Augmented Reality Learning Materials for Motion Picture Making Subject

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Abstract: Learning materials is one of the important components of learning. Learning materials based on Augmented reality is capable of accommodating the needs of learners. Augmented reality intends to insert virtual objects into the real environment. In recent activity, learning materials are still using conventional media such as presentation slides and the internet. Consequently, students do not obtain appropriate material for certain learning. Learning materials assisted by augmented reality can be a solution for students in understanding moving pictures. The development model used was the Lee & Owens model. It produces valid and effective learning material products with augmented reality.

Key Words: learning materials, augmented reality, motion picture, multimedia, vocational high school

Abstrak: Bahan ajar merupakan salah satu komponen penting dalam pembelajaran. Bahan ajar yang baik ialah bahan ajar yang mampu mengakomodir kebutuhan pebelajar. Pada sekolah yang diteliti, bahan ajar yang ada masih menggunakan media *slide* presentasi dan bahan ajar diambil dari internet, sehingga pebelajar mengalami kesulitan jika sudah berada di luar kelas. Selain itu, pebelajar mengalami kesulitan belajar materi yang sesuai dengan kompetensi yang dibutuhkan. Bahan ajar berbantuan *augmented reality* dapat menjadi solusi bagi pebelajar dalam memahami pengambilan gambar bergerak. Model pengembangan yang digunakan ialah model Lee & Owens. Penelitian menghasilkan produk bahan ajar berbantuan *augmented reality* yang valid dan efektif.

Kata kunci: bahan ajar, *augmented reality*, gambar bergerak, multimedia, sekolah menengah kejuruan

INTRODUCTION

Media is pivotal element in learning. These media are needed during the learning process to help students understand the lesson. Media accommodates the curriculum which mean to be mastered by the students appropriate to the basic competence in order to achieve the standard of the basic competence within every subject under certain education units (Sanjaya, 2011). In teaching materials, there must be learning materials and its media. An interesting material may fondly increase students enthusiasm upon the learning itself. Therefore, during the creation process, we should consider the idea of making an attractive media. However, being attractive should never omit its fundamental substantive needed by the students. Learning media are those used to help students to learn and achieve the expected instructional goals (Winkel, 2009).

Motion picture is a subject learned by multimedia students in vocational school. In an institution like a vocational school, a student is expected to be capable and ready to compete with others at work right after finishing their study. Thus, to be a proficient student, both theoretical and practical, happened to be something important. In order to help students understand the material of animation making and all the techniques, starting from measuring the dimension of the viewpoint, taking the right angle, to the movement of the camera, media should accommodate all these needs, both theoretically and practically.

The result of the interviews shows that the media provided at school are only some presentation slides which cannot accommodate the students' need well. In fact, students have many difficulties in learning since they have to remember all the presentation slides. Students need a kind of media which can help them learn at home, or even at any place they feel happy to learn. It is supported by the result of the data collected that all students have a smartphone with Android OS.

This issue triggers the researcher to find out any appropriate solution which can combine printed-based media and smartphone owned by the students. Because nowadays, students choose to be closer to their smartphone instead of reading a book which they consider as boring.

Roedavan (2014) explained that "augmented reality is a technology used to combine virtual 2D or 3D media into a real environment and projecting it into the real world". Augmented reality can be the solution for students to overcome their studying problem, which combines printed-based media coming from the real world, with video playback which can be categorized as a virtual one. Using those combined media, students will definitely learn to utilize virtual environment. "Augmented reality is a combination of real object and virtual object within the same circumstances" (Klopfer, 2008). In the augmented reality application, the researcher put the media together with those which are printed-based. Because this video makes the students understand the material better which basically cannot be explained well by printed-based media from the very first place. Sadiman (2010) defines, "video as audiovisual media that convey factually or even fiction messages, can be informative, educative, or even instructional."

Mobile augmented reality and gamification-based poster advantages are: 1) This product can be used to learn independently, 2) Material provided are appropriate to its objectives, 3) An alternative way for students to achieve the objective of learning that can provide basic individual needs of the students (Hidayat, Kuswandi, & Ulfa, 2017). Setyosari (2015) reveals the idea of "there is a need to prepare a good education that makes the students eager and ready to learn in this digital era, where the atmosphere and the process may take the students to learn in a changeable situation and the experiences are meaningful for them".

Prastowo (2013) believe that "Seen through its forms, media can be grouped into four, they are printed, audio, audiovisual, and interactive". All those kinds of media can be combined into one. The merger form of it all is augmented reality. In the journal of Jorge Becca, Silvia Baldiiris, Ramon Fabregat, Sabine Graf, & Kinshuk (2014) conclude that Augmented reality proved to be an effective way to learn better, improving students motivation to learn, and enhancing the student's involvement in the learning process, and also positive attitude of the students. Therefore, augmented reality which is packed into media expected to give bigger support and motivation to students to learn.

Developed augmented reality application utilize video into media and is combined with printed-based media. Because using this media can help students to understand the materials which cannot be explained by printed-based media. Augmented reality technology capable of letting the students be involved during the learning process and help them improve their visual skill. This technology can also help the teacher to explain the materials better which led into a better understanding of students (Saidin, Halim, & Yahaya, 2015). Using augmented reality media believed to be a way to accommodate the students' need to master the material deeper. Learning media using augmented reality will basically build the students to be more independent for its objective to make students learn with or without the helps of others.

METHOD

This study applied the Lee & Owens model. The Lee & Owens development model has five stages, namely (1) Analysis Phase, (2) Design Phase, (3) Development Phase, (4) Implementation Phase, (5) Evaluation Phase. In the analysis phase, there were two steps taken, namely needs analysis and preliminary analysis. Needs analysis identified gaps between real conditions in the field and expected ideal conditions. In the real conditions, it was found that students are difficult in motion picture making subject because the teaching materials used are still in the form of presentation slides. In addition, it also indicated that all students already have Android-based smartphones which are beneficial for the learning process. In addition to needs analysis, a preliminary analysis was also conducted. In this research development, 10 aspects were analyzed in the initial analysis such as student analysis, technology analysis, situation analysis, task analysis, issue analysis, analysis of important events, objective analysis, media analysis, analysis of existing data, and cost analysis.

The second stage carried out was the design phase. Many products were made since at this design stage the planning was not yet mature and ready but remains continuing. Activities carried out at this stage were planning in terms of schedules, development teams, and media specifications. Therefore, this stage is considered vital, because product planning starts at this stage.

In the development stage, the researcher created the initial prototype of learning products, namely teaching materials assisted by augmented reality. This

stage is the realization stage of the design phase that was carried out previously. Things that need to be prepared at this stage, were tools and materials for the process of video recording, application creation, editing and integrating video with the application.

At the stage of product implementation, the trial was conducted three times, namely individual trials, small group trials, and field trials. In the trial phase, an assessment was obtained from students of the instructional materials that have been developed. At this stage, the evaluation of developed teaching materials is valid and feasible. In this development, the researcher evaluated the formative evaluation stage. Formative evaluation is needed to determine the quality and quality of the teaching materials developed. The researcher conducted a formative evaluation because it was suggested by the statement of Lee & Owens (2004) which states that: "If you have completed all of the activities during the assessment, analysis, design, and development, then formative evaluation - which is all about quality - is completed ". Based on the statement, the results of the data is applicable as a basis for making improvements and improvements to the teaching materials that have been developed. Teaching materials developed received a positive and valid assessment and can be used in motion picture making subject.

RESULT

The result of the product development is a media utilizing augmented reality within animation making subject given for multimedia students in vocational high school. Learning media employing augmented reality capable of bringing good and positive changes during the learning process in vocational high school level within a multimedia class. Under the result of needs analysis in this school, a media using augmented reality is definitely needed by students and it gave a significant improvement to the result of the learning on the subject of animation making. The developed media employing augmented reality is explained as follows.

Product Description

The product is a textbook which has QR code and augmented reality application that can be installed in a smartphone with Android OS owned by most of the students. This printed media supported by augmented reality is published in A5 size of paper, 70 gr paper. It utilized 'Times New Roman' as its choice of font and this developed product is easy to bring. The researcher hoped that in the A5 size, it can easily help the students to understand the material of animation making better since it is easy to bring. Also, this media can actually help the students in the subject of video taking which actually came to be their assignment.

The media supported by augmented reality developed by the researcher is meant to be used by students of vocational school with the major of multimedia. The media was developed appropriate to their needs in order to help them learn the technique of animation making. Technique in animation making included measuring the dimension of the viewpoint, taking the right angle, and the movement of the camera. The students need to understand the technique of animation making cognitively and psychomotor. The media is very effective for it is being fully equipped with videos to learn which is integrated interactively, especially to the material of measuring the dimension of the viewpoint, taking the right angle, to the movement of the camera. All these three materials are most needed by students to make a video well.

In a learning media supported by augmented reality, there is an interesting QR code made by the designer and it is also colorful to interest the students even more in learning. A QR code in the media supported by augmented reality can be the means to students to see the result of each technique in animation making. All those techniques will be displayed in the form of video. Students will understand the technique better if they get the example in every technique.

Materials in animation making are focused on the technique of video taking. There are three techniques of animation video taking which are measuring the dimension of the viewpoint, taking the right angle, to the movement of the camera. All those three materials needed to be master by students both cognitively and psychomotor. Therefore, animation video making techniques are necessary for students in vocational school majoring multimedia.

The application used in this material can be used in the android operating system. The designer chose to put it in this operating system (OS) considering the fact that this operating system is the most used OS in society, including the students. The use of this OS can be categorized as easy and affordable. It is proven by the number of students using the operating system in their smartphone. The application only need a 1 GB RAM of smartphone with 5 megapixels camera at least. In addition, the Android operating system needed is the Jelly Bean version. Augmented reality

is developed to be the means for students in playing the video about their materials. The extension of the video is in .mp4 format. Because learning the technique using video can actually illuminating the idea of animation making they are learning.

The developer is not only developing the printed media and its augmented reality application but also the manual book of this media. The manual book was made in order to help students learn to employ the application well. Moreover, within the manual book, students can also find a link which can be used by students to download the augmented reality application which has been updated. The application installation method has also been explained inside the manual book provided. Using this manual book, students will no longer find difficulties in using the media since using the learning media supported by augmented reality is very easy. Students only need to open the application installed in their smartphone then directing the camera to the QR code within the media supported by augmented reality. Next, students will see the example result of animation making in the form of video in each of their smartphones. That is the thing which can actually help the students understand the technique of animation making deeper.

Data Presentation on the Result of the Product Test and Product Efectivity Test

Media feasibility and effectively supported by augmented reality were measured by material experts, media experts, and students. (Arikunto, 2010), "Collecting data is the most important thing to do in research, moreover when its method has a great big hole which is interesting to researcher". Validation was done by the researcher by the help of material experts and media experts. More after validation, the developer tested the learning media supported by augmented reality to students as the target of the product. The test was done within a personal test, small group test, and field survey test.

First, the researcher validated the learning media supported by augmented reality product along with its manual to media experts. According to media experts, the media is worth 88,24%. That score can be categorized as valid that can be concluded if the media is valid too. Besides the learning media supported by augmented reality, media experts also validated its manual book and gained the sore of 85% which can be concluded as valid too. Other than quantitative data, the developer should also have quantitative data in

the form of suggestions from the experts concerning the media supported by augmented reality along with the manual book. Those suggestions are (1) the picture of the camera for camera video illustration should be made into a more interesting one, (2) illustrations attached in the manual book should be bigger, (3) in general, this learning media supported with augmented reality along with its manual book are worth going to the next validating process.

Second, the next validation process was acquiring an assessment from material experts. According to material experts, a learning media supported by augmented reality got 90,38% and it can be said as a valid one. Its manual book got 87,5% that made both media and its manual book valid. Other than quantitative data, the developer also got more suggestions qualitatively for the sake of perfecting the media wholly and making sure that it is appropriate to the need of animation making materials also feasible enough to go for the next step of validation.

Third, the next step was doing personal testing about the media to a student in Vocational School. This personal testing was done with three students as the target user of the media supported by augmented reality. Based on the result of the testing, the media got 87,5% which can be concluded as valid. Some suggestions obtained from personal testing are, 1) the media supported by augmented reality can actually be a help for students in doing their video making assignment, 2) the media provided has been a very good media for students but still need to improve the examples of the video used to explain every step of animation making technique in a more varied way, 3) learning media supported by augmented reality can help all students in using augmented reality which can be accessed through their smartphone.

Fourth, the developer did a test to a small group of students. In this small group testing, the developer chose six students as a target user. The data resulted from the testing is 82,64%. That numbers can be concluded into as valid. In addition of numbers as its quantitative data, some reactions came up front from the small group tested as, 1) the application is interesting and get the students' spirit to learn increased, 2) some of the students are eager to learn on how to make an augmented reality application, 3) the media developed had become a help for students to learn better in animation making.

Fifth, the field survey test was done by the developer. In this step, the developer got a full score from the whole member of the class consisting of 23 stu-

dents. The learning media supported by augmented reality got the score of 79,89% and is valid. From all the assessment done previously, it can be concluded that the learning media supported by augmented reality has become a feasible media to be used in a learning activity.

In the assessment process done by the developer, other than numbers standing as quantitative measurement, the developer did an effectivity test and acquired some scores of pre-test and post-test f the students. From the result of the t-test, there comes the number of 13,07. It was consulted with t-table, with N = 23 – 1 = 22 with credibility level of 95%, it resulted on t-table sore of 2,07. From the result of the analysis, there are 13,07 > 2,07. This shows that the result of the students learning process had a significant improvement just after they used the learning media supported by augmented reality.

Product Revising

Media experts, material experts, and subjects of the test (students of vocational school majoring multimedia) made some suggestions that the product developed stated to be valid and feasible to be used in a teaching and learning process of animation making. The suggestions came to be considerations to the developer in revising the product of learning media supported by augmented reality.

Some suggestions came from media experts related to the learning material supported by augmented reality and its manual book are 1) the picture of a camera used for the illustration of the video should be made into a more interesting one, 2) illustrations attached in it manual book should be bigger, 3) in general, the learning media supported by augmented reality and its manual book is worth going to the next validation step. Material experts suggestion said that the media is basically appropriate to the material of animation making and worth going to the next step.

Some suggestions were gained from personal testing, those are, 1) learning media supported by augmented reality helped students in doing their video assignments, 2) the media developed has been a very good media but still need to improve its' examples of video in every technique of animation making into a more varied one, 3) the learning media supported by augmented reality can actually be a help for students to learn better using augmented reality application installed from their smartphones. The developer also got some reactions from small group testing subjects

believing that 1) the application is interesting and let the students' spirit of learning improved bigger, 2) some of the students are asked to b taught on how to make augmented reality application, 3) the learning media provided can be a significant help for students to learn about animation making.

All reactions and suggestions from media experts, material experts, and students are used by the developer to revise and develop the learning media supported by augmented reality into a better one. The revision was done by the developer is useful for developing the media supported by augmented reality into a better and credible media to learn. Other than validity and credibility test done by the developer of the learning media supported by augmented reality, an effectivity test had also been done to the media. Effectivity test to the leaning media supported by augmented reality was done by comparing the students result of pre-test and post-test. The validity, credibility, feasibility, and effectivity of the leaning media supported by augmented reality in the subject of animation making are some plus point to consider in using the learning media supported by augmented reality during the subject of animation making under the material of techniques used in animation making. The techniques used in the subject of animation making inside the leaning media supported by augmented reality are related to measuring the dimension of the viewpoint, taking the right angle, to the movement of the camera.

DISCUSSION

The learning media feasibility, validity and effectiveness are obtained in order to get an appropriate standard of the media needed by the students. Media experts in the development process of the media supported by augmented reality gave some suggestions that the learning media supported by an augmented reality still needed some corrections and improvements in some parts of its features that the media can interest people even more. Suggestions like providing a more realistic illustration of the camera video will take the media into a more interesting media. Moreover, the animation making illustration should be made bigger and clearer that the student can see it better. The video in augmented reality application should be more versatile and interesting. Those suggestions will facilitate students in understanding every one of the techniques deployed in animation making. Suggestions came from media experts were some positive suggestions which let the developer go into the next level in

developing the media. Therefore, the developer was eager to go to the next step which is validating the learning media to material experts in order to get some suggestions about the material used in the media.

Material experts' suggestions were used to revise the learning media supported by augmented reality in terms of material attached to the product. The revision was done in order to make the media feasible and appropriate to be used by students. In general, material provided in the learning media supported by augmented reality had been appropriate to the subject of animation making. Considering that the suggestions given by material experts were very positive, the developer was eager to go to the next step of developing the product.

Material experts, not only gave suggestions for the media but also gave some suggestions related to the developed manual book attached to the learning media. The manual book is useful to help students in using the media well. Suggestions came from material experts for the manual book were basically as positive as the learning media got previously. Therefore, the developer had less hesitation to go further into the next step which was personal testing to students.

Personal testing was done to three students of vocational school majoring Multimedia. Those students commented that the learning media could really help them learning animation making technique better and ease their works in completing their video assignments. Moreover, the application is easy to be used and in the end, the learning media was concluded to be one helpful media for students to learn and feasible to be used personally. After all, the developer could consider that the media was ready to be tested in a small group testing session.

Small group testing was done with six students within the group of vocational students majoring multimedia. The opinions were quite varied. Augmented reality application is interesting and students seemed to be enthusiastic in learning the material. Even more, some students wanted to learn how to make augmented reality application because they were interested in augmented reality product. The learning media seemed to be another helpful tool to learn animation making subject and its techniques. They looked very excited to learn using this media.

Last but not least, field survey testing was done by the developer to 23 students in a vocational school majoring multimedia. The result of the test was that the media is appropriately feasible media to be used in a teaching and learning activity. Other than that, the media also said to be one effective media when it

is used during the learning process. These results were gainer through the result of pre-test and post-test of the students. The results of pre-test and post-test revealed that students were significantly improved. These students improved because they used augmented reality application. These facts can be seen through the result of t-test done by the developer to see how effective the media was when it is supported by augmented reality for vocational students majoring Multimedia within the subject of animation making. The degree of effectivity from the learning media supported by augmented reality which is developed could be seen through the comparison of pre-test and post-test done by students. The developer believes that the learning media supported by augmented reality can be an innovative way of learning and become appropriately suitable to be used for students in vocational school majoring multimedia within the subject of animation making, especially its animation making techniques.

CONCLUSION

This research produces instructional materials assisted by augmented reality in the form of printed teaching materials and applications installed on Android-based smartphones. These teaching materials are very flexible and students can use them wherever and whenever. With augmented reality technology, students not only understand the theory but also understand the practice of moving picture displayed through interactive videos. The material presented in teaching materials assisted augmented reality is the material related to the techniques in moving picture, namely 1) field of view size, 2) the standpoint of the image, and 3) camera movement. The techniques are important to be mastered by students before they enter the industrial setting. Based on the feasibility tests conducted, this augmented reality teaching material is categorized as valid. In the effectiveness test of teaching materials, there are significant differences in learning outcomes conducted by students before and after using instructional materials assisted by augmented reality for subjects in moving picture.

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