

BLENDED LEARNING FOR DEVELOPING WRITING SKILLS OF ENGINEERING STUDENTS

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Abstract

Blended learning, a pedagogical approach combining traditional face-to-face instruction with online learning activities, has gained traction in higher education, particularly in engineering disciplines. This paper examines the efficacy of blended learning in enhancing the writing skills of engineering students. The integration of digital tools and resources with conventional teaching methods offers a multifaceted learning environment that addresses the diverse needs of students. The paper synthesizes findings from various studies, highlighting the benefits of blended learning, such as increased student engagement, flexibility, and personalized learning experiences. Key components of effective blended learning programs, including the use of interactive platforms, online discussion forums, and immediate feedback mechanisms, are explored in depth. The review also addresses the challenges faced in implementing blended learning, such as technological barriers, the digital divide, and the need for faculty training. Additionally, the paper evaluates the impact of blended learning on students' writing proficiency, critical thinking, and overall academic performance. Methodologies for assessing writing skills in a blended learning context are discussed, emphasizing both qualitative and quantitative approaches. The findings suggest that blended learning can significantly improve the writing abilities of engineering students by providing them with continuous practice and diverse feedback. However, the success of such programs largely depends on the effective integration of technology and active involvement of instructors. This paper concludes by offering practical recommendations for educators and institutions seeking to adopt blended learning strategies to enhance the writing skills of engineering students, advocating for a balanced approach that leverages the strengths of both traditional and digital pedagogies.

Keywords: Blended Learning, Writing Skills, Engineering Students, Digital Tools, Pedagogical Approaches, Online Learning, Student Engagement, Personalized Learning, Interactive Platforms, Academic Performance, Critical Thinking, Feedback Mechanisms, Faculty Training, Technological Barriers, Digital Divide.

Introduction

The rapid evolution of educational paradigms in the 21st century has significantly transformed the landscape of higher education, particularly in engineering disciplines. Among these transformative

approaches, blended learning has emerged as a powerful educational model, integrating traditional face-to-face classroom methods with online instructional techniques. This hybrid approach not only leverages the strengths of both modalities but also addresses the diverse learning needs of students, enhancing their overall academic experience.

In the context of engineering education, writing skills are paramount, yet often underemphasized in conventional curricula. Effective communication, particularly in writing, is crucial for engineers who must articulate complex technical information clearly and precisely. Despite its importance, many engineering students struggle with developing proficient writing skills, which are essential for their academic success and professional careers.

This paper delves into the potential of blended learning to enhance the writing skills of engineering students. It examines various blended learning strategies and their effectiveness, providing a comprehensive overview of existing research on the subject. By analyzing the integration of technology in writing instruction, the paper seeks to uncover how blended learning can address the unique challenges faced by engineering students in developing their writing proficiency.

The objective of this paper is to offer insights into the best practices and pedagogical frameworks that educators can adopt to facilitate improved writing outcomes. By synthesizing findings from multiple studies, this paper aims to highlight the advantages of blended learning environments and propose recommendations for their implementation in engineering education. Ultimately, this review aspires to contribute to the ongoing discourse on educational innovation and its role in fostering essential skills among future engineers.

Background of the study

In recent years, the educational landscape has undergone significant transformations, primarily driven by the integration of technology in teaching and learning processes. Among these technological advancements, blended learning has emerged as a prominent pedagogical approach. Blended learning combines traditional face-to-face classroom methods with online educational materials and interactive digital activities, aiming to leverage the strengths of both modalities to enhance the learning experience.

The field of engineering education, known for its rigorous curriculum and emphasis on technical proficiency, has also embraced blended learning. However, one critical area that often poses challenges for engineering students is the development of effective writing skills. Engineering students typically focus on technical subjects, and as a result, their writing skills, especially in English, may not receive adequate attention. Proficiency in writing is essential for engineers, as they need to communicate complex ideas clearly and effectively in various professional contexts, including reports, research papers, and project documentation.

Previous research has highlighted the benefits of blended learning in improving student engagement, motivation, and academic performance across various disciplines. Specifically, studies have demonstrated that blended learning can significantly enhance students' language and

writing skills by providing diverse and flexible learning resources, interactive activities, and timely feedback. Despite these promising findings, there is a paucity of research focusing explicitly on the impact of blended learning on the writing skills of engineering students.

This study seeks to address this gap by systematically reviewing the existing literature on the use of blended learning for developing writing skills among engineering students. The review aims to identify effective blended learning strategies, tools, and practices that have been successful in this context. Furthermore, it explores the challenges and opportunities associated with implementing blended learning in engineering education, providing insights and recommendations for educators and policymakers.

By synthesizing the current state of knowledge, this study contributes to the ongoing discourse on educational innovations and their implications for engineering education. It underscores the importance of writing skills for engineering students and highlights the potential of blended learning as a viable solution to enhance these skills. Ultimately, the findings of this review will inform the development of more effective instructional approaches, thereby better preparing engineering students for their professional careers where proficient writing is indispensable.

Justification

1. **Relevance to Educational Needs:** Engineering students often struggle with developing strong writing skills, which are essential for their academic and professional success. The increasing importance of effective communication in engineering disciplines necessitates innovative teaching methods that can enhance students' writing abilities. Blended learning, which combines online digital media with traditional classroom methods, offers a promising approach to address this educational need.
2. **Current Educational Trends:** The adoption of blended learning has been growing across various educational fields due to its flexibility, accessibility, and potential for personalized learning. By reviewing the application of blended learning specifically for developing writing skills in engineering students, the paper aligns with contemporary trends in education technology and pedagogy.
3. **Gap in Existing Literature:** While there is substantial research on blended learning and its general impact on education, there is a specific gap in literature regarding its effectiveness in enhancing writing skills among engineering students. Engineering curricula often prioritize technical skills, sometimes at the expense of developing soft skills like writing. This review addresses this gap by synthesizing existing studies and providing insights into the potential benefits and challenges of implementing blended learning in this context.
4. **Interdisciplinary Approach:** The paper takes an interdisciplinary approach by integrating insights from education, engineering, and technology. This approach is crucial for developing a comprehensive understanding of how blended learning can be effectively

implemented to improve writing skills, considering the unique needs and constraints of engineering education.

5. **Implications for Curriculum Development:** Findings from this paper can inform curriculum developers and educators about best practices and effective strategies for incorporating blended learning into engineering programs. By identifying successful models and common pitfalls, the paper can guide the design of more effective writing instruction methods that cater to engineering students.
6. **Contribution to Educational Practice:** The paper aims to provide practical recommendations for educators who are seeking to enhance their students' writing skills through blended learning. By reviewing and synthesizing empirical studies and theoretical frameworks, the paper offers evidence-based strategies that can be readily applied in educational settings.
7. **Promoting Lifelong Learning:** Writing is a critical skill that extends beyond academic success and into professional life. By focusing on developing writing skills through blended learning, the paper contributes to the broader goal of promoting lifelong learning and professional competence among engineering graduates.
8. **Alignment with Institutional Goals:** Many educational institutions are increasingly focusing on improving student outcomes and ensuring that graduates possess a balanced set of skills. This review supports these institutional goals by exploring a method that can enhance a key competency—writing—thereby contributing to the overall quality of engineering education.

This research paper is justified by its alignment with current educational trends, the identified gap in the literature, its interdisciplinary approach, and its potential impact on curriculum development and educational practice. By examining the effectiveness of blended learning for developing writing skills in engineering students, the paper addresses a critical need in engineering education and offers valuable insights for educators and policymakers.

Objectives of the Study

1. To examine the effectiveness of blended learning approaches in enhancing the writing skills of engineering students.
2. To identify the key components of blended learning that contribute to the development of writing skills.
3. To evaluate the challenges and barriers faced by engineering students in improving their writing skills through blended learning.
4. To explore the perceptions and attitudes of engineering students towards blended learning for writing skills development.
5. To provide recommendations for the implementation of effective blended learning strategies in engineering curricula to improve writing skills.

Literature Review

Blended learning, an educational approach that combines online and face-to-face learning experiences, has gained significant attention in recent years. This method leverages the advantages of both traditional classroom settings and digital learning environments to create a more flexible and engaging learning experience. In the context of developing writing skills among engineering students, blended learning offers unique opportunities to address the specific challenges faced by this demographic. This literature review explores the current research on blended learning, focusing on its efficacy in improving the writing skills of engineering students.

Blended Learning in Higher Education

Blended learning has been widely adopted in higher education due to its potential to enhance student engagement, improve learning outcomes, and provide greater flexibility. According to Graham (2013), blended learning integrates the best aspects of in-person and online learning, creating a more effective educational experience. This approach allows students to benefit from the direct interaction and immediate feedback available in traditional classrooms while also taking advantage of the flexibility and accessibility of online resources.

Writing Skills in Engineering Education

Writing skills are essential for engineering students, as they need to communicate complex technical information clearly and effectively. However, engineering students often struggle with writing due to their focus on technical subjects and lack of emphasis on communication skills in their curriculum (Paretti, 2008). Developing strong writing skills is crucial for their academic and professional success, making it imperative to find effective teaching methods that cater to their unique needs.

Effectiveness of Blended Learning for Writing Skills Development

Research indicates that blended learning can be particularly effective in improving writing skills among engineering students. A study by Garrison and Kanuka (2004) highlights that blended learning environments facilitate critical thinking and reflective writing, which are essential components of effective writing. By incorporating online discussion forums, peer reviews, and writing workshops, blended learning provides engineering students with multiple avenues to practice and enhance their writing skills.

Furthermore, a study by Alammary, Sheard, and Carbone (2014) found that the flexibility of blended learning allows students to learn at their own pace, which is particularly beneficial for mastering complex writing tasks. The combination of asynchronous online activities and synchronous face-to-face interactions helps students receive timely feedback and improve their writing iteratively.

Challenges and Considerations

While blended learning offers numerous benefits, it also presents certain challenges. One major challenge is ensuring that students are equally engaged in both online and face-to-face components of the course. According to Owston, York, and Murtha (2013), maintaining student motivation and participation in online activities can be difficult, especially when students are more accustomed to traditional classroom settings.

Another consideration is the need for adequate training and support for instructors. Effective implementation of blended learning requires instructors to be proficient in both online teaching technologies and pedagogical strategies that foster active learning (Graham, Woodfield, & Harrison, 2013). Providing professional development opportunities for instructors is crucial to the success of blended learning initiatives.

Blended learning holds significant promise for developing writing skills among engineering students. By combining the strengths of traditional and online learning environments, this approach can address the unique challenges faced by engineering students in mastering writing skills. While there are challenges to be addressed, such as maintaining student engagement and providing instructor support, the potential benefits make blended learning a valuable strategy in engineering education. Further research is needed to explore best practices and optimize blended learning models for writing instruction in engineering programs.

Material and Methodology

Research Design

The research design for this review paper is a systematic literature review (SLR), which involves a comprehensive and structured approach to identify, evaluate, and synthesize existing research on the effectiveness of blended learning in developing writing skills among engineering students. This design ensures a rigorous analysis of relevant studies, aiming to provide a consolidated understanding of current knowledge, identify gaps, and suggest future research directions.

Data Collection Methods

Data collection for this review involved several stages:

1. **Database Selection:** Electronic databases such as Google Scholar, PubMed, IEEE Xplore, Scopus, and Web of Science were used to search for relevant studies.
2. **Search Strategy:** Keywords and phrases used included "blended learning," "engineering students," "writing skills," "academic writing," and "education technology." Boolean operators (AND, OR) were employed to refine searches.
3. **Inclusion Criteria Application:** Initially, titles and abstracts were screened for relevance. Studies that appeared to meet the inclusion criteria were retrieved in full and further assessed.

4. **Data Extraction:** Data from selected studies were extracted using a predefined template, capturing information on study design, participants, intervention details, outcomes, and conclusions.

Inclusion and Exclusion Criteria

Inclusion Criteria:

1. **Study Design:** Empirical studies, including experimental, quasi-experimental, and observational studies, were included.
2. **Population:** Studies involving engineering students at undergraduate or postgraduate levels.
3. **Intervention:** Studies examining the impact of blended learning approaches on writing skills development.
4. **Outcome Measures:** Studies that measured writing skills improvements through qualitative or quantitative assessments.
5. **Publication Date:** Studies published within the last ten years to ensure contemporary relevance.
6. **Language:** Studies published in English.

Exclusion Criteria:

1. **Study Design:** Review articles, opinion pieces, and non-empirical studies were excluded.
2. **Population:** Studies involving non-engineering students or mixed populations where data specific to engineering students could not be isolated.
3. **Intervention:** Studies focusing solely on traditional or fully online learning without a blended component.
4. **Outcome Measures:** Studies that did not provide clear outcome measures related to writing skills.
5. **Publication Date:** Studies published more than ten years ago.

Ethical Consideration

Ethical considerations in this systematic review involved ensuring the integrity and transparency of the review process. Since the study did not involve direct interaction with human subjects, ethical approval was not required. However, the following ethical practices were adhered to:

1. **Fair Representation:** Ensuring a balanced and unbiased representation of the literature.
2. **Confidentiality:** Maintaining the confidentiality of data extracted from studies.

3. **Plagiarism Prevention:** Ensuring zero plagiarism by appropriately paraphrasing and citing all sources.
4. **Conflict of Interest:** Declaring any potential conflicts of interest and ensuring they do not influence the review process.

By adhering to these methodological frameworks, the review aims to provide a comprehensive and reliable synthesis of the impact of blended learning on the development of writing skills among engineering students.

Results and Discussion

This paper examines the efficacy of blended learning approaches in enhancing the writing skills of engineering students. Blended learning, which combines traditional face-to-face instruction with online components, is gaining popularity in educational settings. However, its effectiveness specifically in the context of writing skills development among engineering students warrants investigation. Through a systematic review of relevant literature, this paper synthesizes findings from various studies to provide insights into the benefits, challenges, and best practices of implementing blended learning for writing instruction in engineering education.

Key Findings:

1. **Improved Writing Proficiency:** Several studies indicate that blended learning interventions positively impact the writing proficiency of engineering students. By integrating online resources, such as interactive writing tutorials, peer feedback platforms, and multimedia presentations, students have the opportunity to engage with writing tasks in diverse formats, leading to enhanced skills development.
2. **Enhanced Collaboration and Feedback:** Blended learning environments facilitate increased collaboration among students and instructors. Through online discussion forums, collaborative writing projects, and real-time feedback mechanisms, students receive timely and constructive critiques, fostering iterative improvement in their writing abilities.
3. **Flexibility and Accessibility:** The flexibility offered by blended learning enables engineering students to access writing materials and assignments at their convenience, accommodating diverse learning styles and schedules. This flexibility is particularly beneficial for non-native English speakers and part-time students, who may require additional support in language acquisition and academic writing.
4. **Technological Challenges:** Despite the benefits of blended learning, implementation challenges related to technology infrastructure, software compatibility, and digital literacy skills persist. Engineering institutions need to invest in robust technological infrastructure and provide adequate training and support to faculty and students to maximize the effectiveness of blended learning initiatives.

5. **Pedagogical Design:** Effective integration of online and face-to-face components requires careful pedagogical design. Studies highlight the importance of aligning learning objectives, instructional activities, and assessment methods across both modalities to ensure coherence and effectiveness in writing skills development.
6. **Institutional Support and Faculty Development:** Successful implementation of blended learning necessitates institutional support and ongoing faculty development initiatives. Engineering institutions should prioritize the provision of resources, training programs, and incentives to empower faculty members to design and deliver high-quality blended learning experiences tailored to the unique needs of engineering students.

Blended learning holds promise as an effective approach for developing the writing skills of engineering students. However, successful implementation requires careful consideration of technological, pedagogical, and institutional factors. Future research should focus on longitudinal studies and comparative analyses to further evaluate the long-term impact of blended learning on writing proficiency and academic success in engineering education.

Limitations of the study

1. **Sample Size and Diversity:** The study might be limited by a small or homogenous sample size, potentially restricting the generalizability of the findings to a broader population of engineering students.
2. **Duration of Intervention:** If the intervention period for the blended learning approach was short, it might not capture the long-term effects on writing skills development.
3. **Controlled Environment:** The study may have been conducted in a controlled academic setting, which might not fully reflect the challenges and conditions faced by engineering students in real-world writing tasks.
4. **Assessment Tools:** The tools used to assess writing skills and plagiarism might have limitations in terms of validity and reliability, potentially impacting the accuracy of the results.
5. **Self-Selection Bias:** If participants volunteered to take part in the study, there could be a self-selection bias, as those who volunteered might already have a predisposition towards writing or a particular learning style.
6. **External Factors:** External factors such as other concurrent coursework, personal commitments, or access to resources outside the study's control might influence the outcomes of the blended learning approach.
7. **Long-term Retention:** The study might not have assessed the long-term retention of writing skills and avoidance of plagiarism beyond the immediate post-intervention period.

8. **Technology Accessibility:** If the blended learning approach heavily relied on technology, disparities in technology access among participants could have influenced the effectiveness of the intervention.
9. **Teacher Variability:** The effectiveness of the blended learning approach might vary depending on the skills and approaches of individual instructors facilitating the course.
10. **Publication Bias:** There could be a bias towards publishing positive results, potentially leading to an overestimation of the effectiveness of the blended learning approach for developing writing skills and preventing plagiarism.

Addressing these limitations in future research could provide a more comprehensive understanding of the efficacy of blended learning in developing writing skills among engineering students while ensuring plagiarism prevention.

Future Scope

As society and technology continue to evolve, so does the landscape of education. The research paper "Blended Learning for Developing Writing Skills of Engineering Students" presents a promising avenue for enhancing the writing proficiency of engineering students through a combination of traditional and digital learning methods. Looking ahead, several avenues of future research and application emerge, promising to further refine and expand the effectiveness of blended learning in educational settings. Here's a glimpse into the future scope:

1. **Advanced Blended Learning Models:** Future research could delve into refining and developing more sophisticated blended learning models tailored specifically to engineering education. These models could incorporate adaptive learning algorithms, personalized learning pathways, and real-time feedback mechanisms to optimize the learning experience for individual students.
2. **Integration of AI and Natural Language Processing (NLP):** With the advancement of AI and NLP technologies, there is immense potential to integrate these tools into blended learning platforms. AI-powered writing assistants could provide students with instant feedback on grammar, style, and coherence, facilitating self-directed learning and enhancing writing skills.
3. **Virtual Reality (VR) and Augmented Reality (AR) Applications:** Immersive technologies like VR and AR offer unique opportunities to create engaging learning environments for engineering students. Future research could explore the integration of VR simulations and AR overlays to contextualize writing assignments within the engineering domain, providing students with hands-on experiences that enhance both their technical and communication skills.
4. **Cross-disciplinary Collaboration:** Collaboration between educators, instructional designers, engineers, and linguists could lead to the development of interdisciplinary

approaches to blended learning. By leveraging insights from diverse fields, such as cognitive psychology, linguistics, and human-computer interaction, educators can design more effective writing curricula that cater to the specific needs and learning styles of engineering students.

5. **Longitudinal Studies and Impact Assessment:** Long-term studies tracking the academic and professional trajectories of engineering students who have undergone blended writing instruction can provide valuable insights into the long-term efficacy of such programs. By assessing factors such as retention of writing skills, academic performance, and career outcomes, researchers can demonstrate the tangible benefits of blended learning in preparing engineering students for success in the workforce.
6. **Cultural and Linguistic Considerations:** Given the increasing globalization of engineering education, it is essential to consider cultural and linguistic diversity in the design and implementation of blended writing programs. Future research could explore strategies for accommodating diverse linguistic backgrounds and cultural perspectives, ensuring that writing instruction remains inclusive and equitable for all students.
7. **Teacher Training and Professional Development:** Effective implementation of blended learning requires knowledgeable and skilled educators who can leverage technology to support student learning effectively. Future efforts should focus on providing teacher training and professional development programs that equip instructors with the pedagogical strategies and technological competencies necessary for successful blended learning implementation.

By embracing these future directions, educators and researchers can continue to push the boundaries of blended learning in engineering education, ultimately empowering students to communicate effectively and thrive in an increasingly complex and interconnected world.

Conclusion

This research paper underscores the significant potential of blended learning methodologies in enhancing the writing skills of engineering students. Through a comprehensive analysis of existing literature, it becomes evident that the integration of traditional face-to-face instruction with online learning platforms offers a dynamic and effective approach to addressing the unique challenges faced by engineering students in developing their writing abilities.

Blended learning not only provides students with greater flexibility and autonomy in their learning process but also facilitates personalized feedback and engagement, which are crucial components in the acquisition of writing proficiency. Moreover, the incorporation of multimedia resources, collaborative activities, and real-world applications inherent in blended learning environments further enriches the learning experience and cultivates a deeper understanding of writing principles and practices.

However, while the advantages of blended learning for writing instruction are clear, it is essential to acknowledge the importance of proper implementation and ongoing evaluation to ensure its efficacy. Educators must carefully design and scaffold blended learning experiences to align with the specific needs and goals of engineering students, while also fostering a supportive and interactive learning community.

In light of the findings presented in this review, it is recommended that educational institutions and instructors embrace blended learning as a valuable tool for enhancing the writing skills of engineering students. By leveraging the strengths of both traditional and online learning modalities, educators can create engaging and effective learning environments that empower students to communicate effectively and succeed in their academic and professional endeavors.

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