

Approaches on the augmented reality application in Japanese language learning for future language teachers

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Abstract. The article is devoted to the problem, approaches, and features of usage of augmented reality applications in Japanese language learning for future language teachers. We analyzed the usage of augmented reality for supporting and organizing Japanese language learning for future Japanese language teachers and identification of the main approaches to the usage of augmented reality in Japanese language learning. It is concluded that augmented reality tools provide a new paradigm of teaching materials, which has a positive impact on the formation of basic and professional competencies of future Japanese language teachers; it can be effective when used in blended learning that combines distance, online, traditional, and self-directed learning of Oriental languages. Prospects for further research is the creation of guidelines for the usage of augmented reality tools for teaching Oriental languages at different levels of the training of future Oriental languages teachers.

Keywords: augmented reality, augmented reality application, future Japanese language teachers, blended learning, Oriental languages learning, distance learning

1. Introduction

The development of information and communication technologies and their active use in various fields of human activity require young people to find new ways of working, living, and interacting.

Current technologies, used for various professional activities, are of great importance for implementation in the educational process, in particular general education institutions, which is necessary for the competitiveness of young people in the global labor market.

In this regard, immersive technologies, especially augmented reality, are becoming increasingly popular in education [1, 5].

Augmented Reality is a digital or computer-generated information such as images, audio, video, and touch sensations, and overlaying them in a real-time environment. Augmented Reality refers to systems that combine real and virtual objects in a real environment, which are interactive and in real time [4].

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The AR technology is mostly used in education for science classes on human anatomy (Anatomy AR-VR, AR Human Anatomy, The Brain AR App, etc.), Universe (Planets AR, etc.), chemical reactions (MolecularAR, etc.) and plant anatomy contents (Froggipeadia, Arloon Plants AR, etc.). However, this paper deals with AR's place in foreign language education, in particular Japanese language learning. Since a very limited number of applications and AR content are available for language education [2], we will describe all possible usages of AR for Japanese language learning and the experience of students.

2. Theoretical backgrounds

The term "Augmented Reality" was proposed by Caudell and Mizell [7]. They used this term to describe the usage of head-mounted displays by electricians for assembling complicated wiring harnesses [3].

Nelson [16] singles out augmented reality as an important element of "Bring your own device" (BYOD) approach, which is about the usage of mobile devices by teachers and students into classrooms for learning purposes.

Calo et al. [6] define Augmented Reality as "...a mobile or embedded technology that senses, processes, and outputs data in real-time, recognizes and tracks real-world objects, and provides contextual information by supplementing or replacing human senses".

AR is a technology that incorporates digital information such as images, video, and audio into real-world spaces, and provides a possibility to blend virtual environment with reality [14]. Users of this technology have a chance to learn in immersive, computer-generated environments through realistic sensory experiences.

The mobile AR applications can be grouped into three categories depending on their purpose, place of use, and usability, such as marker-based, creation-based, and marker-less AR (figure 1). It should also be noted that some apps in these categories may have both creation-based and marker-less features. However, if an app is a marker-based one, it can't have a marker-less AR feature because it could only work with flashcards.

We can distinguish between the following types of mobile AR [19]:

- marker-based, that uses a camera and a special visual marker, such as a QR code (quick response code);
- creation-based, that uses a browser-based platform, which allows users to upload 3D files and edit them with comments, detailed instructions and animations via a drag-and-drop interface;
- markerless, that uses Global Positioning System (GPS); the most common uses are destination markings, search for the right address, such as a café or office, or in location-based apps.

Researchers identify the following positive effects of AR on students' foreign language learning: improving the effectiveness of their language skills in professional translation, increasing learning motivation, and involving students into cooperation with each other, as well as with native speakers of the foreign language studied by the students [8, 9, 11, 12, 17, 18]. AR has great potential in the field of language education, as it performs such functions as contextual

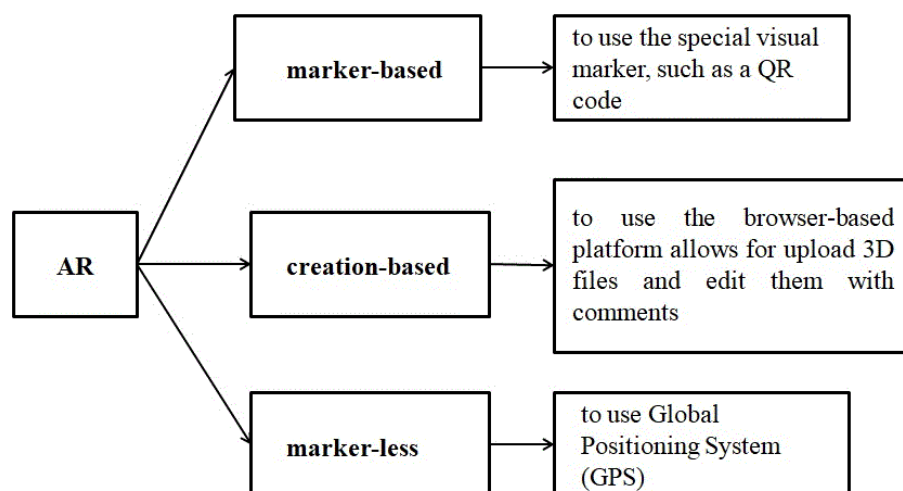


Figure 1: The three categories of mobile AR.

visualization (i.e. presentation of virtual information in an extended context) and interactivity of learning (i.e. the embodiment of interaction with virtual content).

Review of the literature by Viberg and Grönlund [21] states that Mobile Assisted Language Learning (MALL), being the mobile technology which can be adapted to support language learning, is applied in several ways but generally focuses on vocabulary acquisition, listening and speaking skills, and language acquisition as a part of grammar learning. Pronunciation and writing skills were underrepresented in the application of MALL.

Hein, Wienrich and Latoschik [13] analyzed 2507 sources and selected 54 articles for the period from 2001 to 2020, relating to the immersive technologies' role in students' foreign language learning. They found that most of these studies described the comparative analysis of traditional blended learning methods, which included the use of VR and AR. The main characteristics of these technologies, that support the foreign language learning, are to promote the vocabulary learning, development of speaking skills and intercultural competence, students' motivation for foreign language learning, overcoming anxiety and discomfort when communicating in a foreign language. The advantage of learning with AR over traditional teaching methods is in the fact that the student is given an opportunity to feel, rather than imagine, the subject, situation, scenario, which cannot be demonstrated or described in traditional teaching methods.

It should be noted that most of the scientists who study approaches to the use of augmented reality and other mobile technologies for students to learn a foreign language, note that these tools can be successfully used in combination with other methods, forms of learning. They note the blended learning [13, 21], namely: an approach that combines online educational materials and opportunities for interaction online with distance learning and traditional place-based classroom methods.

The purpose of the article is to analyze the use of augmented reality for supporting and organizing the Japanese language learning for future Japanese language teachers, and identification of the main approaches to the use of augmented reality in Japanese language learning.

The research hypothesis is based on the assumption that the training of future Japanese language teachers (in high education institution or general school) will be effective if the following pedagogical conditions are implemented: activating the motivation of future foreign language teachers to carry out project activities in the use of augmented reality technologies as didactic tools for learning Japanese language; improving the content of training future foreign language teachers in order to form their knowledge about the use of information and communication technologies for learning Japanese language.

3. Research methods

To achieve the purpose of our study and also to clarify the problem of using augmented reality tools for future Japanese language teachers we used the following methods: systematic and comparative analysis of pedagogical, psychological, philosophical, sociological research studies, methodological and specialized literature; analysis of the pedagogical experience of using the augmented reality tools at lecturers and seminars of “Japanese Kanji characters” and other courses of the Institute of Philology of Taras Shevchenko National University of Kyiv; synthesis and generalization to formulate the main points of the study; interpretation of the research results.

4. Results and discussion

Scientists attach special importance to the use of augmented reality in the study of Oriental languages by students, in particular future Japanese language teachers.

They note that the preparation of future teachers of Oriental languages (including languages with character-based writing system, such as Japanese, Chinese) for professional activities is a complex process, as it differs significantly from the study and teaching of any other foreign language (i.e English, French, German, Italian, Spain, Turkish, and other languages that are also part of educational program of Institute of Philology of Taras Shevchenko National University of Kyiv).

Researchers recognize the use of AR technologies as a solution to the problems of fast, active, correct, and convenient students’ Oriental languages learning [8–12, 18]. They note that the use of these technologies can improve real-world visualization with virtual objects, graphics, and object recognition technologies.

Frazier, Bonner and Lege [10] singles out the application of Google Earth VR and AR for foreign language learning, including Japanese language that allowed users to visit different locations throughout the world; it meanwhile supports their own learning of various studies i.e. history, political studies, international relations, etc.

Google Earth AR includes various numerous instruments, like Mindshow for creation of different new exciting places and using them for role playing [10]. This tool is markerless, that uses GPS (figure 2). Scientists focuses their attention on the issue that these instruments are useful for distant language learning, though should be supervised by the teacher.

We should pay attention to the possibility of foreign language learning, in particular Japanese language learning, with the help of this service (figure 2) and others that focus on various fields



Figure 2: Example of supporting the Japanese language learning for future Japanese language teachers by using of the Google Earth AR.

of science in Japanese.

We want to pay attention to augmented reality services that support the teaching of various disciplines. Special emphasis should be placed on such education as part of STEM training, which involves integration between the disciplines of natural sciences, technological sciences, engineering and mathematics [15, 19]. For example, many augmented reality applications offer materials in Japanese (BioDigital Human 3D anatomy, 3D Anatomy Learning – Atlas, GeoGebraAR, Planets AR, etc.). It is obvious that the vocabulary of these applications is designed for students who have language skills at the level of B1 and above.

Geng and Yamada [11] offer their experience of usage of AR generators to create markers based on Kanji characters as QR-codes. They made an AR system that supports learning of compound Japanese verbs. Under this system, students can scan a card with the Kanji character of a particular verb, and then watch an animation that displays the corresponding action with the card through the smartphone screen in the application. “In this system, the meanings of verbs, including both single verbs and compound verbs, were represented by 3D animations created by Maya, according to the verb’s visual scheme. Maya is a 3D computer graphics software, and it is used to create interactive 3D animations and visual effects.” The application was developed by scientists using Unity 3D and Vuforia. In addition, the combination function was proposed based on a combination of two cards with the corresponding Kanji characters (V1 + V2) to facilitate the effective study of complex verbs by students (figure 3). Researchers have proven that the approach involving AR in Oriental languages learning is the most effective for students compared to the traditional method.

Platte et al. [17] suggest using ARTranslate (<https://github.com/benpla/ARTranslate>) to foreign language learning using augmented reality. ARTranslate is a software that recognizes up to 1,000 objects in a user’s environment using the Convolutional Neural Networks method [20] and names them accordingly. Objects are superimposed on 3D information in different languages, using AR. The user can open the surrounding everyday objects in any language by

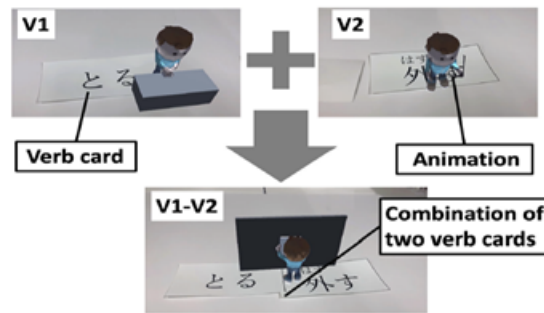


Figure 3: A system for studying complex verbs consisting of one or more Kanji characters, based on AR [11].

switching languages in the ARTranslate application settings.

We surveyed 31 students who took part in this survey on their attitudes towards the usage of AR to improve the quality of Japanese language learning. We proposed the following answers: “Strongly disagree”, “Disagree”, “Neither agree”, “Agree”, “Strongly agree” towards following statements “I have a clear understanding of what augmented reality is and how I can integrate it into my own education process”, “I have heard about augmented reality in foreign language learning”, “I have discussed with my friends about augmented reality for foreign language learning”, “I have experience when teachers use approaches with augmented reality for Japanese language learning”.

Table 1

The results of students’ survey on their understanding of augmented reality in Japanese language learning process (2020–2021).

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I have a clear understanding of what augmented reality is and how I can integrate it into my own education process	8%	17%	32%	39%	4%
I have heard about augmented reality in foreign language learning	3%	16%	28%	49%	4%
I have discussed with my friends about augmented reality for foreign language learning	18%	35%	14%	33%	-
I have experience when teachers use approaches with augmented reality for Japanese language learning	8%	43.6%	35.5%	12.7%	-

Total (N= 31)

According to the questionnaire analysis of the attitudes and understanding of augmented reality in Japanese language learning process, we found out that students understand what aug-

mented reality is, but have not used these tools to learn Japanese: “I have a clear understanding of what augmented reality is and how I can integrate it in my own education process”: Strongly disagree – 8% students; Disagree – 17% students; Neither agree nor disagree – 32% students; Agree – 39% students; Strongly agree – 4% students; “I have heard about augmented reality in foreign language leaning”: Strongly disagree – 3%; Disagree – 16%; Neither agree nor disagree – 28%; Agree – 49%; Strongly agree – 4%.

We showed students the options for using such AR tools for different levels of Japanese language learning (Japanese language learning levels are available at <https://www.jlpt.jp/>) as:

- AR for non-linguistic learning such, as BioDigital Human 3D anatomy, 3D Anatomy Learning – Atlas, GeoGebraAR, Planets AR, Google Earth AR;
- AR for language learning such, as Easy Japanese news, Triplens, ARTranslate;
- Platforms for creating web projects with AR elements such as BlippAR and Google ARCore, that allow students to create their own examples of language learning through augmented reality.

These tools were proposed for usage by 3rd year students of Bachelor program in “Japanese Kanji characters” course, 4th year students of Bachelor program in “Linguistic Tradition of Japan” course, 4th year students of Bachelor program in “Japanese Language Etiquette” course, 2nd year students of Bachelor program in “Japanese language: Practical Course for Translators” course, 1-2 courses year students of Bachelor program in “Oriental Language (Japanese language)” course of the Department of Languages and Literatures of the Far East and Southeast Asia of the Institute of Philology of Taras Shevchenko National University of Kyiv.

After classes and self-study of students with the help of AR, a survey was conducted among 27 students designated as experts on the choice of approaches to the study of Japanese characters. They were asked to use the Likert Scale method to rank approaches to language learning according to their importance – from ineffective (1 point) to very effective (5 points).

Approaches to the study of Japanese Kanji characters were determined according to traditional methods (direct method, grammar-translation method, audio-linguistic method, cognitive method) and considering the usage of information and communication technologies, in particular immersive technologies.

Our students were offered the following approaches to Japanese Kanji learning for the assessment:

- use of electronic dictionaries;
- search and use of Internet resources;
- usage of online educational literature;
- creation and application of their own associations (offline);
- handwriting Kanji character (offline);
- use of AR applications;
- creation of their own educational materials based on augmented reality.

The results of this questionnaire are presented in table 2.

Thus, the results of students’ questionnaires about their opinion on the choice of methods for studying Japanese Kanji character clearly shows the significance of having the opportunity

Table 2

Results of students' questionnaires on their opinion on the choice of approaches to the Japanese Kanji characters learning.

The approaches to Japanese Kanji learning	Mean values
use of electronic dictionaries	4.8
search and use of Internet resources	4.4
usage of online educational literature	3.2
creation and application of their own associations (offline)	2.9
handwriting Kanji characters (offline)	4.7
use of AR applications	3.8
creation of their own educational materials based on augmented reality	5.0

to create their own learning materials based on augmented reality (5 points). According to interviews with students who wished to comment on their answers, this was motivated by the creation of an augmented reality Kanji character that would be of interest to other students and reflect the most difficult cases in Oriental language translation practice. It is also important to use electronic dictionaries (4.8 points), in particular, most AR applications are focused on the assimilation of foreign language vocabulary by users (for example, Triplens, ARTranslate, etc.).

5. Conclusions and prospects for further research

Thus, AR technologies provide a new paradigm of presentation of educational materials, which has a positive impact on the formation of basic and professional competencies of the future teachers of Japanese language. We can single out the following benefits of using AR technologies to train future teachers of Japanese language:

- Usage of AR makes the learning process more visual and mobile;
- Usage of AR increases the interest and motivation of students to learn a language;
- AR improves the learning process, utilizing innovative approaches for student education process;
- AR uses the conditions for the formation and development of creative abilities of students;
- AR technologies and approaches contribute to the support of the linguistic and cultural aspect in student learning.

We should distinguish following approaches to the usage of AR for the study of Japanese by students: 1) usage of specialized applications for language learning; 2) usage of applications for the study of other disciplines (anatomy, biology, computer science, astronomy, etc.) while learning a foreign language; 3) creation of personal examples by students for learning a foreign language with the help of special Web platforms.

AR can be effective if they are used in blended learning that combines distance, online, traditional and self-directed learning of Oriental languages.

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