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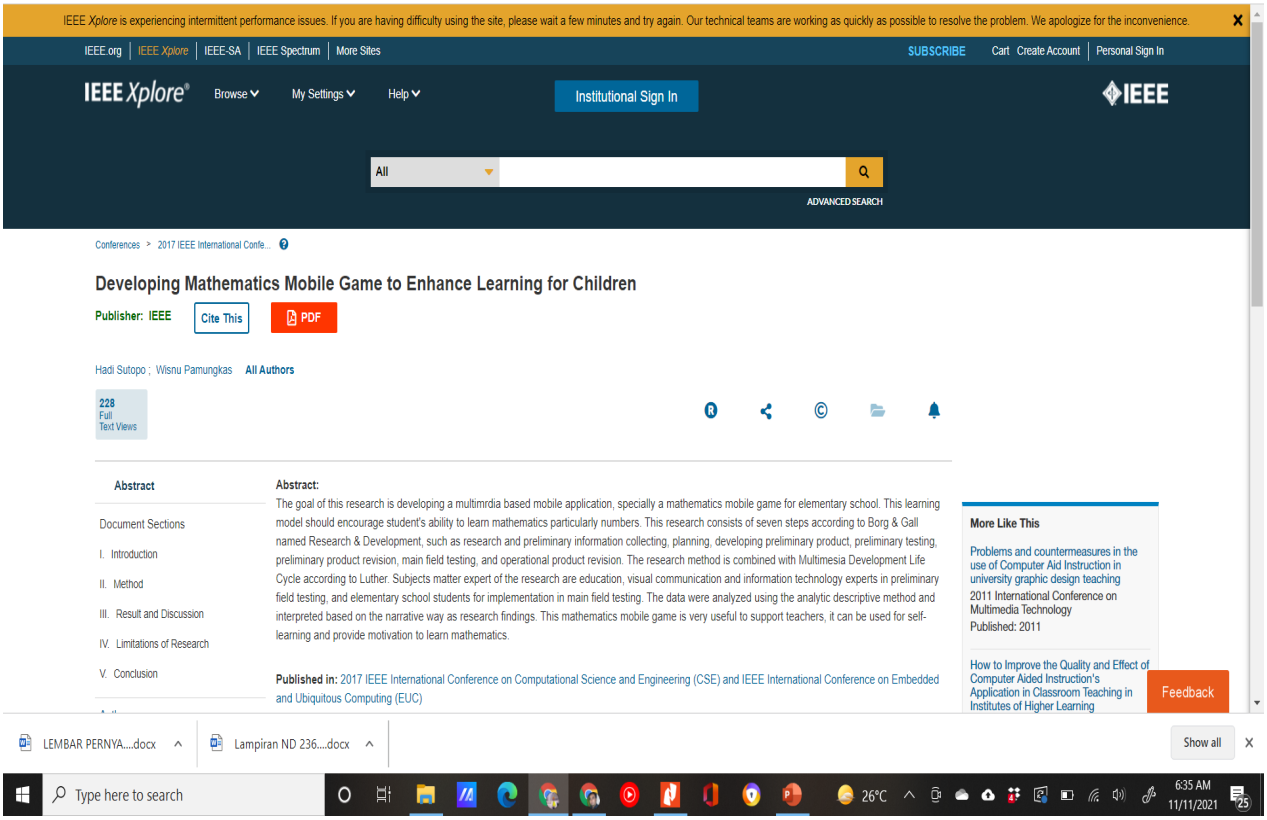

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Developing Mathematics Mobile Game to Enhance Learning for Children

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***Abstract*— The goal of this research is developing a multimrdia based mobile application, specially a mathematics mobile game for elementary school. This learning model should encourage student's ability to learn mathematics particularly numbers. This research consists of seven steps according to Borg & Gall named Research & Development, such as research and preliminary information collecting, planning, developing preliminary product, preliminary testing, preliminary product revision, main field testing, and operational product revision. The research method is combined with Multimesia Development Life Cycle according to Luther. Subjects matter expert of the research are education, visual communication and information technology experts in preliminary field testing, and elementary school students for implementation in main field testing. The data were analyzed using the analytic descriptive method and interpreted based on the narrative way as research findings. This mathematics mobile game is very useful to support teachers, it can be used for self-learning and provide motivation to learn mathematics.**

Keywords*— multimedia, mathematics, learning model, mobile game, ActionScript

I. INTRODUCTION

According to Semiawan, learning is a necessity in life for everyone, since his birth till the ends. People learn to be able to achieve their independence and for adapting to various environmental changes [1]. Mathematics learning at elementary school is poor, formally, and theoretically, and very book-based learning. Teachers are very tired to make children ubderstand mathematics. Mathematics subject is not interesting for children, because it is a serious topic that cannot be learned in a relaxed situation like playing game. Children hardly understand mathematics, and they assume that mathematics is very difficult to learn. Because mathematics is a difficult subject for many children to grasp, keeping the fun alive may just be a way to assist students in their quest for knowledge, and learn while they are playing. These tips for fun mathematics can be used effectively throughout elementary school and even into junior high. The mathematics topic at elementary school consists of number, measurement, fractions, geometry, perimeter and area plane figure [2].

Rapid development in ICT (Information Communication Technology) has changed lifestyle today, including in learning method. There are several learning methods that apply ICT such as computer-based learning, e-learning, distance learning, etc. Computer-based learning implementation in the learning process using multimedia increases creativity and innovations. Multimedia is a combination of text, images, sound, animation, and video delivered via computer or electronic and digital equipment [3]. Using together multimedia elements such as images and animation that are equipped with sound, video clips, and text, will be able give clear meaning to those who need it. Vaughan stated that multimedia can bring radical changes in the learning process, from passive student learning to active student learning. When computers and software are used so that students have new methods of learning curriculum, these tools can promote and enhance students' understanding of content in powerful ways. They can find information, use images and sound as well as text to communicate what they have learned. The explosive growth of mobile devices is stimulating wide spread efforts to clone almost any technology developed for desktop computers to mobile devices [4]. Mobile technologies offer the opportunity to embed learning in a natural environment. Mobile devices such as smartphones are becoming widely used on schools, and as the shape of computing is evolving more into a mobile environment. Children are born in surrounding mobile devices, and they can learn to use by themselves. Unfortunately they can access many films, games that are negative not worth to be seen by children. Educators should think how to create intersting learning model that are useful for children playing.

A model is an abstraction of something for the purpose of understanding it before building it. Because a model omits nonessential details, it is easier to manipulate than the original entity. Abstraction is a fundamental human capability that permits us to deal with complexity [5]. According to Reigeluth [6], modeling can be used in many different ways, including in an instructional model which is usually an integrated set of strategy components, such as: the particular way the content ideas are sequenced, the use of overviews and summaries, the use of examples, the use of practice, and the use of different strategies for motivating the students. An instructional model is merely a set of strategy components that is a complete method with all of its parts described in detail. Mayer [6] argued that constructivist learning activities are conducted on student's cognitive processes during learning, including selecting relevant information, organizing the information produced, and integrating information with existing knowledge. The theory of

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constructivist learning focuses on the way that knowledge is constructed by the learner in working memory. In this construction process the learner uses both incoming material from the environment and prior knowledge in long-term memory. He further stressed on three constructivist processes that is called SOI model, namely S (selecting), O (Organizing), and I (Integrating). The SOI model is a theory of learning that can be used to generate instructional implications.

This study aims to develop a multimedia application particularly mobile mathematics game, presented in Fig. 1. This learning model can be used by children anywhere. By playing the game on mobile device, it is expected to enhance children in mathematics learning. Mathematics game that runs on mobile device is a simple game, i.e. press Enter to start the game, and select the options of conceptual maps, tutorials, practice, and testing. In the practice section, then solve the problem of addition, subtraction, multiplication, and division the randomize number. The mobile game is created based on multimedia, in order to be interested by children.

Fig. 1. Sample mobile game, presenting introduction, main menu, and practice

Multimedia is a combination of text, images, sound, animation, and video delivered via computer or electronic and digital equipment [4]. Using together multimedia elements such as images and animation that are equipped with sound, video clips, and text, will be able to give clear meaning to those who need it. Vaughan stated that multimedia can bring radical changes in the learning process, from passive student learning to active student learning [3].

Preliminary research was created by A. Katmada et al. that focused on the design, implementation and evaluation of an online game for elementary and middle school mathematics. The aim of the research was two topics, (1) the development of the prototype of a flexible and adaptable computer game; and (2) the evaluation of this prototype, as to its usability and technical aspects. The computer game was created to facilitate the mathematics learning, a subject that was often hardly understood by children of all ages. [7]

II. METHOD

This study uses Research and Development (R&D) according to Borg and Gall [8], which consists of ten following stages: (1) Research and Preliminary Information Collecting, (2) Planning, (3) Developing Preliminary Product, (4) Preliminary Testing, (5) Preliminary Product Revision, (6) Main Field Testing, (7) Operational Product Revision that produce mobile game and can be used by children to learn mathematics, (8) Operational Testing, (9) Final Product Revision, and (10) Dissemination and Implementation.

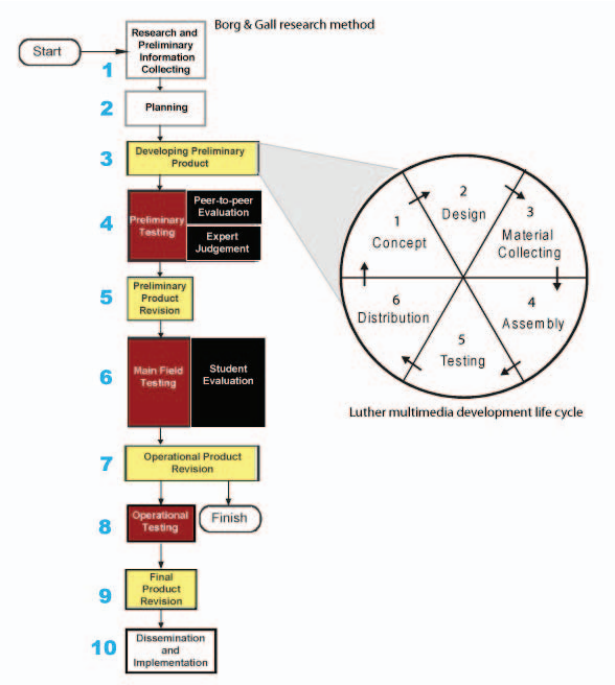

Fig. 2. Procedural model of mobile game planning

This research covers only seven phases, in accordance with the needs of the lecture material in elementary school, include: (1) *Research and Preliminary Information Collecting*. In this stage, the estimation of identification, learning and research literature on a small scale; (2) *Planning*. After obtaining the necessary information, the next step is to plan assembling a product; (3) *Developing Preliminary Product*. After the initiation of the comprehensive plan, the main step in the stage of R&D is to make an early form of learning product that can be tested. At this stage the necessary feedback and suggestions from colleagues in related fields, namely education, visual communication and information technology; (4) *Preliminary Testing*. Initial testing of the expert evaluations, conducted after initial product completely developed, are related to education, visual communication, and information technology; (5) *Preliminary Product Revision*. After the initial testing, the next stage is revising the product in accordance with data obtained from the initial testing; (6) *Main Field Testing*. After the initial product is revised, conducted field testing for evaluation of the product.

The questionnaire are used to obtain feedback from students and teachers. Interviews are conducted on several students and teachers during the testing stage; and (7) *Operational Product Revision*. After having conducted main field testing, the next stage is product revision as an improvement of mobile game for using in the next phase.

The object of the research are mathematics application particularly mobile game, and the research location is conducted at the Elementary School "X" in Jakarta, Indonesia. Respondents consist of children who are studying at the third grade and Subject Matter Expert (SME) in education, visual communication, and information technology.

This developing preliminary product presents the method of mobile game multimedia development that is used in this research. This research uses Multimedia Development Life Cycle (MDLC) [9]. Authoring is somewhat like making a feature film, a movie, and there are many steps to the process. Multimedia Development Life Cycle, a typical multimedia systems development, may involve the following six major steps, as follows: (1) *Concept.* The objective for the project is defined, and the type of the application is specified. In the movies, this is the stage at which the producer decides the kind of movie to take and the subject to be; (2) *Design.* This is the process of deciding in detail what will be in the project and how it will be presented. This stage includes script writing, storyboarding, making navigation structure and some design steps; (3) *Obtaining of content material.* During this stage all the data, audio, video and images for the project are collected in appropriate digital formats; (4) *Assembly.* In this step, the overall of the project is built, mobile game is assembled, and any interactive features are built. The tool for this stage of authoring is Adobe Flash; (5) *Testing.* During testing, the application is run and checked to confirm that it does exactly what the author has intended. In the application, this is similar to screening, where the application or parts of it are viewed and approved by stakeholders; (6) *Distribution*. In this step, the application is reproduced and delivered to end users for their use. In this application, this would be the release phase. Developing mobile game uses the combination of Borg & Gall research and development and multimedia development life cycle according to Luther as can be seen in Fig. 2.

The data is analyzed using the analytical descriptive method and interpreted in a narrative way based on the research findings. Analyzing and data processing carry out with six stages include gathering data, preparing data for analysis, careful reading, developing the code, presenting the data and analyzing the data [10]. The data is collected from interviews and questionnaires with details: (1) Questionnaires with open-ended questions are used to find useful information that supports the theory, the information is needed for model development, information on whether a student can perform the command to play the mobile mathematics game, as well as assessing the quality of the learning model that is developed, (2) Interviews with open-ended questions are used, hence respondents can give information that is not limited from different perspective. Depth interviews are necessary to obtain data about the product and the learning process to play the game. All interview transcripts are stored in text documents; (3) Observations are conducted to obtain data about the learning process while playing the game. Observations require thoroughness and attention to listen carefully and detailed on the events that is seen in Fig. 3.

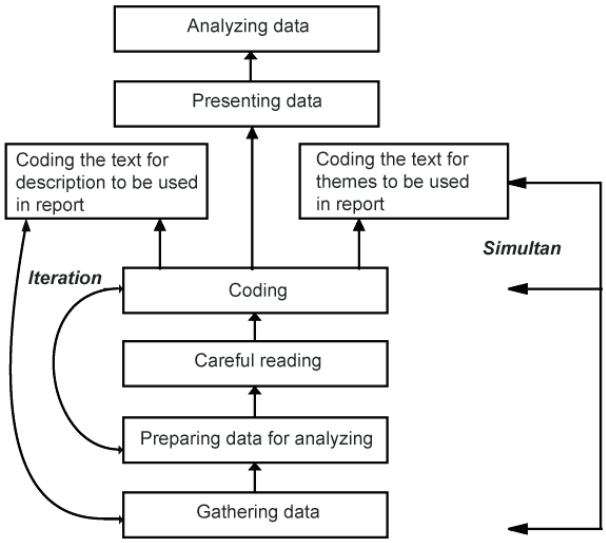

Fig. 3. Qualitative data analyzing method

III. Result and Discussion

A. Research and Preliminary Information Collecting

The objective of this stage is getting the information that is needed by students and teacher in playing mathematics mobile game, production equipment and human resources to develop the product. This phase of research carried out on a small scale at Elementary School "X" in Jakarta Indonesia, involving 14 students at third grade.

Equipment that was used to produce mobile mathematics game development was already available, that was a Pentium Core i5 PC with 4 GB of RAM, 500 GB hard drive and a Android mobile phone. The system software was Windows 7 Professional with the authoring tool Adobe Flash CS6 Professional. Adobe Flash is a visual object-oriented programming tool and can be used to solve problems in developing multimedia. Other supporting tools were Adobe Photoshop CS6, and SoundForge 8.0.

Human resource requirement in creating mobile game was consisted of illustrator, animator, video editor, multimedia programmer and multimedia designer. Based on the information on the research and initial data collection, development of mathematics mobile game should included few items: (1) Categories of font design, history, characteristics and usage, text and background colors in

accordance with the theory [11]. Knowledge of graphic design principles is necessary to build the communicative and aesthetic message; (2) Animated mobile game with timer and feedback; (3) Writing code or programming the way how to input data, mathematics operations, making timer, feedback, and scoring; (4) Multimedia objects i.e, symbol of movie clip, a tool of animation and interactive buttons; (5) File format that are used in the learning model are SWF and APK; and (6) Tutorial text should be incorporated in the mobile game.

B. Planning

Designing the game is required, so that the learning process becomes more effective and efficient. Different model of instructional design had been developed since 1950. These include ADDIE, Dick and Carey, Hannifen and Peck, Knirk and Gustafson, Jerrold Kemp, and Gerlach & Ely. Although many instructional design models exist, they all contain five generic phases. These are analyze, design, develop, implement, and evaluate [12]. Dick and Carey [13] provided guidelines for learning development. In general, the development consists of several groups of learning activities such as analysis, design, development, implementation, and evaluation. There were several topics in the mathematics mobile game development based on learner's requirement. These were conceptual map, tutorial, practice, and testing. The learning material on mathematics in the Tutorial was about numbers. There were 40 problems of mathematics operations in the Practice about addition, subtraction, multiplication, and division. Children's achievement was evaluated by doing the problems in the Testing phase.

The next step was developing a navigation structure and storyboard of the mathematics mobile game reaching the objectives, serves several purposes. First, it developed lateral thought processes, helping to break down the navigation structures that were usually embedded in traditional approaches to course delivery. Second, it could give result in an overview based on quite abstract design, which in turn generated fresh implementation. Third, it provided a storyboard for identifying relationships between the components. Navigation structure was essential for establishing the style of thinking conducive to designing for the characteristics of interactive multimedia. The navigation structure of application is presented in Fig. 4.

There are some constraints in developing multimedia applications development tutorial particularly mathematics mobile game [14], such as: (1) User application was the third grade student at elementary school; (2) Because of the learning materials were used by students independently, students used mobile device as media for interactivity, (3) Mathematics tutorial required an interactive tool to use such as a button and keyboard to switch from one to another particular view, hence the user could choose what they wanted to learn.

Procedural model of mobile game product planning was a combination of Borg and Gall research methodology, and Luther multimedia development method, that can be seen in Fig. 2. At the development stage Dick and Carey learning development model, carried out research and development according to Borg and Gall. In the Develop Preliminary Product phase of Borg and Gall research methodology, the process uses multimedia development methods based on Luther (Multimedia Development Life Cycle), that falls into six areas: Concept, Design, Material Collecting, Assembly, Testing, and Distribution [9].

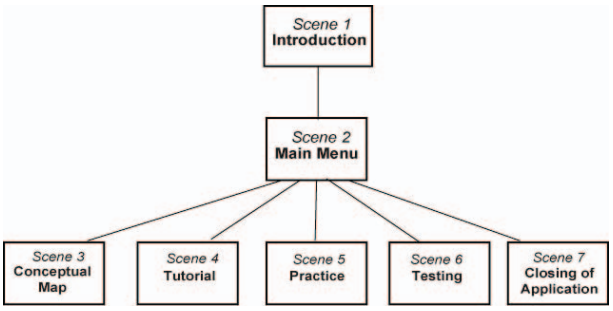

Fig. 4. Navigation structure

The development of multimedia required one of four groups of authoring system [15] These are dedicated authoring system, timeline-based authoring system, structured authoring system and programmable authoring system. Adobe Flash is timeline-based authoring system, a software for creating multimedia applications with professional standards. To process the multimedia objects, Vaughan stated that it need additional software such as the graphic tools, animation tools, audio editor and video editor [3].

C. Developing Preliminary Product

Collecting of materials can be done in parallel with the stages of production. In this stage the materials such as images, animations, audio, video and other products is collected to be used in the next stage. Production stage is the stage where the entire multimedia object is created, and making application based on the storyboard and the navigation structure. Because the mobile game has a lot of interactivity and complexity, it is necessary to use ActionScript programming which is the part of the Adobe Flash authoring [16]. Adobe Flash is a multimedia platform originally acquired by Macromedia and currently developed and distributed by Adobe Systems. Since its introduction in 1996, Flash has become a popular method for adding animation and interactivity, and is commonly used to create animation, advertisements, and various web page components, to integrate video into web pages, and more recently, to develop rich Internet applications [17]. Flash can manipulate vector and raster graphics, and supports bidirectional streaming of audio and video. It contains a scripting language called ActionScript. The Adobe Flash Professional multimedia

authoring program is used to create content applications, i.e. games, presentation, and content for mobile phones and other embedded devices.

Developing mathematics mobile game would provide the first exposure to students in the graphical user interface components of a mobile application. It would expose them to commonly used elements such as labels, textfields, editfields, choice groups, etc. They would also gain knowledge in working with user choices and results, and processing user input to provide scores to users. Screen navigation could also be shown to the students so they could learn how to pass information between screens in a mobile application. To create a game with Adobe Flash, some activities should be done: (1) Make some input text fields which can be input with number, then put it into the stage; (2) Create a buttons that can be accessed by ActionScript and will be used to show whether the user input is right or wrong, (3) Create an animated title and some graphics with color effects, (4) Create a timer with script that is needed, (5) Make feedback that tells to the player weather he succeeds or fails to play the game, and it is provided with sound effects accompanied by applause and the other form, and (6) Make score to calculate the score that is achieved by a player in the game [18]. Fig. 5 shows some of layers to place music, label, text, button, and actions.

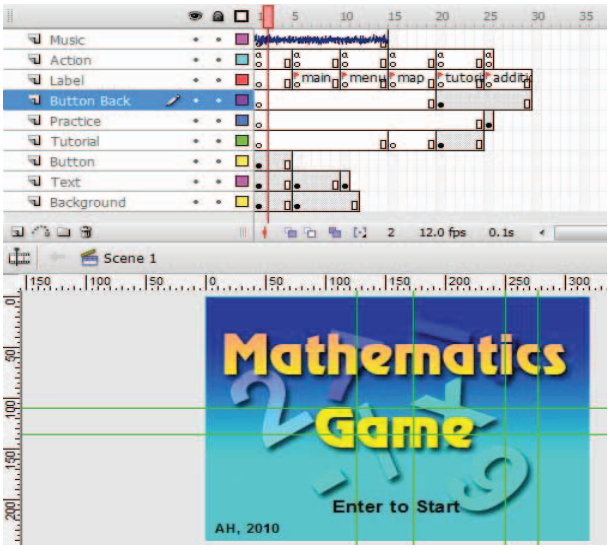

Fig. 5. Layout of some components of mathematics game on the Flash document stage

According to Blue_Chi [19], making rich media for mobile consumption has never been easier since the release of the Flash Lite player for mobile devices. You can make a vector graphics game that could be played on any device regardless of its operating system or screen resolution easily as long as that device is equipped with the Flash Lite player - and lets not forget that you can play that game on a PC as well without using any emulators because the file is still a Flash movie that could be played on the Flash Player. Using inline text-field user can edit the textfield directly in the Flash Lite application rather than in separate model input box [20]. In case of inline text input Flash Lite player does not process the user input directly but devices native input method editor is used. When the inline text field is active, Flash Lite player cannot execute any instruction as Flash Lite player runs in restricted mode. Only after the text field is deactivated, Flash Lite player runs in normal mode. When the user is entering text in the input field, Flash Lite player uses Input Mode Indicator to indicate if it is alpha input(Indicated by letter 'A') or numeric input(Indicated by sign '#').

The script was written to be placed at frame:

```
stop();
import flash.events.KeyboardEvent;
inputText1_txt.type = TextFieldType.INPUT;
inputText2_txt.type = TextFieldType.INPUT;
inputText3_txt.type = TextFieldType.INPUT;

inputText1_txt.stage.focus = inputText1_txt;

inputText1_txt.restrict = "0-9";
inputText2_txt.restrict = "0-9";
inputText3_txt.restrict = "0-9";

function readText(evt:Event):void {
if (inputText1_txt.text == "" || inputText2_txt.text == "" ||
            inputText3_txt.text == ""){
            output_txt.text = "Fields cannot be Empty!";
} else {
            var firstNumber = Number(inputText1_txt.text);
            var secondNumber = Number(inputText2_txt.text);
            var thirdNumber = Number(inputText3_txt.text);
            total_txt.text = firstNumber + secondNumber;
            }
}

enter_btn.addEventListener(MouseEvent.CLICK, readText);

function numberCheck(event:KeyboardEvent):void {
            if (event.charCode >= 48 && event.charCode <= 57) {
                        output_txt.text = "";
            } else {
                        output_txt.text = "Only numbers are allowed.";
            }
}
```

D. Preliminary Testing

Evaluation of peers who have sufficient competence in the field of education, visual communication design, and information technology conduct during the production process is almost complete. Based on the evaluation of peers, the researcher made improvements as follows: (1) The mathematics mobile game was less communicative, because there was no clear instructions what to do. To overcome this, it should be created a text that explains each instruction; (2) Fonts that were used to explain the subject being studied were

too small and lacking in contrast; and (3) One of the evaluators stated that the text in Tutorial should be scrolled.

After the product was complete, the next step was the evaluation by three experts who mastered in education, visual communication, and information technology. Education expert said that it should be included mix operations in practice and testing. Visual communication expert said that the display on screen was not interesting, and should be provided with images and animations. Information technology experts said that the icons that were used should be familiar for users because they use to interact with the mobile device.

E. Preliminary Product Revision

Based on the comments and suggestions from the education, visual communications, and information technology experts, researcher made improvement as follows: (1) the learning material on mathematics were completed with mix operation in practice in testing; (2) The screen display was changed in appropriate advice, the color of text explanation of game was changed to be more contrast, the background color was changed to be lighter, and icons were changed that are used by the users commonly; and (3) The text in Tutorial was provided with scroll buttons to scroll the text up and down as can be seen in Fig. 6.

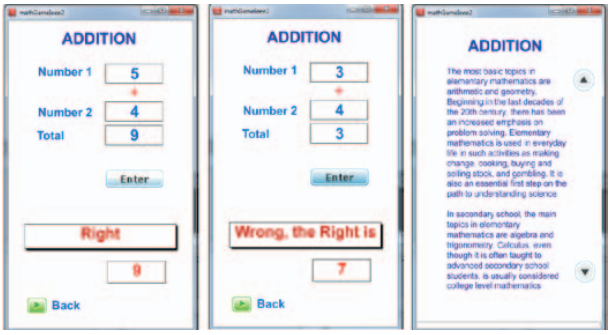

Fig. 6. Presenting the running game and the revised display with scroll buttons

F. Main Field Testing

After the mobile game had been revised, the next activity was creating APK format file. The APK files were distributed to respondents. Main field testing was conducted at Elementary School "X" in Jakarta Indonesia, involving 19 students of the third grade. The mathematics mobile game was given to all students, then the students tried to play the game. Students evaluated the learning material whether the commands in the tutorial were easy to be understood. Advice was also given by students to improve products to be easily understood and used. In general, students could solve the quiz on the game. But there were students who said that they could not be able to do all the quiz because there was not enough time to think.

Students said that learning material was considered complete to the simple game, and easy to understand. According to the teachers, the learning objectives that were shown in the tutorial were complete and easy to learn. Teachers recommended that the tutorial would be interesting if it would have provided with many interesting pictures. They argued that the mobile game could enhance student's learning motivation.

After the implementation of the mathematics mobile game, the student played the mobile game. Student's learning includes solving the problem of mathematics operations on addition, subtraction, multiplication, and division. Student should have competency in mathematics operations. The three competency should be achieved by students were basic, medium, and smart. Student who had basic competency should be able to gain the score equal or more than 2.50 of the problem in the certain time decided by timer. Student who had medium competency should be able to gain the score equal or more than 3.00, and student who had smart competency should be able to gain the score equal or more than 3.50 of the problem in the certain time. Student who gained the score less than 2.50 was not competent. Assessment of students performed that there were 2 students (10.5 per cent) still lack of competency, 10 students (52.6 per cent) in the basic competency, 3 students (15.8 per cent) in the medium competency and 4 students (21 per cent) in the smart competency. It means that there were 89.5 per cent of students who could solve the problem in the certain time, and 10.5 per cent of students were not competent as can be seen in Table 1.

Table 1. Student's competency in solving problems on mobile game

No	Respondent	Addition		Subtraction		Multiplication		Division		Score	Competency
		A1	A2	B1	B2	C1	C2	D1	D2		
1	Student 1	9	8	8	7	6	5	10	8	2,80	basic
2	Student 2	7	6	8	7	9	4	8	6	2,30	not competent
3	Student 3	8	7	6	6	9	8	7	6	2,70	basic
4	Student 4	6	5	7	6	8	8	9	6	2,50	basic
5	Student 5	9	9	8	7	6	5	8	7	2,80	basic
6	Student 6	6	5	7	6	8	5	5	3	1,90	not competent
7	Student 7	10	9	8	7	8	7	8	6	2,90	basic
8	Student 8	10	10	9	9	9	8	9	8	3,50	smart
9	Student 9	7	6	8	6	10	8	8	6	2,60	basic
10	Student 10	9	9	9	8	8	8	7	5	3,00	medium
11	Student 11	6	5	10	9	9	8	7	6	2,80	basic
12	Student 12	10	9	8	8	8	7	8	6	3,00	medium
13	Student 13	10	10	9	9	10	8	9	8	3,50	smart
14	Student 14	10	10	10	8	9	9	8	8	3,50	smart
15	Student 15	10	9	8	8	7	7	9	8	3,20	medium
16	Student 16	9	7	8	6	7	5	9	8	2,60	basic
17	Student 17	10	7	5	4	9	8	7	6	2,50	basic
18	Student 18	8	7	10	9	8	7	10	5	2,80	basic
19	Student 19	10	10	9	9	9	9	8	7	3,50	smart

A1 = Question number of addition
A2 = Right answer of addition
B1 = Question number of subtraction
B2 = Right answer of subtraction
C1 = Question number of multiplication
C2 = Right answer of multiplication
D1 = Question number of division
D2 = Right answer of division

G. Operational Product Revision

Based on the comments and suggestions on the main field testing, researcher made improvements as follows: (1) Decrease the timer in order to give more time for students to think and solve the mathematic operations on the game. (2) Providing with many interested pictures in order to make the mathematics game more interesting.

LIMITATIONS OF RESEARCH

Limitations of research in model development, especially mathematics mobile game include three things: (1) The research and development that consists of 10 stages was not fully implemented. The eight stage Operational Testing, the ninth stage Final Products Revision, and the tenth stage Dissemination and Implementation were not conducted. This study was limited only from first stage to seventh, in accordance with the needs of the learning in Elementary School "X" in Jakarta Indonesia; (2) The mathematics mobile game was especially intended for users who had been accustomed to use mobile devices; and (3) The mathematics mobile game in particular had limitation on the use, especially on mobile smartphones with Android operating systems.

IV. CONCLUSION

Based on the objectives and the results obtained in this study, it can be concluded as follows: (1) Initial research conducted at elementary school involving 14 students to get the information needs to make a mathematics mobile game. Information is used as a guideline for developing multimedia mathematics mobile game; (2) Development of multimedia based mathematics mobile game uses the combination of Borg & Gall Research and Development and Multimedia Development Life according to Luther; (3) The mathematics mobile game is very useful to support teachers, it can be used for self-learning and provide motivation to learn mathematics.

For future work, the mathematics mobile game needs to be developed including measurement, fractions, geometry, and area plane figure. Moreover, the mobile game should be able run on every platform, mobile device product, and resolution of mobile device.

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LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH : *PROSIDING*

Judul Artikel	:	**Developing Mathematics Mobile Game to Enhance Learning for Children**
Nama Pengusul	:	R Wisnu Prio Pamungkas, S.Kom., M.Kom
Jumlah Penulis	:	2 Orang
Status Pengusul	:	Hadi Sutopo, ***R. Wisnu Prio Pamungkas***
Identitas *Prosiding*	:	a. Judul *Prosiding* : Prosiding Seminar IEEEXplore
		b. ISBN/ISSN : ISBN:978-1-5386-3221-5 ISBN:978-1-5386-3222-2
		c. Thn. Terbit, Tempat: Agustus 2017, IEEE
		d. Web Prosiding : https://ieeexplore.ieee.org/document/8005793
		e. Terindex di : Google Schoolar

Kategori Publikasi *Prosiding* (beri √ pada kategori yang tepat)
- ☑ *Prosiding* Internasional
- ☐ *Prosiding* Nasional
- ☐ *Prosiding* Terindex Scopus

I. Hasil Penilaian Validasi :

No	Aspek	Uraian/Komentar Penilaian
1	Indikasi Plagiasi	*Wajib diisi dan dijelaskan secara rinci oleh peer (ditulis tangan)* Indikasi plagiasi tidak ditemukan
2	Linieritas	*Wajib diisi dan dijelaskan secara rinci oleh peer (ditulis tangan)* Sesuai dengan bidang ilmu

II. Hasil Penilaian Peer Review:

Komponen Yang Dinilai	Nilai Maksimal *Prosiding* (isi kolom yang sesuai)			Nilai Akhir Yang Diperoleh
	Prosiding Internasional	*Prosiding* Nasional	*Prosiding* Terindex	
Kelengkapan dan kesesuaian unsur isi *prosiding* (10%)	2,5			0,9
Ruang lingkup dan kedalaman pembahasan (30%)	7,5			2,8
Kecukupan dan kemutakhiran data/informasi dan metodologi (30%)	7,5			2,9
Kelengkapan unsur dan kualitas Penerbit (30%)	7,5			2,9
Total = (100%)	25			9,5
Kontribusi pengusul: (contoh: nilai akhir peer X Penulis kedua : dibagi 2 penulis (nilai akhir yang diperoleh pengusul)			25 × 40% = 10	

Komentar/ Ulasan *Peer Review* :

Kelengkapan kesesuaian unsur	Wajib diisi dan dijelaskan secara rinci oleh *peer* (ditulis tangan) Jurnal sesuai dan lengkap

Ruang lingkup dan kedalaman pembahasan	*Wajib diisi dan dijelaskan secara rinci oleh peer (ditulis tangan)* Pendalaman pembahasan jurnal tidak keluar lingkup
Kecukupan dan kemutakhiran data/informasi dan metodologi	*Wajib diisi dan dijelaskan secara rinci oleh peer (ditulis tangan)* Kecukupan dan kemutakhiran data yang disajikan sudah baik
Kelengkapan unsur dan kualitas Penerbit	*Wajib diisi dan dijelaskan secara rinci oleh peer (ditulis tangan)* kelengkapan unsur dan kualitas penerbit sudah lengkap

Tanggal *Review*, 30 November 2021

Penilai I

(TTD)

NIDN : 0429118007
Unit kerja : Prodi Informatika
Bidang Ilmu : Informatika
Jabatan Akademik (KUM) : Lektor (200)
Pendidikan Terakhir : Magister Teknik Informatika

LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH : *PROSIDING*

Judul Artikel : **Developing Mathematics Mobile Game to Enhance Learning for Children**
Nama Pengusul : R Wisnu Prio Pamungkas, S.Kom., M.Kom
Jumlah Penulis : 2 Orang
Status Pengusul : Hadi Sutopo, ***R. Wisnu Prio Pamungkas***
Identitas *Prosiding* :
a. Judul *Prosiding* : Prosiding Seminar **IEEEXplore**
b. ISBN/ISSN : **ISBN:**978-1-5386-3221-5 **ISBN:**978-1-5386-3222-2
c. Thn. Terbit, Tempat: Agustus 2017, IEEE
d. Web Prosiding : https://ieeexplore.ieee.org/document/8005793
e. Terindex di : Google Schoolar

Kategori Publikasi *Prosiding* (beri √ pada kategori yang tepat) :
☑ *Prosiding* Internasional
☐ *Prosiding* Nasional
☐ *Prosiding* Terindex Scopus

I. Hasil Penilaian Validasi :

No	Aspek	Uraian/Komentar Penilaian
1	Indikasi Plagiasi	*Wajib diisi dan dijelaskan secara rinci oleh peer (ditulis tangan)* Indikasi plagiasi tidak ditemukan
2	Linieritas	*Wajib diisi dan dijelaskan secara rinci oleh peer (ditulis tangan)* Sesuai dengan bidang ilmu

I. Hasil Penilaian Peer Review:

Komponen Yang Dinilai	Nilai Maksimal *Prosiding* (isi kolom yang sesuai)			Nilai Akhir Yang Diperoleh
	Prosiding Internasional	*Prosiding* Nasional	*Prosiding* Terindex	
Kelengkapan dan kesesuaian unsur isi *prosiding* (10%)	2,5			0,8
Ruang lingkup dan kedalaman pembahasan (30%)	7,5			2,5
Kecukupan dan kemutakhiran data/informasi dan metodologi (30%)	7,5			2,8
Kelengkapan unsur dan kualitas Penerbit (30%)	7,5			2,8
Total = (100%)	25			8,9
Kontribusi pengusul: (contoh: nilai akhir peer X Penulis kedua : dibagi 2 penulis = 25 x 40% = 10 (nilai akhir yang diperoleh pengusul)				

Komentar/ Ulasan *Peer Review* :

Kelengkapan kesesuaian unsur	Wajib diisi dan dijelaskan secara rinci oleh *peer* (ditulis tangan) Kelengkapan kesesuaian unsur sudah lengkap dan sesuai

Ruang lingkup dan kedalaman pembahasan	*Wajib diisi dan dijelaskan secara rinci oleh peer (ditulis tangan)* Ruang lingkup dan kedalaman pembahasan sesuai poin utama pembahasan dan tidak kelebar lingkup
Kecukupan dan kemutakhiran data/informasi dan metodologi	*Wajib diisi dan dijelaskan secara rinci oleh peer (ditulis tangan)* kecukupan dan kemutakhiran data / informasi dan metodologi disajikan dengan baik
Kelengkapan unsur dan kualitas Penerbit	*Wajib diisi dan dijelaskan secara rinci oleh peer (ditulis tangan)* kelengkapan unsur dan kualitas penerbit lengkap

Tanggal *Review*, ...

Penilai II

(TTD)

NIDN : 0324028101
Unit kerja : fasilkom
Bidang Ilmu : Informatika
Jabatan Akademik (KUM) : Lektor
Pendidikan Terakhir : S2