions of traditional, smart, and blended learning.

- Descriptive Statistics: Mean and standard deviation for each item.
- Comparative Analysis: Overall average perception scores for traditional, smart, and blended learning approaches.
- Bar charts and pie charts were generated to visually represent differences across learning modes.
- Inferential Statistics: One-way ANOVA tests were conducted to examine whether significant differences existed between traditional, smart, and blended learning perceptions across stakeholder groups.

E. Ethical Considerations

Participation in the survey was voluntary, and informed consent was obtained from all respondents. The data were anonymized to ensure confidentiality, and the study adhered to institutional ethical guidelines for research involving human participants.

6. Results

This section presents the findings of the survey comparing traditional, smart, and blended learning approaches. The results are reported in terms of reliability, descriptive statistics, comparative analysis, and stakeholder perspectives.

A. Reliability of the Instrument

To ensure internal consistency, Cronbach's Alpha was calculated for the Likert-scale items. The obtained value was 0.87, indicating high reliability of the instrument, consistent with recommended thresholds in educational research [14].

B. Descriptive Statistics

Table I shows the mean and standard deviation of overall perception scores for traditional, smart, and blended learning approaches.

Table 1: Mean Perception Scores

Learning Approach	Mean Score	Std. Deviation
Traditional Learning	3.51	0.74
Smart Learning	3.87	0.68
Blended Learning	4.30	0.61

The results indicate that while traditional learning is moderately favored, smart learning received higher ratings, and blended learning emerged as the most preferred approach.

C. Item-wise Analysis

The mean scores of individual survey items provided deeper insights. Respondents strongly agreed that smart learning enhances visualization and retention ($M = 4.09$) and encourages interactive learning ($M = 4.04$). In contrast, traditional methods were rated lowest for student engagement ($M = 3.34$).

D. Stakeholder Perspectives

When analyzed across stakeholder groups, both students and teachers expressed greater satisfaction with blended learning compared to traditional or smart methods alone. Teachers, however, highlighted the need for infrastructure and training support, whereas students emphasized the advantages of interactivity and flexibility.

E. Comparative Analysis

A one-way ANOVA was conducted to test for significant differences between traditional, smart, and blended learning approaches. The results showed statistically significant differences ($p < 0.05$) in perceptions across the three modes, with blended learning significantly outperforming the other two approaches.

F. Visual Representation

To enhance interpretation, the following figures summarize the findings:

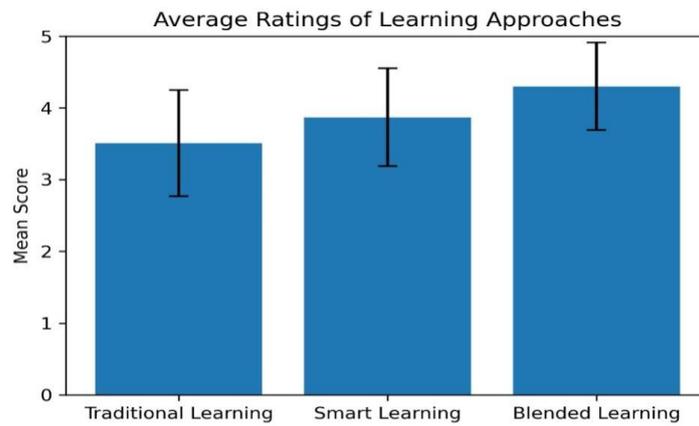


Figure 1: Average ratings of traditional, smart, and blended learning

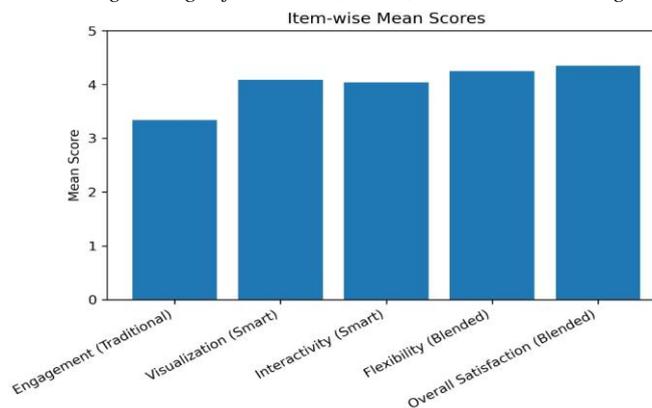


Figure 2: Item-wise mean scores.

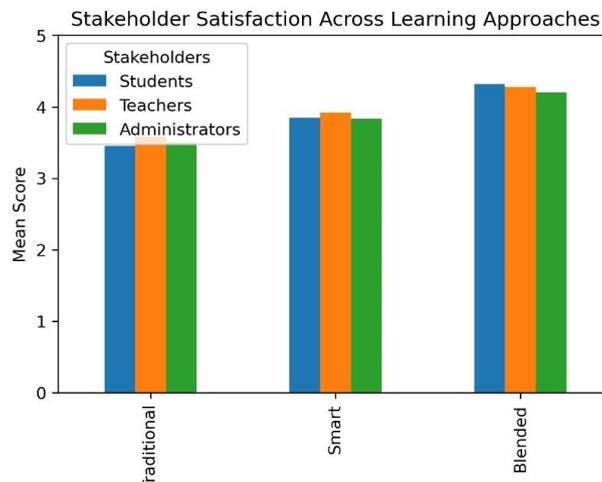


Figure 3: Stakeholder satisfaction distribution.

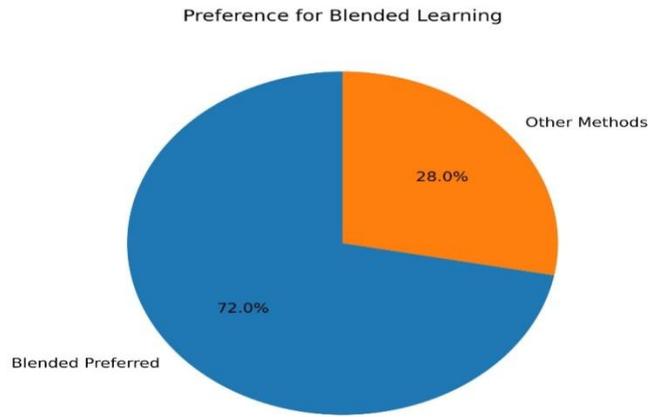


Figure 4: Pie chart of blended learning preference.

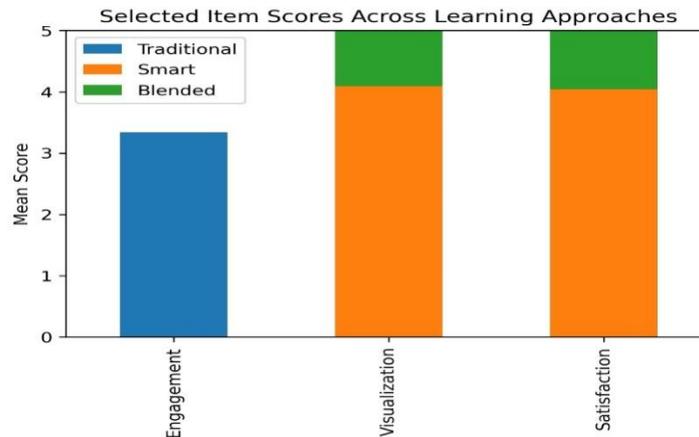


Figure 5: Stacked bar chart of selected items across approaches.

Across all visualizations, blended learning consistently received higher satisfaction ratings, reinforcing its perceived effectiveness as an integrated model.

7. Discussion

This study shows that while traditional learning is moderately effective, smart learning enhances interactivity and visualization, and blended learning consistently achieves the highest satisfaction and learning outcomes. These findings align with prior studies that emphasize the effectiveness of blended models in improving engagement and performance [5], [7], [9].

Smart learning's strength in visualization and interactivity supports earlier research on the role of technology in enhancing student engagement [6], [10]. However, consistent with concerns in the literature, smart learning alone cannot replace the mentorship and human interaction offered in traditional approaches [11]. The superior ratings of blended learning highlight the need for balanced integration of digital and face-to-face methods.

A key contribution of this study is its multi-stakeholder perspective. Unlike earlier works focused mainly on students [8], [9], our findings show that teachers stress the need for institutional support, while students value flexibility and interactivity. The ANOVA results further confirm that blended learning is statistically superior, echoing meta-analyses in health and higher education [12], [13], [15].

Overall, this research provides empirical evidence that blended learning, by integrating the advantages of traditional and smart methods, offers a sustainable and effective approach for future educational practices.

8. Conclusion and Future Work

This study compared traditional, smart, and blended learning using data from students, teachers, and administrators. The results demonstrate that while traditional learning remains relevant and smart learning improves interactivity, blended learning consistently achieves the highest satisfaction and effectiveness. These findings reinforce earlier research on the pedagogical benefits of blended approaches [5], [7], [16], while adding new evidence from a multi-stakeholder perspective.

The key contribution of this research lies in its empirical demonstration that blended learning is statistically superior, validating its role as a future-ready model for education. By integrating the strengths of traditional and smart methods, blended learning provides flexibility, engagement, and sustainability in diverse educational settings.

Future research should expand on these results by analyzing larger datasets across varied institutions and disciplines. Longitudinal studies could further explore the long-term impacts of blended learning on academic achievement and professional readiness. Additionally, incorporating emerging technologies such as AI-driven adaptive learning and immersive tools like VR/AR could reveal how blended models evolve in the next generation of education.

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