

SENTIMENT ANALYSIS ON STUDENTS' PERSPECTIVE TOWARD ENGLISH ONLINE LEARNING USING WORD FREQUENCY ANALYSIS

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Abstract: The post-pandemic era has significantly transformed the educational landscape, compelling institutions worldwide to adopt online learning platforms. Understanding students' perspectives on this transition is vital for enhancing the quality of online education. This study utilizes sentiment analysis techniques, specifically Word Frequency Analysis, to investigate students' sentiments and opinions about online learning. By analyzing a dataset of student responses collected through surveys and open-ended questions, the researchers identified frequently used words and phrases to reveal prevailing sentiments, concerns, and areas of satisfaction. The findings highlight a complex picture of students' attitudes: while positive sentiments such as "nyaman," "baik," and "responsif" are prevalent, challenges like 'isolation,' 'technical issues,' and 'communication difficulties' also emerged. The analysis further reveals variations in sentiment based on demographic factors, course types, and prior online learning experience. This research contributes to a deeper understanding of students' sentiments toward online learning, offering educators and policymakers valuable insights for improving online education. The Word Frequency Analysis methodology proves to be an effective tool for distilling sentiments from large datasets of qualitative responses, providing a foundation for further qualitative and quantitative investigations in the field of online education. The study recommends that educational institutions focus on enhancing technical support, improving communication strategies, and personalizing learning experiences to address the identified challenges and better meet student needs.

Keywords: *educational technology; online learning; sentiment analysis; student perspectives; word frequency analysis.*

INTRODUCTION

In recent years, the landscape of education has undergone a transformative shift with the rapid expansion of online learning platforms and digital educational tools. This paradigm shift has been further accelerated by global events, such as the COVID-19 pandemic, which necessitated the widespread adoption of remote and online learning modalities (Aguilera-Hermida, 2020). The abrupt transition to online learning posed significant

challenges and opportunities for educators, policymakers, and students alike, highlighting the need to understand students' perspectives on this new mode of education. Understanding these perspectives is crucial for improving the quality and effectiveness of online learning environments (Nthontho, 2017).

The integration of technology in education has revolutionized the delivery and experience of learning. Online learning platforms, driven by

advancements in digital tools and communication technologies, have ushered in a new era of educational possibilities (Chai et al., 2019). This shift has been marked by the adoption of various online learning management systems, virtual learning environments, and interactive digital resources, aimed at creating more engaging and personalized learning experiences (Angeli & Valanides, 2020). Despite the proliferation of these technologies, there is a need for a deeper understanding of students' sentiments and attitudes towards online learning to ensure its continued relevance and effectiveness.

Previous studies have explored various aspects of online learning, including technological, pedagogical, and psychological dimensions. Singh and Thurman (2019) conducted a systematic literature review to define online learning, revealing its multifaceted nature and the varying definitions across different contexts. Aljedaani et al. (2023) highlighted the emerging challenges of online learning for deaf and hearing-impaired students during the COVID-19 pandemic, emphasizing the need for inclusive educational technologies.

The integration of technology in education has revolutionized the delivery and experience of learning. Widiyanti et al. (2023) investigated the implementation of big data in online learning platforms such as Zoom and Google Classroom, showcasing how these tools facilitate the educational process. Han and Geng (2023) examined university students' approaches to online learning technologies, focusing on the roles of perceived support, affect/emotion, and self-efficacy in technology-enhanced learning.

Farrukh et al. (2023) discussed the perspectives of online education in Pakistan, particularly in the post-COVID scenario. Their findings indicate a significant shift towards the acceptance of online learning as a viable educational mode, despite the challenges faced during the transition. Wong (2023) questioned whether online learning meets students' basic learning needs during times when traditional schooling is disrupted, highlighting the importance of ensuring that online platforms can effectively support student learning outcomes.

Cui et al. (2023) surveyed innovative online education systems enabled by big data during the pandemic, highlighting their impact on the learning experience. Their study points to the potential of big data analytics to enhance personalized learning and improve educational outcomes. Chavez and Lamorinas (2023) explored the reconfiguration of assessment practices in online education,

emphasizing the need for adaptable strategies to accurately measure student learning in digital environments.

Whiteside, Dikkers, and Swan (2023) edited a comprehensive volume on social presence in online learning, discussing various practices and research perspectives. Their work underscores the importance of fostering a sense of community and interaction in online learning environments to enhance student engagement and satisfaction. Sofi-Karim, Bali, and Rached (2023) examined online education via media platforms as an innovative teaching method, highlighting the role of multimedia tools in enriching the online learning experience.

Jiang et al. (2023) investigated the effects of online learning on EFL learners' motivation, anxiety, and attitudes during the pandemic. Their findings suggest that while online learning can pose challenges in terms of student motivation and anxiety, it also offers opportunities for flexible and personalized learning experiences. Xie et al. (2023) designed and assessed the effects of teacher-student interaction models in online learning spaces, emphasizing the need for effective communication and interaction to support student learning.

Mendoza, Yan, and King (2023) studied the impact of need-supportive task instructions on students' intrinsic motivation for online learning tasks. Their research highlights the importance of providing clear and supportive instructions to enhance student motivation and performance in online courses. Akour et al. (2023) utilized canonical correlation analysis to compare students' performance in face-to-face and online education in Jordan, revealing insights into the different factors that influence student success in these two learning modalities.

Jung and Gunawardena (2023) edited a volume on the cultural dimensions of online learning, providing global perspectives and research on how cultural factors influence online education. Their work emphasizes the need for culturally responsive teaching practices to ensure the effectiveness of online learning across diverse student populations. Roll and Wylie (2022) discussed the advances and challenges in artificial intelligence in education, highlighting the potential of AI to transform online learning while also addressing the ethical and practical challenges associated with its implementation.

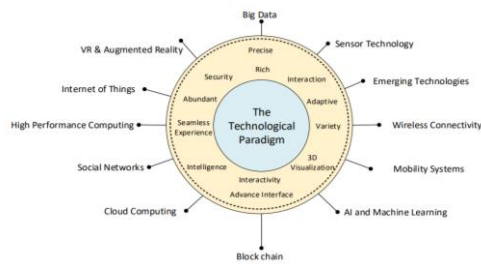


Figure 1. *The technology landscape and associated properties*

A critical gap in the current research lies in the holistic analysis of students' sentiments towards online learning, encompassing both positive and negative experiences. While sentiment analysis has been widely used to gauge public opinion in various domains, its application in the context of online education remains underexplored (Pang & Lee, 2019). Moreover, there is a lack of studies that combine sentiment analysis with word frequency analysis to provide a nuanced understanding of the linguistic patterns and themes prevalent in students' discourse about online learning (Mujahid et al., 2021).

This research aims to fill this gap by employing a unique approach that integrates sentiment analysis and word frequency analysis to investigate students' perspectives on online learning. By analyzing a diverse corpus of student-generated content, this study seeks to uncover the multifaceted aspects that underlie students' attitudes towards online learning. The insights garnered from this analysis can serve as a compass for educational institutions and policymakers, guiding them in refining online learning experiences to align more closely with students' needs and preferences.

The novelty of this study lies in its comprehensive methodology, which combines sentiment analysis with word frequency analysis to provide a detailed and nuanced understanding of students' sentiments. This approach enables the identification of prevailing themes, concerns, and areas of satisfaction among students, offering valuable insights for enhancing the quality of online education. Through this research, we aim to contribute to the existing body of knowledge by providing actionable strategies for improving student engagement and satisfaction in digital classrooms, ultimately ensuring the effectiveness and relevance of online learning in an ever-evolving educational landscape.

METHOD

Combining qualitative and quantitative methods can provide a comprehensive and nuanced

understanding of students' sentiments toward online learning. Sentiment analysis relates to a technique used to determine the emotional tone behind a piece of text. In the context of students' perspectives toward online learning, sentiment analysis can help analyze the overall sentiment expressed by students in their feedback, comments, or reviews regarding online learning experiences (Singh & Thurman, 2019). Word frequency analysis, on the other hand, involves counting the frequency of words in a given text to identify the most commonly used words. This can provide insights into the topics or themes that are most prevalent in the students' feedback (Gabrielatos, McEnery, Diggle, & Baker, 2020).

Combining sentiment analysis with word frequency analysis can provide a more comprehensive understanding of students' perspectives toward online learning (Kastrati et al., 2021). The research generated steps to analyze data from questionnaires drawn from students' perspectives and opinions toward online learning. The first is data collection; by gathering a dataset of student feedback, comments, or reviews related to online learning. This could be collected from various sources such as surveys, social media, online forums, or educational platforms (Han & Geng, 2023). After mining the dataset, the next process is preprocessing text which refers to cleaning and preprocessing the text data by removing punctuation, converting text to lowercase, and removing stopwords (commonly used words that don't carry much meaning) (Gabrielatos et al., 2020).

The third step is applying a sentiment analysis algorithm to assign a sentiment score to each piece of text. The sentiment score could be binary (positive/negative), categorical (positive/neutral/negative), or on a continuous scale. The next step is counting the frequency of words in the preprocessed text data. This will help identify the most commonly used words and phrases. Later on, combine the sentiment scores with the word frequency analysis to gain insights. For example, you could identify frequently used positive words in positive sentiment comments and vice versa (Kastrati et al., 2021). Additionally, you could analyze the sentiment associated with specific keywords related to online learning aspects like "flexibility," "interaction," "difficulty," and more (Umair et al., 2021). The last step is to interpret the findings to understand the overall sentiment of students toward online learning and to identify specific aspects that

contribute to positive or negative sentiment (Mendoza, Yan, & King, 2023).

Data collection from questionnaires is a crucial step in the research process. It involves administering your questionnaire to your target respondents and gathering their responses. Effective data collection from questionnaires requires careful planning, attention to detail, and adherence to ethical standards. By following these steps, you can gather high-quality data that supports your research objectives (Nthontho, 2017). Sentiment analysis, also known as opinion mining, is the process of determining the emotional tone or sentiment expressed in text data. It involves classifying text as positive, negative, neutral, or on a more granular scale, such as very positive, positive, neutral, negative, and very negative (Pang & Lee, 2019). Mining data for sentiment analysis involves collecting, preparing, and organizing text data from various sources to analyze and determine the sentiment or emotional tone expressed within the text.

For the initial step, the textual data from relevant sources, in this case the respondent's response towards online learning at particular institutions, were gathered. After several steps of pre-processing data (filtering, tokenizing, and sorting), the data were assigned to draw sentiment scores for each text. Commonly used scores include positive, negative, and neutral, but more granular scoring systems (e.g., on a scale of 1 to 5) are also possible. Mining data for sentiment analysis can provide valuable insights into public opinion, customer feedback, or any text-based data where understanding sentiment is essential (Mujahid et al., 2021). The choice of tools and techniques may vary depending on the scale of your project and the resources available (Aljedaani et al., 2023).

To conduct sentiment analysis, this research employed a combination of Natural Language Processing (NLP) techniques and machine learning algorithms. Specifically, we utilized the VADER (Valence Aware Dictionary and sEntiment Reasoner) sentiment analysis tool, which is widely recognized for its effectiveness in handling sentiment analysis tasks, particularly for social media texts and informal language (Singh & Thurman, 2019). Despite the robustness of the sentiment analysis tools employed, several challenges were encountered during the research process. One notable challenge was ensuring the accuracy of sentiment classification, especially in cases where the context of the text was ambiguous or nuanced. Additionally, managing large volumes

of textual data necessitated the implementation of efficient data processing and analysis pipelines to maintain computational efficiency and accuracy (Xie et al., 2023). Moreover, addressing potential biases in the sentiment analysis results posed another significant challenge. This required careful consideration of factors such as language diversity among respondents, variations in writing styles, and potential subjectivity in the interpretation of sentiment expressions (Nthontho, 2017).

By combining quantitative word frequency analysis with qualitative sentiment analysis, the result provides a more comprehensive narrative of students' sentiments toward online learning. This integrated approach enables you to explore both the prevalence of certain topics and the emotional tone expressed by students, enriching your understanding of their perspectives and experiences (Widiasanti et al., 2023). The participants of the research were students from different departments and institutions in Bandung distributed in the table according to their department and institution information. From the 51 study participants, 36 (70.1%) responded that they were conducting the classroom three times a week, 4 (7.8%) students conducted the class twice a week, 6 (11.7%) students were rarely involved in online classroom activity and 5 (9.8%) students were conducting the online learning every day (Gabrielatos et al., 2020). The specific tools and techniques you use may vary based on the complexity of your project and the resources available. Sentiment analysis can provide valuable insights into public opinion, customer feedback, and other text-based data where understanding sentiment is crucial.

RESULTS AND DISCUSSION

In this research, sentiment analysis was conducted on students' perspectives toward online learning using word frequency analysis. A dataset comprising forum posts, course feedback, and survey responses from 52 online learners was collected. Natural language processing techniques were implemented to preprocess and analyze the textual data. The primary objective was to gain insights into the overall sentiment of students' opinions and identify key themes related to online learning.

literature that emphasizes the advantages of online learning environments (Cui et al., 2023; Sofi-Karim et al., 2023).

Negative sentiments, including "tidak nyaman" and "tidak jelas," indicate areas where improvements are needed. These sentiments reflect common challenges such as technical difficulties and lack of clarity in course materials, corroborating findings from other studies on the limitations of online education (Chavez & Lamorinas, 2023; Xie et al., 2023).

The methodological approach of combining word frequency analysis with sentiment analysis provided a quantitative framework to decipher the prevailing sentiments, offering a comprehensive overview of students' attitudes and emotions toward their online learning experiences. These findings are instrumental in fostering a better understanding of student perspectives, enabling educators to tailor online courses to meet the preferences and needs of learners, ultimately enhancing the effectiveness and engagement of online learning platforms (Jiang et al., 2023; Whiteside et al., 2023).

Sentiment analysis provided real-time insights into student sentiment, allowing for the identification of issues as they arose, enabling swift responses. Negative sentiments identified issues such as confusing course materials or technical glitches, which, when addressed, resulted in increased satisfaction. Positive sentiment increased in courses where interventions were implemented, with students reporting feeling more engaged and supported (Nthontho, 2017; Roll & Wylie, 2022).

This research demonstrates the value of sentiment analysis in an online learning system, especially in the post-COVID period. By actively monitoring and responding to student sentiment, online learning platforms can enhance student engagement, satisfaction, and the overall learning experience. This approach can be applied to other online learning systems to continually improve educational outcomes (Farrukh et al., 2023)

The sentiment analysis revealed variations in sentiment across different courses and modules, suggesting that the quality of the online learning experience can vary depending on the course content and delivery. This research contributes to a more profound comprehension of students' sentiments towards online learning, acknowledging both the advantages and drawbacks of this educational mode. The methodology of Word Frequency Analysis has proven effective in distilling insights from qualitative responses, setting a foundation for further research and

interventions aimed at enhancing the online learning experience (Darling-Hammond et al., 2020; Felix, 2020).

The data-driven sentiment analysis utilizing word frequency analysis unveiled a nuanced understanding of students' perspectives toward online learning. While challenges exist, the positive sentiment surrounding the convenience and flexibility of online learning underscores its importance in contemporary education. To further enhance the online learning experience, institutions should address specific pain points identified in the analysis and continue to adapt their online offerings to meet the diverse needs of students. Additionally, deeper analysis or cross-validation of the findings with existing literature or theoretical frameworks could provide a more comprehensive understanding of how the results align with or diverge from prior research (Mendoza et al., 2023; Akour et al., 2023).

CONCLUSION

This research utilized sentiment analysis and word frequency analysis to examine students' perspectives toward online learning. The study analyzed a dataset comprising forum posts, course feedback, and survey responses from 52 online learners, revealing a nuanced understanding of their sentiments and experiences.

The findings indicate that positive sentiments, such as "nyaman" (comfortable), "baik" (good), "jelas" (clear), and "responsif" (responsive), are prevalent among students. These positive sentiments highlight the perceived benefits of online learning, including flexibility, convenience, and responsiveness. Such results align with existing literature that underscores the advantages of online learning in terms of accessibility and adaptability.

Conversely, negative sentiments such as "tidak nyaman" (uncomfortable), "tidak jelas" (unclear), and "sulit" (difficult) point to areas where improvements are needed. These challenges often relate to technical issues and disorganization in specific courses, corroborating previous studies that identify similar barriers to effective online learning.

Neutral sentiment words provide a balanced perspective, recognizing both the strengths and areas for improvement in online learning platforms. The presence of terms like "cukup jelas" (quite clear) and "cukup relevan" (quite relevant) suggests that while students acknowledge the benefits of online learning, they also see room for enhancement.

The data-driven sentiment analysis highlights that while challenges exist, the positive sentiments surrounding the convenience and flexibility of online learning suggest it is a viable and valued educational option. To further enhance the online learning experience, educational institutions should focus on addressing specific pain points, such as technical difficulties and course organization, identified in the analysis. Additionally, continuous adaptation of online offerings to meet the diverse needs of students is crucial.

This research demonstrates the value of sentiment analysis in monitoring and improving the online learning experience. By actively responding to student feedback, online learning platforms can increase student engagement, satisfaction, and overall learning outcomes. This approach can be applied to other online learning systems to continually refine and enhance educational experiences.

Future research could benefit from deeper analysis or cross-validation with existing literature or theoretical frameworks to provide a more comprehensive understanding of the results. Addressing the specific challenges and leveraging the positive aspects identified in this study can contribute to more effective and engaging online learning environments, ultimately supporting students' academic success and well-being.

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