

DEVELOPMENT OF WATERFALLS AND LADDERS INSTRUCTIONAL MEDIA FOR MATHEMATICS LESSON

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Abstract

The purpose of this research is to develop the learning media in the form of a waterfalls and ladders game on the learning of mathematics. This media was developed from children's games media that "snakes and ladders" board game. Instructional media was developed based on characteristic Lubuklinggau city. In addition to learning mathematics, students can also get to know the natural resources and typical places of the city Lubuklinggau. Stages in development include: (1) identity instructional goals, (2) conduct instructional analysis, (3) analyze learners and Contexts, (4) write performance objectives, (5) develop assessment instruments, (6) develop instructional strategy, and (7) develop and select instructional materials. Finally, characteristics of the media developed are (1) media of waterfalls and ladders consists of a game board, 4 pieces pawns, 1 dice, cards matter, and the rules of the game; (2) the game board is divided into small boxes of 100 and the boxes containing the typical image of the city Lubuklinggau; (3) the game starts from box 1 and ending on the 100th box; (4) the game board size 30x30 cm; (5) about the card given if the student stops at a predetermined box; (6) the questions given in the form of a mixture of numbers for arithmetic operation, as a basic concept the fourth grade of elementary school students in solving problems mix integer arithmetic operations; and (7) this learning media, can be used in groups of 2-4 students.

Keywords: development, instructional media, waterfalls and ladders, mathematics, the hallmark of Lubuklinggau city

INTRODUCTION

Education is a very important thing that must be owned and understood by everyone. The role of education is becoming a reference in the development towards more advanced. Education is guidance in the growth of children's lives (Dewantara, 1977). The purpose of the notion that all the forces of nature that leads there is the children, so that they are as human beings and as a member of the public safety and happiness it can achieve the highest.

Technology education is a field which includes the application of a complex and integrated processes in analyzing and solving the problems of learning (Miarso, 2009). This means, technology education is a process in any solution to the problem involving people, procedures, ideas, equipment, and organizations. In educational technology, it was incarnate in the form of all the learning resources that are designed or selected and

or used in the study purposes. One source of this learning can be identified as a medium of learning. Instructional media for the purpose of learning media suitable or effective can help the purposes of learning for students.

Instructional media is one component of learning that has an important role in the educational process. The use of the media should be part of teachers who should receive attention in each learning activity (Miarso, 2009). Therefore, teachers need to learn how to establish a medium of learning in order to achieve effective learning objectives in the learning process. In fact, media of learning is still often neglected for various reasons, among others: the limited time to make preparations, difficult to find the right media, and the unavailability of the cost. It is unnecessary if every teacher has to have knowledge and skills about learning media (Miarso, 2009). Instructional media can be used to help facilitate learning effectively and efficiently. So the teacher has very influential role both in using, utilizing, and media selection.

As a developer of learning, researchers are interested in developing media of snakes and ladders. This media, designed as a learning medium which combined the hallmark of Lubuklinggau city. In the end, this media known by children, turned into a waterfalls and ladders media. This waterfalls and ladders media is a learning medium that uses a game board and contains the images of the Lubuklinggau city. It is expected to invite the active and constructive involvement of students in their learning process to the media.

THEORETICAL FRAMEWORK

Instructional Media

The word comes from the Latin media *medius* which literally means middle, intermediate or introductory, in intermediary or introductory message source with the message recipient. So the media is a tool that has the function of conveying the message (Heinich, et.al, 1996). According Miarso (2009), learning media is anything that is used to distribute messages and can stimulate the mind, feelings, concerns, and the willingness to learn so as to encourage the learning process deliberate, aimed and controlled.

According Smaldino, Lowther, & Russel (2001), the most common media used is text, audio, visual, video, engineers and people. Text is an alphanumeric character that may be displayed in any format, namely: books, posters, stationery paper, computer screens and so forth. Audio include anything that could be heard (can be directly heard or recorded), namely: the voice, music, noise and so forth. Visual includes diagrams on a poster, drawing on the blackboard, pictures, cartoons and so forth. Video is a medium that show motion, namely: DVD, videotape, computer animation, and so forth. Engineers are three-dimensional and can be touched and held by students, namely: props, miniatures and so forth. Person is important for learning, namely: teacher, student and expert field of study. The students learn from teachers, other students, and adults.

Lots of children's games media encountered in everyday life, for example: monopoly games, snakes and ladders, checkers, plots vituperation, and others. Each medium has a character of its own and ordinances games. In the learning process of children's games media can be used as a medium of learning. Teachers are required to be able to design learning using learning media, particularly the use of the media children's games are simple, which can increase the competence of student learning. One example of children's

games media that can be used as a medium of learning is the media of snakes and ladders. It is relevant to research conducted by Sitiq & Mahmud (2010), Maharani & Sumarno (2012), Permatasari (2014).

Waterfalls and Ladder

Waterfalls and ladders is a board game for children that is played by two people or more. This games divided into small boxes and in some boxes drawn a number of ladders and waterfalls that connect it to another box. Utilization media this game can be played for all subjects and all grade levels in elementary school. Teachers can create their own media with the purpose of adjusting and learning materials. This game is to motivate students to learn to always learn or repeat material that has been studied previously which will be tested through the game, so that was fun for the students. The use of game media as a medium of learning is done in stages of activities classified as easy, moderate and difficult. Media learning media in the form of children's games, purpose and its use should be prepared teachers. The preparation should be varied according to the degree of difficulty can be selected by children in various activities. This can result in the growth of feeling successful in children according to their abilities.

The waterfalls and ladders game as a learning medium indirectly useful also in character education, including: a) know winning and losing, it means the students are directed to be sportsmanship in the game; b) cooperate, meaning that students are taught to interact with other students in the games; c) waiting for their turn, means that students exercise patience in waiting; d) develop imagination, meaning that students can develop their creativity in the games; e) given the rules of the game, meaning that students must follow the rules of the game that have been established; f) to solve the problem, meaning that students are expected to solve a given problem in games or in the form of questions given.

METHOD

According to Richey & Klein (2007), design and development of research is using various methodologies. This study does not use the general population, but are limited to digging depth of the phenomenon. Researchers chose individuals in the areas under study (Creswell, 2005). According Semiawan (2007), Research and Development (R & D) is the border of qualitative and quantitative approaches, especially to bridge the gap between research and educational practice. Meanwhile, according to Borg & Gall (2007). R & D is used for designing new products and procedures, subsequently applying research methods for field trials, evaluate and refine the products and procedures to meet the criteria of an effective, qualified and standardized. This research aims to develop something new and is expected to improve the quality of students' mathematics learning. Skills that will be developed in this study by using a learning media, waterfalls and ladders on the mathematics. While research method used in this study with consideration of compatibility with the nature of the research to be carried out the method of R & D. This study uses a model of development Dick & Carey (2005).

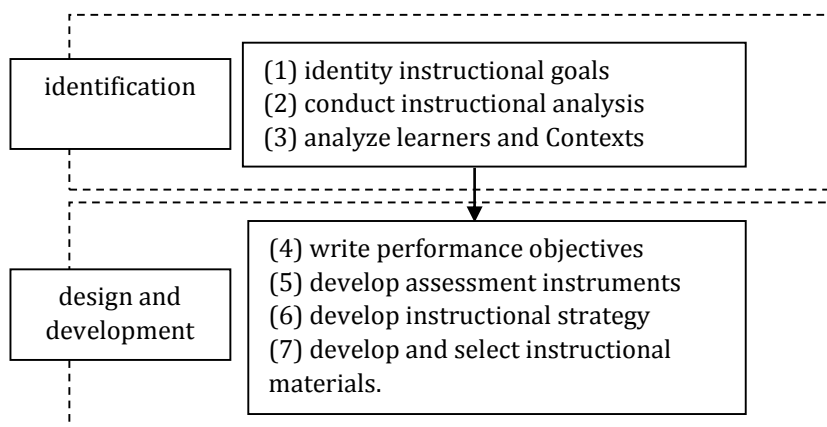


Figure 1: The Seventh Stage of The Ten Stages of Development Models Dick & Carey

RESULT AND DISCUSSION

Development of instructional media waterfalls and ladders which is described in the article just to stage the identification, design and development (evaluation and revision of the media has not been implemented). It means, this paper is part of a bigger study, but this paper will only limited to the identification and design/development processes. The steps in the development of instructional media are only until the seventh stage of the ten stages of development models Dick & Carey. The steps are: (1) identify instructional goals, (2) conduct instructional analysis, (3) analyze learners and Contexts, (4) write performance objectives, (5) develop assessment instruments, (6) develop instructional strategy, and (7) develop and select instructional materials.

a. Identity Instructional Goals

The activity needs derived types of knowledge, skills, and attitudes that have never been studied or have not done well by the students. This type of knowledge, skills, and attitudes are still common or course outline, which is controlled by the expected learning outcomes of students after learning. The early stages of development is determining what is desired for students when they have completed the learning program. Identifying learning needs is a process to: (1) determine student performance gap caused by lack of opportunities for education and training in the past, (2) identify the form most appropriate learning activities, and (3) determining the target population can follow the learning activities. As a result of identifying learning needs using instructional media of waterfalls and ladders is as follows: (1) train the child's imagination to play while learning, (2) give a more real experience and evoke the world of theory with reality, (3) know the characteristics of the Lubuklinggau city which includes natural resources or tourist objects, and (4) after using these media students are able to perform integer arithmetic operations mixture.

b. Conduct Instructional Analysis

Competencies required in learning a mixture of integer arithmetic operations on *the* fourth grade of elementary school are: (1) students can perform arithmetic operations mixture of addition and subtraction of integers from -10 to 10, (2) students can perform arithmetic operations mixture of addition, subtraction, multiplication, and division of integers from -10 to 10, and (3) the student can solve everyday problems associated with a mixture of integer arithmetic operations integer from -10 to 10. Competence is often not achieved not because they do not understand the basic theory perform arithmetic

operations mix, but due to the weakness in basic arithmetic operations and the lack of thoroughness of students to mark numbers and sign of operation. Expected by using instructional media waterfall-steps, students can learn to be a real mix of integer arithmetic operations. In completing the integer arithmetic operation, there are two things to note, that "sign of arithmetic operations" and "brackets." If in a mixture of integer arithmetic operations are bracketed, workmanship are in brackets should be done first. If in an integer arithmetic operation there are no parentheses, the process is based on the properties of the order of arithmetic operations.

c. Analyze Learners and Contexts

Mix integer of arithmetic operations is the subject matter of the elementary school curriculum. This material is a continuation of the basic material arithmetic operations (addition, subtraction, multiplication and division) which has been studied since the second grade started elementary school. The material prerequisites that must be owned by the students before the study material is a mixture of arithmetic operations basic arithmetic operations and understanding of integers (positive round and round negative). Some of the obstacles that are often found in learning arithmetic operations prerequisite material mixture is controlled weak students. Characteristics of the students in the classroom are very heterogeneous results in many students do not understand the difference between "number sign" and "sign operation", especially if it involves arithmetic operations mixture of negative numbers.

d. Write Performance Objectives

Instructional objectives formulated in the form of a verb that can be seen by the eye (observable). Instructional objectives is the only basis for preparing the test grating, therefore instructional objectives should contain elements that may provide guidance to test developers in order to develop a test that can actually measure behavior contained therein. General Instructional Objectives and Specific Instructional Objectives are formulated using the ABCD format (Audience, Behavior, Condition and Degree).

General Instructional Objectives: After following this subject using instructional media of waterfalls and ladders, students can use a mixture of integer arithmetic operations to determine the addition, subtraction, multiplication, and division

Specific Instructional objectives:

- 1) After using instructional media of waterfalls and ladders, 80% of students can perform arithmetic operations mixture of addition and subtraction of integers from -10 to 10.
- 2) After using instructional media of waterfalls and ladders, 80% of students can perform arithmetic operations mixture of addition, subtraction, multiplication, and division of integers from -10 to 10.
- 3) After using instructional media of waterfalls and ladders, 80% of students can solve everyday problems associated with a mixture of integer arithmetic operations of integers from -10 to 10.

e. Develop Assessment Instruments

This step is to develop grain parallel assessment (criterion reference test) to measure the student's ability as estimated from the goal. The main emphasis is put on the kind of skills related to that described in the objectives and the assessment requested. Benchmark

reference test is intended to measure each student's level of mastery of the behavior listed in the Specific Instructional Objectives. Problems are given is a mixture of integer arithmetic operation -10 to 10, to the operations of addition, subtraction, multiplication, and division.

f. Develop Instructional Strategy

Intructional strategies contained four following definitions: (1) a sequence of learning activities, namely the sequence of activities the teacher in delivering course content to students; (2) methods of learning, namely how to organize teacher and student learning materials to enable the learning process effectively and efficiently; (3) learning media, namely equipment and learning materials used by teachers and students in learning activities; and (4) the time spent in completing each step in the learning activities. In the design process include process design purposes, flowcharts, storyboards, user interface design, and systems integration. Flowchart is a graphical depiction of the steps and the order of procedure of a program. Storyboard rather like comics we read every day. On each page shows the development of the story or information (Vaughan, 2011). Storyboard is a summary of adaptation functions and tools that should be used in making instructional media of waterfalls and ladders on a mathematics lesson.

g. Develop And Select Instructional Materials

Involvement of students actively demonstrate whether the media being used effectively or not. Learning designed to create activities that allow students to apply knowledge or new skills and receive feedback on the suitability of their efforts before and after the study. The initial step in this phase is to develop materials about the card mix integer arithmetic operations for instructional media of waterfalls and ladders. Further developing a board game based on the hallmark of Lubuklinggau city, as well as guidebooks use instructional media-staircase waterfall.

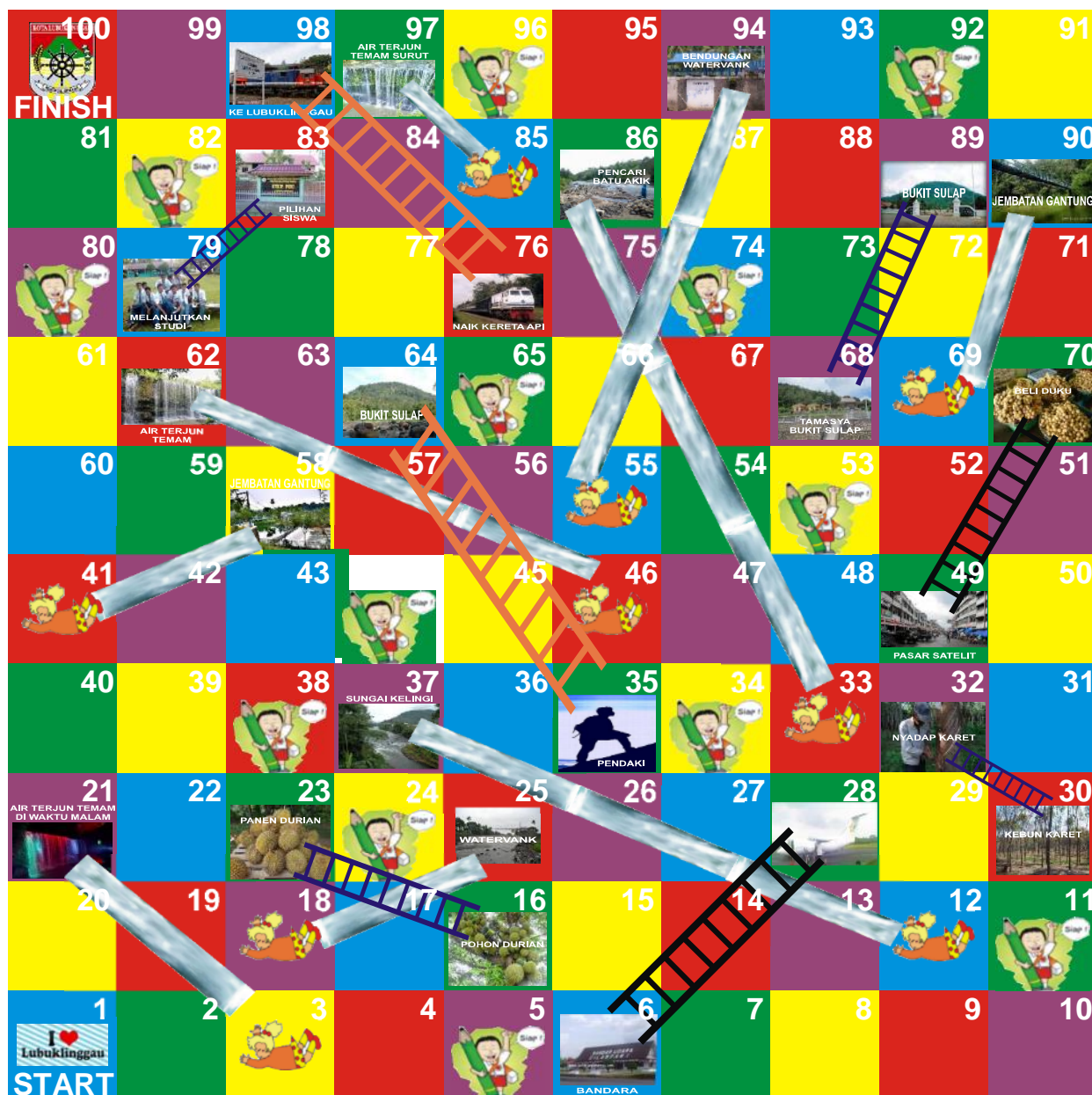


Figure 2: Intructional Media of Waterfalls and Ladders

Instructional media of waterfalls and ladders on a mathematics lesson is one of the educational learning media that can help teachers hone skills Elementary School fourth grade students, especially in the materials mix integer arithmetic operations. Instructional media was developed based on the hallmark of Lubuklinggau city, which is also expected that students can get to know the natural resources and typical places of the Lubuklinggau city. This media consists of a game board, 4 pieces pawns, 1 dice, cards matter, and the rules of the game. The game board is divided into small boxes of 100 and the boxes containing the typical image of the Lubuklinggau city. The game starts from box 1 and win the game if the first up to the 100th box.

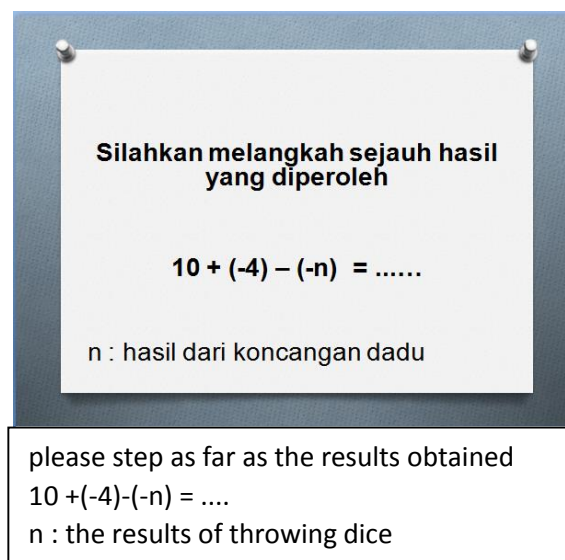


Figure 3: Sample Problem Cards

Game board sizes 30x30 cm, with 10 boxes of vertical and 10 horizontal box. The game is done like the game of snakes and ladders as usually, students get the chance to play first will be able to turn to shake the dice first. If the die 6 shuffled, the students will get a bonus to shake the dice one more time. On the board, there are symbols for the students to answer questions. When students stop in the box, then the student must answer the question that is on the card that has been prepared. Values obtained dice eye replaced with n contained in the matter. The questions were given in the form of a mixture of numbers for arithmetic operation from -10 to 10, as a basic concept the fourth grade of elementary school students in solving problems mix integer arithmetic operations. For example: $7 + 8 - n = \dots$ ($n =$ the dice are to the outside). The result is a decisive step answer these students. If the result is positive (+), then the pawn forward on the resulting value. Meanwhile, if the result is negative (-), then the pawn backward according to the value generated.

This game can be used in groups of 2-4 students. Box contained a picture of stairs, meaning that if students get into the box, then the pawn will go up as far as the existing stairs. While the box contained a picture waterfall is a place of recreation in the city Lubuklinggau, like a waterfall temat, watervank, Kelingi river, and others. When students get into the box, then the pawn will go down as far as the existing waterfall. The boxes are there in the game board contains the image characteristic of Lubuklinggau city.

Boxes are available amounted to 100, resulting in students not always be able to walk forward, the consequences will be time-consuming if the game must be completed to complete. In the application in the classroom, the teacher can stop the game at a time that is considered sufficient in training proficiency of students to solve problems in the materials that have been defined. Then the winner is the students who are in the farthest box. Teachers and students at the beginning of the game can make a mutual agreement how long the game will be done. For students who won this game, the teacher will give out prizes so that the students will be excited in this learning process.

Results of this research is a media of learning. The next phase of research that will be done is the eighth stage of the model development Dick & Carey i.e. formative evaluation. Furthermore, through this learning media can initiate research in the field of education.

CONCLUSION

Instructional media of waterfalls and ladders on a mathematics lesson is one of the educational learning media that can help teachers hone skills Elementary School fourth grade students, especially in the materials mix integer arithmetic operations. The media is one of the media that aims to improve the skills of students in mathematics. The media was developed from children's games media that snakes and ladders board game. Instructional media was developed based on the hallmark of Lubuklinggau city. Instructional model used Dick & Carey model until the seventh step, include: (1) identify instructional goals, (2) conduct instructional analysis, (3) analyze learners and Contexts, (4) write performance objectives, (5) develop assessment instruments, (6) develop instructional strategy, and (7) develop and select instructional materials. Characteristics of the media developed, namely: (1) learning media waterfall and ladders consists of a game board, 4 pieces pawns, 1 dice, cards matter, and the rules of the game; (2) the game board is divided into small boxes of 100 and the boxes containing the typical image of the Lubuklinggau city; (3) the game starts from box 1 and ending on the 100th box; (4) the game board size 30x30 cm, with 10 boxes of vertical and 10 horizontal box; (5) about the card given if the student stops at a predetermined box; (6) the questions given in the form of a mixture of numbers for arithmetic operation from -10 to 10, as a basic concept the fourth grade of elementary school students in solving problems mix integer arithmetic operations; and (7) this learning media, can be used in groups of 2-4 students.

REFERENCES

- Creswell, J.W. (2005). *Educational Research*. Upper Sadle River, NJ: Pearson.
- Dewantara, K.H. (1977). *Pendidikan [Education]*. Yogyakarta: Majelis Luhur Persatuan Taman Siswa.
- Dick, W.C. & Carey, J.O. (2005). *The Systematic Design of Instruction*. Boston: Pearson.
- Gall, M.D., Gall, J.P., & Borg, W.R. (2007). *Educational Research*. USA: Pearson Education, Inc.
- Heinich, R. et.al. (1996). *Intructional Media and Technologies for Learning*. New Jersey: Upper Saddle River.
- Maharani & Mahmud. (2012). *Pengembangan Media Pembelajaran Matematika Interaktif dengan Permainan Ular Tangga pada Pokok Bahasan Bangun Ruang Sisi Datar untuk Siswa SMP Kelas VIII [Development of Mathematics Instructional Media Interactive with the game Snakes and Ladders on Build Space Highlights Flat side for Junior High School Students Class VIII]*. Journal of Mathematics Education, 3. Abstract retrieved from <http://journal.student.uny.ac.id/jurnal/artikel/79/43/150>.
- Miarso, Y.H. (2009). *Menyemai Benih Teknologi Pendidikan [Sowing Seeds Technology Education]*. Jakarta: Kencana Prenada Media Group.

- Permatasi, A.N. (2014). *The Effectiveness of Using Snakes and Ladders Games to Improve Students' Speaking Ability for Seven Graders in MTSN Mojosari*. Journal of Retain, 1, 0-6.
- Richey, R.C. & Klein, J.D. (2007). *Design Development and Research*. New Jersey: Lawrence Erlbaum Associates.
- Semiawan, C.R. (2007). *Catatan Kecil tentang Penelitian dan Pengembangan Ilmu Pengetahuan [Small note on Research and Development of Science]*. Jakarta: Kencana Prenada Media Grup.
- Sitiq & Mahmud. (2010). *Using an Edutainment Approach of a Snake and Ladder game for teaching Jawi Script*. Paper presented at International Conference on Education and Management Technology, Malaysia.
- Smaldino, S.E., Lowther, D.L., & Russel, J.D. (2011). *Instructional Technology and Media for Learning*, diterjemahkan Arif Rahman. Jakarta: Kencana Prenada Media Group.
- Vaughan, T. (2011). *Multimedia: Making It Work*. New York: Mc Graw Hill.