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Practices of ARCS Chinese language instructional design with MR application participation

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Abstract: This inquiry employed the ARCS instructional design theory and an author-developed Mixed Reality (MR) application. To ascertain its efficacy, seven Chinese language learners who are Japanese native speakers, consisting of three males and four females (average age = 44.43 years, *SD* = 16.59), participated in a validation experiment. They were divided into two groups and underwent three times 100-minute Chinese language classes. The MR application, rooted in TPR, gamification, and engagement theories, emphasizes individual learning and integrates shared experiences in mixed reality, fostering collaborative learning. Evaluation encompassed engagement, motivation, learning strategies, achievement scores, and affective scales. The outcome reveals enhanced intrinsic motivation and collaborative engagement after three times classes.

Keywords: Mixed Reality, ARCS instructional design, Chinese language learning, engagement

1. Introduction

Since the 1990s, the globalization of the economy has led to a rising number of Japanese individuals studying Chinese (Hirai, 2016). Japanese universities are witnessing an increasing trend in students selecting Chinese as their second foreign language. This surge is reflected in the growing implementation of Chinese language courses across Japanese universities, with over 15,000 classes and approximately 500,000 students annually (Sunaoka, 2017). Notably, most Chinese language learners, as indicated by the 'Six Language Survey,' are beginners, constituting more than 70%. Despite generally having high motivation, these learners often need a strong intrinsic drive compared to learners of other languages. Pronunciation practice dominates class time, hampering the development of practical skills (Sunaoka & Yamaguchi, 2014, Sunaoka *et al.*, 2016). In light of these findings, it is evident that research into effective design for Chinese language courses targeting Japanese learners is imperative.

Concurrently, addressing the decline in academic motivation and achievement has led to increased interest in student engagement as a potential solution. Engagement is believed to be adaptable, influenced by contextual factors, and responsive to environmental modifications. Student engagement encompasses three primary dimensions: behavioral, emotional, and cognitive, with collaborative engagement also considered (Kuh *et al.*, 2001). Simultaneously, the emergence of Mixed Reality (MR) technology, characterized by interactivity, the fusion of virtual and real elements, immersion, and unique physical attributes, offers opportunities to create captivating and interactive learning tools. The ARCS Motivation Model was created to enhance our grasp of motivation for learning and to address motivation-related issues systematically. It outlines four key conditions (Attention, Relevance, Confidence, and Satisfaction) for initiating and sustaining motivation (Keller, 1987).

In this study, an MR app designed to harness the interactive and immersive qualities of MR (Holz *et al.*, 2011) is utilized to boost classroom interest and elevate student

engagement levels. This study aims to formulate an instructional design using the ARCS model and incorporate the MR app into the textbook, thereby enhancing Chinese learners' engagement, internal motivation, improvement in learning strategies, and achievement of higher academic performance.

2. Design

2.1 MR Application

The MR application, designed for this research, incorporates gamification, Total Physical Response (TRP) theory, engagement theory, and pedagogical agents. It features six segments: S0 for introducing objectives, S1 for speech-to-text word learning, S2 for interactive word games, S3 for sentence practice, S4 for verb-object pronunciation, and S5 for grammar exercises. S2 and S5 promote collaborative learning with shared virtual objects, enhancing motivation and engagement.

2.2 ARCS instructional design

Table 1 shows a Chinese language class that was structured using the ARCS model and MR application. Each class spanned 100 minutes, with participants attending three sessions to emphasize collaborative activities and creative learning. The approach aimed to move beyond conventional mechanical exercises, focusing on meaningful language acquisition and application.

The introductory session employed real-life examples to familiarize learners with course content. The MR application's S0 section engaged learners, leveraging the MR headset's (Microsoft Hololens 2) immersive visual experience to stimulate interest. This session employed the Attention and Relevance strategies of the ARCS model. During the personal learning with MR session, learners utilized the MR application on Hololens2 to master new vocabulary and sentences. The app's voice recognition and feedback features allowed for personalized learning. Positive reinforcement and timely feedback further motivated learners, utilizing the Relevance and Confidence strategies of the ARCS model. In the listen to the lecture session, teachers addressed learners' challenges from the personal learning session. Pronunciation, sentence composition, and meaning were clarified. Grammar was emphasized for subsequent group tasks, employing the Attention and Relevance strategies. Group tasks prompted learners to apply knowledge gained, crafting dialogues and diary entries. Teacher feedback enhanced learners' confidence and satisfaction, embracing the Confidence and Satisfaction strategies. Group tasks with the MR involved pairs or trios completing MR application sections to reinforce vocabulary and grammar. Interactive features aimed to boost concentration, confidence, satisfaction, and collaborative engagement, combining Attention, Confidence, and Satisfaction strategies. The summary session saw teachers recap lesson content, address issues, and recognize group achievements. The ARCS model's Attention and Satisfaction strategies underpinned this session.

Table 1. *ARCS instructional for Chinese Class Design*

Sessions	ARCS model	Time(min)
1 Introduction	Attention, Relevance	5
2 Personal learning with MR	Relevance, Confidence	20
3 Listen to lecture	Attention, Relevance	20
4 Group task	Confidence, Satisfaction	30
5 Group task with MR	Attention, Confidence, Satisfaction	20
6 Summary	Attention, Satisfaction	5

3. Evaluation

To verify the effectiveness of the instructional design, seven participants (3 males and 4 females, average age = 44.43 years, *SD*= 16.59) were invited to participate in the pilot experiment. They were Japanese native speakers and beginners in learning Chinese, had

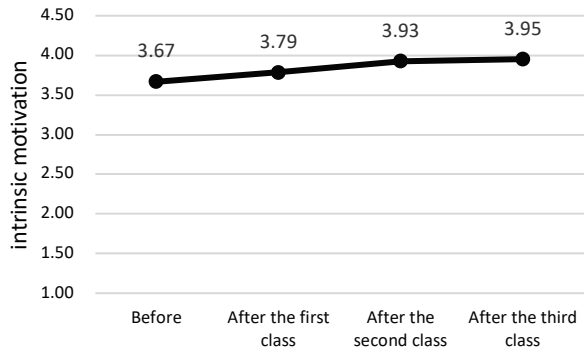

Figure 1. Average points of the intrinsic motivation scale

mastered Pinyin pronunciation, and possessed some rudimentary knowledge of Chinese. The questionnaire on the intrinsic motivation scale (6 items) was made based on the research of Okada (2019). The Behavioral engagement scale (4 items) and Emotional engagement scales (5 items) were taken from the Student Engagement Scale (Skinner et al., 2009), and the Collaborative engagement scale was taken from the research survey by Kuh *et al.* (2001). Figure 1 shows the result of intrinsic motivation. A within-subjects ANOVA analysis on participants' intrinsic motivation scale responses before and after each session showed a significant increase overall ($F(3,18) = 5.32$, $p < .01$). Emotional and behavioral engagement remained consistent across sessions. Collaborative engagement significantly increased in the second and third sessions (second-time class $F(3,18) = 5.40$, $p < .01$; third-time class $F(3,18) = 6.02$, $p < .01$), but not in the first session. Comparisons revealed higher collaborative engagement during group tasks with MR and group task sessions compared to personal learning with MR sessions.

The future objective involves optimizing the teaching model for better utilization of the MR application to achieve more effective learning outcomes.

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