Development of Interactive Multimedia for Early Readers with Dyslexia at an Inclusive Elementary School in Malang City

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Abstract: Interactive multimedia is an electronic system containing images, animation, and an interaction between the media and students. It considered that dyslexic student needs multisensory methods and media in the learning process as well. This study aims designing interactive multimedia development for early reading of dyslexic student and finding out its effectiveness. The method used is William W. Lee and Diana L. Owens' (2004) development model. The procedures are: (1) Assessment / Analysis, (2) Design, (3) Development, (4) Implementation and (5) Evaluation. The results of feasibility and effectiveness trials conducted by media experts scored 96% means "very feasible". In addition, the assessment of the material experts also obtained 91.3% and the practitioner gave 87%, both of them were in the "very decent" category. The results of the assessment on subject's early reading ability at baseline conditions (A1) ranging from 45% to 50%. Meanwhile, a significant increase was shown during the intervention condition (B), namely the subject's ability of early reading increased from 65% to 75%. In addition, to determine the effectiveness of the interactive multimedia (intervention) in subject's reading ability, it was added the baseline conditions (A2) ranged from 80% to 90%. Based on the analysis, it showed that interactive multimedia of early reading for dyslexic is feasible and effective to be used in the learning process of early reading for dyslexic students.

Keyword: Interactive multimedia, early reading, dyslexia.

INTRODUCTION

Dyslexia occurs in 10% to 15% of the population of school-age children; this indicates that 1 out of 10 children suffer from dyslexia (Vellutino, Fletcher, Snowing & Scanlon, 2004). However, this prevalence may diverge in various countries around the world. For example, approximately 7% of the total population of children in Malaysia has dyslexia. In another part of the world, NICHD (National Institute of Neurological Disorders and Stroke) revealed that up to 17% of children in the United States have dyslexia. In China and Australia, the percentage of students with dyslexia were 8% and 16% respectively (Smythe, Everatt & Salter: 2004). According to the Indonesian Central Bureau of Statistics (BPS, 2010), there were around a total of 24 million Indonesian children aged 5-7 years. Children in this age range (5 to 7 years old) need more attention because this is a critical age range for reading comprehension, in which children are introduced to reading (pre-reading). If 10% or 1 out of 10 children in this age range have dyslexia, then there are at least 2.4 million children in Indonesia who have dyslexia.

Dyslexia is a lifelong condition and only occurs in children with at least a normal IQ. Dyslexia is not a disease that can be cured but rather an inherited condition (Julia, 2006). Dyslexia is a form of learning difficulty, specifically in language, which is caused by neurological disorders. In addition to inability to compose or read sentences in the correct order (reading in reverse), other cases of people with dyslexia also compose or read sentences from top to bottom, left and right, and they have difficulty in accepting commands that should be passed on to their memory in the brain. This one is leading most of people to assume that dyslexics cannot focus and easy to get distracted.

Although the characteristics of dyslexia seem to gradually disappear in childhood, it does not mean that the dyslexia has been cured. The characteristics of dyslexia seem to disappear since the individual manages to find solutions to overcome the difficulties caused by dyslexia. Even though it cannot be cured, dyslexics can try to find learning method that is suitable for them (Pertiwi, 2016).

Obviously, in elementary schools, students learn a variety of basic skills such as start to build reading, writing and arithmetic skills. One of the most important skills is reading skills. According to Subini (2012), reading is the main basis for gaining knowledge in various fields. Through reading, one can open up world horizons, which end up finding out what they did not know previously. Therefore, it is natural for parents to feel worried once their children have difficulty in reading. Unlike writing and counting, reading is a complex process, involving both hemispheres of the brain. Reading involves eyes and mind at the same

time to understand the meaning of each letter, word, and sentence that has been read. Someone who has difficulty in reading will also find it difficult to interpret symbols, letters, and numbers through visual and auditory perceptions. This will certainly affect reading comprehension.

In elementary school, reading learning is divided into two stages, namely beginning and advances. In introduction, students are taught to pronounce letters and words correctly. At this stage, it is possible for students to pronounce the letters they read without understanding the meaning. In general, the initial-reading stage begins at the very first day of a student at elementary school, which is around six years old. Nevertheless, there are also children who have learned to read earlier, and some are even only learning to read at the age of seven or eight (Abdurrahman, 2012).

Students who do not have any problems in reading will continue their normal life at school; however, students who still have problems in reading, even in their first year, will have difficulty in learning. Reading difficulties experienced by students will also have an impact on writing difficulties. Difficulty in reading, writing and spelling without peripheral sensory disturbances, low intelligence, unsupportive environments, primary emotional issues or lack of motivation is what is called dyslexia.

After conducting an assessment and approach to students of SD Islamic Global School Malang, it was found that there are students with low-degree dyslexia. During learning and teaching process in the classroom, they experienced repeated difficulties in distinguishing directions (right and left), could not pronounce several letters correctly ('m' was pronounced 'n', 'u' was pronounced 'n' , 'f' was pronounced 't', 'b' was pronounced 'd' and vice versa), could not write letters in one word completely and could not pronounce it correctly. In addition, students tend not to focus in classroom learning and teaching activities, which can be seen from their behavior. Most of the time, they did not pay attention to teacher instructions and did not submit assignments on time, which eventually lead to low learning outcomes. However, they managed to answer oral questions correctly, because basically, dyslexic students have normal intellectual abilities.

Students with dyslexia require specific long-term learning methods. Several methods, such as multisensory learning, phonic method (sound), linguistic method, and media, can help dyslexic students to learn. Just like children in general, children with dyslexia cannot learn to read on their own. It is very important for teachers to understand the best and suitable methods and media for their students to learn to read (Jenkins, 2016).

Along with the development of information and communication technology in this globalization era, educators or teachers are required to have the ability to create or develop a medium that supports the success of the learning process. Therefore, learning media development is required to support learning and teaching process in accordance with the four pillar recommendations, which were initiated by UNESCO (2004), namely: 1) learning to know, 2) learning to do, 3) learning to live together, 4) learning to be (learning to be/ develop yourself).

In his research entitled "Interactive Multimedia Learning: Innovating Classroom Education in a Malaysian University", Leow and Neo (2014) also stated that there are 87% of students agree that multimedia can help students get realistic information. Meanwhile, 77.4% of students agree that media can deepen their understanding. In this journal, the students stated that they did not need to spend a lot of time reading, because animation and pictures can help them understand the lesson faster and better than being taught by a teacher.

Various problems above indicate that it is necessary to develop a product in the form of interactive multimedia that involves multisensory to help students with dyslexia in pre-reading stage. This kind of media was chosen because in addition to attracting students' interest in learning, it is also equipped with pictures, animation, as well as audio, and it provides interaction between students and media, so that in its practice, students take an active role in learning activity. Therefore, the appropriate title for this research is 'Development of Interactive Multimedia for Early Readers with Dyslexia at an Inclusive Elementary School in Malang City'.

METHOD

The development model which was used in this study was designed by Lee & Owens, with development procedures consisting of: (1) assessment/analysis, (2) design, (3) development, (4) implementation, and (5) evaluation. The subjects involved in this study were fourth grade students of SD Islamic Global School Malang with dyslexia. Data was collected using observation sheets, needs analysis, questionnaires for media expert assessment, material experts, practitioners and using learning outcome test sheets to determine the effectiveness of using this interactive multimedia.

In the analysis stage, there are two types of analysis, namely need assessment and front-end analysis. (a) Lee & Owens (2004) defined need assessment as a systematic process of setting goals, identifying gaps between reality and expected conditions, and setting priorities for activities. Need analysis was carried out by interview and field observation.

Table 1. Recapitulation of Validator's Data Analysis

No	Validator	Percentage	Feasibility
1.	Media Experts	96%	Highly Valid
2.	Material Experts	91.3%	Highly Valid
3.	Practitioners	87%	Highly Valid

(b) Front-end Analysis is a technique of analyzing data and information that has been collected and then determining which data and information will be used in the research. In this case, the researchers conducted interviews with guidance teachers as well as class teachers and made direct observations of student activities at school. In this stage, the researchers found that there was a lack of supporting media in learning and teaching process.

The next one is design stage. In this stage, the researchers set schedules with a series of activities in interactive multimedia research and development. This stage included designing substance specifications and technical specifications. As for substance specification is designing the structure of the material developed in the process of making interactive multimedia, while technical specification is designing physical design structures and programs developed in making interactive multimedia products. In multimedia development, there are several drafting teams consisting of writers, multimedia creators, media experts, material experts and practitioner experts.

The next stage is product development, namely translating product specifications into physical form (interactive multimedia). Product development stage consists of material analysis, material design to be developed, and developing the content presentation in the form of interactive multimedia. The next stage is to conduct reviews or improvements that are required so that the product is considered feasible and effective to use in supporting the learning process. The final step is packaging the product into a CD (Compact Disk).

The next stage is implementation. In this stage, the first thing that had to be done is validation by media experts and material experts. If the product is declared feasible by the media and material expert validator, the product can be tested on the target subjects. The product to be tested was carried out individually because it is tailored to the needs of students with dyslexia at SD Islamic Global School Malang.

The last one is evaluation stage. In the evaluation stage, the researcher clarified the data obtained from a questionnaire that had been filled in by material expert validators, media experts, and practitioners, as well as the post-test scores of four grade students with dyslexia at SD Islamic Global School Malang during product trial.

Development at this stage aims as a benchmark, measure of success or evaluation in students' understanding of the material that has been studied. The evaluation tools used were questionnaires and tests objectively. The researchers prepared questionnaires, which were then filled in by validators. It aims to obtain valid results from the media being developed. The objective test was arranged based on the existing materials and adjusted to the applicable curriculum. The objective test consisted of 10 objective items which aim to measure students' understanding in receiving the material contained in the learning media, specifically interactive multimedia.

FINDING AND DISCUSSION

Finding(s)

Based on the results of the media experts' validation presented in the table 1, it can be said that the multimedia is very valid and good to be used in learning process. It can be seen from the percentage and scores given by all validators, which is 96%, which means that the media is very valid. In general, the media expert assume that the media is quite good; however, there are several aspects that can be improved, for example: visual design (font color), typography (font type and size), and easy to store.

The results of media experts' validation presented in the table above indicate that the material is very valid and suitable to be used in learning and teaching process. It can be seen from the percentage and scores given by all validators, which is 91.3%, which means that the media is very valid. Material expert validators suggest that in composing learning materials for children with special needs, it is necessary to analyze a small task so that the concept of knowledge formulated can be achieved effectively and efficiently.

Based on the results of practitioners' validation presented in the table 2, it can be seen that the media is very valid and suitable to be used in learning and teaching process. Practitioner validators suggest that learning activities written in the lesson plans should be revised, and errors in punctuation and grammar should be avoided. The media should be provided with more than one picture for the quiz of arranging syllables into simple words.

Field product trial data were obtained from the results of the effectiveness test on interactive multimedia, which consisted of 10 questions and was given to grade 4 dyslexic students at SD Islamic Global School Malang for 15 sessions. The test results indicate that the use of interactive multimedia can improve the pre-reading skills of students with dyslexia. It can be seen from the score of pre-reading skill that has been got by research subjects at baseline (A1), ranging from 45% to 50%.

Table 2. Field Trial Results

Baseline (A1) Session	Score (%)
	Pre-reading Skills
1	45%
2	50%
3	50%
4	50%
Intervention (B) Session	Score (%)
	Pre-reading Skills
5	65%
6	70%
7	65%
8	70%
9	75%
10	75%
Baseline (A2) Session	Inlay (%)
	Pre-reading Skills
11	85%
12	85%
13	80%
14	90%
15	90%

Meanwhile, a significant increase was shown during the intervention (B). The pre-reading skills of the research subjects increased to 65% up to 75%. In addition, to find out the extent to which the use of interactive multimedia (intervention) could affect students' pre-reading skills, the researchers added the baseline (A2), ranging from 80% to 90%.

Discussion

Learning media development, in this case is in the form of interactive multimedia, is a part of technology-assisted media development. Technology has a very important influence on the learning process and consequently, the researchers conducted a study on the development of learning media, specifically in the form of pre-reading interactive multimedia for students with dyslexia. The purpose of this research is to develop interactive learning multimedia that is attractive, valid, effective and practical.

This kind of multimedia was developed in order to facilitate students with dyslexia in learning to read, specifically in pre-reading stage. The material presentation, content and appearance are also tailored to the characteristics of students with dyslexia. After using this interactive multimedia, students are expected to be able to understand the concept of pre-reading, starting from alphabet and syllables.

The product of this development research that has been developed and revised is in the form of interactive multimedia for pre-reading to students with dyslexia at an inclusive elementary school in Malang. This interactive multimedia contains text, images, animation, audios and videos that can attract students' attention in learning the content of media.

The whole displays on the interactive multimedia can be controlled and moved back to the main menu page. This page contains several menus, namely: (1) Back to the start page, (2) Material, (3) Evaluation, (4) Videos, and (5) Instructions for use. This is in accordance with Arini and Heryanto's opinion (2010: 25) that interactive multimedia is a media equipped with tools for control that can be operated by the user, so that the user can operate any menu he wants.

All icons which appear in interactive multimedia will emit a description sound when the cursor points to one of these icons; therefore, it will be much easier for students with dyslexia to operate the interactive multimedia even though they cannot read yet.

The font color of the content of the material and evaluation is contrast with the background color, so that it is easier to read, whether or not the message is readable depends on the contrast between the font color and the background color (Sharon, 2005). The colors used in the material display and evaluation in this interactive multimedia also have the right contrast proportion between the font color and the background color; therefore, the message conveyed in the material is easy to read.

The font size and typeface which are used in the interactive multimedia are adjusted to the size and type of font that students with dyslexia can easily read. Gotham Round with a size of 20 was chosen to make students more comfortable when reading it.

According to the media validator, the suitability of the media display design with the subject, the font size and the choice of color used in the interactive multimedia are adjusted to the characteristics of students with dyslexia. This multimedia use easy-to-read fonts with the appropriate size and colors that contrast with the background color so that the text and images are clearly visible to the students. This is in line with Sharon (2005) who said, "The readability of the text depends on the contrast between the font color and the background color". Besides its accessibility for students with dyslexia, this kind of media is very good because it is equipped with navigation and audio that makes it easier for students to use it themselves. This is in line with the opinion of Arini and Heryanto (2010) that interactive multimedia is a learning media that is equipped with tools fot control that can be operated by users, so that users can operate any menu that he wants for the next process.

According to the material experts, the material presented in the interactive multimedia is very relevant to the competencies that must be mastered by students. The material is described in language that is communicative and fits to the characteristics of students with dyslexia. It is also presented in a way that encourages students to interact with the multimedia. This is in line with Warsita (2008), who stated that interactive multimedia has two-way communication, has the ability to accommodate user responses and carry out various activities, which in the end can also be responded to by multimedia programs through feedback. This level of interactivity is a benchmark in assessing the quality of interactive multimedia programs.

In this development, the product, namely interactive media, has strengths and weaknesses. The advantages of interactive multimedia for pre-reading stage are: (1) Easy to apply, (2) Attractive appearance, (3) Can be used in the long term, and (4) practical packaging, so it is easy to carry anywhere. However, the material of this interactive multimedia is limited to pre-reading stage only.

CONCLUSSION

The interactive multimedia for pre-reading stage developed in this research has good potential to be developed, given that technological developments continue to occur all the time. Based on the findings of this research and development, the multimedia material should be developed further by adding material for the next stage, so that the resulting product will be more comprehensive, because this product only contains material for pre-reading stage, starting from introduction to alphabets, introduction to syllables, and arranging syllables into simple words.

The next researchers are expected to develop interactive multimedia that is not only used offline, but also online; therefore, students can access and use the multimedia without having to copy the software. However, to realize these new aspects, the researchers have to consider the characteristics and needs of students with special needs, so that the resulting product will be truly effective.

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