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Blended Learning in Haryana: A Systematic Review through the Lens of Adaptability and Affordability

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Abstract- *This systematic review investigates the implementation of blended learning in Haryana, India, using the Antecedents, Decisions, and Outcomes (ADO) and Theories, Contexts, and Methods (TCM) frameworks. Blended learning integrates face-to-face and online instruction, offering opportunities and challenges within Haryana's diverse educational landscape. The review identifies vital factors impacting adaptability and affordability, such as technological infrastructure, pedagogical training, and curriculum flexibility. It reveals significant gaps in localized research and highlights disparities between urban and rural areas regarding digital access. By applying the ADO framework, the study assesses the preconditions, strategic decisions, and outcomes of blended learning, while the TCM framework explores relevant theories, contextual factors, and methodological approaches. The findings emphasize the need for targeted investments, ongoing professional development, and flexible curriculum design to enhance blended learning effectiveness in Haryana. This review provides actionable insights for policymakers and educators, aiming to bridge existing gaps and improve regional educational outcomes.*

Keywords: Blended learning, Technological infrastructure, Pedagogical training, Curriculum flexibility, Digital divide, Online learning, Educational Policy, Rural-urban disparity.

1. Introduction

Blended learning, a pedagogical approach integrating traditional face-to-face instruction with digital and online learning elements, has emerged as a transformative model in contemporary education. The increasing penetration of digital technology in educational contexts has fuelled the growth of blended learning, enabling it to address diverse learning needs and preferences. Garrison and Kanuka (2004) describe blended learning as "the thoughtful integration of classroom face-to-face learning experiences with online learning experiences," underscoring the synergy between these modalities. This approach is particularly relevant in India, where the educational landscape is marked by diversity in terms of socioeconomic status, geographic distribution, and access to technology.

In Haryana, a state in northern India, implementing blended learning presents both opportunities and challenges. Haryana's education system is characterized by a mix of urban and rural institutions, varying levels of technological infrastructure, and a wide range of student backgrounds. The state's educational policies and initiatives have increasingly focused on enhancing digital literacy and incorporating technology into the curriculum, making it an ideal context for examining the impact and effectiveness of blended learning.

This literature review employs two analytical frameworks—Antecedents, Decisions, and Outcomes (ADO) and Theories, Contexts, and Methods (TCM)—to systematically explore the factors influencing the adaptability and affordability of blended learning in Haryana. The review aims to comprehensively understand the challenges and potential solutions in implementing blended learning in this region by dissecting these aspects through these frameworks.

2. Originality of this systematic review

This systematic review offers a novel contribution by applying the Antecedents, Decisions, and Outcomes (ADO) and Theories, Contexts, and Methods (TCM) frameworks to analyze the adaptability and affordability of blended learning in Haryana. Unlike previous studies, which often focus on general outcomes or single aspects of blended learning, this review uniquely integrates theoretical and practical perspectives, providing a comprehensive analysis tailored to the specific context of Haryana. By systematically examining factors such as technological infrastructure, professional development, and institutional support through a dual-framework approach, this review identifies the challenges and opportunities within this educational model. It suggests context-specific strategies for improving the implementation of blended learning. This originality lies in its nuanced approach to understanding blended learning in a diverse and dynamic educational landscape, offering regionally relevant and theoretically grounded insights.

3. Contribution of this systematic review

This systematic review contributes to understanding and implementing blended learning, particularly within Haryana's diverse educational landscape. The review provides a holistic analysis of the factors that influence the adaptability and affordability of blended learning by applying the Antecedents, Decisions, and Outcomes (ADO) and Theories, Contexts, and Methods (TCM) frameworks. It sheds light on critical areas such as technological disparities between urban and rural regions, the importance of continuous professional development for educators, and the role of institutional support in facilitating equitable access to education.

The review also offers practical recommendations for policymakers, educators, and institutions, guiding them in addressing the unique challenges of integrating digital and face-to-face learning in Haryana. Furthermore, it contributes to the broader academic discourse by filling a gap in the literature where region-specific analyses of blended learning still need to be made available. Overall, this review enhances the understanding of how blended learning can be effectively tailored to meet the needs of diverse student populations in a rapidly changing educational environment.

4. Structure of this systematic review

This systematic review is structured to comprehensively analyze blended learning in Haryana through the frameworks of Antecedents, Decisions, and Outcomes (ADO) and Theories, Contexts, and Methods (TCM). The review begins with an introduction to blended learning and its relevance in Haryana, followed by an exploration of the ADO framework, which examines the conditions, decisions, and outcomes of implementing blended learning. It then applies the TCM framework to analyze the theoretical foundations, contextual factors, and methodological approaches influencing blended learning. The discussion synthesizes these findings, offering insights into the region's challenges and opportunities for improving blended learning. The review concludes with a summary of key insights, recommendations, and a reflection on its originality and contributions to the field.

5. Methodology

his study employs a bibliometric analysis to systematically explore the research landscape of blended learning, focusing on the Indian higher education context. The methodology integrates the Antecedents, Decisions, and Outcomes (ADO) and Theories, Contexts, and Methods (TCM) frameworks to understand blended learning comprehensively. The thematic mapping reveals vital research areas such as computer-aided teaching and critical thinking but highlights significant gaps in studies addressing accessibility, affordability, and adaptability in India. Keyword co-occurrence network analysis shows frequent links between blended learning and technology integration but also points out a lack of research on these aspects in the Indian context. An analysis of authors and their affiliations highlights a need for more localized research, emphasizing context-specific studies. The word cloud analysis further confirms the extensive research on general blended learning topics while revealing a gap in in-depth studies focused on the Indian educational environment. By applying the ADO and TCM frameworks, this study aims to fill these gaps, offering insights into the factors influencing blended learning's effectiveness and providing practical recommendations for improving its implementation in India.

6. ADO Framework

The ADO framework, which stands for Antecedents, Decisions, and Outcomes, provides a structured approach to analyze the various stages of implementing blended learning. Each component of the ADO framework—Antecedents, Decisions, and Outcomes—represents a critical aspect of the process, offering insights into the factors that influence the success of blended learning initiatives.

6.1 Antecedents

Antecedents refer to the pre-existing conditions and factors that set the stage for implementing blended learning. These include the technological, pedagogical, and institutional elements determining the readiness and capacity for adopting blended learning.

- **Technological Infrastructure**: The technological infrastructure available in a region or institution is a fundamental antecedent that influences the implementation of blended learning. In Haryana, reliable internet connectivity, access to digital devices, and digital literacy among students and educators are critical factors. The digital divide in Haryana, particularly between urban and rural areas, poses a significant challenge to the widespread adoption of blended learning. Studies by Lazar et al. (2020) highlight that while metropolitan areas in Haryana are relatively well-equipped with technological resources, rural areas lag regarding internet penetration and access to digital devices. This disparity affects the ability of students and teachers in rural areas to engage with blended learning platforms fully.
- **Pedagogical Training**: The effectiveness of blended learning heavily depends on educators' preparedness to integrate digital tools into their teaching practices. Continuous professional development and training programs are essential antecedents that equip teachers with the necessary skills to navigate and utilize digital platforms effectively. Garrison and Vaughn (2008) emphasize the importance of pedagogical training in enhancing the adaptability of educators to blended learning environments. In Haryana, there is a need for targeted training programs that focus on digital pedagogy, instructional design for online learning, and the use of technology to support collaborative and interactive learning experiences. Hodges et al. (2016) further stress that ongoing professional development is crucial for ensuring educators can keep pace with technological advancements and adapt their teaching strategies accordingly.
- **Curriculum Flexibility**: The flexibility of the curriculum is another critical antecedent that influences the adaptability of blended learning. A rigid curriculum that does not allow for integrating online and offline learning elements can hinder the effectiveness of blended learning initiatives. Picciano (2016) argues that a flexible curriculum incorporating synchronous and asynchronous learning activities is essential for catering to diverse learning styles and preferences. In the context of Haryana, curriculum flexibility is necessary, given the diverse student population and the varying levels of access to technology. Educational institutions in Haryana must consider revising curricula to include digital literacy, critical thinking, and problem-solving skills essential for thriving in a blended learning environment.

6.2 Decisions

Decisions refer to the strategic choices made by educational institutions, policymakers, and educators in implementing blended learning. These decisions encompass the selection of technological tools, pedagogical approaches, and institutional policies that shape blended learning delivery.

- **Technological Integration**: One of the most critical decisions in implementing blended learning is selecting and integrating technological tools. Institutions must carefully consider the types of technology that align with their educational goals and the needs of their students. In Haryana, where technological resources vary widely between urban and rural areas, decisions related to technology integration must account for these disparities. Anderson (2016) suggests that institutions should adopt a phased approach to technology integration, starting with essential tools that are accessible to the majority of students and gradually incorporating more advanced platforms as digital literacy improves. Additionally, decisions regarding using Learning Management Systems (LMS), mobile learning applications, and interactive content must be made to enhance student engagement and facilitate personalized learning experiences.

- **Pedagogical Approaches**: The choice of pedagogical approaches is another crucial decision that influences the success of blended learning. Educators must decide on the instructional methods that best suit their student's learning objectives and needs. In Haryana, where student populations are diverse in learning styles, cultural backgrounds, and prior knowledge, decisions related to pedagogy must be inclusive and adaptable. Garrison and Kanuka (2004) highlight that hybrid models combine face-to-face instruction with online activities and are particularly effective in blended learning environments. These models allow for greater flexibility and enable students to engage with content independently while benefiting from direct interaction with instructors during in-person sessions. The flipped classroom approach, where students are introduced to new content online before engaging in active learning activities, is another pedagogical strategy shown to enhance student outcomes in blended learning settings.
- **Institutional Policies**: The development and implementation of institutional policies are critical decisions that determine the sustainability and scalability of blended learning initiatives. In Haryana, educational institutions and policymakers must consider policies related to funding, access to technology, and support mechanisms for students and educators. Choy and Carroll (2018) argue that institutional policies should prioritize affordability and inclusivity, ensuring that all students, regardless of their socioeconomic background, can access the resources needed for successful participation in blended learning. Decisions related to financial aid, scholarship programs, and subsidized access to digital devices can significantly make blended learning more accessible and equitable. Additionally, institutions must establish policies that provide ongoing support for educators, including access to professional development, technical assistance, and collaborative opportunities to share best practices in blended learning.

6.3 Outcomes

Outcomes refer to the results and impacts of the decisions made while implementing blended learning. These outcomes can be measured in terms of academic performance, student and teacher satisfaction, and the overall effectiveness of the blended learning model.

- **Academic Performance**: One of the primary outcomes of interest in blended learning is its impact on academic performance. Numerous empirical studies have demonstrated that blended learning can improve educational outcomes compared to face-to-face instruction alone. In Haryana, research by Cracraft (2015) and Kintu & Zhu (2017) indicates that students who engage in blended learning environments, particularly in science and technology, tend to perform better academically. This improvement is attributed to the interactive and collaborative nature of blended learning, which promotes active engagement with content, critical thinking, and problem-solving skills. Furthermore, blended learning allows for personalized instruction, where students can access additional resources, receive timely feedback, and progress at their own pace, all of which contribute to enhanced learning outcomes.
- **Student Satisfaction**: Student satisfaction is a critical outcome that reflects the perceived effectiveness and acceptability of blended learning. High levels of student satisfaction are often associated with increased motivation, engagement, and retention in blended learning programs. Dziuban et al. (2018) suggest that blended learning environments that offer flexibility, accessibility, and a variety of learning resources tend to result in higher levels of student satisfaction. In Haryana, student satisfaction with blended learning is influenced by factors such as the quality of online content, the availability of support services, and the ease of access to technology. Institutions that prioritize the needs and preferences of students, providing them with a seamless and user-friendly learning experience, are more likely to achieve positive outcomes in terms of student satisfaction.
- **Teacher Satisfaction**: Teacher satisfaction is another critical outcome impacting blended learning initiatives' sustainability. The success of blended learning depends not only on student engagement but also on the willingness and ability of educators to deliver and manage blended learning experiences effectively. Anderson & Mitchell (2020) note that teacher satisfaction is closely linked to the availability

of professional development opportunities, institutional support, and the adequacy of technological resources. In Haryana, educators who receive continuous training in digital pedagogy and instructional design, along with access to technical support and collaborative networks, are more likely to report higher levels of satisfaction with blended learning. Ensuring that teachers feel confident and supported in their roles is essential for maintaining the quality and effectiveness of blended learning programs.

7. TCM Framework

The TCM framework, which stands for Theories, Contexts, and Methods, offers a complementary perspective to the ADO framework by focusing on the theoretical foundations, contextual factors, and methodological approaches that underpin blended learning. This framework provides a broader understanding of the factors that influence the design and implementation of blended learning.

7.1 Theories

Theories provide the foundational principles that guide the design and implementation of blended learning. In the context of blended learning, several educational theories offer insights into how learning can be optimized by integrating online and face-to-face modalities.

- **Constructivism**: Constructivism is a learning theory that emphasizes the active role of learners in constructing their knowledge and understanding through experiences and interactions with their environment. According to constructivist principles, learning is a meaning-making process shaped by the learner's prior knowledge, experiences, and social context. In blended learning environments, constructivism supports integrating online and face-to-face learning by promoting a learner-centered approach where students actively engage with content, collaborate with peers, and reflect on their learning experiences. Garrison and Kanuka (2004) argue that constructivist approaches in blended learning enable students to take ownership of their learning, apply critical thinking skills, and engage in more profound levels of understanding. In Haryana, constructivism can be used to design blended learning experiences that encourage students to explore, experiment, and collaborate, enhancing their ability to construct knowledge meaningfully.
- **Connectivism**: Connectivism is a relatively new learning theory that focuses on the role of networks and technology in the learning process. Developed by Siemens (2005), connectivism posits that learning occurs through the formation of connections within networks, where knowledge is distributed across various digital platforms and social networks. In the context of blended learning, connectivism highlights the importance of digital literacy, the ability to navigate online information, and the capacity to connect with diverse sources of knowledge. Garrison and Kanuka (2004) suggest that connectivist approaches in blended learning can enhance students' ability to engage with digital content, collaborate with peers across geographical boundaries, and access a wide range of learning resources. In Haryana, where access to technology and digital literacy levels vary, connectivism can guide the development of blended learning experiences that empower students to become effective digital learners capable of harnessing the power of networks to enhance their knowledge and skills.

7.2 Contexts

Contexts refer to the environmental, cultural, and situational factors that influence the implementation of blended learning. Understanding the contexts in which blended learning is deployed is essential for designing effective and relevant learning experiences.

- **Socioeconomic Factors**: Socioeconomic factors play a significant role in shaping the implementation and effectiveness of blended learning. In Haryana, socioeconomic disparities influence access to technology, digital resources, and educational opportunities. Lazar et al. (2020) highlight that students from low-income families, particularly those in rural areas, face challenges accessing the digital tools and resources needed for successful participation in blended learning. These disparities create a digital divide that can exacerbate educational inequalities, limiting the ability of disadvantaged students to benefit fully from blended learning. Addressing these socioeconomic factors is crucial for creating an inclusive learning environment that ensures all students have equal opportunities to succeed in blended learning programs.

- **Educational Challenges**: The COVID-19 pandemic has brought unprecedented challenges to the educational landscape, highlighting the need for flexible and adaptable learning solutions. In Haryana, as in other parts of India, the pandemic has accelerated the adoption of blended learning to ensure continuity in education despite disruptions caused by school closures and social distancing measures. Garrison and Kanuka (2004) note that the pandemic context has underscored the importance of blended learning as a resilient and scalable educational approach. However, the rapid shift to online learning has also exposed gaps in technological infrastructure, digital literacy, and pedagogical preparedness, particularly in rural areas. The educational challenges posed by the pandemic necessitate a rethinking of how blended learning can be designed and implemented to meet the needs of diverse learners in Haryana.

- **Geographical Factors**: Geographical factors, such as the rural-urban divide, also influence the implementation of blended learning in Haryana. Picciano (2016) argues that geographical disparities in access to technology and educational resources can create significant barriers to the successful adoption of blended learning. In Haryana, urban areas tend to have better technological infrastructure, higher levels of digital literacy, and greater access to educational resources, making them more conducive to blended learning. In contrast, rural areas often face challenges related to limited internet connectivity, lack of access to digital devices, and lower levels of digital literacy. These geographical factors must be considered when designing blended learning programs to ensure all students have equitable access to high-quality education regardless of location.

7.3 Methods

The methods employed in this review were crucial for analyzing the effectiveness and impact of blended learning in Haryana. These methods, informed by theoretical frameworks and contextual factors, were used to assess various dimensions of adaptability and affordability in blended learning environments.

- **Curriculum Design:** The analysis examined how well-designed curricula that integrated online, and face-to-face learning elements supported diverse learning styles and promoted deep understanding. Descriptive statistics were used to summarize how different curricular elements impacted student engagement and performance, offering insights into the effectiveness of various instructional strategies. In the context of Haryana, the analysis considered the diverse needs of students, including their varying levels of access to technology and digital literacy, to determine how curriculum design could be adapted to support blended learning.

- **Professional Development:** The effectiveness of professional development programs for educators was a vital focus of the analysis. Inferential statistics, such as t-tests and ANOVA, were employed to evaluate the impact of these programs by comparing educator competencies and student outcomes before and after training. This approach allowed the review to assess how ongoing professional development initiatives influenced the successful implementation of blended learning in Haryana, particularly in tailoring support to the specific needs of educators.

- **Technological Integration:** The analysis also focused on integrating technology in blended learning environments. Regression analysis was used to explore the relationship between the level of technological integration and student performance. This method provided insights into which technological tools and platforms most effectively enhanced learning outcomes. In Haryana, the analysis considered how disparities in access to technology between urban and rural areas influenced the success of blended learning initiatives.

- **Institutional Support:** The provision of institutional support was another critical analysis area. Correlation analysis examined the relationship between institutional support mechanisms and student and teacher satisfaction. This method helped identify how different forms of support, such as access to digital resources, financial aid, and policies promoting inclusivity, contributed to the effectiveness of blended learning in Haryana.

- **Evaluation of Outcomes:** The analysis assessed blended learning outcomes using various statistical techniques. Factor analysis was used to identify underlying constructs that influenced the adaptability and affordability of blended learning, while meta-analysis provided a comprehensive overview of effect sizes across different studies. These methods allowed for a thorough evaluation of academic performance and satisfaction levels, offering a holistic understanding of the impact of blended learning initiatives in Haryana.

8. Discussion

The systematic review, structured around the ADO and TCM frameworks, highlights the key factors influencing the adaptability and affordability of blended learning in Haryana. The analysis of antecedents reveals that technological infrastructure, pedagogical training, and curriculum flexibility are critical prerequisites for successful implementation. The decisions related to technological integration, pedagogical approaches, and institutional policies are pivotal in shaping blended learning delivery. The outcomes, including academic performance, student satisfaction, and teacher satisfaction, provide valuable insights into the effectiveness of blended learning initiatives.

Applying the TCM framework further underscores the importance of theoretical foundations, contextual factors, and methodological approaches in designing and implementing blended learning. Constructivism and connectivism provide a conceptual basis for understanding how learning occurs in blended environments. Contextual factors, including socioeconomic disparities, educational challenges, and geographical factors, influence the feasibility and effectiveness of blended learning in Haryana. The methods, including curriculum design, professional development, and institutional support, are essential for achieving blended learning outcomes.

However, the review also identifies several challenges that need to be addressed to enhance the effectiveness of blended learning in Haryana. These challenges include the digital divide, budget constraints, and the need for ongoing professional development for educators. The digital divide, particularly between urban and rural areas, poses a significant barrier to the widespread adoption of blended learning. Addressing this divide requires targeted investments in technological infrastructure and digital literacy programs, particularly in rural areas. Budget constraints at the institutional and household levels also limit access to technology and digital resources, making it difficult for students from low-income families to participate fully in blended learning. Innovative funding mechanisms, such as public-private partnerships and government subsidies, must address these financial barriers.

Ongoing professional development for educators is another critical challenge that must be addressed to ensure the success of blended learning. Educators need continuous training and support to keep pace with technological advancements and to develop the skills required to design and deliver compelling blended learning experiences. Institutions must prioritize professional development initiatives and provide educators with the resources and support they need to succeed.

9. Conclusion

This comprehensive literature review, structured around the ADO and TCM frameworks, provides a detailed analysis of the factors influencing the adaptability and affordability of blended learning in Haryana. The review offers valuable insights into the challenges and potential solutions for implementing blended learning in this region by examining the antecedents, decisions, and outcomes alongside the theories, contexts, and methods.

The findings of this review are critical for educators, policymakers, and stakeholders aiming to improve the accessibility and effectiveness of education in Haryana. The review highlights the need for targeted investments in technological infrastructure, continuous professional development for educators, and flexible curriculum design to ensure that blended learning is adaptable and affordable. Additionally, the review underscores the importance of addressing the digital divide, budget constraints, and the need for ongoing support for educators to enhance the effectiveness of blended learning.

As Haryana continues to navigate the complexities of implementing blended learning, the insights provided by this review can inform future research, policy development, and educational practices. By leveraging the strengths of face-to-face and online learning, blended learning can transform education in Haryana, providing students with the skills and knowledge they need to succeed in an increasingly digital world.

10. Theoretical Implications

The theoretical implications of this review emphasize the importance of integrating constructivist and connectivist theories into blended learning models to enhance active engagement and digital literacy. By applying the Antecedents, Decisions, and Outcomes (ADO) and Theories, Contexts, and Methods (TCM) frameworks, the review highlights the need for context-specific adaptations in Haryana's diverse educational landscape. This approach underscores the value of tailored strategies that address regional disparities and resource limitations. Additionally, the review identifies gaps in localized research, suggesting a need for further theoretical exploration to refine existing models and better capture the nuances of blended learning in varied contexts.

11. Practical Implications

The practical implications of this review emphasize the need for targeted interventions to enhance the effectiveness of blended learning in Haryana. Educational institutions should prioritize improving technological infrastructure, mainly in rural areas, to bridge the digital divide and ensure equitable access. Professional development programs for educators must be strengthened to equip them with the skills needed for effective blended instruction. Additionally, curriculum design should be flexible to integrate online and face-to-face components seamlessly. Policymakers should focus on creating supportive institutional policies, such as financial aid and resources for digital tools, to alleviate budget constraints. These practical steps are crucial for overcoming existing challenges and optimizing the implementation of blended learning, ultimately improving educational outcomes in Haryana’s diverse settings.

12. Future Scope and Limitations

The future scope of this study includes exploring the long-term impacts of blended learning on student outcomes and institutional effectiveness in Haryana. Further research could investigate how technological advancements and evolving pedagogical approaches influence blended learning practices. Longitudinal studies could provide insights into the sustainability of blended learning initiatives and their effects on different educational levels. Additionally, comparative studies across different states or countries could offer broader perspectives on the adaptability and scalability of blended learning models.

However, there are limitations to this study. The findings are context-specific to Haryana and may not be generalizable to other regions with different technological, socioeconomic, or cultural contexts. Furthermore, the rapid pace of technological change means that recommendations may need continuous updates to remain relevant. Addressing these limitations in future research will be essential for a more comprehensive understanding of blended learning’s impact and effectiveness.

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