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Submission date: 24-Feb-2021 11:31AM (UTC+0700)
Submission ID: 1516766079
File name: ation_on_triangle_concept_using_Adobe_Flash_Professional_SC6.pdf (839.37K)
Word count: 3813
Character count: 20891

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IOP Conf. Series: Journal of Physics: Conf. Series **943** (2017) 012052 doi:10.1088/1742-6596/943/1/012052

Visualization on triangle concept using Adobe Flash Professional SC6

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Abstract. The purpose of this paper is to develop teaching aids using Adobe Flash Professional CS6 emphasize on Triangle concept. A new alternative way to deliver a basic concept in geometry with visualization is software Adobe Flash Professional CS 6. Research method is research and development with 5 phase of Ploom's model, namely (1) preliminary, (2) design, (3) realization/ construction, (4) test, evaluation and revision, and 5) implementation. The results showed that teaching aids was valid, practice, and effective. Validity: expert judgement for material score is 3.95 and media expert judgement produce an average score of 3,2, both in the category are valid. Practically: the average of questionnaire response is 4,04 (good). Effectiveness: n-gain test value is 0,36 (medium). It concluded that developed of teaching aids using Adobe Flash CS6 on triangle can improve student achievement.

1. Introduction

The one of development in science and technology today is computer which has been widely used in all sectors of human life. The widespread popularity of entertaining computer is in various sectors, such as not limited on health, education, and military [1]. Computers have become a living part of today's society, not only adults, but also children. The study conducted by [2] about the challenge to education to exploit computer for doing, learning, and teaching mathematics. To use the computer as an interactive learning suggestion needs hardware as a support facility [2]. One of transformation role in education through IT, one way to enhance these changes are by curriculum design may be reconsidered in such a context [3]. Using computer as a teaching aid at school needs some requirements, because teaching aid has the ability to increase student learning motivation, should be able stimulate students to remember what has been learnt, and can provide new learning stimuli for students [2]. Thus, good media should have the ability to enable students to provide response, feedback, and encourage students to practice properly. These will be easily to enable teachers and students to bring image from the outside into the mathematic classroom.

Basic skill in mathematics by National Council of Teachers Mathematics is Geometry [4]. It is taught in Indonesian primary and secondary school curriculum. Spatial ability is a main role in teaching mathematics and geometry [5]. Many various sub dimension in geometry ability, such as spatial visualization, spatial perception, spatial perception, spatial perception, spatial relation, spatial orientation, and mental rotation [6]. Abilities on visualization are the ability to represent, transform, generalize, communicate, document, and reflect on visual information [7]. It focused on their figural properties, i.e., their properties as figures perceived through the senses and interpreted by mental reflection, with spatial (sensorial) representation. By [8] clearly that visualization plays a main role in

the understanding of geometry. Also [9] emphasize the essential part of geometric thought is visualization.

Research by [10] conducted the difficulties teachers in the area of geometry, the difficulties are a weak background and dislike teaching geometry. TRIAD (Technology-enhanced Research-based, Instruction, Assessment, and professional Development) model is used to change that promotes depth and quality of children's thinking, placing research-based learning trajectories at the core of the teacher/child/curriculum [10]. The difficulties that occur as a result of their spontaneous processes of visual perception in cases in which they contradict the geometric concepts/knowledge aimed at by the teacher and the tasks [10]. Students fail to accomplish a dimensional deconstruction of the figures in order to infer mathematical properties in axiomatic geometry [8]. The study by [11] conducted 3D model and the multimedia courseware aims to support the students geometric thinking by Van Hille [12] on level 1 (visualization) by providing a learning aid for this topic. The student ability to master the first level is very important in order for them to progress to the higher level of geometric understanding.

Visualization focused on their figural properties, i.e., their properties as figures perceived through the senses and interpreted by mental reflection, with spatial (sensorial) representation. The preced conducted research about geometry visualization generally used available apps such as Geogebra, Cabri 3D, and Google SketchUp, by examining the use of google Sketchup to develop spatial visualization. On the other study, it has found the effect of teaching Geometry using Cabri 3D [13]. It is determined that activities on Cabri 3D contributed significantly to the spatial ability of the teacher.

A new alternative to deliver a basic concept in geometry with visualization of 3D is software Adobe professional CS 6. Adobe Flash Professional CS6 is used to create and deliver interactive content [14]. Adobe Flash Professional CS6 is the authoring environment for creating rich, interactive content and advertisement for digital, web delivery. There are key feature areas in flash CS6 Professional (1) drawing environment. Flash features a complete set of drawing tools to handle intricate illustration and typography, (2) Animation. Flash light weight animation that incorporates images, sound, and video, and can be quickly downloaded through the Web [14]. Based on the features presented by Adobe Flash Professional CS6, the development of instructional media using Adobe Flash Professional CS6 software can produce visualization for the learning of geometry on Triangle material in 3-D.

2. Method

The method used in this research is research and development. Research and development method is a method used to produce a certain product, and test the effectiveness of the product. According to Nieveen [15], a product is said to be good/proper if it meets aspects of quality, among others validity, practicality, and effectiveness.

The development model being used refers to Ploom's development model in [9] this model consists of five phases, namely preliminary investigation phase, design phase, construction phase, evaluation and revision, and implementation phase. In the preliminary investigation phase is (1) curriculum analysis, (2) analysis of student characteristics, and (3) analysis of computer utilization. The next design phase is making the product design to be developed, media flowchart, and storyboard which the general design are covering the design of the template, the location of the menu, the navigation key, and the materials to be presented. Furthermore, the construction phase is realized in the design to become a product, so that the teaching aids obtained by the first prototype. After that, the result of this construction is reviewed by the researcher for the improvement. The next phase of the test, evaluation and revision are conducted in two main activities (1) the teaching aids validation activities, (2) limited experimental activity to use teaching aids. Furthermore, the implementation phase is evaluated and the product obtained, so the product can be implemented. In limited trials, products that have been revised and valid for use are then tested on field (classroom) learning. Flowchart' development teaching aids described on Figure 1.

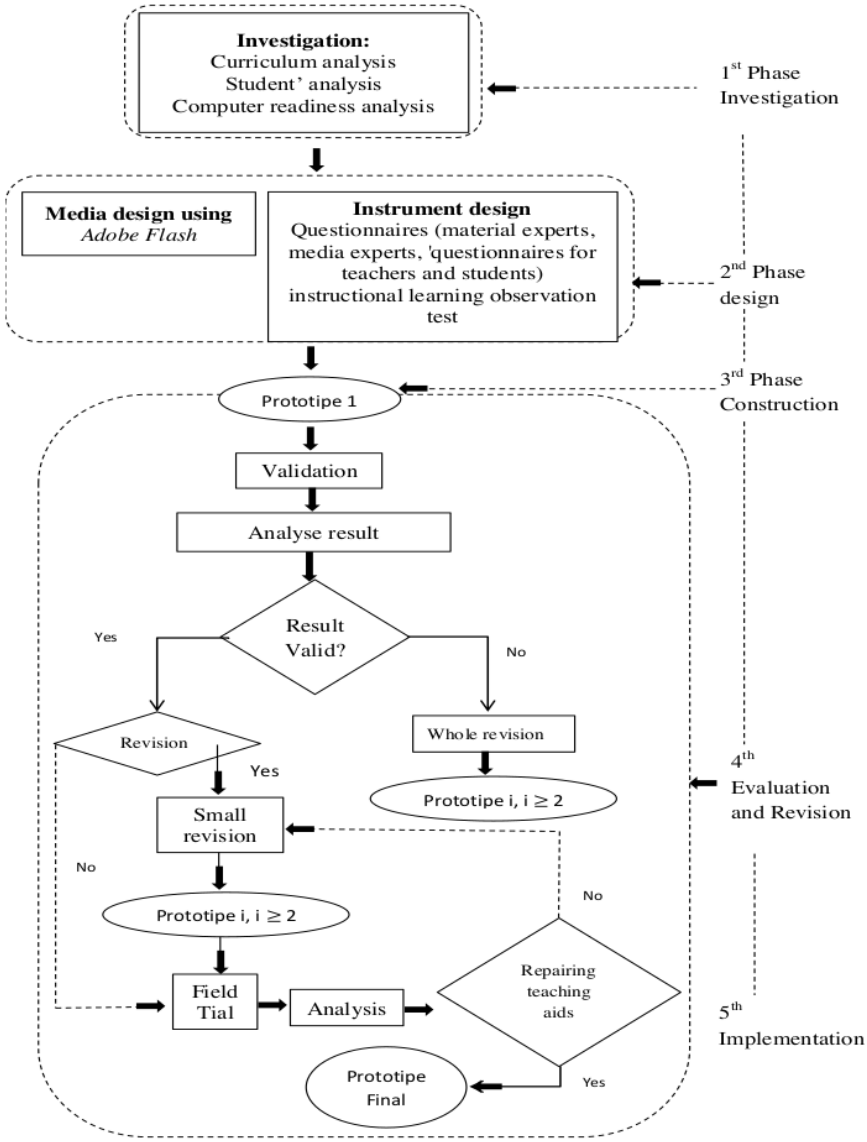

Figure 1. Flowchart of Development Teaching Aids

Data collection techniques in this development research are interviewing, observing of learning, giving questionnaire, testing and documenting. Instruments being used include questionnaires for material experts, questionnaires for media experts, respondents' questionnaires for teachers, and respondents' questionnaires for students, instructional learning observation sheets, and test. Then, the data obtained are analyzed descriptively.

The purpose of the questionnaires material experts and questionnaires media experts are to review the media design, consideration to media revisions, and media validation. The questionnaire for the material expert is used to measure the validity of teaching aids. Aspects of assessment used for the questionnaires

material expert include content quality and objectives, instructional quality, and instructional design [16]. The questionnaire media expert is used to measure the validity of teaching aids that has been developed. In order to measure the validity of the media are visual communication, software engineering, content quality and objectives and instructional quality.

Respondents' questionnaires are the assessment instrument used to measure the practicality of learning media that has been developed. The purpose of this assessment is to review the accuracy of teaching aids content and visualization on teaching aids. Respondents' questionnaire is given to teacher of mathematics and students at SMPN 3 Banguntapan. Aspects used to construct the questionnaire are instructional design, content quality and purpose, visual communication, and software engineering Instructional learning observation sheet is an instrument used to measure the practicality of teaching aids in terms of easy to use. It is filled by observer teacher and student activity in class. Teaching aids validation analysis was obtained using Likert Scale 1-5, and scoring using mean ideal formula. N-gain of the test is an instrument used to measure the effectiveness of developed teaching aids where is consists of preliminary and final tests Data obtained from the process of developing teaching aids on the subject matter of triangle for students of SMP class VII in accordance with predetermined will be analyzed descriptively.

3. Result and discussion

The development of teaching aids using Adobe Flash CS 6 was conducted on mathematic subjects of triangle subject in SMP Negeri 3 Banguntapan. The process of development is conducted in stages and to produce a decent and quality teaching aids is done material expert validation, media expert validation, limited testing, field trials, learning implementation observation, and test. All processes are intended to obtain media quality data viewed from the validity, practicality, and effectiveness of the next revision or improvement in order to achieve a decent, quality and useful teaching aids for its users.

After the teaching aids process is completed, it was reviewed by an expert who will assess the validity of the teaching aids (i.e. material experts and media experts). Each expert fills out a validation questionnaire that has been compiled based on predetermined aspects. Data from media questionnaire by material experts are presented in Table 1.

Table 1. The result of material experts

Aspect	Average Value	Criteria
Quality of content and purpose	3,87	Good
Instructional	4	Good
Learning design	4	Good
Average	3,95	Good
Validity	3,95	Valid

From the Table 1, it can be seen the average value of each aspect, then from all these aspects average is 3.95. Media validity can be revealed by converting score to scale 5. According to expert judgment result of conversion of average score, it can be concluded that the media stated valid. Expert judgment stated that instructional media deserve to be tested with little revision. Furthermore, data from media questionnaire results by media experts presented in Table 2.

Table 2. The result of media experts

Aspect	Average value	Criteria
Visual communication	3,5	Very Good
Software engineering	3	Good
Quality of content and purpose	3	Good
Instructional	3,3	Good
Average	3,2	Good
Validity	3,2	Valid

From Table 2, it can be seen the average value of each aspect, then from all these aspects average is 3.2. Teaching aids validity can be determined by converting scores to scale 4. According from material expert judgment result of conversion of average score, it can be concluded that the teaching aids stated valid. Material expert judgment stated that teaching aids is worthy to be tested without revision.

Trial for teaching aids conducted after the teaching aids is said to be valid and feasible to be tested by a lecturer of material experts and lecturers media. It is intended to determine the practicality of the media developed. Trial conducted in SMP Negeri 3 Banguntapan on 10 students of 7th Grade class G. Table 3 is the result of the questionnaire of the student's response to a limited trial.

Table 3. A limited student response questionnaire

Aspect	Average value	Criteria
Learning design	3,9	Good
Quality of content and purpose	4,5	Very Good
Instructional quality	3,9	Good
Visual communication	4	Good
Software engineering	3,9	Good
Average	4,04	Good

The result from Table 3 can be seen the average value of each aspect, then from all aspects in the average is 4.04. The quality of the media can be determined by converting that average score with the conversion guide to scale 5. From the results of the average conversion of the score can be concluded that according to a limited scale trial the media has a good. After the product has been revised and valid for use, then it is tested on the learning in the class. The trial was conducted in class 7th Grade class F with the number of students that is 26 students and some teachers. This trial class is conducted to see the effectiveness of learning kits developed by using questionnaire responses of students, teacher response questionnaires and student achievement test. Questionnaire response student field trials aims to determine whether the teaching aids developed can be used properly. Table 4 is the results of the field questionnaire response questionnaire.

Table 4. A field response questionnaire

Aspect	Average value	Criteria
Learning design	4,1	Good
Quality of content and purpose	4,4	Very Good
Instructional quality	4,2	Good
Visual communication	4,2	Good
Software engineering	4,1	Good
Average	4,2	Good

The results of the average conversion of the score in Table 4 can be concluded that according to the results of questionnaire responses of field trials, teaching aids has a good. Questionnaire response teacher field trials aims to determine whether the teaching aids developed can be used properly. Table 5 is the results of the field teacher response questionnaire.

Table 5. Master field response questionnaire

Aspect	Average value	Criteria
Learning design	4,3	Very Good
Quality of content and purpose	4	Good
Visual communication	4	Good
Software engineering	4,5	Very Good
Average	4,2	Good
Validity	4,2	Good

From the quality of the teaching aids can be known by converting the average score with the conversion guidelines to scale 5. From the results of the average conversion of the score can be concluded that according to the results of questionnaire responses of field trials students, teaching aids have good and declared valid without revision.

Test consists of two kinds, namely the initial test and the final test. The test is conducted before and after the use of teaching aids. The test was given to 24 students which aimed at knowing the improvement of student learning achievement and assess the effectiveness of teaching aids developed. Table 6 is the result of preliminary and final test.

Table 6. Preliminary and final test results

	Pre-test	**Post-test**	**N-Gain test**	**Criteria**
Mean	54,8	71,25	0,36	Medium

The results of the initial test score analysis obtained an average value of 54.8 and the final test obtained an average score of 71.28. The n-gain test scores obtained an average of 0.36 with moderate (medium). This indicates that the initial test to the final test has increased.

Teaching aids is valid which states that teaching aids can be used with little revision or no revision. The results showed that the expert analysis of the material obtained an average score of 3.95 so that the validity of the media stated valid. Media experts obtain an average score of 3.2 so that the validity of the media is declared valid. From the analysis of material experts and media experts can be concluded that the teaching aids is valid and can be used. In the aspect of practicality, the validator states that the media can be used in learning with a little revision. Questionnaire response of the limited trial students obtained an average score of 4.04 and expressed by of good. It shows that the developed teaching aids can be used well. In the aspect of effectiveness, student test results have increased. Judging from the results of the initial test score analysis obtained an average value of 54.8 and the final test obtained an average score of 71.28. The N-gain test scores obtained an average of 0.36 with moderate (medium). Questionnaire of field trial student responses earned an average of 4.2 otherwise with good. Furthermore, the questionnaire responses of subject teachers earned an average of 4.2 otherwise with good. It can be concluded that the developed teaching aids can be used well and declared effective.

Based on the criteria of validity, practicality, and effectiveness that have been explained before, this research has generated a new product teaching aids for teaching geometry by using software Adobe Flash CS6. It is different with research conducted by [6, 10, 13, 17] that was used available teaching aids such as Geogebra, Cabri 3D, Google Sketchup. Teaching aids generated by this research has many strengths such as: (1) teaching aids has packed on Interactive CD that can be used on a computer without installing, (2) the content consists of materials and also questions based on indicator, (3) The material are presented interestingly with animation, narration, and background music to decrease the students' boredom, (4) the student can operate it everywhere. It is in accordance with statement regarding revolution that should be conducted by teachers in combination learning method with information technology to be more interactive, efficient and pleasant. It is stated that software used in development the animation in teaching aids is Macromedia Flash, a software that can create graphic media, this facilitating their transmission to any user connected to the network [18-20].

4. Conclusion

To develop teaching aids in Triangle subject with Adobe Media Flash CS 6 can use Ploom's model, which consists of five phases, namely preliminary investigation phase, design phase, construction phase, evaluation and revision, and implementation phase. Teaching aids to be good is have minimum three aspects of quality (1) validity; both of expert judgment said that teaching aids valid, (2) practicality; student response and field response said that teaching aids on Criteria Good, it should be practice, and (3) effectiveness: final test result on medium Criteria, it should be teaching aids effective for student's ability. This develop teaching aids can be supporting teachers in class. But it could not be primary aid to deliver triangle concept to student.

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