THE DEVELOPMENT OF INTERACTIVE MULTIMEDIA CONTENT BY USING *COURSE LAB* FOR STATISTICS AND PROBABILITY

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ABSTRACT

Statistic and probability material have an important role on math for students in senior high school. Therefore, to increase students' interest and comprehension in statistic and probability we need a tools or media that is able to boost student's motivation to study statistic and probability. As the development of technology increases rapidly, it provides an opportunity for educators to develop Media Interactive Learning (MPI). One of the MPI is the Course Lab MPI 2.4 application. This study aimed to produce a valid, practical and effective interactive multimedia teaching materials. Researcher use Plomp development method which consists of three phases there were preliminary research phase, prototyping phase, and assessment phase. Based on the result of the hypothesis testing, it was found that; Course Lab interactive multimedia were valid, practical, and effective. Students' test scores average changed at 25 with a standard deviation of 7.07. The test results were statistically demonstrating the value which means there were some differences in the average score of the initial test and final test.

It can be concluded that the multimedia modules developed was effective in improving student learning achievements.

INTRODUCTION

The quality of education can be improve by the effective learning process, it means that the learning process can run smoothly, directed and in accordance with the purpose of learning. There are some factors that influence the learning process, from the learners themselves or from other factors such as educators, teachers, facilities, environmental, and instructional media used. Student should be active, creative and empowered themselves with technology as well as the teacher whom master the learning material and have a good strategy in delivering the learning materials will raise the quality of learning. However, there were still many constraints in teaching and learning.

Statistic and probability material have an important role in mathematics, especially for senior high school students. The fact is that these material are conceptually difficult to understand by the students due to these materials require high reasoning power. Therefore, we need a media which is able to increase students' interest so that they can increase their motivation and comprehension of statistic and probability.

Learning media is something that can be used to deliver the message (learning materials), so it can stimulate students' attention, interests, thoughts, and feelings in learning activities to achieve the goal of learning (Santyasa, 2007: 3). As the development of technology that increases very rapidly, it provides an opportunity for educators to develop Media Interactive Learning (MPI). One of the learning media is multimedia modules. Learning by using multimedia modules is expected to motivate students to learn independently, creatively, effectively and efficiently. With multimedia modules, it is expected to reduce the saturation of the students due to the learning process done by most teachers (had been face to face methods (lectures)) that caused students became bored and tired, thus the students' motivation decreased. One of the MPI software are Web Blog, Macromedia Flash, Course Lab, and so forth that belong to edutainment, a mix between education and entertainment. One of the software that is used the most on education is Course Lab 2.4. It is a software to arrange multimedia teaching materials for e-learning which is powerful and easy to use. Course Lab 2.4 offers an environment WYSIWYG (What You See Is What You Get) that is free from programming to produce interactive teaching materials that can be published on the internet, Learning Management System (LMS), and CD-ROM.

Course Lab 2.4 application is a free base application that can be used to create teaching materials. By using this application we

can create a teaching material that can later be integrated with web-based Learning Management System. Course Lab 2.4 is a solution to overcome the various problems faced by teachers in the use of teaching materials or modules that still refer to a very broad subject where the students are difficult to understand the material provided by the teacher. Course Lab 2.4 application usage is almost similar to Microsoft Power Point application usage, so teachers will not find any difficulties in making the teaching material by using this application.

This research aimed to seek more about the advantages of Course Lab 2.4, when used by students in independent learning. So, the writer considers it is important to do this research called "The Development of Interactive Multimedia Teaching Materials by Using Course Lab on Statistic and Probability". The purpose of this study is to create a valid, practical, and effective interactive multimedia learning material by using Course Lab on statistic and probability for senior high school students. Ahmad Novandi (2016) conducted research on "Development of Learning Media Presentation by Using Course Lab 2.4 on Fundamental of Digital Electronics at SMK Negeri 3 (Vocational High School) Surabaya ". The study is equally the form of research and development by using Course Lab 2.4. The difference is in the subject matter being used. The findings of this study show that learning material using Course Lab 2.4 ineligible to use by the teachers and easy and increases students' interest to understand the learning material.

METHODOLOGY

The methodology used in this was research design Plomp (2013: 19) which consists of three phases: preliminary research, prototyping phase, and assessment phase. At the first phase "Preliminary research" it is used an analysis of the problem and the study of literature. Prototyping phase is the stage of prototyping. Assessment phase is the phase of assessing whether the user can use the media and would like to apply, as well as to assess the effectiveness of the media developed.

Evaluation methods used in this study is a formative evaluation that took place in all the phases and the development cycle. According to Tessmer (1993) formative evaluation has several layers, as illustrated in Figure 1.
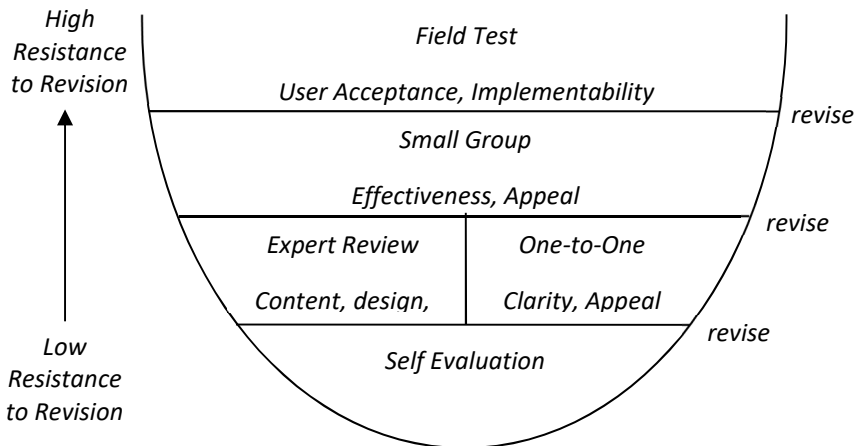

Figure 1, Layer Formative Evaluation

Figure 1 illustrates some of the formative evaluation methods commonly used. In this study, formative evaluation used is as follow:

a. Expert review. At this stage, the expert group (an expert in the field of study, expert instructional design) provides an assessment and advice on the products developed
b. Self-evaluation is conducted to use a check lists the essential characteristics or design specifications.
c. Evaluation of one-to-one (done by users who are representative of teachers or students).
d. Small group or micro-evaluation: involving small groups of students by using the product in normal situation. At this stage, the evaluator observed and interviewed the respondents.

Field test on this study could not be done due to the limit of time and cost. Therefore, this study is limited to a small group testing phase.

PROCEDURE DEVELOPMENT

The details of the development procedure as follow:

A. Preliminary Research (Preliminary Investigation Stage)

At this stage, we identify problems and needs related to the media that will be created. The data collection were done by interviewing with teachers and students and also by collecting the relevant literature and textbooks of mathematics.

B. Prototyping Phase (Phase Prototyping)

Prototype activities are carried out as follow:

1. Designing systematic and structure media, conduct self-evaluation, analysis, and systematic revision of the design and structure of the media,

2. Arranging a prototype based on the design of systematic and structural media, perform a self-evaluation, analyze and revise prototypes based on the results of self-evaluation,

3. Validating the contents and constructs (expert review) of the prototype media, analyze, and revise prototypes based on the results of the expert review.

4. Evaluate one-on-one with two teachers and three senior high school students, analyze, and revise prototypes.

5. Evaluate a small group of students from one of senior high school in Muko-muko. Trials activities will be conducted in the computer laboratory for four meetings.

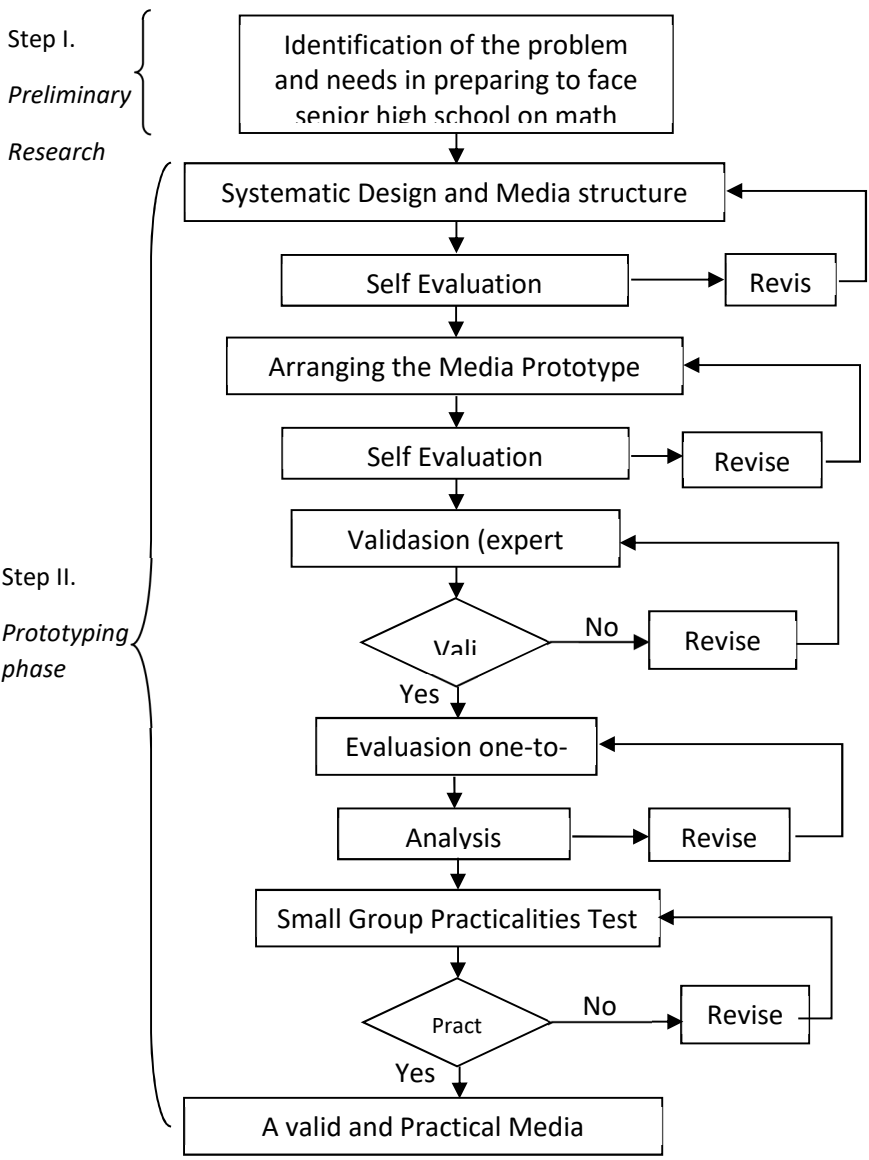In summary the research procedure can be seen in Figure 2.

Step I.

Preliminary

Research

Identification of the problem and needs in preparing to face senior high school on math

Systematic Design and Media structure

Self Evaluation → Revis

Arranging the Media Prototype

Self Evaluation → Revise

Validasion (expert

Vali — No → Revise

Yes

Evaluasion one-to-

Analysis → Revise

Small Group Practicalities Test

Pract — No → Revise

Yes

A valid and Practical Media

Step II.

Prototyping phase

Figure 2, Flowchart Development

Try out were conducted in the third week of September so the test would be chosen from some of the students who received monthly test of mathematics, each represented a high, medium and low group. Try out on small group would be conducted for third grade students (6 students) who were selected from senior high school in Mukomuko. Subjects were chosen representatively for each academic ability of high, medium and low.

The instrument used in the development was the media sheets validation, guidelines for self evaluation (Self Evaluation), questionnaires, interview guidelines, achievement test.

Data analysis techniques validity and practicalities obtained through the instrument that has been said is described as follow:

A. Validity analysis

The results of the validation for all aspects observed, are presented in tabular form, then determined the average score by using the formula:

$$R = \frac{\sum_{j=1}^{n} V_{ji}}{nm}$$

Explanation:

R : the average assessment results of the expert or validated person

V_{ji}: assessment score of experts or practitioners ke-j to ke-i criterion

n : the number of experts or practitioners who judge

m : the number of criteria

Average obtained is confirmed with the specified criteria. How to get these criteria is by assigning a score range starts from 1 (sr = low score) to 4 (st = high score). The score range is divided into four class intervals. Criteria for each interval are classified into five levels as shown in Table 1.

Table 1. Criteria Validity Instruments and Media Inspiration

Average Range	Criteria
3,00 < R ≤ 4,00	Very Valid
2,00 < R ≤ 3,00	Valid
1,00 < R ≤ 2,00	Valid Enough
0,00 < R ≤ 1,00	Less valid

(Modification of Arikunto, 2010: 270-272)

B. Practicalities Analysis

Questionnaire

Students' questionnaire responses were arranged in the form of Likert scale with positive statements. The data from students' response were analyzed with the following steps.

a. Score for each item answer, Strongly Agree (4), Agree (3) Disagree (2), and Strongly Disagree (1).

b. Calculate the total score for each validated person for all indicators.

c. Scoring the practicalities by using the formula:

$$P = \frac{\Sigma f}{N} x\ 100\%$$

With   *P* = the final score

    F = acquisition score

    N = maximum score

The results were interpreted by the following criteria.

Table 2. Criteria practicalities Questionnaire Results Based

Average Range	Criteria
3,00 < R ≤ 4,00	Very Practice
2,00 < R ≤ 3,00	Practice
1,00 < R ≤ 2,00	Practice Enough
0,00 < R ≤ 1,00	Less Practice

(Modification of Arikunto, 2010: 270-272)

The data from the interview were qualitative data which were analyzed qualitatively. There were three stages to analyze qualitative data consists of; the data reduction, data presentation and data conclusion (Miles and Huberman, 1992: 16). The data reduction is a selecting activity, focusing, abstracting and transforming raw data collected.

Learning Achievement

Learning achievement data were analyzed by comparing the results of pre-test and post-test by using *t* test. This was done to identify the differences between these two values significantly. Research hypothesis is:

$$H_0 : \mu_1 = \mu_2$$
$$H_1 : \mu_1 > \mu_2$$

Explanation:

μ_1: average students' learning achievement before using interactive modules course lab based

μ_2: average students' learning achievement after using interactive modules course lab based

RESULT

At this session data were collected along the development of interactive module based on course lab. The data includes an interview with teachers and students, collected documents syllabus, and text books of statistic and probability.

Result from interview with teachers and students. According to the interviews on August the 8th, 2016, it was obtained information about spatial students ability to learn statistic and probability. The use of teaching book or textbook by students are still lacking. The students receive information from the teacher with face to face Methods with a way of explaining matter, giving examples, and exercise so students less motivated and untrained imagination in space. Teachers also have never been writing material that can help students in learning statistic and probability. Development of interactive module based course lab designed to facilitate limitations in learning. The use of lectora as the media in the presentation of material can provide view and animation into the room interesting and able to motivate students in learning so spatial ability students also

increase. According to teachers and students, interactive module based on lectora very interesting and can be used by students to independent study.

The result of syllabus analysis done in line with the competency and students accomplishement. Analysis some textbook in statistic and probability aims to knowg how the contents of statistic and probability book, the presentation, examples, and exercise with syllabus lecture prevailing. Result of text book analysis that textbook referral used is several mathematical books teaches in Senior High School. Material on these books has covered competence to be accomplished students. The presentation of material statistic and probability in accordance with syllabus. But, there is a difference in the order of content of the textbook. The sequence were adjusted to follow the logic of the learning material and also the syllabus.

1. **Design Phase**

Prototyping multimedia module based on Course Lab started with designing a flowchart and storyboards of multimedia modules. Based on the developed storyboard flowchart-based multimedia module Course Lab. Storyboard cover, manual, competence, training, and evaluation are designed as in Figure 3.

Home	
Main menu	
Probability	**Statistic**
Statistic Menu	
Cover	
Main Menu Introduction Data Collection Table Diagram Data Processing Data Analysis Self-evaluation	Learning Material 1. Subject/material 2. Images 3. Animation (can be used for 1 pages or more)
Probability Menu	
Cover	
Space, sample and event, Probability of event, Frequency of hope, Multiplex event, Independent event, Conditional event	Learning Material 1. Subject/material 2. Images 3. Animation (can be used for 1 pages or more)

Picture 3. Storyboard multimedia module

a. **Early Prototype Design** The design phase began to design and structure multimedia module. Produced by next prototype systematic and structure designed. The presentation of material began discussion of material statistics and probability. The early display module

presenting home, the authors, and menu containing a list of choice matter who want to be studied by students. At the beginning of subjects sub basic begins with the presentation of competence base and learning experience. Followed by presentation of matter and exercise. At the end an interactive module evaluation for students who has been completed all sub subjects. Based on systematic and structure interactive module designed produced a prototype. The first prototype is the title of interactive module a button navigator menu "start" and menus the authors is presented in figure 4.

Figure 4. Opening Slide Multimedia Module

The navigator menu "star" useful to lead students to open the next interactive module show on figure 5.

Figure 5. Main Menu

The main menu button was made independent so student can freely choose which topic they want to learn. And the student where been given exercise for all subject. The initial design of interactive modules can be seen in Figure 6.

Figure 6. Module Interactive

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The prototype module has been revised based on the recommendation from the research team and by the reviewer. After self-evaluation phase the module was reviewed by the expert. The expert came from ICT expert from STIKIP PGRI west Sumatera and Senior Highschool 15 Mokumoku. The expert

reviewed orally and writing. There are two types of data on this expert review stage, the data is advice from experts for the improvement of the validity of the data modules and modules based on expert judgments. Analysis and revision of the prototype are done to obtain valid module according to experts. Some suggestions and revisions made are as follows.

Figure 7. Display Main Menu Before and After Revisions

Figure 8. Display Main Menu Before and After Revisions

The review aimed to see the module validity to achieve interactive lectora module was valid. The data collected through validation sheets and advice delivered directly and writing. The evaluation rendered includes four aspects presentation of material, the feasibility, languages, and graphic. The assessment on the presentation of materials with average 3,73, the feasibility with average 3,76 , language with average 3,9, and

graph with average 3,89 . The evaluation of small group involving ten senior high school students representing the population target. All students involved were from SMA 15 Mukomuku. The research conducted in four meetings on May 2, 3, 9, and 10 september 2016 to spending time 3 until 45 minutes per meeting. A pretest conducted on 2 september 2016 and posttest done on September 10 2016. Evaluation for small group conducted to see interactive module efectiveness. The data collected through the survey. The score 1 provided if strongly disagree with statement at the survey, the score 2 to disagree, the score 3 to considerable agree, 4 to agree, and 5 to could not agree. The survey compiled consists of three indicators that 1 statement. The first one is the time it takes in using module consists of a statement. Indicators both the ease of use module consists of six statement. A third indicators benefit gained in using module consists of three statement. The charging survey by students shows that the majority of students said the time to look matter is in accordance with the time available. It also applies to ease the use of modules and benefit gained in using the module, the majority of students said they agreed. The analysis score for the survey shows that interactive module based on lectora have practical used by students.

Testing were also carried out to see the effectiveness interactive module developed and to get information to further improvements to module developed. The effectiveness of data

collected in pretest scores and postest of students joining testing small group. The use of module by students at each meeting satisfying enough. The first meeting of cube material can well understood by students. The second matter beams learned, prism on third meeting, and limas in the fourth. Pretest conducted in the first meeting before the learning that starts. Question have been tested is the question evaluation is contained in interactive module. About the same tested back on the tests conducted after the research phase. Tests late aims to obtain data to study for students after implementation of learning using module developed. That test scores students rata-rata changed as much as 25 with byway 7,07 raw. This data showing how a change in value ranges from 17,93 until 32,07. Seen from rata-rata test scores the beginning and final test, there has been increasing scores of the students 17,93 until 32,07. The results of testing statistically showing that the $t_{count} > t_{table}$ which means that there are differences the average score a pretest and postest. Seen from the average test scores, been an increase in a value sufficiently significant. Thus, can be concluded that module interactive developed effective in improve learning outcomes students. In other words, the spatial ability of students increased after using module interactive based on lectora. Test results of pretest has increased enough significant impact on a pretest. The comprehensive learning strategy to a learning material gives good impact for student it can be showed in their exercise score or achievement. As

expressed by suparno (1997: 61) that student with prepared knowledge, goals and motivation gives impact to interact with the learning materials. Understanding and the application of knowledge and experience gained through examples and exercise contained in module expand and refine knowledge and students increase of understanding of material learned .In accordance with statements from Hamalik (2012: 95) stated that the exercise give learning experience that can help mastery behavior changes aspect, develop the capacity to solve problems, and helping the learning process effective.

According to the data analysis and discussion has obtained conclusions as follows reviews of the module based interactive lectora has the validity of the (relevance) and constructs (consistency). The feasibility of includes the contents, the presentation of material, language, and graph. Every aspect is valid. The evaluation of small group involving ten students shows that prototype interactive module developed already practical. Material on the presentation of this module easily understood, the language used is clear and easy to understandThe module observed through learning outcomes of students after using interactive module showed that the module is already effective. This conclusion based on the results obtained evaluation trial of small group involving ten junior high school students in the city of padang. The results of the trial showed that learning outcomes students experienced a significant difference between the value of test tests the beginning and the end of which is

obtained. Data analysis showed that been an increase in the average value of students from the pre test to posttest.

The module is different from the teaching sources in use of media and presentation of material more interesting.

This module can be used as a source of independent study and help students in visualizing up room so that the ability into spatial students increased. Module based interactive lectora was able to improve learning outcomes. This research can provide an illustration and providing comments to the teacher in implementing learning activities. This module demanding students to run some activities such as reading, writining, and answering a question. In the use of this module, teachers can facilitate learning activities use the model blended learning.

CONCLUSION

Course lab based interactive multimedia application is an alternative solution as a learning resources for teacher, students and learner especially in statistic and probability. Based on the analysis of data and discussion, the conclusion can be seen as follow:

1. The data showed that multimedia module Course Lab based already has content validity (relevancy) and construct (consistency). Validity assessment includes aspects of the feasibility of the content, presentation material, language, and graphic. Every aspect validated

has been considered valid in terms of content and construct.

2. The evaluation results involving a small group of ten students showed that the prototype multimedia module had been practically developed. Presentation of the material in this module is easy to understand, the language used is clear and easy to understand.

3. The effectiveness module was observed through students' learning achievements after using multimedia module indicated that the module was effective. This conclusion is obtained based on the evaluation of small group trial involving ten senior high school students in the Bengkulu city. The trial results showed that students' learning achievements have significant differences between the score of the obtained initial test and final test. Analysis of the data showed that an increasing in the average score of students from initial tests to the final test.

SUGGESTION

Based on what have done in this study, there were some suggestions which can be forwarded to the teacher, students and other researchers:

1. Course Lab-based multimedia module can be used as an alternative source in learning activity.

2. This module was developed only on the probability and statistic material, teachers or further researchers can use course lab as a media in developing learning materials with a wider range of materials or for different disciplines.
3. This module can be used by teachers as a teaching material in the learning process by using blended model learning.

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