

Augment Reality Human Anatomy (ARMY) as Learning Media in Sport Science

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Abstract— Human body parts were not easy to remember and learn in anatomy. The purpose of this study was to facilitate student, teacher, and scientist to learn anatomical human body used technology based on Augment Reality. Augment Reality Human Anatomy (ARMY) was a Research and Development study. Total participant in the small test was 10 participants, and the field test was 40 participants. All participants were agreed and full fill the inform consent before did the test. Total questions were 30 and divided into three items; knowledge of anatomy, knowledge of ARMY, and Implementation of ARMY use. The results of the knowledge of anatomy were 28.1 in moderate knowledgeable, the knowledge of ARMY was 37.7 in high knowledgeable, and the implementation of ARMY use was 40.3 in high knowledgeable for the small test. The field test results showed the knowledge of anatomy 32.8 in high knowledgeable, knowledgeable of ARMY found 38.9 in high knowledgeable and the Implementation of ARMY use showed 41.3. The differences between small test and field test showed that there was an improvement in learning and understanding of anatomy knowledge. ARMY facilitated learning media to introduce the human body part using technology and can be used as one of the solutions for people to learn anatomy.

Keywords—augment reality, anatomy, learning media

I. INTRODUCTION

Anatomy was the study of the structure of the human body from head to toe. When studying anatomy, difficulties often occur especially for students in sports and health. The student has an obligation to explored the material and could explain every part of the human body. A large number of body parts studied raises a person's curiosity and creativity to make an application to simplify displaying parts of the human body as a whole simply. The development of these technologies can facilitate the learning process by combining the real world and cyberspace [2][7], the technology meant virtual reality (VR). In summary, there was a merger between an environment that was simulated using by a computer. Technically, VR was used to describe the three-dimensional (3D) environment produced by a computer and could interact with something such as human [1].

Virtual Reality technology usually used in the fields of medicine, architecture, aviation, entertainment, and others. Several samples of VR were found in many decades, such as

FPS (*First Person Shooter*) game that would make users felt they were in the real situation. In addition, VR was used in photos and 360^o videos that make users felt they were in that place with experiences as they were in the real world. Another term that was also used in cyberspace was Augment Reality (AR). Augment Reality was the integration of digital information with the user environment in real time [8]. It was different from Virtual Reality which creates a truly artificial three-dimensional (3D) environment. According to Yudhanto & Pratisto [13], Augment Reality technology used the environment in the real world and then adds new information on it. AR usually used in the military, medical, communication and manufacturing [14]. Media that was often used was Google Translate. With this technology, it was possible for users to translate the words in foreign languages that were seen using a smartphone camera such as writing on a bulletin board or signs to be translated into other desired languages. This explanation can reveal that the difference between Virtual Reality and Augmented Reality were Virtual Reality can replace reality with the Cyberspace as a whole, while Augmented Reality by adding or completing the reality with pseudo-objects around it.

Based on observations by the author in discussions about the understanding and knowledge of the anatomical human body in the laboratory, 60% of participants had difficulty in memorizing and understanding every part of the human body part. This would be more interesting when learning could be integrated by combining technology with science in the subject matter. As we knew that the problem now that the number of human body parts should be memorized and studied in anatomy created difficulties and anxiety towards someone who wants to learn anatomy. Creativity and initiative in developing technology were expected to make it easier for someone to study the structure of the human body using Augment Reality. Someone who wanted to learn about anatomy can use the applications that were easy to access. Based on the description above, the authors interested in designing an application device in the form of Augment Reality (AR) which contains information on the human body. Development of technology and science were the ideal solution to help teacher and student to learn anatomy used Augment Reality. The purpose of this study was to facilitate student, teacher, and scientist to learn anatomical human body used technology based on Augment

Reality. Several problems above should get intensive attention to solve the issue for better equality of science.

II. METHODS

ARMY was a Research and Development study. This development used to create a system or tool that gave benefits to the sciences and technology. Previous researches [6][3][12] focused on the elements of physical fitness, and this study helped to provide the basic anatomical human body knowledge in a simple way via smartphone. This study already qualified from the review of Health Research Ethics Committee of Universitas Negeri Semarang, Indonesia based on the Standards and Operational Guidance for Human Participants regarding WHO 2011.

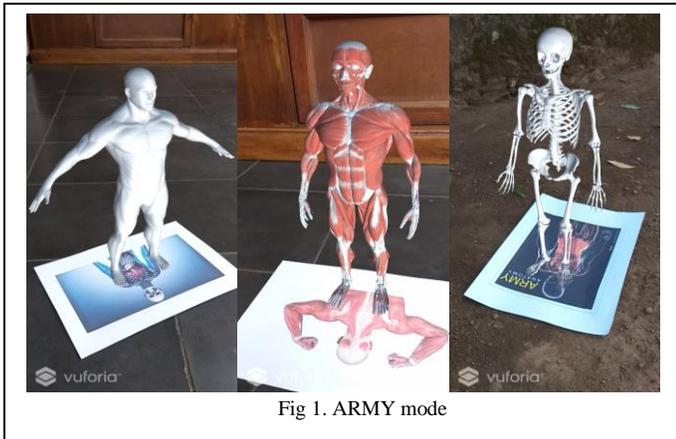


Fig 1. ARMY mode

Total participant in the small test was 10 people. After completing and adding some recommendation from the learning media expertise then field test used 40 participants. Participants in the small test and field test were different to minimize the intervention of the test. All of the participants were agreed and full fill the inform consent before did the test. The research procedures were divided into nine phases: 1) observation and collect the information, 2) preliminary study of human body anatomy, 3) study of human body parts to be displayed through a smartphone device, 4) develop the initial product, 5) expert validation and evaluation, 6) small test, 7) product design revisions 8) field test, 9) ARMY Product.

Discussion, question and answer were used as secondary data after the questionnaire gave to the participants. Total questions were 30 and divided into three items. The questionnaire item consists of knowledge of anatomy, knowledge of ARMY, and Implementation of ARMY use. Application mode using Vuforia system based on Augment Reality that can show 3D animation of anatomical parts of the human body, skeletal system, and muscular system (Figure 1). This application used in smartphone to saw the Augment Reality and can rotate into 360° from frontal, sagittal, and transverse planes. The application was simple to saw each detail part of the human body with the eye-catching view as background. The animation also can be set zoom mode and can be displayed the explanation when touching the screen.

Data collection of this study using observation, interview, and questionnaire. In this study the instrument needs to collect the data and make the study more systemic and easier. The instruments that used were questionnaire sheet and interview when using the application. Questionnaire sheet was used to collect the data from the knowledge of anatomy, knowledge of ARMY, and implementation of ARMY use. Recommendation and suggestion additionally used to complete the data result and all data were analyzed using percentage.

III. RESULT AND DISCUSSION

The result of this study used percentage analysis that came from the questionnaire from participants with showed and operated ARMY. The instrument that used was validated by health expertise. Several aspects were evaluated such as knowledge of anatomy, knowledge of ARMY, and implementation of ARMY used. The results of the evaluation from the validator declared appropriate to be used as a reference and then continued to data collection. The small test result showed that the knowledge of anatomy was 28.1 in moderate knowledgeable, the knowledge of ARMY was 37.7 in high knowledgeable, and the implementation of ARMY use was 40.3 in high knowledgeable (figure 2). Based on the small test that used 10 participants, this study also got several suggestions and input in the perfection of the ARMY such as; simplifying the menu on the screen that only used one setting can be used at a time. Another improvement that was in the details of each item in the human body in one touch would saw a description of the human body part and it would not disappear before the next touch.

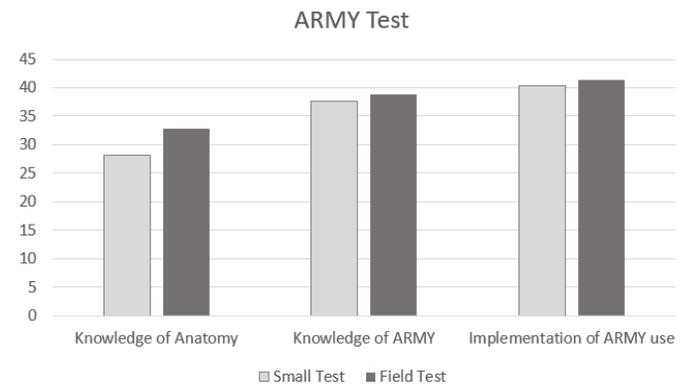


Figure 2. ARMY Test

After completing of shortcomings of ARMY, the researcher took the field test to the 40 participants. Based on figure 2 this study got the significant different data in the knowledge of anatomy that the result found 32.8 showed in high knowledgeable. The item of knowledgeable of ARMY in the field test found 38.9 higher than 37.7 in the small test. The results in the Implementation of ARMY used also has different even not significant that the field test showed 41.3 and the small test showed 40.3 in the result. The differences between small test and field test showed that there was an improvement in the knowledgeable of ARMY used that the participants only

understand the anatomy human body when there were in the class. After they used ARMY, they felt more understand and easier to learn human body part by smartphone. The usage of ARMY in the participant perspective was simple, easy, and eye-catching. Simple meant that everyone can operate the application by touch the screen. Easy to used meant that the way to use like playing the game via Android in the smartphone. The wall and background were eye-catching meant the mode of the system can be displayed anywhere depend on what people want to use.

The ARMY procedure was easy, Augment Reality human anatomy operator (ARMOR) or user should install the application via Android. Prepared the wall or background to make sure that the application in mode human anatomy, musculoskeletal, and skeletal were ready. Explore the application and capture the image in the wallpaper. The rotation or display using the camera in the phone to saw the ARMY 3D animation (Figure 1). Zoom setting can be operated by moved the camera closer or move over. Description of each item human body part can be showed when ARMOR touch the screen and it would be appear for several seconds before any touched. Detail information could have appeared in the ARMY screen.

This application would make the student, user or ARMOR easy to understand and receive the information clearly than information from the teacher. ARMOR can learn and search by them self to knew more about the ARMY, and it supported the research by Putra & Mayangsari [10] about the anatomical human body learning application based on multimedia. Assessment for the knowledgeable of ARMY used by the evaluation from the questionnaire form. ARMOR also can develop and imagine about the 3D model to knew every part of the human body part. Human planes, detail human body part, and information were complete to give the information to the ARMOR when they want to study by them self. Science study by Irawan, Chuang, & Peng [4] stated that the human has creativity to learn and explore their imagination to develop human body to generate performance used analysis. Borg and Gall in Irawan & Prasetyo [5] also agreed that teaching to the students should be using research and development methods. The reason research and development in education and science can adjust to the circumstances and needs of students.

The use of appropriate technology was expected to be able to overcome problems that had to do with the science that support the progress of sports and science. Limitations in supporting devices could be inhibiting factors in progress and services of learning, training and practice directly in the field. Literature and information about description and picture of the human body parts were can only be accessed in printed books and browsing through to the internet. Need to get solution and information for users when they felt difficult to access the information. ARMY came to solve the problems and facilitate the application of knowledge and technology, in line with research from Maulana [9] that the application of Augment Reality can be marketed with the application of products using software.

Augment Reality technology in real life could be interactive in virtual. Information about objects and the environment around us could be added to the Augmented Reality system which then displayed the information on the real-world screen in real-time as if the information was real. Some systems of human body motion, namely motion caused by muscle contractions that move bones. The motion could be explained in collaboration between bone (skeletal) and muscle (musculoskeletal). The bone itself was a passive movement because it follows muscle control, while muscles were called active movements because they were able to contract and move human bones. Multimedia-based applications about anatomy had also been used by Setiawan, Setyaningsih, & Qur'ania [11] for the introduction of the anatomy of the human body including the respiratory, digestive and circulatory organs. This was also the basis that technology makes it easy for us to learn and understand about the human body part in detail.

The implementation in the development between technology and scientific fields, especially on sport and health would be realized if there was a unity between technology developers, sports scientists, and educators in a vision and mission for scientific progress. Competition and forms of ideas can improve technological progress, especially for technological innovation and supporting facilities in sport and health [8]. Hopefully, these simple applications (ARMY) for future could helpful in providing information and knowledge in introducing anatomical human body parts.

IV. CONCLUSION

This study concluded that Augment Reality Human Anatomy (ARMY) was interested in learning media. ARMY facilitated learning media to introduce the human body using technology. This media facilitated to introduce human anatomy in the simple and interest way that can memorize and learn faster than the conventional way. ARMY also can be used as one of the solutions for people to learn anatomy via handphone and may be used as a reference in learning anatomy. Future study can develop motion analysis system with Augment Reality to analysis performance and injury risk prevention.

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