The development of the computer-based instructional media with the interactive tutorial model

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Abstract. This research aims to develop the computer-based instructional media with the interactive tutorial model. This research used the development model design composed by Borg and Gall modified by Sugiyono. The development was conducted through the following steps: (1) potentials and problems; (2) data collection; (3) media design; (4) validation; (5) revision; (6) small group trial; (7) revision; (8) big group trial; and (9) revision. At the stage of potentials and problems, researchers created a need analysis of the results of interviews with mathematics teachers. The media was developed for four meetings, validated by three validators and furthermore revised based on the input from validators. The revised media was tested on small and big groups by students at the Junior High School 8 Pekanbaru. The results of the data analysis showed that the computer-based instructional media with the interactive tutorial model on the coordinate system is valid with the average value of 3.4 and is practical to use by students.

1. Introduction

Mathematics is an abstract subject, so that teachers are required to be able to find the instruction that is easy to understand by students. In the learning process, there are several supporting factors, such as the use of media in order that the learning process can run well [1, 2]. In the learning process, the lesson uncertainty can be assisted by presenting media as an intermediary [3]. The media acts as a tool to facilitate teachers and students in the learning process. Selecting and using the appropriate instructional media is very useful in the learning process such that students are more easily to understand the lesson.

Researchers have interviewed a mathematics teacher of the eighth grade. From the interviews, there are problems in learning the lesson of the coordinate system. When the teacher drew the coordinate system on the board with the same measure of point distances to the x and y-axes, it took a long time. Another problem occurs if the distance between points does not have the same scale, then the straight line cannot be straight. The existence of instructional media providing the lesson of the coordinate system, clearly makes the learning time more efficient than the usual learning.

The next problem often done by students is to determine the point distance to the x and y-axes. For example, when the teacher asks a question, to determine the distance of the point A(2,4) to the x and y-axes. Students often answer in reverse, the point distance to the x-axis is 2 and to the y-axis is 4, while the correct answer for the point distance to the x-axis is 4 and the point distance to the y-axis is 2.

One of solutions to overcome these problems is to create an instructional media. The function and role of the instructional media are: (1) clarifying the information so as it is not too abstract; (2)
overcoming the limitations of place, time and sense power; and (3) making the learning process exciting and allowing students to learn according to their own abilities and interests [4].

The rapid development of Information and Communication Technology (ICT) has a positive impact on education [5]. Microsoft Office Power Point and Microsoft Office FrontPage are computer software for creating the instructional media. This computer-based instructional media uses an interactive tutorial model with Microsoft Power Point and Microsoft Office FrontPage packaged in Compact Disk (CD). The learning interaction in the form of this tutorial is designed in such a way as the interaction of the teacher and students in the usual learning [6]. The advantages of this model are students can learn independently, the lessons can be practiced directly by students and students can repeat the lesson many times [7]. Using computer technology on mathematics not only give significant positive effect of computer technology on mathematics achievement but were also able to identify conditions particularly corroborating the beneficial effects of computer technology [8, 9].

Taking those described problems into account, researchers conducted the development research of the computer-based instructional media with the interactive tutorial model. The purpose of this study is to produce a computer-based instructional media with the interactive tutorial model that is valid and practical to use by students.

2. Method
This research is a research and development study with the development design that is adapted from Borg and Gall development model and modified by Sugiyono. The steps of development are: (1) potentials and problems; (2) data collection; (3) product design; (4) design validation; (5) design revisions; (6) small group trial; (7) product revisions; (8) big group trial; and (9) product revisions [10].

The subjects of the study on the small group trial were 5 students of the eighth grade with the heterogeneously academic ability and the capability of using the computer. Subjects on the big group trial were 25 students of the eighth grade at Junior High School 8 Pekanbaru. These students have not studied the lesson of the coordinate system but already having the necessary knowledge to understand the coordinate system.

The data collection instrument is the validation sheets and the student response questionnaires. The instructional media validation sheets including four aspects: learning aspect, curriculum aspect, program aspect and cosmetic aspects with Likert scale 1-4. The validation sheets were analyzed to determine the validity level of computer-based instructional media with the interactive tutorial model on the lesson of the coordinate system by using the average formula and were categorized based on validity criteria [11]. The student response questionnaires with Guttman scale "Yes" and "No" were analyzed to determine the practicability level of the developed media with the Cochran’s Q test.

3. Result and discussion
This section presents result of nine steps model design of Sugiyono. At the step of potentials and problems, researchers conducted an interview to a teacher to get the need analysis. Then, researchers collected the necessary data to create media, in the form of learning lessons, exercises and figures. The three kinds of data were obtained from mathematics books of the eighth grade at Junior High School and from the internet.

In designing the media, the researcher classified the lesson of the coordinate system into four sub-lessons, namely: (1) the position and distance of a point to x and y-axes; (2) the position of a point to the origin point (0,0) and to the particular point (a, b); (3) the position of parallel and perpendicular lines; and (4) the position of intersected lines. The lesson of the coordinate system in the instructional media is arranged as referring to the Curriculum 2013. The arrangement is done with the paper based design that is the media learning design on the paper. The design is processed with Microsoft Office Power Point and packed with Microsoft Front Page in the website view. Figure 1 shows media cover, beginning of learning activities with the problem and the look of Front Page.
Figure 1. The appearance of the developed media.

Then, the instructional media is validated by three validators arranging from two lecturers and one teacher. The results of validation of instructional media are shown in table 1.

Table 1. Instructional media validation results.

| Validator  | Total | Average | Categories   |
|------------|-------|---------|--------------|
| Validator 1| 99    | 3.1     | Valid        |
| Validator 2| 119   | 3.7     | Very Valid   |
| Validator 3| 109   | 3.4     | Very Valid   |
| Overall total| 109  | 3.4     | Very Valid   |

Generally, the media that has been compiled is considered as very valid. Furthermore, the researchers revised in accordance with the assessment on the validation questionnaires as well as comments and suggestions from the validators. Revisions made by researchers can be seen in table 2.
Table 2. Revisions of the instructional media based on validation results.

| Aspect     | Comments and suggestions validator                                                                 |
|------------|-------------------------------------------------------------------------------------------------------|
| Program    | There were some web links that were not working properly.                                            |
|            | Indicators of achievement of competencies should be linked to the appropriate basic competencies.     |
| Learning   | The learning objectives did not match for the learning lesson.                                       |
|            | The usage instructions showed up too often.                                                          |
|            | The media needed to add a sign or description for the menu button on the main menu.                  |
| Curriculum | There is a discrepancy in the size of the plan figures in the meeting one.                           |
| Cosmetics  | There were some twisted effects.                                                                     |
|            | Fix the typing errors                                                                                |
|            | Home menu in front page view should be created in the full screen mode.                              |

At the small group trial step, the revised instructional media was tested to five students of the eighth grade at Junior High School 8 Pekanbaru. Students are selected based on values of the exam in the previous semester. The trial required students to use the computer-based instructional media with the interactive tutorial model on the lesson of the coordinate system. After using instructional media, students filled out the student response questionnaires.

The questionnaires were analyzed with the Cochran’s Q test. The value of the Cochran Q for them is 19 and the value of $\chi^2$ with $\alpha = 5\%$ and df = 19 is 30.14. Thus, the value of the Cochran’s Q is less than the value of $\chi^2$ (19 < 30.14). Viewed from the value of asymptotic significance = 0.457, this expresses the probability is greater than 0.05 (0.457 > 0.05). The results showed that $H_0$ is accepted. It can be concluded that students give the same or homogeneous value. This means that students’ responses to the practicality of the instructional media are good. From the results of the small group trial, researchers revised the instructional media. Revisions made by researchers can be seen in table 3.

Table 3. Revision of instructional media based on small group trial.

| No | Students’ comments and suggestions                                                                 |
|----|-----------------------------------------------------------------------------------------------------|
| 1. | There were still some web links that were not working properly.                                     |
| 2. | Fix the typing errors.                                                                             |
| 3. | Look out the location of the writings and figures so that the media could be arranged more neatly.  |

Furthermore, researchers conducted the big group trial. The trial was conducted in the eighth grade at Junior High School 8 Pekanbaru with 25 students. The researcher played a role as a teacher who carried out the lesson. At the end of the lesson, students are asked to fill out the student response questionnaires. The value of the Cochran’s Q for this trial is 17 and the value of $\chi^2$ with $\alpha = 5\%$ and df = 19 is 30.14. Thus, the value of the Cochran’s Q is less than the value of $\chi^2$ (19 < 30.14). Viewed from the value of asymptotic significance = 0.590, this expresses the probability is greater than 0.05 (0.590 > 0.05). The results showed that $H_0$ is accepted. It can be concluded that students give the same or homogeneous value. This means that students’ responses to the practicality of the instructional media are good.

Based on the results of the big group trial, researchers revised the media again. Generally, there were not too many improvements made by researchers because the results of the big group trial are very good. Revisions made by researchers is add images so that images contained in the media more diverse. Eventually, researchers checked all the components of the instructional media from the first meeting to the last one and packed it in the CD.

Based on the data analysis from the overall student response questionnaire of the trial step, the instructional media have fulfilled the requirement of the practicality so that it can be used in the learning
process. Students said that the display of instructional media is very interesting and the language is easy to understand. Students are easier to understand the lessons that are accompanied by illustrations rather than verbal explanations from the teacher. This is because the media can clarify the presentation of the message so as it is not too abstract [4], interest the students and improving the students’ learning motivation [12-14].

4. Conclusion
This development research has produced a product in the form of computer-based instructional media with the interactive tutorial model. This media is considered as valid after going through the validation process and dealing with the requirements of practicability for the use of eighth grade students after going through two test steps.

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