

Development of Interactive-Multimedia-Assisted Social Cognitive Model for Early Reading Learning

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ABSTRACT

A research report from USAID PRIORITAS (2017) shows gaps in the quality and quantity of the processes and learning resources available to students in Indonesia, which causes poor quality of their reading capabilities. Therefore, it is important to develop a model to facilitate early reading learning for students in Indonesia. This paper discusses design-based research to develop the Interactive-Multimedia-Assisted Social Cognitive Model for Early Reading Learning and its implementation in a natural setting. The model is based on social cognitive theory, which states that learning occurs through interaction between intrapersonal factors, behavioural factors, and environmental factors (Bandura, 2012). Social cognitive learning happens in four steps: attention, retention, production, and motivation (Bandura, 2010). To aid the implementation of social cognitive theory in early reading learning, interactive multimedia for early reading is also developed. Development of the model and interactive multimedia is conducted following design-based research steps proposed by Reeves (2006). The result of this research is a model called Interactive-Multimedia-Assisted Social Cognitive Model for Early Reading Learning (IMAS Model for Early Reading Learning). IMAS model was implemented to teach early reading at two private elementary schools in Bandung. The increase in students' average early reading scores shows that the model is effective to improve the early reading skills of students. The result of this study can be used as a reference to develop a similar model and interactive multimedia for other subjects or other levels of education.

Keywords: *Early reading, social cognitive model, interactive multimedia*

1. INTRODUCTION

A research report from USAID PRIORITAS (2017) shows gaps in the quality and quantity of the processes and learning resources available to students in Indonesia. This results in gaps in students' reading abilities. Therefore, a learning model needs to be developed to facilitate students' early reading learning. Reading skills are generally learned in the formal setting of school education or the informal setting of home. It is important to develop reading skills because they will enable students to acquire another knowledge (Garcia & Cain, 2014).

Studies on early reading and reading skills of lower grade students in Indonesia (USAID, 2013, 2017; OECD, 2016) indicate that there are gaps in the quality of the learning process, learning materials, and learning results experienced by students. USAID (2013) found that less than half of lower grade students in Indonesia were able to fluent reading and reading comprehension.

Meanwhile, OECD (2016), through their PISA program, found that the roots of this problem were the lack of conducive learning environment, unfair distribution of programs, and lack of quality control of education in Indonesia. Therefore, an intervention to aid students' reading learning, especially in the early reading stage, is necessary. This research aims to develop a learning model that can be implemented to facilitate early reading learning and solve students' reading problems in Indonesia.

2. LITERATURE REVIEW

In the context of Indonesia, early reading learning interventions are aimed towards accelerating the development of early reading quality by improving learning innovations, instruction quality, and inter-institutions cooperation. This research develops a learning model based on social cognitive learning principles implemented with the aid of interactive multimedia for early reading learning. Even though

many practitioners have incorporated social cognitive learning theory or interactive multimedia in early reading learning, there has never been an attempt to combine them in an integrated model. Recognizing this gap, the researchers attempt to develop a learning model for early reading learning that integrates social cognitive theory into interactive multimedia specifically designed for that purpose.

This research combines social cognitive learning principles and steps to create design principles for the Interactive-Multimedia-Assisted Social Cognitive Model (IMAS Model) for Early Reading Learning. The design principles are then integrated into interactive multimedia for delivering early reading learning materials. The model developed in this research is expected to provide a new perspective in implementing and creating more active and more fun early reading learning for Indonesian students. The model is also expected to be effective in providing early reading lessons and improving students' early reading skills.

The reading process requires the ability to automatically comprehend words, which involves the skills to combine letters and sounds and general awareness of words' meanings (Goswami, 2014; Watson & Clark, 2015). With these skills and sufficient vocabulary, students will be able to direct their effort to comprehend the meaning of the whole text, rather than individual words. Hence, vocabulary mastery will allow students to transform the reading activity into an instrument of knowledge transfer (Grabe & Stoller, 2019).

Before students can read fluently, they need to learn early reading. Early reading learning hugely affects students' reading skills development and, in turn, determines their academic achievement in the future (Grabe & Stoller, 2019; Leahy and Fitzpatrick, 2017; Yalçintas et al., 2017). Referring to EGRA (Early Grade Reading Assessment) instrument, developed in the USAID PRIORITAS program (USAID, 2013), early reading skills are indicated by a student's ability to read letters, read syllables, read words, and read sentences/texts. As such, early reading learning should focus on the development of these abilities.

It is important to note that reading syllables also includes reading diphthongs (a combination of two vowels), clusters (a combination of two or more consonants), and digraphs (a combination of two consonants that form one sound). For simplification purposes, these three combinations of letters are referred to as diphthongs in this study. Young learners need to learn diphthongs because diphthongs are an important part of Bahasa Indonesia's word structure (Ministry of Education and Culture, 2016). Besides, previous studies found that young learners had difficulties in reading diphthongs (Lestari, 2017; Hadiana et al, 2018), which hinder their early reading ability. For students to acquire

good reading skills, they have to understand how diphthongs sound in Bahasa Indonesia. Hence, reading diphthongs is included as part of the materials in this model to improve students' early reading skills.

One of the approaches to develop students' early reading skills is the social cognitive learning theory. Social cognitive learning principles can be used to predict academic success (Agustiani, Cahyadi, & Musa, 2016) and can indirectly reduce the possibility of students failing in the future (Fernandez-Rio & Cecchini, 2017). Social cognitive learning theory stated that learning occurred through interaction between personal, behavioral, and environmental determinants (Bandura, 2012). The personal determinant is defined as an individual's belief about his or her capabilities to perform or replicate the learned action/behaviours. This belief is also called self-efficacy. Behavioural determinant that affects social cognitive learning can be outlined as outcome expectation and goals. Outcome expectation is an individual's expectation about the result he or she might get when reproducing the learned behaviour. Outcome expectations will also affect the learning goals that students set for themselves. Meanwhile, environmental determinant in social cognitive learning is defined as various environmental aspects that influence an individual's ability to perform an action or produce a behaviour well. This means that the learning environment needs to be conditioned so that it is conducive to improving students' self-efficacy.

Social cognitive learning theory puts great emphasis on students' cognitive processes and emotions while learning and producing behaviors. The goals and results of social cognitive learning are students' ability to produce behaviors they observed in the learning process. The social cognitive learning process occurs in four stages, i.e. attention, retention, production, and motivation (Bandura, 1986; 2006; Kay & Kibble, 2016; Zhou & Brown, 2017). The three social-cognitive determinants play a role in each stage.

In this research, Bandura's social cognitive learning is the theoretical background for formulating an early reading learning model. The four stages of social cognitive learning, i.e. attention, retention, production, and motivation, are integrated into each learning activity in the interactive-multimedia-assisted social cognitive learning model. At the same time, students' self-efficacy is developed and promoted through various learning activities that are formulated in such a way and presented with the help of interactive multimedia.

Considering that the model is developed for early reading learning, Bandura's social cognitive learning theory is implemented in various early reading activities. To support the implementation of social cognitive learning principles and process, interactive multimedia for early reading learning is also developed.

Interactive multimedia is learning multimedia that involves interaction between the multimedia and its users (Mayer, 2014). In this research, the developed interactive multimedia is called ‘*Aku Senang Membaca*’ (I Love Reading). This interactive multimedia is developed by considering the implementation of social cognitive learning principles in early reading learning. ‘*Aku Senang Membaca*’ interactive multimedia combines texts, images, animations, videos, music, and sounds to display interesting early reading learning that engages students’ cognitive process. Furthermore, this application also allows for, even requires, students’ active interaction with the multimedia.

3. METHOD

This research is sign-based research to develop an interactive-multimedia-assisted social cognitive learning model for early reading learning (IMAS model for early reading learning). The subject of this research is 112 first grade students from two private elementary schools. To ensure that the effectiveness of the developed learning model, the model’s prototype was tested on the subjects in real-life early reading learning situations.

This research was conducted by following design-based research steps proposed by Reeves (2006). The steps included practical problem analysis, solution development, repeated process to test and refine the solution and reflection.

In the first step of this research, the researcher conducted a problem analysis. The problem-focused of this research was the improvement of students’ early reading ability. This problem was formulated based on previous studies on early reading, experiences of the researcher and collaborators, and field observation of crucial learning problems. Then, a literature study was conducted to develop a framework for designing a model to solve the research problem.

Solution for the research problem was developed in the second step of design-based research. In this research, the solution for improving students’ early reading ability was an interactive-multimedia-assisted social cognitive

learning model for early reading learning. In addition to the model prototype, interactive multimedia was also developed to help the implementation of the model. Once the prototype was finished, the interactive-multimedia-assisted social cognitive learning model was implemented in the field to find out its effectiveness. This was the third step. The implementation process was then recorded for evaluation. The evaluation was an important step to discover any weaknesses in the model that should be addressed.

The final step was reflection based on the results of model evaluation. The results of reflection would be the basis to refine the interactive-multimedia-assisted social cognitive learning model for early reading learning. The output of this step was a final model that was ready to be implemented in the field.

4. FINDINGS AND DISCUSSION

4.1. Practical Problem Analysis

Based on the findings of USAID Prioritas (USAID, 2013), less than half of lower grade students in Indonesia are capable of fluent reading and reading comprehension. This indicates that there is room for improvement in early reading learning implemented in elementary schools in Indonesia. Furthermore, PISA (OECD, 2016) found that there were gaps in the quality of the learning process, materials, and results that students in various regions of Indonesia experienced. Field observation, pre-test, and interview with teachers that the researchers conducted supports both findings. Results of pre-test conducted before this research show that the majority of the subjects possess early reading skills ranging from Poor to Fair categories. The test for early reading skills in this research is developed based on the EGRA test (USAID, 2013), with some adjustment. The scores are converted into five categories: Bad (score 0-1), Poor (score 2), Fair (score 3), Good (score 4), and Excellent (score 5). Table 1 shows students’ initial early reading skills for each aspect (reading letters, reading syllables, reading words, and fluency and intonation in reading sentences).

Table 1. Students’ early reading skills

Skills	Excellent	Good	Fair	Poor	Bad	Average
Reading letters	9.8%	25%	59.8%	5.35%	0%	3.39
Reading syllables	5%	18.75%	51.78%	25%	0%	3.02
Reading words	1.78%	17.85%	49.10%	31.25%	0%	2.90
Reading sentences (Fluency)	0.89%	14.28%	40.17%	44.64%	0%	2.71
Reading sentences (intonation)	0%	3.57%	32.14%	58.92%	4.46%	2.34

The subjects' average score for reading letters skill subjects is 3.39, which means that overall students are in Fair Category. The majority of the subjects (59.8%) show fair reading letters skill, followed by those in Good Category (25%), Excellent Category (9.8%), and Poor Category (5.4%). None of the subjects has Bad reading letter skills. Meanwhile, for reading syllables skill, the subjects have an average score of 3.02 (Fair Category). Most of the students show reading syllables skill in Fair Category (51.78%), followed by Poor Category (25%) and Good Category (18.72%). Even though none of the students has Bad reading syllables skills, only 5% of the subjects show an Excellent Category of reading syllables skills.

In terms of reading words skill, 49.10% of students are in Fair Category. Most other students are in the Poor Category (31.25%). 17.85% of the subjects show Good reading words skill, but only 1.8% has Excellent reading words skill. On average, students' score for reading words skill is 2.90, which means that the subjects' average reading words skill is in Poor Category.

The category of reading sentences (fluency) skills is dominated by students with Poor (44.64%) and Fair (40.17%) skills. 0.89% of students show Excellent fluency in reading sentences and of 14.30% of students are in Good Category. In terms of fluency in reading sentences, none of the students has Bad skills. Meanwhile, more than half of the subjects (58.83%) are in Poor Category for their intonation of reading sentences. 3.21% of students show Fair skills in reading sentences with appropriate intonation. Nearly the same number of students are in Good and Bad Category (4.57% and 4.46%) respectively. However, none of the subjects show Excellent skill in reading sentences with the correct intonation. The average scores of sentence skills, in terms of fluency and intonation, are 2.71 and 2.34 respectively, which put the students in Poor Category overall.

Students' low early reading skills are the basis to develop a learning model in this research. The model delivers an early reading learning intervention using social cognitive learning approach with the aid of interactive multimedia specially designed for early reading purposes.

4.2. Learning Model Development

This research develops an interactive-multimedia-assisted social cognitive learning model to be implemented in early reading learning. This model is based on the social cognitive learning theory proposed by Bandura (1989, 2012). In social cognitive learning theory, three factors are determining the learning activities and results. The three factors are personal determinants (self-efficacy), behavioural determinants (outcome expectation and goal), and environmental

determinants (facilitators and impediments) (Bandura, 2012). Furthermore, learning in social cognitive theory occurs in four stages: attention, retention, production, and motivation. The interactive-multimedia-assisted social cognitive learning model developed in this research is a learning model that integrates social cognitive learning principles into interactive multimedia to improve early reading learning for lower grade students.

In developing the interactive-multimedia-assisted social cognitive learning model, social cognitive learning principles and steps are broken down into seven basic principles of the model. The seven principles are Modelling, Attention, Retention, Production, Motivation, Self-Efficacy, and Self-Regulated Learning. These seven principles are integrated into an interactive multimedia for delivering early reading learning (Figure 1).

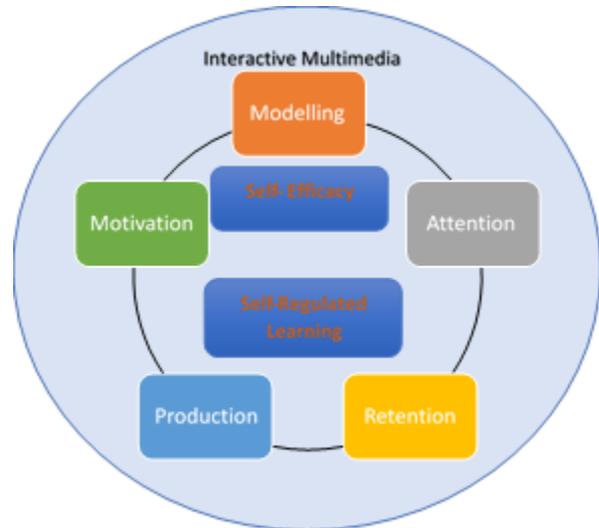


Figure 1 Interactive-Multimedia-Assisted Social Cognitive Model for Early Reading Learning.

In this model, the contents of the interactive multimedia are designed as interesting modelling of early reading activities. The modelling principle in this model is a practical realization of environmental determinants in social cognitive learning theory. With the Modelling principle, the 'Aku Senang Membaca' interactive multimedia becomes a facilitator of early reading learning.

The contents of the interactive multimedia are also designed so that students will pay attention to and Retain the lessons that are displayed. These two principles involve the personal determinant of social cognitive learning. Students' belief of their capability in early reading is developed and promoted in various activities with Attention and Retention principles. By observing the models (examples) in interactive multimedia, students can assess whether or not they have the required skills and abilities to perform the same behaviour/action. This will affect their future action; whether they will work hard to retain the lesson and improve their skills or not.

The Production and Motivation principles are integrated with fun game activities, in which students demonstrate their early reading skills and receive rewards in the form of stars. These two principles represent the behavioural determinants of social cognitive learning. Through their cognitive process, students who have observed early reading mode modelling be able to assess their facilities. When they face the challenge of reproducing the e-reading skills, they will form outcome expectations based on their assessment. Students will expect to improve their skills and complete the early reading challenges presented in the form of games. Their outcome expectation will also be promoted by rewards in each game. This motivation will affect their cognitive process during the learning process.

These five principles, which are integrated into interactive multimedia, will interact with each other so that students will be able to produce early reading activities they observe. Moreover, each activity delivered with the aid of interactive multimedia is designed to develop students' Self-Efficacy so that they can evaluate their own skills and the learning challenges. This will allow them to Self-Regulate their learning by selecting the activities they deem suitable for their skills.

Once the interactive-multimedia-assisted social cognitive learning model for early reading learning is finished, the model is translated into lesson plans to ensure that teachers can implement the model in early reading learning as expected.

The interactive multimedia developed to aid the implementation of social cognitive learning in this research is called '*Aku Senang Membaca*' (I Love Reading). This application consists of various interactive activities that combine videos, music, animations, sounds, texts, and images for early reading learning. Activities in '*Aku Senang Membaca*' application are focused on reading letters, reading syllables, reading words, and reading sentences learning. In addition to interactive early reading activities, the application also includes lesson plan, general information, and evaluation.

The early reading materials in the interactive multimedia consist of reading letters, reading syllables, reading words, and reading sentences (fluency and intonation). Each material is comprised of modelling and games. The principles of Modelling, Attention, and Retention are integrated into the examples (models), while the principles of Production and Motivation are integrated into the games. Each content in interactive multimedia is also designed to develop and promote students' self-efficacy. In addition, the format of this interactive multimedia also allows the student to regulate their learning.

4.3. Implementation of the Learning Model

Interactive-multimedia-assisted social cognitive model for early reading learning is implemented in four cycles. To test the model's effectiveness, it was implemented in the natural setting of the classroom. This model was utilized to teach early reading learning for first-grade students.

4.3.1. Cycle 1

In this first cycle, the early reading learning material was focused on reading letters. The Modelling stage involved teachers displaying '*Lagu Alfabet*' (the alphabet song) and '*Lagu AIUEO*' (the vowel song) in interactive multimedia. In the Attention stage, students sang the songs along with the model. This activity also involved the principles of Retention and Self-Efficacy. Then, teachers asked and guided students to interact with games '*Huruf dan Benda*' (letters and objects), '*Menangkap Bintang*' (catching stars), or '*Apa Ini Ya?*' (what is this?) in the Production stage. Each game contained intrinsic Motivation in the form of stars given on the screen if students were able to finish the game well. Game activities also involved the principle of Self-Regulated Learning. The learning result evaluation showed that the average score of students' reading letters skill had increased from 3.39 (Fair Category) in the pre-test to 4.55 (Good Category) after cycle 1.

Based on the field observation in the first cycle, there was no problem found in the implementation of the interactive-multimedia-assisted social cognitive model for early reading learning. Teachers were able to complete all activities in the lesson plan very well and students were enthusiastic in following the interactive-multimedia-assisted lesson. The songs used in Modelling stage were easily memorised and followed by the students. The students also had no problems in completing the games to demonstrate their reading letter skills.

4.3.2. Cycle 2

In the second cycle, the initial reading learning material was delivered. In this second cycle, the early reading learning material focused on reading syllables. The Modelling stage involved the teacher displaying '*Mengeja Suku Kata*' (reading syllables) and '*Membaca Suku Kata Diawali Huruf Vokal*' (reading syllables with vowel initial) menus in interactive multimedia. In Attention stage, students paid close attention to the teacher's explanation and read along with the syllables with the models. This activity also involved the principles of Retention and Self-Efficacy. For the next activities, teacher asked and guided students to interact with games '*Latihan Suku Kata*' (syllables game) and '*Latihan Suku Kata Diawali Huruf Vokal*' (syllables with vowel initial game) in Production stage. Each game contained intrinsic

Motivation in the form of stars given on the screen if students were able to finish the game well. Game activities also involved the principle of Self-Regulated Learning. Based on the learning result evaluation, the average score of students' reading syllables skill increased from 3.02 (Fair Category) in the pre-test to 4.12 (Good Category) after cycle 2.

The problem found in Cycle 2 had to do with the implementation of the lesson plan. In the lesson plan, which was developed as a guideline for the teacher to implement the interactive-multimedia-assisted social cognitive learning model, the material of reading diphthong was separated from reading syllables. Reading diphthong was put together with reading words, even though diphthong should be learned and evaluated in the reading syllables stage. This separation of the two materials was done with consideration of the available learning time.

4.3.3. Cycle 3

In the third cycle, the early reading learning material focused on reading words. The Modelling stage involved teacher displaying '*Membaca Kata Sederhana*' (reading simple words) and '*Diftong*' (diphthong) menu, and '*Kata Sederhana Diawali Huruf Vokal*' (reading words with vowel initial) submenu in interactive multimedia. In Attention stage, students paid close attention to the teacher's explanation and read along with the words and diphthong with the models. This activity also involved the principles of Retention and Self-Efficacy. After the teacher Modelling stage, the teacher asked and guided students to interact with games '*Kata-Kata Sederhana*' (simple words game) and '*Latihan Kata Diawali Huruf Vokal*' (words with vowel initial game) in the Production stage. Each game contained intrinsic Motivation in the form of stars displayed on the screen if students were able to finish the game well. Game activities also involved the principle of Self-Regulated Learning. Based on the learning result evaluation, the average score of students' reading syllables skill increased from 2.90 (Poor Category) in the pre-test to 4.12 (Good Category) after cycle 3.

In the third cycle, there was no problem found in the implementation of the interactive-multimedia-assisted social cognitive learning model for early reading learning. However, it was realized that there are too few examples of words with diphthong in interactive multimedia.

4.3.4. Cycle 4

In the fourth cycle, the early reading learning material was focused on reading sentences. The Modelling stage involved the teacher displaying sentences in interactive multimedia and explaining about intonation in reading. Besides, the teacher also displayed videos of short story

reading so that students can pay attention and memorize how to read sentences with appropriate intonation. In the Production stage, students were asked to read sentences and a short story displayed in interactive multimedia. Learning evaluation in this cycle assessed the aspect of intonation in reading sentences only. Students' average score increased from 2.34 (Poor Category) in the pre-test to 3.73 (Fair Category) after the lesson.

4.3.5. Reflection

Based on the implementation of an interactive-multimedia-assisted social cognitive learning model for early reading learning, a reflection process was performed to evaluate the developed model. Overall, the model developed in this research was able to improve students' early reading skills, in terms of reading letters, reading syllables, reading words, and reading sentences. The problems found during the implementation of the model in the field were more related to the lesson plan and the content of interactive multimedia than to the basic principles of the model.

In the second cycle, it was found that reading diphthong was separated from reading syllables lesson, even though diphthong is essentially part of syllables. This was done due to the insufficiency of lesson time preventing the teacher from teaching diphthong during reading syllables lesson. To ensure that students still learn the reading diphthong skill, the lesson plan combined diphthong learning with reading words. In other words, students learned diphthong as a part of a whole word, rather than as a syllable.

Another weakness found during the implementation of the model was the lack of examples for words with diphthong in the interactive multimedia. To resolve this, the application '*Aku Senang Membaca*' was revised by adding more words that contain diphthong to '*Membaca Dua Konsonan dan Dua Vokal (Diftong)*' (reading two consonants and two vowels (diphthong) menu.

Based on the result of this study, the implementation of the IMAS model successfully improved students' early reading skills. This confirms that carefully developed interactive multimedia can assist the implementation of the social cognitive model in learning (Yalçintas et al, 2017). Interactive multimedia makes learning more interesting, more captivating, and easier to follow for students, which will positively affect the learning results (Yalçintas et al, 2017). Previous studies have shown that social cognitive learning is an effective model to improve students' learning (Bandura, 2006, 2010,2012; Agustiani et al, 2016; Fernandez-Rio & Cecchini, 2017). The result of the present study indicates that the social cognitive model can also be effective if implemented or delivered through interactive multimedia.

5. CONCLUSION

The results of this study show that interactive multimedia assisted social cognitive model for early reading learning is effective to improve students' early reading skills. This indicates that we can integrate the social cognitive learning model into interactive multimedia to effectively deliver lessons to students and improve learning results. Although the IMAS model successfully increased the quality of students' early reading skills, the model has several drawbacks. It requires basic training in computer operation for teachers and students before they can use interactive multimedia in classroom learning. For instance, students, in particular, should know how to use a mouse to use the application in the IMAS model. Another weakness of this model is that interactive multimedia takes a long time to develop or revised. In other words, the contents of the interactive multimedia cannot be easily updated.

In the current era of information and technological revolution, integrating traditional models of learning with modern educational technology will improve the learning process and learning results. The interactive-multimedia-assisted social cognitive model is an example of such integration. We believe that this is the way forward. We argue that the findings in this study can serve as a reference for teachers, in collaboration with software engineers or computer programmers, to design and develop interactive multimedia for implementing the social cognitive models in other subjects.

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