

## **Augmented Reality Manga (ARM): The Use of the ADDIE Model for Japanese Reading Enhancement in People's Republic of China**

Ayana Kato, Rajamangala University of Technology Thanyaburi, Thailand  
Metee Pigulong, Rajamangala University of Technology Thanyaburi, Thailand

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### **Abstract**

The research question in this study is 1) What is the efficacy of the augmented reality that the researcher is developing in enhancing the Japanese skills of students? 2) Just how effective will the comparison of the student's learning achievement scores be? The research objectives are to 1) evaluate the learning achievements of students between pre-test and post-test scores using an augmented reality comic book and 2) determine the effectiveness of the augmented reality manga after its use. The study population consisted of 23 students in the College of Science and Technology at Ningbo University during the second semester of the academic year 2025. The data was analyzed and interpreted using the following statistics: dependent t-test and effectiveness index. 1) The anticipated advantages include the potential for augmented reality to enhance the Japanese language skills of students. 2) Augmented reality enhances students' self-assurance and facilitates the completion of classroom assignments more efficiently. 1) This study may serve as supplementary evidence for individuals who wish to conduct action research concerning the utilization of digital technology. According to the research findings, the paired t-test comparing the pre-test and post-test results demonstrated statistically significant differences at the 0.05 level ( $t = 6.02$ ,  $p = 0.00$ ). The results also indicated that the effectiveness index was 0.597, which indicates that the students experienced a 59.7% increase in cognitive score improvement following the test.

*Keywords:* augmented reality, manga, ARM, language education, Japanese learning achievement improvement

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## Introduction

In recent years, digital technology has become an essential component in foreign language education, contributing to enhanced learning support and pedagogical innovation. In particular, Augmented Reality (AR) has attracted increasing attention due to its ability to overlay digital information onto the real world, creating interactive and immersive learning environments. Previous studies have indicated that AR can increase learner motivation, improve comprehension, and support contextualized learning. However, research focusing on the application of AR in Japanese language education, especially in the context of Chinese universities, remains limited.

At Chinese universities, Japanese language instruction has traditionally emphasized grammar explanation and textbook-based reading activities. While this approach is effective for developing foundational knowledge, it often fails to sufficiently engage learners or support the development of practical reading comprehension skills, particularly when dealing with authentic materials such as manga. Manga contains colloquial expressions, cultural references, and contextual cues that are difficult for learners to interpret without adequate support.

To address these challenges, this study aims to develop an Augmented Reality Manga (ARM) learning material and examine its effectiveness in improving Japanese manga reading comprehension among second-year university students in China. Using the ADDIE instructional design model, AR-based short video clips—such as cooking videos, vocabulary explanations, and kanji reading support—were integrated into selected scenes from the manga *Shinya Shokudō*. This research investigates whether ARM can enhance learners' reading comprehension and motivation compared to conventional learning methods.

## Literature Review

Recent advances in educational technology have significantly influenced foreign language education, particularly through the integration of digital and immersive learning environments. Among these technologies, Augmented Reality (AR) has attracted increasing scholarly attention due to its ability to overlay digital information onto real-world contexts, thereby enhancing learner engagement and comprehension (Azuma, 1997). Previous studies have demonstrated that AR-based learning environments can promote motivation, contextual understanding, and learner autonomy by combining visual, auditory, and interactive elements (Nakazawa, 2021).

In language education, AR has been applied to vocabulary learning, pronunciation training, and cultural instruction. Gayevska (2022) reported that AR-assisted Japanese language learning increased learners' interest and supported both linguistic and cultural understanding. Similarly, Miyosawa (2012) compared AR-based learning materials with traditional printed resources and found that although test scores did not differ significantly, AR materials stimulated higher cognitive engagement and reduced learning-related stress.

Manga has also been widely recognized as an effective instructional medium in Japanese language education. Manga provides authentic language input, colloquial expressions, and culturally embedded contexts that are difficult to convey through textbooks alone. However, learners often struggle with manga reading due to informal expressions, onomatopoeia, and cultural references. These challenges highlight the need for instructional support that maintains authenticity while facilitating comprehension.

To systematically design such instructional materials, the ADDIE model—consisting of Analysis, Design, Development, Implementation, and Evaluation—has been widely adopted in educational innovation research. Integrating AR, manga, and the ADDIE model provides a strong theoretical foundation for developing innovative learning materials that address current challenges in Japanese language education.

### Methodology

This study employed a one-group pre-test and post-test experimental design to examine the effectiveness of an Augmented Reality Manga (ARM) learning material. The participants were 23 second-year undergraduate students enrolled in the College of Science and Technology at Ningbo University during the second semester of the 2024 academic year. They had completed basic Japanese grammar courses and demonstrated an intermediate reading level equivalent to JLPT N3–N2.

The instructional material was developed following the ADDIE model. During the Analysis phase, common difficulties in manga reading—such as colloquial expressions, kanji readings, and culturally specific vocabulary—were identified through classroom observation and instructor feedback. In the Design and Development phases, selected scenes from the manga *Shinya Shokudo* were chosen based on their conversational density and cultural relevance. The ARM content was developed using Unity and included short AR video clips that provided cooking demonstrations, vocabulary explanations, kanji reading guidance, and cultural notes.

During the Implementation phase, students used their own smartphones to scan the manga pages and access AR content while reading independently. Data collection consisted of a reading comprehension pre-test and post-test, as well as qualitative student comments collected through questionnaires. The Evaluation phase focused on comparing test scores and analyzing learner feedback to assess learning outcomes and user experience.

### Results

The quantitative analysis revealed a clear improvement in students' reading comprehension performance after using the ARM learning material. The mean pre-test score was 4.83, while the mean post-test score increased to 7.91, indicating a statistically significant improvement. The Effectiveness Index (EI) was calculated as 0.597, demonstrating that learners achieved approximately 59.7 percent of the expected learning progress.

**Table 1**

*The Effectiveness After Using an ARM for 23 Second-Year Students*

<b>c</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>Min</b>	<b>Max</b>
<b>Pre-Test</b>	<b>23</b>	<b>4.83</b>	<b>1.95</b>	<b>2</b>	<b>8</b>
<b>Post-Test</b>	<b>23</b>	<b>7.91</b>	<b>1.50</b>	<b>4</b>	<b>10</b>

**Table 2**  
*Pre-post Test Scores*

Pre-Post Test Scores	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Pre-Test Score	5	2	4	8	2	5	4	6	4	3	7	3	8
2 Post-Test Score	8	8	10	10	7	7	7	8	7	6	9	4	8

  

Pre-Post Test Scores	14	15	16	17	18	19	20	21	22	23	Total	SD
1 Pre-Test Score	5	4	8	7	5	5	4	7	2	3	111	1.95
2 Post-Test Score	9	8	10	7	6	8	9	9	10	7	182	1.50

Qualitative data supported these findings. Many students reported that the AR video support helped them better understand characters' emotions, situational context, and informal expressions. Vocabulary explanations and kanji reading assistance were frequently mentioned as particularly useful, allowing learners to read more independently without relying on teacher intervention.

However, some negative feedback was also identified. Several students reported physical fatigue from holding smartphones for extended periods, while others experienced technical issues such as unstable video playback or limited compatibility across different smartphone models. These factors occasionally affected learners' concentration during the reading activity.

### Discussion

The findings of this study are consistent with previous research indicating that AR can enhance motivation and contextual understanding in language learning. Similar to the results reported by Gayevska (2022) and Nakazawa (2021), the ARM learning material increased learner engagement by providing multimodal and context-sensitive support.

Compared with traditional manga reading instruction, ARM reduced cognitive load by offering immediate explanations aligned with the reading context, which supports Krashen's (1985) concept of comprehensible input. The use of short AR video clips, rather than lengthy explanations, also helped prevent information overload and maintained learners' focus on reading.

Nevertheless, technical and physical limitations must be considered. Device compatibility issues indicate the need for cross-platform optimization, while physical fatigue suggests that AR-based activities should be used selectively rather than continuously. These findings suggest that ARM is most effective as a supplementary learning tool within a structured instructional framework.

### Conclusion

This study developed an Augmented Reality Manga (ARM) learning material and examined its effectiveness in improving Japanese manga reading comprehension among Chinese

university students. The results demonstrate that ARM can enhance learners' reading comprehension and motivation by providing contextualized visual and auditory support.

From a pedagogical perspective, ARM offers practical implications for Japanese language educators. It can be used as an effective supplementary tool for teaching colloquial expressions, cultural content, and authentic reading materials. Teachers are encouraged to conduct device compatibility checks in advance, provide clear instructions on AR usage, and integrate ARM activities strategically to minimize cognitive and physical fatigue.

Several limitations should be acknowledged. The sample size was relatively small, and the study focused on a single manga title. In addition, technical issues related to smartphone compatibility were observed. Future research should involve larger participant groups, explore a wider range of manga genres, and improve technical stability across devices.

In conclusion, this research highlights the potential of ARM as an innovative and learner-centered approach in Japanese language education. With further refinement and broader implementation, ARM can contribute to more engaging, effective, and authentic reading instruction in higher education contexts.

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**Contact email:** [ayana\\_k@mail.rmutt.ac.th](mailto:ayana_k@mail.rmutt.ac.th)