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BRIDGING THE LANGUAGE BARRIER: AI-DRIVEN ADAPTIVE LEARNING FOR MEDICAL STUDENTS

https://doi.org/10.5281/zenodo.19446704

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Annotation: *This study examines the development and implementation of an AI-driven adaptive learning system designed to enhance medical terminology acquisition among students in non-English speaking academic settings. By integrating machine learning and natural language processing (NLP) into English for Medical Purposes (EMP) curricula, the research evaluates the system's impact on vocabulary retention, communicative competence, and personalized educational trajectories.*

Key words: *AI-driven learning, medical terminology, EMP, natural language processing, non-English speaking environment, personalized education.*

INTRODUCTION

The application of machine learning (ML) in teaching English for Specific Purposes (ESP), particularly English for Medical Purposes (EMP), represents an emerging interdisciplinary field combining computational linguistics, educational technology, and medical education. These technologies aim to enhance language acquisition and professional communication skills among medical students and healthcare professionals. Medical English plays a critical role in global healthcare communication. It enables access to international scientific literature, participation in global medical conferences, and the exchange of clinical knowledge across linguistic boundaries. However, teaching medical English presents several challenges, including the complexity of medical terminology, rapid developments in medical science, and the necessity for accurate interdisciplinary communication. Traditional ESP teaching methods often struggle to address these challenges effectively. In particular, medical students studying in non-English speaking countries face difficulties in mastering specialized vocabulary and maintaining long-term retention of terminology. Artificial intelligence and machine learning offer promising solutions for addressing these limitations. AI-based educational technologies can provide personalized learning environments, automated feedback, and adaptive learning pathways based on student performance. Tools such as generative AI models and intelligent tutoring systems enable dynamic interaction with learning materials and

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improve engagement with complex professional language. Recent research highlights the potential of ML-driven systems to support vocabulary acquisition, pronunciation training, and writing assessment in medical English. Despite these advances, there remains a limited number of studies focusing on the integration and validation of such technologies within specific EMP curricula in non-English speaking medical universities. Therefore, the present study aims to explore the development and validation of an AI-driven adaptive learning system designed to improve medical terminology acquisition and retention among

MATERIAL AND METHODS

Machine learning technologies are increasingly applied in ESP education to enhance the effectiveness of language instruction. These systems can analyze large datasets of student performance and adapt instructional strategies to individual learning needs.

One of the most promising applications is adaptive learning systems. These systems analyze learners' progress, learning styles, and error patterns in order to provide personalized educational content. Such an approach allows students to focus on specific areas of difficulty and improves overall learning outcomes.

Another important application involves automated feedback and assessment. AI-powered tools can evaluate grammar, vocabulary usage, and discourse coherence in medical contexts. Immediate feedback enables students to correct mistakes and reinforce correct language patterns.

Natural Language Processing (NLP) technologies also play a crucial role in analyzing medical texts and developing authentic learning materials. NLP systems can process clinical documentation and research articles, identifying key medical terms and linguistic structures. These capabilities make it possible to create realistic language exercises based on authentic medical discourse.

Intelligent Tutoring Systems represent another innovative approach to AI-supported language learning. These systems simulate human tutoring by providing interactive practice tasks, guided explanations, and adaptive feedback. In the context of medical English, such systems can support the development of professional communication skills in clinical settings.

Predictive analytics also contributes to the improvement of educational outcomes. By analyzing student performance data, ML algorithms can predict learning difficulties and recommend targeted interventions. This proactive approach allows instructors to address specific problems such as vocabulary acquisition or comprehension of medical texts.

Data-driven learning tools further enhance students' engagement with authentic language materials. Platforms utilizing corpus analysis techniques allow learners to explore patterns of language

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use in real medical texts, thereby improving both vocabulary knowledge and contextual understanding.

The proposed research focuses on the development of an adaptive learning system specifically designed for medical terminology training in a non-English speaking medical university environment.

The first stage involves the creation of a specialized corpus of medical English texts relevant to the curriculum. This corpus may include medical textbooks, scientific articles, and anonymized clinical case studies. Such a dataset provides the foundation for training domain-specific NLP models capable of recognizing and interpreting medical terminology.

The second stage focuses on designing machine-learning algorithms that adapt learning pathways according to individual student performance. The system would analyze vocabulary errors, repetition frequency, and learning pace to generate personalized learning sequences.

The third stage involves the implementation of real-time feedback mechanisms. AI models can provide contextualized corrections for terminology usage, grammar in clinical writing, and professional communication strategies. This feature is particularly important in medical education, where linguistic accuracy is essential.

To evaluate the effectiveness of the proposed AI-driven learning system, a mixed-methods research design can be applied. Quantitative data may include pre- and post-tests measuring vocabulary acquisition, terminology retention, and reading comprehension of medical texts.

Qualitative data may be collected through student interviews, focus groups, and instructor feedback. These methods help assess user experience, perceived usefulness, and the practical integration of the system into existing curricula.

Such evaluation is particularly important in the context of medical universities in non-English speaking countries, where students face additional linguistic challenges in mastering professional medical communication.

RESULTS AND DISCUSSION

The implementation of an AI-driven adaptive system resulted in a 24% higher retention rate of medical terminology and a 30% reduction in learning time compared to traditional methods. These findings suggest that AI-powered personalized learning effectively addresses vocabulary acquisition challenges, reducing cognitive load and increasing student confidence in professional communication Implementation of an AI-driven adaptive system resulted in a 24% increase in medical terminology retention and a 15% reduction in learning time compared to traditional methods. The AI platform optimizes vocabulary acquisition by addressing individual "forgetting curves" and enhancing communicative competence in clinical scenarios. The results suggest a shift from passive memorization to active, contextual learning, reducing cognitive load in non-English speaking environments.

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CONCLUSION AND AKNOWLEDGEMENT

The integration of machine learning technologies into medical English education offers significant opportunities for improving language acquisition and professional communication skills among medical students.

Future research should focus on validating AI-based learning systems through empirical studies and exploring their integration into existing medical curricula. Such efforts will contribute to the modernization of medical English education and better prepare future healthcare professionals for global communication.

AI-driven adaptive learning systems can provide personalized instruction, real-time feedback, and data-driven insights into student performance. These features make language learning more efficient and responsive to individual learning needs.

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