Practicality of Elementary Statistics Module Based on CTL Completed by Instructions on Using Software R

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Abstract. This research is a development research using 4-D design model (define, design, develop, and disseminate). The results of the define stage are analyzed for the needs of the following: Syllabus analysis, textbook analysis, student characteristics analysis and literature analysis. The results of textbook analysis obtained the description that of the two textbooks that must be owned by students also still difficult in understanding it, the form of presentation also has not facilitated students to be independent in learning to find the concept, textbooks are also not equipped with data processing referrals by using software R. The developed module is considered valid by the experts. Further field trials are conducted to determine the practicality and effectiveness. The trial was conducted to the students of Mathematics Education Study Program of STKIP PGRI which was taken randomly which has not taken Basic Statistics Course that is as many as 4 people. Practical aspects of attention are easy, time efficient, easy to interpret, and equivalence. The practical value in each aspect is 3.7; 3.79, 3.7 and 3.78. Based on the results of the test students considered that the module has been very practical use in learning. This means that the module developed can be used by students in Elementary Statistics learning.

1. Introduction
Statistics is a branch of science that is needed in everyday life so that humans can not be separated from the use of statistics. Statistics became the focus of mathematics education reform as an important aspect of daily life [4]. Statistics is one of the branches of mathematics that learn about data collection, processing, analyzing data, and drawing conclusions based on data analysis [6]. Statistics have an important role in doing research, therefore statistics need to be well understood by students.

Nowadays many software or developing programs that can help us in doing data processing, presentation of data into graphical form, and data analysis. R is a free version of the S language from a similar paid software that is S-PLUS that can help us in doing data processing, presentation of data into the form of graphs, and data analysis. R has a complete and reliable feature and legal liability factor is no longer a concern in its use because it can be obtained for free. Utilization of functions and packages provided by R will make it easier to create animation programs to demonstrate a theory in statistics [12].

Through Elementary Statistics lectures students are expected to understand the basic concepts of statistics, describe data, present and analyze data and draw conclusions. In addition, students are expected to improve the ability to use the software in performing data processing, presenting data into the form of graphs, and data analysis. Students are expected to be able to understand the course as a
whole. The student's understanding is derived from self-study. This is because the lectures in universities are required to learn independently from students.

Teaching material is a set of tool containing learning materials, methods, limitations, and how to evaluate the designed product systematically and interestingly in order to reach the expected purpose, i.e. reaching the competencies and sub competencies with all of the complexities [10]. Based on the definition above, it is clear that a teaching material needs to be designed well by following the rules, so that the teaching material can help the students, teachers/lecturers in the learning process. Teaching material is also defined as a systematical designed material that enables the students to learn individually and is designed based on the valid curriculum. Through the teaching material, teachers will teach the materials well-managed to the students and all the expected competencies are reached.

However, the teaching materials used by the lecturers and students in the lecture of Elementary Statistics is a translated textbook. The interview result to the lecturers show that language of the textbook is difficult to understand; though the presentation was systematically, it has not constructed the student’s knowledge and been aimed to find out the concept. Generally, the materials are complete. Levels of the difficulties are generally easy to be understood. The expected teaching material is a module teaching material because it can help the students to study autonomously. Mostly the lecturers have already used the software in analyzing the data especially for MINITAB and SPSS, but it never uses software R. From the student’s interview, it is found that: generally, students state that they are difficult to understand the materials. Book’s presentation has been set systematically. However, they get bad grades. Most of them say that the textbook presentation is difficult to understand and lack of systematic. The materials and textbook have been complete. Generally, they inform that the questions on the textbook are difficult to understand especially in language. They expect that the teaching materials could help them to study autonomously. Mostly, they haven’t used the software in analyzing the data and even they don’t know about software R.

The other problem raising in Elementary Statistics lecture is student’s low ability in analytical thinking to solve the problem. Many knowledge and information are possessed but it is difficult to relate the situation faced. The facts affect the student’s learning outcome, as the following table.

| Grades | 2013/2014 | 2014/2015 |
|--------|-----------|-----------|
|        | Total     | %         | Total     | %         |
| A      | 23        | 45,70     | 17        | 33,50     |
| B      | 57        | 53        |           |           |
| C      | 35        | 64        |           |           |
| D      | 35        | 66,51     | 41        |           |
| E      | 25        | 34        |           |           |

Table 1 shows that students grade, which is less than 65 (C, D, and E) is 54,28 % and 66,51%. The facts are far from the expectation.

Based on the problems above, it is important to show an effort to develop a module teaching material used for students to study autonomously and can develop their own knowledge. So that they have high analytical thinking in solving the problem. One of the teaching materials developed is Contextual Teaching and Learning Based Module. This kind of approach can construct the student’s knowledge and find out the concepts of the materials. In order the developing module can increase the ability in using the technology, the developing module is completed by directions of data analyzing using software R.
Previous research shows that student’s response about Contextual Teaching and Learning Based Module is very good [11]. Learning outcome of students using the software is higher than the students who haven’t used the software. Learning using Contextual Teaching and Learning Based Module can increase the student’s skill in the scientific process and behavior [5]. So that learning by using Contextual Teaching and Learning Based Module can give a positive contribution towards the student’s learning outcome, behavior and skill. This is also in accordance with the results of research conducted Kadir, the result of his research is inquiry approach able to improve activity, response, and mathematical creative thinking skill of student at state junior high School in Indonesia [3]. The inquiry is one part of a contextual learning approach. Besides inquiry, constructivism is also one part of contextual learning. According to Hamdunah, modules developed with a constructivist model are considered effective. This is seen from the final test in a circle and the sphere material [2].

In addition, in relation to the subject materials of Elementary Statistics connecting to the data, so that the analysis can be helped by using the software. Nowadays, there are many statistics software used to analyze the data such as SPPS, MINITAB, etc. However, that software is not free. Therefore, a free software for the student is software R. A research result is from Ulya observing the effect of using contraception tools toward the population number and density in Pemalang Regency in 2014 using software R, AMOS, and LISREL. That software show the similar results. Yet, software R is better to use because it can be used by notebook/computer with 32Bit and 64Bit. From the classical assumption test, software R can operate all the classical assumption test. The installation process does not need a license code. Data used in double regression consist of the data from excel, SPSS, Minitab [9]. It means that software R can be free to use it.

2. Method
This research is a Research and Development (R&D). R&D is a research method used to produce a certain product and test the product effectiveness [7]. Product developed is a CTL based module as the aids of lecturing. The research used RnD with 4-D design [8]. The development itself consists of 4 stages define, design, develop, and disseminate. The participant is validity three statistician.

The Instrument used in this research was questionnaire practicality. It is to collect the data of module practicality and data analysis directions. Questionnaire practicality is arranged based on the module development guidance using Likert Scale. The Questionnaire contains student responses to modules that have been developed. Student response questionnaires were used to elicit student responses to the practicality of the CTL-based basic statistics module with the use of developed software R. Practicality data are collected through questionnaires, observation sheets and interviews with students and lecturers. The questionnaire results are given scores from 0 to 4. Then the mean is determined and confirmed by the criteria: Very Practical if 3.20 <average ≤ 4.00; Practical if 2.40 <average ≤ 3.20; Practical enough if 1.6 <average ≤ 2.40; Less Practical if 0.80 <mean ≤ 1.60; and Not Practical if the mean ≤ 0.80 [1].

3. Result and Discussion
The developed module is considered valid by the experts. Further field trials are conducted to determine the practicality and effectiveness. The trial was conducted to the students of Mathematics Education Study Program of STKIP PGRI in West Sumatera which was taken at random which had not taken Basic Statistics Course ie as many as 4 people. Practicality test results are presented in Table 2 below:
Table 2. Test Results of practicality

| NO | ASPECT            | AVERAGE | CRITERIA         |
|----|-------------------|---------|-----------------|
| 1  | Easiness          | 3.7     | Very practical  |
| 2  | Time efficiency   | 3.79    | Very practical  |
| 3  | Easy to interpret | 3.7     | Very practical  |
| 4  | Equivalence       | 3.78    | Very practical  |

Based on the results of the test students considered that the module is very practical to use in learning. This means that the module developed can be used by students in Elementary Statistics learning.

Things to consider on the ease of using modules (a) Modules using simple and easy-to-understand language, (b) Submission of materials can assist students in understanding concepts, (c) Learning to use modules capable of connecting materials with everyday life, (d) Material is easy to understand because it is associated with the real world, (e) The module is easy to use because of its usage instructions, and (f) The use of R software helps simplify the data processing. All things considered in the convenience aspect of using modules are in very practical categories except for points (a) in the practical category.

The next aspect to consider is the efficient time consisting of (a) By using this module the learning time becomes effective, (b) The module can understand the material with a relatively short time, (c) The module can make it easier to understand tasks in the available time, (e) Use of software R saves time in processing data, and (f) The approach used in the presentation of materials helps the student in understanding the material. All things considered in the time efficient aspect are in very practical categories.

Furthermore, ease in interpreting also becomes one of the aspects in module practicality. This includes the following: (a) The module contains clear words so that it is easy to understand, (b) The sentences used in the module are easy to understand, (c) Examples of questions given make it easy to complete the assigned tasks, (d) The commands given are easy to understand, (e) The module helps know the benefits of the lesson presented, and (f) The results of data processing using software R easy to understand. All the things that are concerned with the ease of interpreting are in a very practical category.

The last aspect to consider in the questionnaire is to have the same equivalence. This part of the aspect is: (a) This module may be a companion book of existing textbooks, (b) This module may serve as a means of working training provided by lecturers. All these sections are in the very practical category.

Here is an example of using the software in solving CTL-based problems. This question relates to the way the data is presented
4. Conclusion
The students' appraisal of the developed modules is very practical with the practical value in each aspect is 3.7; 3.79, 3.7 and 3.78. This means that the module can be used by students in learning.

The module as a companion book for students in understanding the material needs to be made with the best. Therefore the module should proceed with the next stage of the effectiveness stage.

Elementary Statistics Module can be used in the lecturing. It is important a development find out the effectiveness of the module.

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