

Dissemination of Augmented Reality Book to Learning Geometry Analytic

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Abstract-In learning process of courses geometry analytic space in particular at UPBJJ UT Semarang and in general Open University, lecturers are still not able to make renewable teaching materials based on augmented reality. This research method uses Borg and Gall development model with 10 stages. The research in second year using steps 7-10 with augmented reality based teaching material products in the space analyte geometry subjects that have been tested are expanded by giving responses to student and lecturer responses, with an average percentage of student response aspects of media by 80%, aspects of material by 85%, aspect of language and display by 92% and aspect of example problem and exercise by 80% which means that students generally assess this product as valid and practical to be used in classroom learning, while the results of the average percentage of lecturer response are aspects of media by 82%, aspects of material by 95%, aspects of language and display by 80% and aspects of example questions and exercises by 88% means that lecturers in general assess this product to be very valid and practical to be used in geometry learning in the classroom, then the posttest results obtained an average value, experiment class is better than the control class which are 69,35 > 60.42 and t count < t table are 1,12 < 1.56 so that This media is effectively for learning mathematics education at open university.

Keywords-Development, AR Book, Analytical geometry

I. INTRODUCTION

The Course Geometry Space analytic is one of subjects that must be mastered by students at Open University Mathematics Education program, this is based on curriculum KKNI (Kerangka Kualifikasi Nasional Indonesia) which requires graduates to master their respective fields in a professional manner. In this case as a provision for students who have become teachers in junior and senior high school, students are required to take and master Geometry Space analytic as a provision when becomes a high school teacher.

Based on data from PISA (International Program for Student Assessment) in the last 2012, Indonesia ranked 64 of 65 participating countries, while the last was TIMSS (Trend in International Mathematics and Science) in 2011, Indonesia ranked 36 of 40 participating countries. Previously Stacey (2011) also explained that based on OECD data in PISA 2009, 70% of students in Indonesia could only solve math problems at level 2 or below. Based on PISA (Program International for Student Assessment) and TIMSS (Trend in International Mathematics and Science) shows students' ability in Indonesia is still low in solving problems in the form of questions. Based on these data, we as educators of junior and senior high school teachers should make a breakthrough to overcome them, one of which is to improve and package teaching materials for mathematics learning with interesting and efficient.

According to the research of [1] shows that with augmented reality students is learning independence better to find a concept or formula of a problem. Then reinforced by research [2] which explains that using augmented reality, the value of newness a media or teaching material will never die or the novelty value is always evolving. Then reinforced by research [3] which shows that with augmented reality can combine two objects, namely 2 dimensions and 3 dimensions so that teaching materials or learning media become more interesting.

A. Special Purpose

This study generally aims to obtain obtain products form of [4] AR Book applications in analytical geometry courses that can be used. in the study program of mathematics education at open university so that produce intelligent, creative and innovative human resources that are able to compete in the global era.

B. Research Urgency

[5] This advanced research is expect to produce theoretically and practically as follows: theoretically is expected to rich the theory of existing learning models, especially those based on ICT. In practical terms, the results of this study are expected to provide input, namely: (1) specifically in Open University mathematics education study programs, especially lecturers of geometry analytical courses in

order to be able to create and use AR Book whose material is interesting for students. (2) in general for lecturers and mathematics students to be able to package more interesting android-based learning media, one of them is by using AR Book.

II. PRELIMINARIES

A. Development of teaching materials

Teaching materials is materials students must learn in a certain time. This material can form of concepts, theories, and scientific formulas, ways, procedures, and steps to do something; and norms, rules or values [6].

Teaching materials for cognitive learning (knowledge) will manifest scientific theories or concepts. Teaching materials for psychomotor learning (skills) will be form ways or procedures to do something. While teaching materials for affective learning (attitudes) will take the form of values or norms. So, as prospective educators later students must be able to choose teaching materials related to aspects that students learn must meet cognitive, psychomotor, and affective domains [6]. Instructional development guidelines, teaching materials function as:

- 1) Guidelines for lecturers who will direct all their activities in the learning process, as well as a substance of competence that should be taught to students.
- 2) Guidelines for students who will direct all their activities in the learning process, as well as the substance of competence that should be studied / ruled.
- 3) Tool for evaluating achievement / mastery of learning outcomes.

Thus, the function of teaching materials will be closely related to the ability lecturers to make decisions related to planning, implementing and implementing activities, and assessing.

B. Augmented Reality

Added Reality or sometimes known as AR (Augmented Reality) is a technology that combines two-dimensional or three-dimensional virtual objects into a real three-dimensional environment and then projects these virtual objects in real time. No same virtual reality which completely replaces reality, reality is added to simply adding or completing reality.

The application of augmented reality technology is actually quite extensive, including in the field of education. [7] argues that the use of augmented reality technology in education is still being developed to this day, because unlike computing technology in general augmented reality interfaces are able to integrate users, virtual objects and the real environment and in their application to the school environment there needs to be collaboration between lecturers or instructors with researchers in the field to know the suitability of the application of augmented reality media with the curriculum on the campus.

This opinion is in line with the conclusion of [8] that as progress in the development of pedagogical concepts, applications, technology, and decreases in hardware costs, the

use of small-scale augmented reality technology for educational institutions becomes very possible in this decade (assuming careful level development) However, the potential of this technology requires careful attention so that it can truly be used to improve educational success.

[7] also revealed the reason for the use of augmented reality technology in the world of education, namely: (1) supporting the interaction between real and virtual environments, (2) the use of interfaces that seem real to object manipulation, (3) the ability to translate smoothly between real environments and virtual objects.

Based on some opinions of these experts it can be concluded that Augmented Reality technology has the potential to be applied to the world of education, especially in the learning process as a learning medium.

C. Geometric Learning Analytical Space

Space analytic geometry is a part of mathematics that discusses the shape and size of an object that has a certain order [9] based on the curriculum of KKNi SN Dikti the learning achievement of analytical geometry courses includes field analytic geometry and space analytic geometry, this course aims to provide understanding to students about basic concepts in analytic geometry so that students can solve problems related to concepts that exist in analytic geometry. in addition, this course also aims to provide a strong tool and foundation for students to study further subjects and who need materials in analytic geometry such as calculus II courses, Multivariable Calculus, and Transformation Geometry. [10]

Based on the experience of researchers in managing space analytic geometry courses since 2000 there are several obstacles. The main problem is the reference and media for analyzing space geometry learning is very lacking. There is a main reference that was compiled in 1973 with the final print in 1993, so that it is not clear to read and not comfortable as a learning resource. If students only memorize formulas and theorems then they will not understand the concept, so they will have difficulty when faced with geometric problems that are more complex and will have an impact on learning outcomes that are less optimal. Whereas students as prospective mathematics teachers at the junior and senior high school level are required to be able to present geometrical material that departs from something concrete then is followed up with (semi-concrete) drawings, and then ends with an abstract nature, besides geometric formulas as well must be accompanied by validated mathematically, then in analytic geometry learning have not used renewable application media such as Cabri 2D, Cabri 3D and GeoGebra which facilitate students in the process of understanding the concept of analytic geometry in an interesting, effective and efficient manner.

D. Student Learning Outcomes

According to [11] learning outcomes is abilities that students have after they receive their learning experience. According to [12] which refers to [13] thinking, presents five categories of learning outcomes, namely: verbal information, intellectual skills, cognitive strategies, motor skills, and

attitudes. While it has not revealed the three areas of teaching which are the abilities of a person that must be achieved are learning outcomes namely cognitive, effective, and psychomotor.

III. RESEARCH METHODS

This research includes the types of research and development or types of development research. The development carried out was the development of Augmented Reality Book to Learning Geometry Analytic Space which will be carried out for 2 years. The procedure for developing learning devices uses a model developed by Borg and Gall which includes 10 stages, namely (1) Research and information collecting, (2) Planning, (3) Developing preliminary form of product, (4) Preliminary field testing, (5) Main product revision, (6) Main field testing, (7) Operational product revision, (8) Operational field testing, (9) Final product revision, (10) Dissemination and implementation

In the second year, stage (7) Operational product revision is carried out in an integrated manner where the activity at this stage is a trial draft 2 to find out whether draft 2 has shown a performance as expected. If there are still weaknesses then the stage is carried out (8) Operational field testing is an improvement in draft 2 to analyze weaknesses based on the results of the expanded trial. The next step is (9) Final product revision that produces a revised draft 2. The results of the improvement from draft 2 are then called the final draft that is ready to be published. The final stage of this research is (10) Dissemination and implementation. This stage is taken with the aim that the product that has just been developed, namely augmented reality book to learning geometry analytic space course can be used by the wider community. The core activity at this stage is to disseminate products from development at regional and national levels. This publication is carried out through professional meetings and in the form of seminars, scientific international journals.

The research procedure that adopts the 10 stages of development of Borg and Gall can be seen in Figure 1 below.

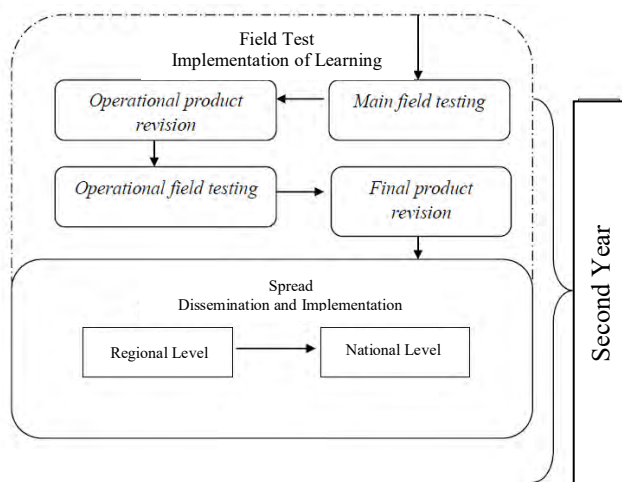


Fig. 1. Research Schemes for the Development of Borg and Gall of the Second Year

A. Research subject

Research subject is class VA and VB open university semarang school year 2018/2019.

B. Data Collection Method

Data collected on the development of augmented reality book in the form of quantitative data as the main data and qualitative data in the form of advice and input from respondents as additional data. The data provides an overview of the feasibility of the product being developed

IV. RESULT

The students open university has received a very good response, because in the open university, lecturers and students has been not used augmented reality book in classroom. Based on the results of interviews and filling in questionnaires by students the results average percentage of student responses namely media aspects by 80%, material aspects by 85%, aspects language and appearance by 92% and sample aspects of questions and exercises by 80% means that students generally asses this product to be valid and practical to use in classroom learning.

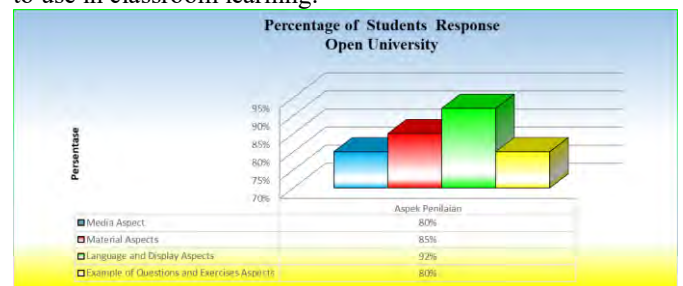


Fig. 2. Students Response Open University

The results of the average percentage of lecturer responses are media aspects by 82%, material aspects by 95%, aspects of language and appearance by 80% and sample aspects of questions and exercises by 88% its means that lecturers in general assess this product is very valid and practical used in learning geometry analytic space in the class.

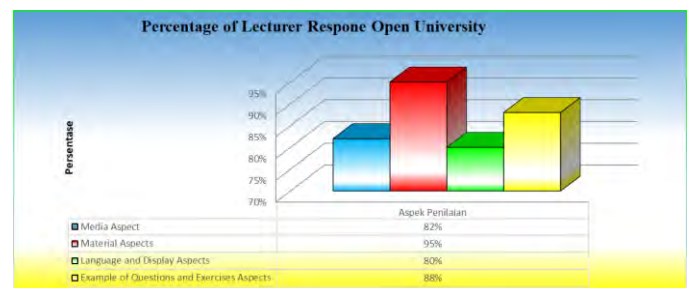


Fig. 3. Lecturer Response Open University

Based on the posttest results obtained by the average grade of experimental class is better than class control is $69,35 > 60,42$ and $t \text{ count} < t \text{ table}$ is $1,12 < 1,56$ so that this product is effectively used as a media for learning mathematics for the mathematics education program at open university semarang.

V. CONCLUSION

Based on the results from second year research, several aspects of lecturer and student responses have been produced holistically. It can be concluded that augmented reality book products have been produced that are suitable for use in the learning process of mathematics education programs at open universities and have received excellent responses from lecturers and students so that augmented reality book products are marketed in university.

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