

Applying Augmented Reality in Foreign Language Learning Materials: Research and Development

Octi Rjeki Mardasari^{1,*}, Novi Eka Susilowati², Ariva Luciandika³,
Primasa Minerva Nagari⁴, Zhao Yanhua⁵

^{1, 2, 3, 4} Universitas Negeri Malang, Malang, Indonesia

⁵ Guangxi Normal University, Guilin, China

*Corresponding author. Email: octi.rjeki.fs@um.ac.id

ABSTRACT

Indonesian Language Learning for Foreign Speakers (BIPA) for Chinese learners program runs well. However, the program implementation is not optimal yet due to the absence of readiness to use learning materials. The learning material becomes one of the components that determines the success of learning. The lack of learning materials has made BIPA learning with academic aims impressed operate sporadically. Moreover, Chinese learners have both language and cultural characteristics, which differ from students in other programs, so they require specific BIPA learning materials. For that, an effort is needed to develop BIPA for academic purpose learning materials using Augmented Reality (AR) technology. AR is a breakthrough in learning using virtual and real technologies that enhance the quality of learning. There will be markers to display audios for listening materials and videos for speaking materials. Branch's (2009) ADDIE model of research and development method is used. Augmented Reality-based BIPA learning materials can be used to solve the limitations of BIPA learning materials and increase learning independence. Thus, it helps international students learn faster and increase the attractiveness of BIPA learning in the eyes of international students. The expert validations (media specialists, material specialists, and BIPA practitioners) showed that Augmented Reality-based BIPA learning materials were excellent learning materials and were suitable for BIPA for academic purpose learning materials in classrooms and independent learning activities.

Keywords: *Augmented Reality, BIPA, Learning Material, R&D.*

1. INTRODUCTION

The use of technology in the learning process is not new in the world of education. Lecturers and teachers have used various kinds of technology as media to support learning activities in the classroom. Augmented Reality technology is an alternative to accompany learning materials or teaching media, which is currently a trend in education and learning research [1], both in elementary and secondary schools or higher education. In 2011 the New Media Consortium predicted AR would gain widespread popularity [2]. New Media Consortium also released the Horizon Report in 2012 and stated that AR technology is the newest technology for teaching, learning, and creative research [3].

Augmented Reality or commonly abbreviated AR, is a hybrid form of visualization that combines the real and virtual worlds (video, sound, photograph, text, 3D

models, etc.) [4] – [6], created with the help of computers. Virtual objects can be the texts, animations, 3D models, or videos linked to the real environment so that users experience virtual objects in their environment. Historically, AR appeared in the context of cinematography and was related to the world of graphics. In subsequent developments, AR is used in various scientific studies. In general, AR is interpreted as a combination of real and virtual objects in a real environment, running interactively in real-time, and there is integration between objects in three dimensions, namely virtual objects integrated into the real world. Merging virtual and real objects is possible with appropriate display technologies, interactivity is possible through specific input devices, and good integration requires effective tracking. AR can be concretized in smartphone applications, digital media, games, or other media that use internet/virtual

assistance. AR presents new possibilities for teaching and learning, not least for learning Indonesian for foreign speakers or better known as BIPA.

BIPA learning can be divided into two types, namely (1) general-purpose BIPA learning and (2) academic BIPA learning. So far, general-purpose BIPA learning has been quite good. Learning is carried out by following the curriculum developed by the Indonesian Ministry of Education and Culture. The learning material used is the book *Sahabatku Indonesia*, also published by the Indonesian Ministry of Education and Culture. However, BIPA learning materials for academic purposes have never been developed before, so many BIPA teachers continue to use the *Sahabatku Indonesia* book in their learning process. This situation may result non-optimal learning objectives of BIPA with academic purposes because the characteristics of the learning materials compiled in the book are not relevant with the goals of BIPA learning for academic purposes. Learning materials play an essential role in determining the success of learning. BIPA learning materials for academic purposes have a distinctive academic element reflected in the components and substance of the material. The Indonesian material taught is standard Indonesian, including common vocabulary and effective sentences. The topic of the material is also according to academic needs.

One of the BIPA programs for academic purposes at Universitas Negeri Malang is the 3+1 program in collaboration with Guangxi Normal University (GXNU), China. This program has been running well since 2018. The implementation of the partnership is expected to increase as more students and study programs are involved. The performance of this increasing program must undoubtedly be welcomed, one of which is realized by the development of learning materials that are ready to be used for program implementation in the future.

Applying Augmented Reality technology in learning materials is felt to provide added value to these learning materials. Through Augmented Reality, a teacher becomes easier in transferring knowledge to students. Therefore, as a method/approach, Augmented Reality can be an alternative media to accompany learning materials or become media that can help students become learning subjects.

The learning materials developed in this research are in the form of printed learning materials which are based on Augmented Reality technology. There will be a marker that serves as a marker to display the audio for listening material and learning video for speaking material in the learning materials. Students are asked to download the AR application to display audio and video learning in the learning materials. After the application is downloaded, scan the QR-Code in the learning materials using the application, then the audio or video

you want to hear or watch will appear. By implementing AR technology in the BIPA learning materials, it is expected that it can increase learning independence, make it easier for students to learn, and increase the attractiveness of BIPA learning in the eyes of Chinese students or other international students.

2. METHOD

The research and development method used is a development model ADDIE developed by Branch [7]. The model stages with a gradual pattern and a feedback loop at each location can minimize errors when all steps are carried out. The steps of this model are presented in Figure 1.



Figure 1 ADDIE Research and Development Model

2.1 Analyze

At this step, the researcher carried out two steps. First was identifying the linguistic characteristics in the spoken-written communication of learners from China. The identification results have been analyzed and described carefully in previous studies. Linguistic traits could be found in the spoken-written touch of Chinese learners from various aspects, including phonological, morphological, and syntactic elements. In addition, from language skills, the characteristics of learners' language skills from China have also been identified. From the results of this study, it was also found that the characteristics of the language skills of Chinese learners and the language skills they needed mostly supported the success of their learning objectives in learning Indonesian. All the results of this study became the basis for developing BIPA learning materials for academic purposes. Second was doing needs analysis. Observations were made on the activities of BIPA students from China and interviewed BIPA teachers to find needs in conducting the teaching and learning activities. This needs analysis activity was carried out so that researchers got an overview of the current state of learning BIPA for academic purposes.

2.2 Design

At this step, the researcher needed to design the concepts by (1) determining the division of large units of learning materials consisting of large units per subject presented in the lesson; (2) designing special units per course; (3) ordering of learning materials per course; (4) marking of materials for being repeated and emphasized; (5) making storyboards for learning videos through Augmented Reality; (6) determining the location of the marker in the form of a QR-Code in listening and speaking subject units; and (7) designing the appearance of the AR application and the features from the AR application such as the AR Start, Instructions for Use, About and Exit.

2.3 Develop

The initial development step was to collect the material used. Then the developer visualized the design draft. At this step, the developer began to develop learning materials based on the designs that had been made. Then the AR application design that had been compiled was created by using software with the support of several other software, namely Wondershare Quiz Creator, Adobe Photoshop CS 4, Adobe Premiere Pro CC 2017, and Ultimate C# Audio and Video Framework. Furthermore, the learning materials were validated by specialists, validated by practitioners, and tested on a limited scale. Specialists' validation consisted of media specialists and material specialists. The media specialist was a lecturer in Educational Technology with a Master's degree in education having more than five years of experience reviewing graphic and multimedia products. Meanwhile, the material specialist and practitioners were Indonesian language education lecturers who have actively taught Indonesian language programs for foreign speakers (BIPA).

2.4 Implementation

At this step, trials were carried out on the developed product. If there had been deficiencies, revisions would have been made. This process would also be documented, resulting in an implementation video. The trial subjects of this product were Chinese students who had been currently taking BIPA learners for academic purposes. Then the researcher observed the students during the learning process using the learning materials that had been prepared. During the trial, the researcher recorded the events or events that became the research data.

2.5 Evaluation

The final step was the evaluation stage. At this step, the researcher evaluated the product test results. The evaluation was carried out based on the validation questionnaire of media experts, material experts, and practitioners. Field notes contained about the effects of students' processes, reactions, and responses when using

learning materials. Evaluation activities were carried out to find out whether the learning materials made or developed were successful and by initial expectations or not. The results of the evaluation were taken into consideration for further use/utilization of these learning materials. Then, the learning materials were revised according to suggestions and criticisms from experts and practitioners.

3. FINDINGS AND DISCUSSION

The initial development results, namely learning materials, were divided into four main parts: teaching listening, speaking, writing, and grammar competencies. Each section in this learning material consisted of 9 subsections comprised of three crucial components: concepts, examples, and exercises. With these components, it was expected that BIPA students with academic goals could understand the learning materials well because the prepared learning materials were equipped with examples and exercises.

In contrast to BIPA learning materials in general, learning materials, especially language skills learning materials, in these learning materials were presented separately. In general, BIPA learning materials were divided into several units: learning language skills and grammar. The presentation of learning material per language skill and grammar were presented separately in this learning material until it was complete and was not divided into chapters. This situation was based on the demands of the depth of the material that the learner had to achieve. However, so that each of these language skills was intertwined, a theme binds each section in each subsection.

In addition, BIPA learning materials were integrated with Augmented Reality (AR) applications. A marker functioned as a marker to display the audio for listening competence and a learning video for speaking competence in the learning materials. Students were asked to download the AR application to display audio and video learning in the learning materials. After the application had been downloaded by moving the QR-Code in the learning materials using the application, then the audio or video would appear that you wanted to hear or watch. The following are the features that exist in the AR application, such as the AR Start, Instructions for Use, About, and Exit.



Figure 2 AR application main menu display

Next is the QR-Code display as a marker in listening and speaking subject units to bring up Augmented Reality.



Figure 3 Marker in the BIPA material teaching display

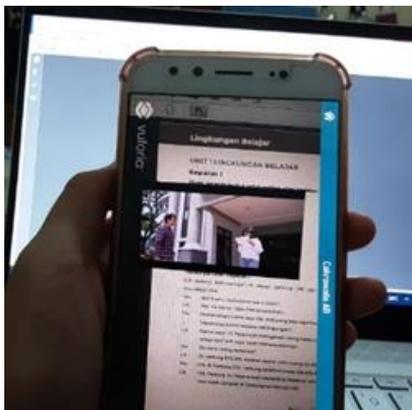


Figure 4 Live augmented reality video view

3.1 Media Specialist Questionnaire Results

Before testing augmented reality-based learning materials' validity to material specialists and BIPA practitioners, the augmented reality application as a companion media for BIPA learning materials was first tested for validity to a media specialist. This application assessment consisted of 20 aspects of questions related to the appearance of augmented reality applications, audio displays, and video displays. From the media specialist's assessment results, six aspects got 75%-84% with good categories. Still, they needed to be revised, namely aspects: the suitability of the typeface in the application, the clarity of the voice in the video, the clarity of the learning objectives, the suitability of the captions in the video, the clarity of the captions in the video, and the attraction of the bumper on the video. Meanwhile, 14 aspects fell into the percentage of 85%-100% with a very good category. Still, they did not need to be revised, including aspects: the attractiveness of the main menu appearance of the application, suitability of layout in the application, suitability of application color composition, clarity of application title, suitability of font size selection in the application, image clarity, clarity of usage instructions, systematic order of utilization instructions, video attractiveness, video clarity, audio, and video quality, appropriateness of volume settings, smooth operation of applications, clarity of sound in audio, and compatibility of video and audio duration. The validation aspect from the media expert was then processed, and the data obtained were 95.25%. From this percentage, it could be interpreted that the augmented reality application as a companion media for BIPA learning materials was included in the very good category and did not need revision. The results of this validation proved that this augmented reality application was able to become unique instructional medium, affording educators opportunities to create, customize and scale authentic, student-centered, interactive learning experiences [8].

3.2 Material Specialist Questionnaire Results

After testing the validity of the augmented reality application, the development results in the form of Augmented Reality-based BIPA learning materials were tested for validity by a material specialist. The assessment of learning materials consisted of four components, namely (1) content description, (2) systematic presentation, (3) language use, and (4) display of learning materials with a total of 54 questions. 6 questions got a percentage of 75%-84% with the category of good learning materials and need to be revised, namely on the aspect of the feasibility of the content regarding the accuracy of the exercises based on the concepts and examples presented; the accuracy of the material presented from easy to difficult, and the consistency of learning activities in each section; the accuracy of the use of punctuation marks; the clarity of

additional information on the cover and the attractiveness of the selected typeface. Forty-eight questions fell into the percentage of 85%-100% with a very good category and did not need to be revised, covering aspects of the assessment of the accuracy of the content of the material from seven questions, six of which get a value of four, all questions in the supporting section of the content of learning materials got a value of four; in the aspect of presentation regarding the completeness of the presentation, all questions got a value of four, the coherence of the presentation of five questions, three of which got a value of four; in the aspect of language use regarding, the accuracy of sentences and paragraphs all questions got a value of four, the accuracy of linguistic rules, two of the questions got a value of four, all questions on the limitation of the message got a value of four; the display aspect of the cover design, four questions three of which got a value of four, all questions in the illustration section of the image got a value of four and typography four questions, three of which got a value of four. The validation aspect that came from the material expert was then processed the data and obtained 98, 2%. From this percentage, it could be interpreted that Augmented Reality-based BIPA learning materials were included in the very feasible category and did not need revision. This validation proved that the BIPA learning materials had met two principles that had to be considered in developing BIPA learning materials. First, the material development format could be formatted according to the demands and learning objectives because there was no structured and standardized format. Second, the development of BIPA learning materials could be patterned and developed based on the orientation of outcomes or behaviors expected to be possessed by students. The development of learning materials can be carried out using discrete or integrative approaches [9].

3.3 BIPA Practitioners Questionnaire Results

In the validity test from material experts to BIPA practitioners, the aspects asked in the assessment of learning materials were the same as questions for material experts, namely (1) content description, (2) systematic presentation, (3) language use, and (4) display of learning materials with a total of 54 questions. The difference lay in obtaining validation results from practitioners of 95.67% after the data had been processed, which was smaller than the results of material expert validation. However, these learning materials were still interpreted as very feasible and do not need revision. From the BIPA practitioner's assessment results, fourteen questions got a percentage of 75%-84% in the category of good learning materials, and stills needed to be revised. The aspects of the question that still needed to be revised were the suitability of grammar material with BIPA competencies for academic purposes; the suitability of choosing speaking material, writing material, and

grammar material with the needs of learners BIPA; the accuracy of theory or content presented in learning materials; clarity of exposure to concepts, examples, and exercises and availability of exercises that trained students to think critically; the continuity of the content or topics of learning materials; accuracy of sentence structure; clarity of the language used to explain concepts, and clarity of instructions in exercises.

4. CONCLUSIONS AND SUGGESTIONS

BIPA learning for academic purposes for Chinese students has been going quite well so far. The implementation of this program has not been optimal. One of which is due to the absence of ready-to-use learning materials. Learning materials are one of the components that determine the success of learning. The absence of adequate learning materials has caused BIPA learning for academic purposes to seem sporadic. Moreover, Chinese students have different language and cultural characteristics from students in other programs, so Chinese students cannot use learning materials that are commonly used in other BIPA programs. For this reason, an effort is needed to develop BIPA learning materials for academic purposes.

The development of augmented reality-based BIPA learning materials is not only developed as a solution in solving the limitations of BIPA learning materials. Still, it can also be a solution in increasing learning independence, making it easier for international students to learn, and increasing the attractiveness of BIPA learning in the eyes of international students. Based on the validation that has been done to media specialists, material specialists, and BIPA practitioners, it can be concluded that Augmented Reality-based BIPA learning materials are very good. These learning materials are suitable for BIPA learning materials for academic purposes, both for classroom learning and independent learning.

ACKNOWLEDGMENTS

The research was funded by *Hibah Penerimaan Negara Bukan Pajak (PNBP)/Non-Tax Revenue Grant*. We thank the research assistant for their great effort in helping this project. Also, we thank the families, students, school staff, and colleagues for their participation and support in helping and assisting with this study.

REFERENCES

- [1] J. Bacca, S. Baldiris, R. Fabregat, S. Graf and Kinshuk, "Augmented reality trends in education: A systematic review of research and applications,"

- Journal of Educational Technology and Society, vol. 17, no. 4, pp. 133–149, 2014.
- [2] L. Johnson, S. A. Becker, M. Cummins, V. Estrada, A. Freeman and C. Hall, “NMC horizon report: 2016 higher education edition,” pp. 1–50, The New Media Consortium, 2016. <https://www.learntechlib.org/p/171478/>
- [3] L. Johnson, S. Adams and M. Cummins, “The NMC horizon report: 2012 higher education edition,” New Media Consortium, 2012. <https://eric.ed.gov/?id=ED532397>
- [4] I. Barakonyi and D. Schmalstieg, “Augmented Reality agents for user interface adaptation,” *Computer Animation and Virtual Worlds*, vol. 19, no. 1. Wiley, pp. 23–35, 2008. doi: 10.1002/cav.220.
- [5] D. H. Choi, A. Dailey-Hebert, and J. Simmons Estes, “Emerging tools and applications of virtual reality in education,” *Advances in Educational Technologies and Instructional Design*. IGI Global, 2016. doi: 10.4018/978-1-4666-9837-6.
- [6] H. Göker and H. Tekedere, “Examining the effectiveness of augmented reality applications in education: A meta-analysis,” *International Journal of Environmental and Science Education*, vol. 11, no. 16, pp. 9469-9481, 2016. <http://www.ijese.net/makale/1181.html>
- [7] R. M. Branch, *Instructional Design: The ADDIE Approach*. Springer US, 2009. doi: 10.1007/978-0-387-09506-6.
- [8] M. Wang, V. Callaghan, J. Bernhardt, K. White, and A. Peña-Rios, “Augmented Reality in education and training: Pedagogical approaches and illustrative case studies,” *Journal of Ambient Intelligence and Humanized Computing*, vol. 9, no. 5. Springer Science and Business Media LLC, pp. 1391–1402, Jul. 08, 2017. doi: 10.1007/s12652-017-0547-8.
- [9] I. Suyitno, *Norma Pedagogis Pembelajaran BIPA: Deskripsi Teoretis dan Hasil Kajian Empiris (Cetakan Kesatu)*, PT Refika Aditama, 2017.