The Application Design of Interactive Multimedia of IT-based Mathematics Learning on Strengtening Students' Characters

N. Bito[a*], S. Ismail[b*], R. D. R. Dako[c*]

[a,b,c]*Department of Mathematics, Universitas Negeri Gorontalo, , Jl Joesoef Dalie No.78, Kota Gorontalo 96128, Indonesia*

[a]*Email: nursiyabito@gmail.com*
[b]*Email: sumarnoismail@ung.ac.id*

Abstract

This research aims to develop interactive multimedia application of Coordinate System-based on the strengthening of Grade VIII Junior High students' characters. The development model used in this study refers to the 4-D model proposed by Thiagarajan, Semmel and Semmel consisting of Define, Design, Develop, and Disseminate stages. Product development was tested on 20 students and field test was conducted in three junior high schools namely SMPN 3 Gorontalo, SMPN 1 Kabila Bone Bolango District and SMPN 11 Gorontalo City. The results of this study indicate that interactive multimedia Coordinate System that has been developed: (1) Categorized valid and feasible according to the expert; (2) Multimedia interactive coordinate system is easy to use and improves learners' response in learning. In addition, the implementation of learning by using multimedia coordinate system is in very good criteria, (3) Multimedia can improve the activity and learning outcomes of learners which based on observations obtained the percentage of student activities by 89.75% for limited and average trial class percentage for the field trial class of 94.87% with very good criteria.

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* Corresponding author.

Students' learning outcomes provide classical completeness data for the limited trial class of 87.50% and field trial classes obtained by an average percentage of 89.33% with very good criteria, (4) Improving character based on the above, the interactive Multimedia coordinate system developed has been said to be valid, practical and effective so that it can be used in the process of Mathematics learning at grade VIII Junior High School.

Keywords: Interactive Multimedia; Coordinate System; Character Education; Validation.

1. Introduction

Education is a conscious effort to develop the potential of learners optimally. In addition, education has a function to develop cultural values and character. Therefore, cultural education and character of the nation is at the core of an educational process. The process of developing the values on which the character is based will require an ongoing process to be carried out through the various curricular currents of the curriculum.

In character education in schools, all components must be integrated, i.e. the content of the curriculum, learning process and assessment. Character education can be attributed to the advancement of science and technology. In addition, the development of science and technology increasingly encourages renewal efforts in the utilization of technology results in creative and innovative learning process to achieve learning objectives. The development of technology in education brings a positive impact for teachers and learners as well as other educational tools. Technological aspects have also been incorporated into the school curriculum as an effort to cultivate and foster positive interests and attitudes toward technological developments. The intended technology is a learning media technology that becomes one of the important components in the learning process.

Author in [21] stated that learning media is a tool that allows learners to understand and understand a concept easily. Furthermore, some scholars suggest that an abstract mathematical object is a difficulty faced by students in learning mathematics. Mathematical concepts can be understood easily if it is concrete so that appropriate media selection is required, one of which is the interactive multimedia of mathematics learning.

According to the authors in [9], multimedia composed of computer platforms, Mayer [12] defines interactive multimedia as a medium that represents material to in the form of verbal and nonverbal words as well as both static and dynamic images. The researchers in [8] explained that the use of audio and visuals that will help students learn more from the computer screen. Furthermore, according to [4] the use of interactive multimedia can make the learning process more interesting, interactive, the amount of teaching time can be reduced, the quality of learners can be improved and teaching and learning process can be done anywhere and anytime, and learning attitudes of learners can be improved , in addition, the use of multimedia has significance in improving the quality of learning and also improves students' learning attitudes [1]. The use of multimedia and learning resources in the learning process of mathematics will open up greater opportunities for the creation of effective learning and learning conditions, as proposed by [3] which suggests that learning mathematics using interactive multimedia produces better mathematics learning achievement than with learning conventional. Some research results show that interactive multimedia can improve learning outcomes of learners throughout the education level. Among these are the results of [7] study which states that the effectiveness test results show that the

students' mathematics learning outcomes using interactive multimedia are better than students who do not use interactive multimedia learning. These results are supported by [10] which states that multimedia can facilitate students in understanding the lessons and implement knowledge in math problems or exercises.

In fact, although interactive multimedia learning can improve students' learning outcomes, nevertheless multimedia learning of mathematics is still rarely used in the learning process, due to limited availability of multimedia learning itself. Therefore, through this research, the researcher develops an interactive multimedia based on character education of Mathematics of Coordinate System, which through multimedia is not only become a media of mathematics learning that can improve the response and learning result of learners but also can be used as a means to instill the participant character educated early on.

2. Research Methodology

The development model that will be used to develop multimedia learning in this research is [16] model known as Four-D Model (Model 4-D) consisting of 4 stages: define, design, develop, and disseminate. The product developed in this research is multimedia material coordinate system based on character education. This research has been conducted for one year starting from February 2018 and completed in February 2019, where the test phase was conducted on 20 students and field test was conducted in three junior high schools namely SMPN 3 Gorontalo, SMPN 1 Kabila Bone Bolango District and SMPN 11 Kota Gorontalo. The instruments used in this study are: 1) expert validation sheet to assess the validity of multimedia coordinate system, where the validation is done by four experts, consisting of two mathematics education experts and two media instructional experts, 2) interview guidance to get response data of interest and learners' motivation about the application of multimedia coordinate system in learning, 3) observation sheet of learning implementation using multimedia coordinate system, 4) observation sheet of learners activity, 5) test of learning result. Data analysis in this study as described as follows:

1.1 Validity Analysis

Expert validation results are analyzed by referring to the validation criteria shown in Table 1.

Table 1: Validation criteria

Average	Validation Criteria
4.44 – 3.375	Highly Valid
3.75 -3.00	Valid

Reference [15]

Based on the above table, the interactive multimedia in the learning can be used if it meets the valid or highly valid criteria based on expert judgment.

1.2 Analysis of Teacher Response and Learners, and the Implementation of Learning Process

The response of teachers and learners is obtained from interviews. Data of interview result of teacher and learner are analyzed, then result of interview each indicator is made conclusion. Assessment of learning implementation is done by matching result of average total score given with criterion as follows:

Table 2: Criteria of learning implementation

Score Range	Interpretation
86% - 100%	Very Good
76% - 85%	Good
66% - 75 %	Enough
56% - 65%	Not good
0% - 55%	Not very good

Reference [15]

1.3 Analysis of Learning Activities and Learning Outcomes

Activity assessment of learners is done by matching the average results of the total score obtained with the criteria in Table 2. Similarly, for the learners' learning results are analyzed by referring to the individual mastery of 80% and classical completeness of 85% of learners achieve minimal mastery criteria, after it is converted to criteria as shown in Table 2.

3. Finding and Discussion

This research produces product of interactive multimedia "coordinate system" for grade VIII Junior High. This development is carried out by stages referring to the FOUR-D development model as follows:

3.1 Define

At this stage, it is done an analysis of the results of interviews with teachers, where required the development of multimedia learning, especially for subjects Mathematics. Multimedia developed contains learning materials about the Coordinate System. The developed multimedia is designed to provide interactive effects on the child in learning to understand the Coordinate System, in addition also through this interactive multimedia embedded character values, for example.

3.2 Design

It is created of multimedia coordination system based on character education in this phase. In addition, a multimedia validation sheet was developed, interview guides to obtain response data in the form of interest and motivation of learners, observation sheet of learning implementation, activity observation sheet of learners, and

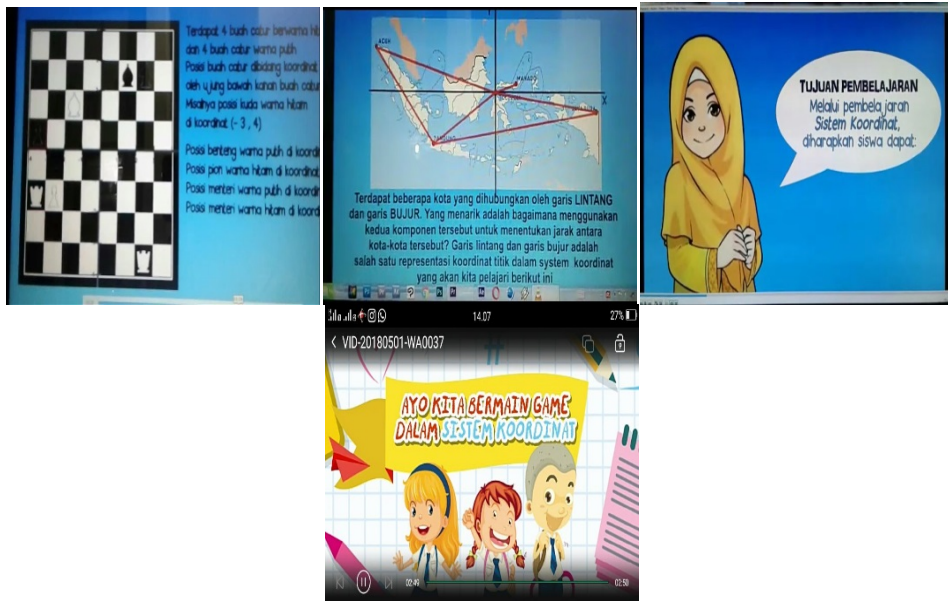test of learning result. The following are given some multimedia display images that have been developed.

Figure 1: Interactive multimedia display

The interactive multimedia dish Coordinate System has several functions among them.

3.2.1 Tutorial

This presentation format is a multimedia learning in the delivery of material done in tutorial. Information that contains an explanation of a concept presented either silent or moving images and graphics. In general, the tutorial stage of the coordinate system material includes 1) Introduction, 2) Presentation of Information / material, 3) Simple examples and problem solving, 4) Questions and response responses, and 5) Conclusions. In the learning interaction in the form of tutorials, information and knowledge are communicated in such a way as when teachers present instruction to learners.

3.2.2 Practice and Exercise

This format is intended to train learners to have skills or deepen the concept of coordinate system. The program provides a series of questions or questions that are usually displayed at random, so that each time the questions / questions that are displayed are always different or have different combinations. The program also comes with correct answers, complete with explanations. At the end of the learner can see the final score achieved, as an indicator to measure the level of success in solving the questions posed.

3.2.3 Simulation

Multimedia learning with this format tries to match dynamic processes that occur in the real world, such as

simulate the position of the point with another point as a representation of two objects and real-world issues that are relevant.

3.2.4 Game

This format is designed to increase the interest of learners so that the concept can be absorbed well and increase knowledge and skills. Another goal is to bring a fun atmosphere in some form of game types, chess games and maps. Through this format is expected to occur learning activities while playing.

3.3 Develop
3.3.1   Expert Validation

Multimedia validation and learning tools The Coordinate System contains several assessment parameters in terms of construction, content and language, readability and appearance. Validation results obtained in the form of qualitative suggestions and assessment sheets. Qualitative advice is used as a reference to revise the multimedia of mathematics learning and other learning tools. After revised the experts fill out the assessment sheet with the following assessment results.

Table 3: Results of tool coordinate learning system validation

Learning media	Assessment category	Feasible/not
Comic	Highly Valid	Feasible
Syllabus	Highly Valid	Feasible
Lesson Plan	Highly Valid	Feasible
Worksheet	Highly Valid	Feasible
Teaching Material	Valid	Feasible
Learning Outcomes Assessment	Valid	Feasible

Based on the above table it can be seen that in general the learning media of comic IPA and other learning devices are in very valid category, so it is feasible to be used in the learning process.

3.3.2   Product Trials
3.3.2.1 Response and implementation of learning process using multimedia Coordinate System

The results of interviews with teachers and learners show that multimedia learning mathematics material Coordinate System is easy to use in the learning process. The Author in [13] suggested that one of the learning process can improve student understanding, enthusiasm, class attendance and satisfaction, This shows that when students provide environhed enriched by different senses, students learn more easily and effectively. Instructional materials can address students with different characteristics and opportunities to learn in their own

learning and speed [5]. is in line with the results of interviews on learners who explain that multimedia learning mathematics Coordinate System can increase interest and motivation of learners in the learning process.

Paseleng and Arfiyani stated that the interactive multimedia-based learning media provide a positive influence on the formation of student interest in learning, especially mathematics subjects. This is supported by [14] who recommends it was found that the acquired retention was better in the case of interactive multimedia.

In terms of process implementation obtained the percentage of learning activities using the Multimedia Coordinate System as shown in Table 4 below.

Table 4: Percentage of average learning enforcement

Class	Percentage of learning performance (%)	Criteria
Trial	88.33%	Very Good
Field trial	91.67%	Very Good

3.3.2.2   Activities and Learning Outcomes

Activity of learners observed in the learning process consists of 5 general categories namely readiness of students to receive lessons, enthusiasm of students in learning activities, student activities in the use of multimedia, and student participation in making conclusions. Percentage of observation results of learners' activity can be seen in the following table:

Table 5: Average percentage of students' activities

Class	Percentage of students' Activities (%)	Criteria
Trial	89,75 %	Very Good
Field trial	94,87 %	Very Good

Based on Table 5 it can be seen that the activity of students in the learning process using interactive multimedia is in very good criteria, it shows that the use of interactive multimedia in the learning process can increase the students' activity, as stated by the researchers in [19]. Students in the e-learning environments that provided interactive videos achievable higher learning performance and a higher level of learner satisfaction than those in

other settings. However, students who used the e-learning environment that provided non-interactive video did not improve either. The findings suggest that it may be important to integrate interactive instructional video into e-learning systems. Student learning outcomes depend on the learning design and student activities (Wardani, et.al. 2017). Through instructional design using multimedia interactive as well as criteria of student learning activities as shown in Table 5, the learning results obtained as shown in Table 6.

Table 6: Average percentage of students' learning outcomes

Class	Mastery of classical learning outcomes (%)	Criteria
Limited Trial	87,50 %	Very Good
Field Test	89,33 %	Very Good

Table 6 shows that learners 'learning outcomes are at very good criteria, meaning that the use of interactive multimedia contributes positively to improving learners' learning outcomes in the learning process, because through interactive multimedia learners will be more motivated in learning that has an effect on improving learning outcomes students, as the results of Ju & Nan's (2016) study show that there is a significant correlation between learning motivation and learning outcomes if students learn to use interactive multimedia.

The results of [20] show that including images into structural text information presents significant effects on the students' outcome and the reduction of cognitive. This is in line with the results of [11]'s research (2016) which states that interactive multimedia affects the ability to understand the mathematical concepts of students, as well as the results of [2] which states that there is a significant effect of learning using multimedia on student learning outcomes.

Based on the above description then the multimedia Coordinate System feasible use in the process of learning mathematics because it can increase interest and motivation learners learn, as well as activities and learning outcomes of learners.

3.4 *Disseminate*

The dissemination stage in this research is done by using interactive multimedia mathematics in the process of learning which is more widespread, that is by distributing interactive multimedia Coordinate System is in some junior high school in district / regency in Province of Gorontalo.

4. Conclusion

Based on the results of research and discussion above, the conclusion in this research are: (1) Multimedia

interactive mathematics Coordinate system valid according to expert assessment, so feasible to be used in the learning process, (2) Multimedia interactive mathematics material Coordinate system practical use in learning process, where the results of interviews with teachers and learners obtained multimedia information Coordinate System is easy to use and can improve the response of learners in learning. In addition, the implementation of learning by using multimedia mathematics Coordinate system is in the criteria very well, (3) Multimedia mathematics material Coordinate system effectively used in the learning process, which based on observations, average percentage of learning activities for the class of experiments is limited to 89.75% and field trial class of 94.87%. The percentage of student activity for the limited test class was 89.75% and the average percentage for the field trial class was 94.87%, both of which were on very good criteria. Furthermore, based on the test of learning results obtained students' classical completeness for the limited trial class 87.50% and for the field trial class obtained an average percentage of 89.33% with very good criteria, (4) Can apply the character of discipline, honest, res+ponsible, work same in grade VIII SMP.

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