

# Development of Augmented Reality Based Wushu Training Module to Improve Basic Movement Ability

<sup>1</sup>Syaipul Ramdhan, <sup>2</sup>Egga Asoka

<sup>1,2,3</sup>Global Institute, Tangerang, Indonesia, 15114

E-mail: <sup>1</sup>syaipulramdhan@global.ac.id, <sup>2</sup>eggaasoka@stmikglobal.ac.id

## ARTICLE HISTORY

Received : 18 July, 2021

Revised : 20 August, 2021

Accepted : 30 September, 2021

## KEYWORDS

Modules

Wushu

Augmented Reality

Horse Stance



## ABSTRACT

Wushu martial arts is one of the favorite martial arts in Indonesia, with achievements that are routinely obtained at various international events such as the SEA Games and ASIAN Games including the World Championships. During this pandemic, wushu college students practice independently, in fact only a few universities have started practicing together by implementing health protocols. Therefore, the researchers developed a wushu training module using Augmented Reality technology, which will be a fun new tool for Sasana Wushu Salsabila Indonesia students. Interactivity and three-dimensional display are presented in an attractive manner and can be used anywhere and anytime. This training module is an android application. Students can find out in detail the correct movement according to existing standards, namely IWUF (International Wushu Federation). This research method uses the ADDIE development model (Analysis, Design, Development, Implementation, and Evaluation). The test results on media experts are 84.15%, material experts are 94.5% and respondents are 87.5%. At the evaluation stage using Kolmogorov-Smirnov with a significance level of  $\alpha = 0.05$  is 0.409. normally distributed. Research proves the influence of good learning media for students.

## 1. INTRODUCTION

Wushu means the art of war or martial arts [1]. In ancient Chinese history it is explained that wushu is the oldest martial art that is the cultural root of martial arts history throughout the world. Wushu is a martial art that emphasizes artistic aspects and effective defense [2] The world wushu federation makes wushu a martial art that is included in world championships such as the ASIAN GAMES or the Olympics. Wushu is now easier to learn and understand by various groups, because the broad technical dimensions can be enjoyed by even children and parents. Its dynamic movements are interesting to watch and witness, so that wushu has become a performing art for various events.

Wushu martial arts is one of the martial arts that has accumulated quite a lot of achievements for Indonesia. Many colleges have now been established to train the martial art of wushu. One of them is Sasana Wushu Salsabila Indonesia. Students at this college find it very difficult to practice during the COVID-19 pandemic. All activities that should be carried out freely like other self-defense cannot be carried out because they must

use health protocols. Even the health protocols turned out to be unable to handle the increasing number of COVID-19 cases. So that this college cannot carry out face-to-face classes [3].

Sasana Wushu Salsabila Indonesia students are currently trying to practice independently at home even though it is not optimal. Even the students also use the practice facilities that can be accessed freely on the internet, but it still does not produce maximum results for students. Considering that novice students need a lot of media and facilities to support the training process to match the movement standards [4], because of the lack of meetings during the pandemic which prevents them from practicing better.

The presence of technology can help humans facilitate all their life activities, including in this martial arts training activity. Augmented Reality technology [5] or virtual reality is a technology that presents the perception of virtual reality into the real world in the form of images, audio, video and direct interaction with objects. Objects in Augmented Reality can be rotated, enlarged according to the wishes and needs.

Augmented Reality is applied in many educational activities, religion [6], business [7] which helps people learn things faster.

Martial arts training activities during the pandemic require valid media and information related to training materials that can support students learning from home. AR technology equipped with modules [8] will make students more enthusiastic about learning independently at home, so that when face-to-face exercises are opened, students are more prepared, their bodies will be healthier.

## 2. THEORITICAL FOUNDATION

### 2.1. Augmented Reality Based Marker

In its current development, augmented reality is not only visual, but can be applied to all senses, including hearing, touch, and smell. Besides being used in fields such as health [9], military, manufacturing industry, augmented reality can also be used to translate text in various languages with the addition of OCR [10] that is owned by AR.

The marker method is one of the most widely used in learning media because it has a higher interactivity, where users use printout media designs that are used as guidelines in tracking [11] camera devices.

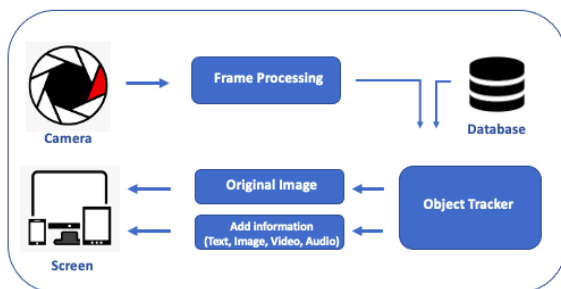


Figure 1 Augmented Reality Application Flow

### 2.2. Wushu Horse Stance

Wushu is the oldest martial art in the world whose development is currently the fastest. Has two types of skills, arts and combat. Wushu already exists in international events such as the SEA Games and ASIAN Games including the World Championships. The movement has been standardized by IWUF (International Wushu Federation). One of the basic forms of wushu practice is the stance, this movement becomes a mandatory movement in the early learning of wushu martial arts. There are 5 types of obligatory horses that are judged in the race, both empty-hand art and the art of using weapons.

Bow stance (Gōng Bù), stance stance (Mǎ Bù), empty position (Xū Bù), crouched position (Pū Bù), cross-legged bowing (Xiē Bù) and sitting cross-legged (Zuò Pán). Each movement has an effect on the strength and energy of the pounding of the other movements; punch, kick, jump, pose and spin.

### 2.3. Modul

From the 2 frameworks above, namely technology media and basic stances, the authors developed a training module with Android and 3D digital technology. The module is made following the IWUF (International Wushu Federation) curriculum for the standard Equestrian Movement. The material is made in an attractive and easy-to-use module design. In the android application there is a guide for using the application and the scan marker module.

### 2.4. Previous Work

PIK Rusmono, et al [13], this study produced a digital module product to display the instructions for wushu movements, which were tested on training students. Jarudin [14], researched to create a media module that uses hyperlinks to tutorials. In both of these studies, the focus is on digital-based module media for the same topic of wushu martial arts training.

### 2.5. Purposed Research

In the research proposed by the researcher using modules as well but the interactivity uses augmented reality technology that displays three-dimensional objects, in this case children prefer, where wushu is a martial art that must be started from the age of the child. This study also uses the ADDIE method to measure product implementation and evaluation results [15].

## 3. METHODS

### 3.1. ADDIE Method

This research method uses the ADDIE development model (Analysis, Design, Development, Implementation, and Evaluation). The first step was to analyze the curriculum for IWUF standard wushu material, then interview the trainers and students. Researchers only conducted field trials by taking a sample of only 1 branch as many as 10 people. The second stage is the design of making a module design that is in accordance with the needs analysis. The third stage is development, the process of making modules with Augmented Reality. The fourth stage is implementation to students. And the fifth stage is evaluation [16].

### 3.2. Analysis

Analysis of student problems, analysis of development tools, competency analysis, and instruction are part of this analysis phase. Here is the full description:

#### 3.2.1. Analysis of the problems faced by students in learning basic movements

In making learning media in the form of AR-based modules, of course, it cannot be separated from the background of the problems that students face. To collect information about the student's problems, the

researchers used interviews, observations or observations at the centralized training location of the Tangerang City Achievement Park, which became the location for training for city athletes and beginner club students.

### 1. Interview

Researchers conducted interviews with trainers at the Salsabila Wushu College by asking questions about training during the pandemic. The results of the interviews found that novice students were given a day off and asked to repeat the basic material that had been given. However, not a few students have difficulty remembering and understanding the Movements taught before the pandemic. Especially the basic movement of the stance is the most difficult movement for students to master and it takes quite a long time.

### 2. Observation or observation

Researchers observed training for students who had become athletes at the training location which had been permitted in July with a limited number. Found the difficulty of correct stance movement because the stance movement combines the physical endurance of the legs with the determination of the movement. While novice students are not allowed to practice, so they occasionally do video communication to see student progress. Unfortunately, many students are lazy to practice because they are not directly guided by the instructor and there is no special media for learning.

### 3. Development Tool Analysis

The hardware used by the researchers was an Apple mid 2013 i5 laptop with 8 GB RAM specifications and Mojave OS, Infinix 8 brand smartphone with Qualcomm SDM450 processor specifications, 4 G RAM and an Advance sketch tablet with Unisoc SC9863A specifications (28 nm) Octa-core CPU (4 x 1.6 GHz Cortex-A55 & 4 x 1.2 GHz Cortex-A55).

### 4. Competency Analysis

The basic competencies taken by researchers in this study are basic competencies in the basic material of the Chinese IWUF Equestrian Movement. This learning material is material that is given to all martial arts students, the difference is that during practice, the longer you practice, the better and correct the horses will be.

Table 1 Basic Competencies of Basic Equestrian Movements

Basic competencies	Indicator
Easel Standards in International Wushu Regulations (Iwuf)	Gōng Bù (Bow Stance) is a Bow Stance with one knee bent 450
	Mǎ Bù (Horse Stance) atau disebut kuda kuda dengan kedua lutut ditebuk 450 seperti duduk tanpa kursi.

On the Basic Movement of Wushu/ Taolu.	Xū Bù (Empty Stance) is an Empty Position with one knee as a support and one leg extended to the floor with the legs attached straight
	Pū Bù (Crouching Stance) or Squat Position with one leg straight and one leg bent sitting without touching the calf
	Xiē Bù (Cross-Legged Crouching Stance) or Cross-legged Bending with one leg tucked between the knees
	Zuò Pán (Cross-Legged Sitting) atau Duduk bersila dengan paha menempel keperut

### 3.3. Design

Researchers design modules and applications by making product designs first, then proceeding with the preparation of materials and questions and answers, then making logos, backgrounds, images, and buttons which will be used in the media.

#### 1. Making Media Design (Storyboard)

Making a media design or Storyboard in this case is a depiction of learning media which as a whole will be loaded in the application. The storyboard or media design here has a function as a guide for programmers to create module and application designs.

#### 2. Determination of Learning Materials

In the learning module that was made, the researcher took the material, namely IWUF Competition Rules. Researchers took this material because this material is because the basic movements are quite difficult for students to master even though they have been practicing for a long time without the correct information students will have difficulties in the future. The horses in the wushu rules appear many times in the race movement, if the horses are wrong and shake the value will be reduced.

#### 3. Preparation of Practice Questions

The researcher arranged the practice questions according to the selected material, namely the material about the basic wushu movements, namely the horses. Materials, questions and exercises are given in the module as well as the application as an assessment that students have understood the movement correctly.

#### 4. Basic Competence

The Basic Competencies used by the researcher are in accordance with the standard curriculum for the rules

of the Equestrian Movement in competitions compiled by the International Wushu Federation (IWUF).

### 3.4. Development

#### 1. Making Augmented Reality Applications

In this stage, the researcher creates an AR-based module, to run the AR, the researcher needs to create an application. The application that has been made by the researcher is named "iWushu Apps" where the researcher targets that in the future this application will continue to be equipped into an integrated wushu martial arts learning package. according to the learning material. The researcher assembled and compiled the assets that had been prepared using the Unity 2019 .4.0f3 software with the c# script programming language.

#### 2. Main Menu

The main menu page contains several features. The menu contains materials, guides, AR scans, evaluations. In the material menu, there are module and marker menu contents, as well as videos as additional information and movement guidance.

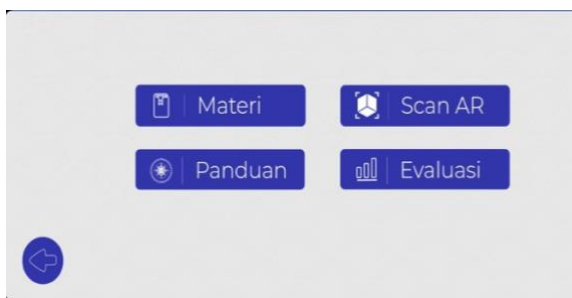


Figure 2 Menu Page

#### 3. Scan AR

Pada halaman scan AR berisi objek-objek 3D Gerakan kuda-kuda yang dilengkapi dengan info tips Gerakan.



Figure 3 Scan AR

#### 4. Guide Page

The guide page as a guide for using the application, so that users are easy to use.



Figure 4 Guide Menu

#### 5. Evaluation Exercise

The evaluation menu contains questions from the material provided to test students' understanding with the movements being studied.

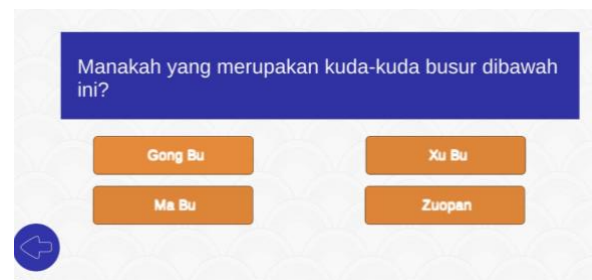


Figure 5 Sample Practice Questions

#### 6. Learning Module Making

AR Module iEushu Apps is a learning module for the basic movements of the wushu martial arts stance that supports Augmented Reality applications in the form of displaying 3D objects. The AR Module is designed in a concise manner only for one class meeting which has 6 pages, this is to make it easier to understand and interesting.



Figure 6. Virtual Module

## 4. RESULTS AND DISCUSSION

### 4.1. Development

Through the research process that has been carried out using the ADDIE method in making the iWushu Apps application game combined with the module, it can improve the experience of wushu martial arts students in practicing independently at home. This learning media is an improvement from the media and

previous research which only interacted with modules and links, while in this study it was enhanced with more in-depth interaction, students were able to practice with complete guides and features that support each other. This knowledge is new and interesting to continue to develop its features and interactivity as well as assessment of each material in the standard wushu curriculum. This application was tested on 20 online student respondents and tested on material experts and media experts to determine the quality and perceived benefits of users. the results of the application can run well and bring up three-dimensional objects with movement tips in it.

The developed application has several limitations, namely the basic movements that focus on the horses standardized by IWUF. The features provided can still be developed with more complete materials and assessments that can show the quality of students.

#### 1. Validation Test

Validation tests by experts are carried out to determine the feasibility level of a product that has been developed. The validation test was carried out by material experts and media experts. The validation test in this research and development involved 2 experts, namely 1 media expert and 1 material expert. The validation results produce an assessment, comments and suggestions, which will later be used by researchers as material for improving the modules that have been made before being tested on end users, namely beginner martial arts students.

##### a. Media Validator

Media validation is intended to find out that the modules and applications made by researchers are feasible to be tested on students. The media validator conducts an assessment by filling out a questionnaire that has been provided by the researcher and filled in through the google form due to the pandemic condition. Here are the validation results:

Table 2. Media Expert Validation Results

No	Assessment Aspect	Total score	Average Percentage (%)	Category
1	Design	36	80,8	Very Worthy
2	Software	21	87,5	Very Worthy
Total		57	84,15	Very Worthy

##### b. Material Validator

Material validation is intended to find out that the modules and applications made by researchers are feasible to be tested on students. The media validator conducts an assessment by filling out a questionnaire

that has been provided by the researcher and filled in through the google form due to the pandemic condition. Here are the validation results:

Table 3. Validation of Design Aspect Media Experts

Indicator	Total score	Average Percentage (%)	Category
Material Suitability with KD	4	100	Very Worthy
Compatibility of Material with Video	4	100	Very Worthy
Material Sequence	11	91,6	Very Worthy
Contents	11	91,5	Very Worthy
Material Discussion	7	87,5	Very Worthy
AR Compatibility with Material	4	100	Very Worthy
Image Compatibility	7	87,5	Very Worthy
Grammar	4	100	Very Worthy
Total	52	94,5	Very Worthy

From the table 3, it is found that the results of the software aspect test with 9 indicators obtained 80.8% results, with indicators including Material Conformity with KD, Material Conformity with KD, Material Conformity, Content Completeness, Material Discussion, AR Conformity with Material, Image Suitability and Arrangement language. The final value of material validation is 94.5%.

#### 4.1. Implementation

The implementation phase of this product was tested on wushu martial arts students at Salsabila College with a total of 10 students. The product trial was carried out 1 time which was carried out online.

Table 4. Product Trial Assessment Results by Students

No	Indicator	Total score	Average Percentage (%)	Category
1	Software	101	83,7	Very Worthy
2	Learning	465	83,6	Very Worthy
3	Media Display	103	85,6	Very Worthy

Total	569	87,5	Very Worthy
-------	-----	------	-------------

From the table 4, it is found that the results of the trial product is 87.5%.

### 5. Evaluation

The evaluation stage, is the stage to determine the effectiveness of the media that has been made by researchers.

There were 10 respondents who were tested which were then processed using Kolmogorov-Smirnov normalization. Here are the results of the data.

Table 5. Respondent

NO	NAME	SCORE
1	Rumsiah	97
2	Erikca Nur Adhelia	75
3	Ryad hidayat	75
4	Wafiq Azizah	78
5	Valdan prananda	82
6	Fareld Alfarabi Setiawan	76
7	Keisha putri ramadhani	73
8	Murnita Rachman	75
9	Arrini cikal syahadah	78
10	Sahlani	100

Table 5. Media Effectiveness Testing using Kolmogorov-Smirnov through pre-test and post-test questionnaires.

SCORE	FREQ	f(X)	F(X)	Z	F(2)	D= [F(X) - F(Z)]
73	1	0,1	0,1	-0,821205624	0,205764577	0,105764577
75	3	0,3	0,4	-0,613305466	0,26983719	0,13016281
76	1	0,1	0,5	-0,509355387	0,305251571	0,194748429
78	2	0,2	0,7	-0,301455229	0,381533693	0,318466307
82	1	0,1	0,8	0,114345087	0,545517879	0,254482121
87	1	0,1	0,9	0,634095482	0,736990744	0,163009256
100	1	0,1	1	1,985446509	0,976452592	0,023547408
TOTAL	10					
AVERAGE		80,9				
STD DEVIATION		9,620002			Dmax	0,318466307

Kolmogorov-Smirnov statistic value  $D_{max} = 0.318$

The Kolmogorov-Smirnov Critical Value with  $n=10$  and the significance level = 0.05 is 0.409.

If  $D_{max} < D_{critical}$  = then the data is normally distributed.

If  $D_{max} > D_{critical}$  = then the data is not normally distributed.

$$D_{max} = 0.318 < D_{critical} = 0.409.$$

It can be concluded that there is a difference between the results of learning scores for basic wushu movements for pre-test and post-test, so it can be concluded that there is an influence on the use of the module learning media on student learning outcomes, because it has a positive effect, Augmented Reality-based wushu learning media is worthy of used in student learning.

## 5. Conclusion

Through the research process that has been carried out using the ADDIE method in making the iWushu Apps application game combined with the module, it can improve the experience of wushu martial arts students in practicing independently at home. This learning media is an improvement from the media and previous research which only interacted with modules and links, while in this study it was enhanced with more in-depth interactions, students were able to practice with complete guides and features that support each other. This knowledge is new and interesting to continue to develop its features and interactivity as well as assessment of each material in the standard wushu curriculum. This application was tested on 10 online student respondents and tested on material experts and media experts to determine the quality and perceived benefits of users. the results of the application can run well and bring up three-dimensional objects with movement tips in it.

The developed application has several limitations, namely the basic movements that focus on the horses standardized by IWUF. The features provided can still be developed with more complete materials and assessments that can show the quality of students.

## 6. ACKNOWLEDGMENT

We express our gratitude to the Ministry of Research and Technology (Kemenristek)/BRIN for funding the lecturers research under the program called Penelitian Dosen Pemula (PDP).

### References

- [1] International Wushu Federation [Online]. Viewed 5 Juni 2021. Available: <http://www.iwuf.org>
- [2] PIK Rusmono, Jarudin. 2020. "Development of Digital Instruction as a Guide in Wushu Training". *International Journal of Science and Research (IJSR)* 7 (11), 1748-1754.
- [3] Jarudin, et.al. 2020. "Develop of Hyperlinks Media to Learn Basic Wushu Techniques. *Journal of Computational and Theoretical Nanoscience*", Volume 17, Number 2-3, February 2020, pp. 825-832(8)
- [4] SM Jarudin and N. Ibrahim. 2020. "Develop Self-Directed Instructional Media for Wushu Training". *International Journal of Science and Research (IJSR)* 7 (11), 1748-1754
- [5] J Baeti Rohman, Desy Ayuningrum. 2020. "The Effect of Instructional Strategies and Learning Motivation on Learning Outcomes of Sciences". *International Journal of Psychosocial Rehabilitation* 24 (03), 1690-1697
- [6] Syaipul, et.al. 2020. "Pengembangan Aplikasi Tuntunan Salat Menggunakan Augmented Reality Berbasis Android". *Jurnal Sisfotek Global*, Vol. 10 No. 1, 27-32.
- [7] Theeboom, M., Zhu, D. and Vertonghen, J. 2017. "‘Wushu belongs to the world’. But the gold goes to China...: The international development of the Chinese martial arts’, *International Review for the Sociology of Sport*, 52(1), pp. 3–23. doi: 10.1177/1012690215581605..
- [8] Agustinus Sirumapea, et.al. 2017. "Aplikasi Augmented Reality Katalog Baju Menggunakan Smartphone Android". *Jurnal Sisfotek Global*, Vol. 7 No. 2, Hal. 1-6
- [9] Sugianto. 2001. *Jianshu Jurus Pedang Tunggal*. PT. Gramedia Pustaka Utama, Jakarta
- [10] Wong Kiew Kit. 2001. *The Complete Book Of Tai Chi Chuan*. Elex Media Komputindo, Jakarta
- [11] A. R. Hakim, et.al. 2021. "The Development of Learning Module with Mobile Augmented RealityBased on 9E Learning Cycle to Improve Problem Solving Skills". *UJMER* 10 (1) 2021 : 1-9.
- [12] Tri Yuliono, et.al. 2018. "Keefektifan Media Pemelajaran Augmented Reality Terhadap Penguasaan Konsep Sistem Pencernaan Manusia. *Jurnal Pendidikan Dasar*". *Jurnal Pendidikan Dasar*, Hal. 65-84
- [13] Yuli Imawati, Atien Nur Chamidah. 2018. "Efektivitas media berbasis augmented reality terhadap kemampuan anak tunarungu mengenal kebudayaan Yogyakarta". *Jurnal Pendidikan Khusus*, 14 (1), Hal. 26-34
- [14] Rusmono,, Jarudin, Prajka Ibnu Khuzaimah. 2020. "Development of Digital Instruction as a Guide in Wushu Training". *Universal Journal of Educational Research* 8(3A): 6-11
- [15] Branch, R. M. 2009. *Instructional Design-The ADDIE Approach*. New York: Springer.
- [16] J. A. Weaver. 1973. "Optical character recognition" *Physics Bulletin*, vol. 24, no. 5, pp. 277-278.