Preliminary analysis of problem-based statistical learning media

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Abstract. Learning media is one of the important things to improve the quality of learning. Learning media are developed in accordance with the student’s needs so that a learning can be carried out better. Nowadays, there is no learning media for statistics course that is in accordance with the needs of Informatics Education study program students at STKIP PGRI in West Sumatra. Based on the background of the problem, the purpose of this study was to analyze the students’ need on statistics courses’ learning media. It was a research and development using the design of Plomp development (Preliminary research, prototyping phase, and assessment phase). The stages carried out were limited to the preliminary research stage. At this stage, the process was conducted by analyzing lesson plan, syllabus, learning resources and student needs. Particularly, the data regarding student needs were obtained through questionnaire and an interview with students and their peers, as well as analyzing students’ characteristics. Questionnaire and interview data were analyzed qualitatively. The results of the study show that the students need a problem-based learning media for the statistics course.

1. Introduction
Statistics is a very useful branch of science. It is often encountered in everyday life and it has expanded in various fields of science, such as economics, sociology, psychology, health, and other fields of science, even it is used by large world companies to obtain best results [1]. Statistics is used to make decisions and predict what may happen in the future [2]. Because of the importance of studying statistics, the Informatics Education study program of STKIP PGRI West Sumatra requires student to take statistics course in the third semester. Statistics is a prerequisite course for students before taking other courses such as learning evaluation and research methods. Moreover, statistics learning is very useful for students in doing their final project (thesis). From the results of assessment of 2018/2019 year students’ assignment, it is found that students who do not understand the statistical concept well are 53.4% and they are failed. Linuwih's research states that education in statistics is a serious problem that needs change because the community does not understand statistical reasoning generally, so that, they do not appreciate the use of statistics [3]. That teachers must have methods in learning as strategies to facilitate students to master the knowledge provided. In addition, teachers must know the difficulties experienced by students in mathematics learning, so that, appropriate solutions can be given and learning objectives can be achieved [4]. For these reasons, there is a need for lecturers to improve student learning Wahyudin also said that one important aspect of planning depends on the teacher's ability to anticipate needs and materials or models that can help students to achieve the learning objectives. Sagala believes achievement and one of the ways is to develop a
learning media that fits the student’s need. It is in line with Fitri’s research stating that it is necessary to develop a learning media, so that learning is smooth, successful and innovative [5].

2. Methods
It was a research and development research. It used Plomp model where this model consisting of model of three development stages, namely preliminary research phase, prototype design phase, and assessment phase [6]. This research was limited to the preliminary research stage analyzing the needs of STKIP PGRI West Sumatra students on learning media of statistics course. At this stage, the process was carried out by analyzing lesson plan, syllabus, learning resources, student needs. The method in this research is descriptive research. The instrument used for the analysis of analyzing lesson plan, syllabus is a validation sheet, while for the analysis of student needs, the instrument used is a questionnaire and interview guidelines. The validation sheet of the lesson plan has aspects of assessment including course identity, course descriptions, learning outcomes, learning media, prerequisite subjects, study material, forms of learning, assessment, time estimation, academic norms, final score and the bibliography. Validation sheets of syllabus have aspects of assessment including course identity, learning achievements, lecture material, learning methods, learning activities, final grades and bibliography. Questionnaires were given to students of Informatics education study program consisting of 19 respondents, while an interviewes were conducted to representative of students from different academic category (high, middle, and low achievement), and one lecturer of statistics course. The students’ responses regarding the questions in the questionnaire related to the teaching material then analyzing using equation (1)

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F = \frac{o \cdot s \cdot (s - \bar{s})}{\sum \frac{m_i}{n_i}} \cdot \frac{\text{area}}{100\%} \quad (\text{Equation 1})
\]

3. Result and Discussion
3.1. Design of the Lesson Plan still focusing on teacher-centered
Lesson plan is a plan for the learning process prepared for one semester of learning activities in order to meet the learning outcomes in the course/module [7]. Analysis lesson plan aim to determine whether all components exist in lesson plan are in line with the applicable curriculum. The results of preliminary analysis shows that the forms of learning in Statistic course do not contain student-centered learning activities, and innovative learning strategies that require students to think critically in accordance with the objectives of statistical learning, so that, learning needs to be provided for students to develop life skills such as problem-based learning. In accordance with the definition, problem-based learning is a learning model in which students from the beginning have been facing a problem, then it is followed by an information seeking process towards student-centered learning [8]. The statement is also in line with the learning process in the 21st century where students need to improve their critical thinking skills and be able to solve problems, be creative, innovative, communicative and collaborative [10,11].

3.2. The necessity of integrating media into syllabus
This analysis aims to find out whether all components exist in syllabus are in accordance with the applicable curriculum. The results of the analysis on syllabus for aspects of learning activities need to be added to a learning media that can channel messages, stimulate students’ thoughts, feelings, and willingness, so that, they can encourage the learning process for the students. According to Edgar Dale, in the world of education, the use of instructional media often implements the principle of cone experience, which requires media such as textbooks, learning materials made by teachers and audio visual [12]. Module is learning materials that can be used in the learning process. Based on the results of syllabus of Statistics course, it is concluded that in syllabus of Statistics Course need to include a learning media such as modules in learning activities.
3.3. Content structure exist in the learning Resource

The content structure analysis was carried out to find out the structure of the content exist in the learning resources, whether it can meet the learning needs of students and able to facilitate students to learn independently. The results of the analysis on learning resources produce learning resource such as teaching materials are set related to the learning outcome of the course and scientific systematics. The material description in the introduction to the chapter/teaching material is expected to motivate students to study. One of the ways is to create a problem-based teaching material. The teaching materials are expected to facilitate active learning students. Teaching materials developed can be in the form of module. This problem-based module will contain problem solving steps, so that students can find the concept of solving the problem. Based on the results of the analysis of the learning resources of the Statistics course, it is concluded that teaching material is important in the form of a problem-based module that can motivate and facilitate students for active learning.

3.4. Students’ obstacles in the learning process

Interviews aim to find out basic problems, so that the development of learning media is needed. Interviews were conducted to three Informatics Education study Program students who had taken statistics courses, and a lecturer of statistics. The three students were selected with different academic abilities seen from the grades obtained after the lecture was completed. Each student who get A, C and E grades in the statistics course.

Based on the results of interviews with students, it is found that information about the learning process is still less motivating students to learn actively and independently. Understanding of students is still lack in using statistical formulas to solve problems, so that, there are errors in the execution of practice questions and examinations. Students tend to easily forget the material that has been studied before because the understanding of the material is not well embedded. The most difficult lecture material is testing the hypothesis. Teaching materials in the form of modules are preferred to use in the learning process. Modules, which contain problems and resolution steps are preferred, so they can find their own concepts. So, with the existence of a problem-based module, it is expected that understanding the material learned can be embedded well.

Based on the result of interviews with the lecturers, it is found that the obstacle that is often encountered in the learning process which is the difficulty of students applying the concept in the form of a statistical formula in solving problems given. Student difficulties are encountered in solving problems regarding testing hypotheses. In the statistics lecture, teaching materials have been used in the form of textbooks, power points, and handouts, but less provided a significant increase in learning outcomes. Teaching materials that begin with problems and there are steps to solve are needed by students in lectures because they are expected to help students to understand and find concepts independently. Learning should be better to be implemented in group in order to share knowledge. Therefore, it is necessary to develop teaching materials in the form of problem-based to overcome the difficulties of students in studying statistics.

3.5. Students’ need toward teaching material

Students’ need toward teaching material were exploring through the questionnaire contains 20 questions. Based on the results of filling in the questionnaire, it is found that there are 31.58% of the students stated that the statistical lecture are not pleasant and the statistical teaching materials that has been used could not make good grades. Only 21.06% of students do not experience difficulties in Statistics lecture. There are 57.9% of students who need a long time to understand the material in the statistics lecture in the textbook used so far. 31.58% of students states that the teaching materials used in the statistics lecture are unlimited. All students need easy-to-understand teaching materials in learning statistics. 84.22% of students need teaching materials that can build on the knowledge they have to acquire new knowledge. All students need teaching materials that can facilitate group learning. Almost all students like teaching materials that can make active learning. 89.47% of students like teaching materials that begin with context problems in everyday life. All students prefer learning with problem solving steps. 63.16% of students states that existing teaching materials made it difficult for
them to understand the material. Students prefer group learning to solve problems in textbooks. Almost all students like teaching materials in the form of modules that can make them learn independently.

From the current results, it can be inferred that a problem-based statistical module is needed for teaching statistics in order to build up the knowledge that is already possessed to acquire new knowledge. The module begins with the problem of context in everyday life along with the steps of completion that can motivate and facilitate students for active learning. In addition, teaching materials in the form of problem-based modules that are easy-to-understand and facilitate students in group and independent learning also need to be developed.

3.6. Type of media that student’s need
Based on the results of student character analysis, it is concluded that a learning media is needed containing a form of group learning that could motivate and give students direction to solve problems. So students could learn and understand the concepts of material learned in their own way. One form of learning that can overcome the problem above is problem-based learning. In addition, to help students learn the material independently, a teaching material needs to be made containing completion steps. So that, with this step of completion, students can find their own concepts.

4. Conclusion
The results of the preliminary analysis indicate that students of Informatics Education study program at STKIP PGRI West Sumatra who took statistics courses, require learning package in the form of the lesson plan which is focusing more on developing students critical thinking skills. The syllabus prepared also is expected to integrate the interactive media for motivating students to learn statistics. Questionnaire survey revealed that integrating familiar context and real data in the problem-based learning media could improve their interest in learning. Considering the results, it is a must for lecturer statistic to consider student’s need in developing material to improved students’ understanding in Statistic course.

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