# Abstract

In the current global landscape, where interconnectivity between nations and cultures is at its peak, the skill of being multilingual has taken on a new level of significance. Within this multilingual spectrum, the Japanese language has become a particularly vital language to acquire. This holds especially true for international students residing in Japan, where fluency in Japanese goes far beyond academic achievements, transforming into an essential component for effective daily life and deeper cultural assimilation. For these students, learning Japanese is not merely a pursuit of linguistic proficiency for educational purposes. Instead, it represents a key to unlocking a fuller, more enriched experience within Japan. Proficiency in Japanese allows them to navigate the complexities of everyday interactions, from the simplicity of market transactions to the intricacies of social customs and traditions. It also plays a pivotal role in establishing meaningful connections with the local community, enabling a richer understanding of the cultural nuances and historical contexts that define Japanese society. In essence, Japanese language proficiency is more than a mere academic endeavor for international students in Japan. In an increasingly interconnected world, it is indispensable for day-to-day living, cultural understanding, and personal growth. In response to these challenges, this study introduces the PICSU system, whose pioneering approach integrates object recognition technology with the extensive WordNet lexical database, setting a new precedent in Japanese vocabulary learning.

The research explored the innovative use of images smartphones captured as a vocabulary learning tool. This approach integrates the learning of synonyms and antonyms through a thesaurus-based system, seamlessly embedding it within the framework of image-based learning. The system, named PICSU, represents a substantial shift from traditional language learning methodologies. It significantly enhances learner engagement by providing a contextually rich environment crucial for effective language acquisition. Unlike the conventional rote memorization techniques often associated with flashcards, PICSU leverages the visual stimuli from everyday life captured in photographs. This method not only aids in retaining new vocabulary but also helps in understanding the practical application of these words in real-world scenarios. By doing so, it offers a more holistic and immersive learning experience. Furthermore, the research delves into the comparative effectiveness of this innovative approach against the traditional flashcard methods, highlighting the benefits of integrating visual elements in language education.

The research employed a novel methodology, combining the YOLO object recognition

model with the WordNet database to enrich learners' vocabulary through a photo-based learning environment. An extensive experimental study involving 20 students from the Japan Advanced Institute of Science and Technology (JAIST) was conducted. This study assessed the PICSU system's efficacy compared to traditional flashcard methods. Participants were divided into four groups, each engaging in learning Japanese nouns through both the PICSU system and the flashcard method. The experimental design was meticulous, ensuring a comprehensive evaluation of the system's effectiveness in enhancing vocabulary learning.

The study's results clearly demonstrated the superior effectiveness and learner engagement of the PICSU system compared to traditional methods. Participants using PICSU showed significantly higher success in memory assessments, indicating better retention and understanding of vocabulary. They also experienced less memory loss and made fewer errors in tests, suggesting a deeper and more lasting grasp of the learned words. This success is attributed to PICSU's innovative approach, combining visual stimuli with contextual learning. The system's use of smartphone-captured images and thesaurus integration creates a more immersive and relatable learning environment. Additionally, learners reported higher levels of motivation and enjoyment with PICSU, underscoring its potential as a modern, effective tool for language learning.

These findings support the hypothesis that visual aids, a core component of the PICSU system, considerably enhance memory retention and facilitate more effective learning. The empirical data underscored the advantages of integrating visual aids into language learning methodologies, particularly in the context of complex languages like Japanese.

The study represents a significant advancement in language learning technology. By synergizing advanced object recognition technology with a comprehensive language database, the PICSU system has effectively demonstrated its potential to revolutionize language acquisition, especially focusing on thesauruses. The system's ability to integrate seamlessly into learners' daily lives, providing an engaging and interactive learning environment, sets it apart from traditional language learning methods.

The study opens the door for further exploration in key areas such as long-term retention effects of the PICSU system, understanding the cognitive mechanisms behind its learning process, and examining its adaptability across various learner demographics. Future enhancements of PICSU are planned to include gamification elements to boost engagement, as well as auditory components and voice functionality, aiming to create a more immersive and comprehensive learning experience. These developments are targeted not just towards facilitating effective Japanese language acquisition, but also catering to a broader range of learners, thereby enriching their journey towards fluency.

The ultimate goal is to evolve PICSU into a tool that transcends traditional vocabulary acquisition, fostering not only language learning but also promoting deeper cultural understanding and integration, making it a pivotal tool for cultural exchange and global communication.

In summary, the PICSU system marks an important advancement in the field of language education, signaling the start of a promising new chapter in this area. By ingeniously integrating cutting-edge technology with highly effective learning strategies, PICSU stands out as an avant-garde system. It offers a unique, engaging, and efficient approach to language acquisition, perfectly aligning with the needs and preferences of today's technology-oriented generation. The system's innovative use of smartphone-captured images and integration of thesaurus-based learning provide a contextually rich and visually stimulating educational experience. This not only aids in faster vocabulary acquisition but also ensures a deeper understanding and retention of the language. Furthermore, the potential of PICSU to revolutionize the landscape of language education is immense. Enhancing the learning experience for current students significantly contributes to increased motivation, engagement, and, ultimately, better learning outcomes. Its adaptability to incorporate future advancements in technology and pedagogy positions it as a dynamic and evolving tool. This adaptability ensures that PICSU will continue to set new benchmarks in language education, meeting the evolving needs of learners. Additionally, as demonstrated by the research, its proven effectiveness over traditional methods underscore its potential to become a standard in language learning, paving the way for a more interactive, immersive, and effective educational experience. In this way, PICSU is not just a tool for the current generation of learners but also fosters the future of language education, creating a legacy that will benefit future generations by providing a more engaging and technologically advanced learning environment.

Keywords: Japanese vocabulary learning, thesauruses learning, object detection, object recognition, learning system, YOLO, WordNet.