The Identification of Students’ Learning Difficulties on Sampling Technique Course Undergraduate Programme In Mathematics Universitas Negeri Medan

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Abstract. This study aims to describe the learning difficulties of students in the Sampling Technique Course in undergraduate program in mathematics Universitas Negeri Medan. The subject of this study is the students of undergraduate programme in mathematics on the sampling technique course for 2018/2019 school year. This research method is descriptive qualitative. The instruments used in this study included tests on the ability of sampling techniques, questionnaires and interviews. The results shows that: 1) The students have difficulty in terms of contents respectively: the two stage sampling, systematic sampling, cluster sampling, stratified sampling; 2) The students have difficulty in terms of the procedure of taking samples, rationality (concepts) underlying the estimation formula used, using estimation formulas in problem solving, choosing the right sampling method in problem solving; 3) The reasons of students why they have difficulty respectively: rarely study at home, Textbooks (teaching material) are difficult to understand, few learning resources and the other reasons.

1. Introduction
In principle, learning is a process of organizing education that is done consciously in engaging with the environment with the aim of gaining new knowledge that causes changes in a person’s behaviour [1]. How much the alteration can occur after the learning process an be done through the assessment of learning outcomes or evaluations.

According to Nitko in [2] assessment is a process to obtain information that used in making decisions on students, curriculum and programs, as well as education policy. Indeed, through learning process it is expected that the recipient (students) can achieve what is the goal of the learning process itself. In fact, this often experiences several obstacles, both internal and external. This study aims to describe the difficulties of students in learning sampling techniques course.

Sampling techniques course is compulsory subject for all students in undergraduate of the mathematics study program at Universitas Negeri Medan. Sampling technique is the study of how sampling is carried out in a survey research. In general, the sampling method is divided into two major parts namely probability sampling and non-probability sampling. In the course of sampling technique that apply in this mathematics study program includes some material about the probability sampling method, the theoretical basis along with the estimated parameters for each given method. In terms of the material being taught, the sampling technique is very applicable and needed in various fields of industry, government and social society.
Based on the semester learning plan of the sampling technique course in accordance with the KKNI curriculum, the stated learning objectives include the ability of students to understand the basic concepts (theoretical basis) of each sampling method, sampling procedures, rationality of the parameter estimation formula, determination of parameter estimators and make a conclusion. Meanwhile, the determination of learning outcomes obtained by students is determined based on the applicable academic regulations at Universitas Negeri Medan, namely: grade A for 90 – 100, B for the range values from 80 to 89, C for 70 – 79, and E for the range 0 – 69.

The results of the mid-semester examination and the final-semester examination in sampling technique course on the even semester 2018/2019 show there are still many students who experience difficulties in these courses. Table 1 shows the distribution of the results of midterm and final semester exams obtained by students in sampling course in the even semester 2018/2019.

### Table 1: Distribution of Student’s Test Results for Mid-semester and Final-semester Examination in Sampling Technique Course Mathematics Study Program in even semester 2018/2019

| Score | Frequency |
|-------|-----------|
|       | Mid | Final |
| 0 - 69| 16  | 12    |
| 70 - 79| 6   | 12    |
| 80 - 89| 6   | 4     |
| 90 - 100| 0  | 0     |
| Total | 28  | 28    |

From Table 1, it can be concluded that the percentage of students who get low score is quite large, namely 57 % for mid-term exam and 43 % for final exam. This fact encourages more information about what causes it and identifies student’s difficulties in leaning sampling technique.

### 2. Material and Methods

#### 2.1 Sampling Method

To find out the characteristics of a population it is often not possible to collect data comprehensively from all members of the population, or do not need to be done even sometimes it can not be done, such as checking the quality of the production of light bulbs, checking the quality of the yield of citrus fruits in a certain area, and others. Therefore, sample survey research becomes an alternative solution to draw conclusions that are applied to the population.

Using a sample as a database to describe the population has several advantages including: reducing costs, less time needed, greater scope of research, and greater level of accuracy [3]. There are many ways to determine a sample in a survey study. Sampling technique is the study of how a sample procedure is determined from a population group. The theoretical basis and the underlying principles as well as the follow-up actions of the selected sample cover the scope of the sampling technique.

According to [4] classifies the sampling method into four categories, namely: a) probability sampling: sampling based on equal opportunities for prospective samples to be taken; b) purposive sampling: sampling is based on determining specific characteristics that are consistent with the research objectives; c) convenience sampling: sampling is based on the ease of researchers obtaining it; d) mixed sampling methods: sampling on the basis of combining several other sampling methods.

#### 2.2 Sampling Technique Course
For the course of sampling technique implemented at the Mathematics Study Program at the State University of Medan, it has been determined that the scope of material in the course includes probability sampling including random sampling, stratified sampling, cluster sampling, two stage cluster sampling and systematic sampling. Whereas non probability sampling is given as enrichment.

In accordance with the KKNI curriculum at Universitas Negeri Medan, the learning objectives of sampling technique courses are stated in the form of learning outcomes i.e: 1) able to explain the concepts of each sampling method; 2) able to apply the sampling method in problem solving.

The learning achievements are redefined into several indicators, namely: a) explaining the basic concepts of the sampling method; b) explain the sampling procedure with selected sampling methods; c) rediscover the parameter estimating formula according to the chosen sampling method; d) determine the parameter estimator values according to the selected sampling method; e) determine the sample size needed for each parameter estimator according to the selected sampling method.

2.3 Students’ Learning Difficulties

As the purpose of a learning process, it is expected that changes will occur in students. Usually this is measured through learning outcomes assessment activities. The existence of student learning outcomes that are still not satisfactory (low) in a learning process can be an indication that there are difficulties experienced by students in the process.

Westwood (in[5]) states that learning difficulties refer to obstacles that limit access to participation and results in a learning plan. Still from the same source, Dalyono also revealed that learning difficulties are a condition that causes students to not be able to learn as they should. In mathematics, the ability to manipulate and understand numerical information is central to academic and professional achievement (Duncan et al, in [5]). However, individuals differ greatly in their math skills and those who struggle the most may have some form of math learning difficulty (Kucian and Von Aster in [5]).

Based on Faizal Amir (in [6]) in his research found that the types of difficulties students have in learning absolute value material include not being able to fully apply the concept of distance and absolute value definitions so that the completion step is not complete; misunderstanding the condition of absolute value; experiencing a misconception in the form of an assumption of absolute value is always positive; experiencing difficulties in terms of conceptual, procedural and algorithm.

In line with Faizal Amir, research conducted by [7] also concluded that the learning difficulties of students in mathematics courses included factual knowledge 12.2%, conceptual knowledge 19.7%, procedural knowledge 20.7% and metacognitive knowledge 47.4%.

Beside that, [8] said about the causes in-depth learning difficulties concerning in mathematics, namely an appreciation of the structure of mathematics, the availability or otherwise of learning resources, teacher quality, the curriculum, the learners themselves, and the value placed on the subject by society.

The information about the difficulties experienced by students in the learning process can be used as input for the improvement of the next learning process or the provision of facilities and other things that support the learning process. This is consistent with what is given by Yetkin (in [9]) seeing that it is a necessary but hard task to improve comprehension in mathematics, it can be said that recognizing the learning difficulties faced by students in mathematics and the sources of these difficulties and designing a teaching model to eliminate these problems is a very crucial step towards achieving this task.

2.4 Methods

This study aims to identify the difficulties of students in sampling technique courses. The subjects of this study were students of the Mathematics Study Program at Universitas Negeri Medan who had taken 28 sampling techniques in the even semester period 2018/2019. The instrument in this study was a test sheet of knowledge about sampling techniques through midterm and final exam, questionnaires and interviews. The method used in this research is descriptive qualitative. Data analysis is done descriptively and data reduction.

3 Results
Based on Table 1 in the previous section it appears that the percentage of students who received low scores (0 - 60) in the sampling technique courses for mid exam and final exam were 57% and 43%, respectively. If it’s seen from the percentage of the number of students who get low scores reaching 50% it can be assumed that students experience difficulties. Further research is needed to explore into the causes.

This fact is relatively similar to the results of data collection through a questionnaire in which as many as 54% of the 28 students who answered the questionnaire stated that they had difficulty learning sampling techniques, the remaining 46% stated that they did not experience difficulties in sampling techniques as shown in Diagram 1.

Furthermore, the identification of students' difficulties in sampling techniques in terms of the content of the material that has been determined according to the applicable curriculum is shown in Diagram 2. There are five materials in sampling technique course, namely: 1) random sampling; 2) stratified sampling, 3) cluster sampling, 4) two stage cluster sampling; 5) systematic sampling. Diagram 2 presents the percentage of students who find these materials difficult.

From Diagram 2 it can be concluded that the students experienced the most difficulty in the two stage cluster sampling material which is 45% followed by systematic sampling material as much as 30%. In this case, after deepening the information through interviews, when asked why the two stage cluster sampling material was difficult because students were confused in determining the group twice.

Identification of other difficulties in terms of the level of understanding of knowledge about the material (learning objectives) as shown by Diagram 3.
Diagram 3 shows the percentage of students’ difficulties in sampling techniques in terms of understanding their knowledge (learning objectives). It appears in the diagram that around 45% of students have difficulty when determining the sampling method that should be used in solving a problem. In an in-depth interview, the respondent stated that if questions or routine assignments were given at the end of the discussion of the material in one chapter, it was easier to regret it because the sampling method was determined. This is different when examining or analyzing a problem to determine which sampling method is appropriate. Students claimed to be confused about choosing which sampling method when a problem was raised.

Another part that was stated to be difficult based on the questionnaire data was the rationality of the estimation formulas used, which reached around 18% and ranked the second most difficult in terms of understanding knowledge. What is meant in this case is how the reduction in estimation formulas is obtained for each sampling method. From the interview, students stated that the estimation formula was only memorized without understanding the basis of its decline, so that with the many sampling methods studied, many formulas had to be memorized. This often makes even confused sometimes confused.

Furthermore, the difficulty experienced by students in terms of understanding their knowledge is about the procedure (procedure) of sampling by 13%, followed by the use of a parameter estimation formula of around 10%. It is interesting to note when using the parameter estimation formula. From the results of the analysis on the student answer sheet on the final exam, there was an error in using the estimation formula. In Figure 1(a), it appears that the problem given is the estimation of the percentage parameters (proportions) but students use the estimation formula (notation) for estimating the average parameters. This also shows that the ability of students to recheck answers is still lacking where the proportion should not exceed 100%.

This fact reinforces the results of previous interviews that students have difficulty (confused) in the placement of estimation formulas for each sampling method. This can be caused by the lack of understanding of students’ concepts of these formulas. In other words students only memorize but do not understand the rationality or decline in the formula.
Another error in using the parameter estimation formula was also found in determining the value of $Z_{\alpha/2}$ as shown in Figure 1 (b). It shows that students make mistakes when determining the value of $Z_{\alpha/2}$ where the value of $Z_{\alpha/2}$ is written as 0.01 which is actually the value of $\alpha / 2$ itself. The value of $Z_{\alpha/2}$ is the value of $Z$ which corresponds to the area under the normal curve in the left or right hemisphere. The value of $Z_{\alpha/2}$ can be seen from the tables that have been provided.

On the other hand, knowledge of normal tables should be understood in prerequisite courses. This shows that re-stabilization of mastery of the materials needed to support sampling technique at the beginning of the lecture. This is in line with what is stated by Gullop (in Ramli, 2013) that the prior knowledge students bring to the learning situation is considered to be a vital factor in facilitating in-depth learning.

Further identification is carried out to see what factors affect students so that they experience difficulties in sampling technique course. This is presented in Diagram 4.
Diagram 4 shows that about 42% of students claimed that the difficulties experienced in sampling techniques were due to lack of study at home. Whereas students who stated that the textbooks used were difficult to understand and at least learning resources ranged between 27% and 18%, respectively. Furthermore, in the interview students stated that the book used was a textbook translation. Students find it difficult to understand the language and sentences in a textbook. Students also recognize that group learning is preferred to self study at home.

In addition, based on the reduction of data obtained from the questionnaire, several notes were added as an alternative solution to the problem of students' difficulties in sampling techniques ie the types of teaching materials students expect to help in learning the successive sampling techniques from the most recommended ones are: textbook, modules, manuals, visual teaching materials, learning videos and examples of questions.

Furthermore, more about the textbook, students suggest the elements that should be present in a textbook, namely: definitions, procedures, examples of questions and discussion, decreasing formulas, learning instructions, competencies achieved, theories and supporting information, practice exercises, and student worksheets.

4. Conclusions
Based on the descriptions in the previous section, some things that became conclusions related to the identification of students' learning difficulties in sampling techniques courses as follows:

1. The students have difficulty in terms of contents respectively: the two stage sampling, systematic sampling, cluster sampling, stratified sampling.
2. The students have difficulty in terms of the procedure of taking samples, rationality (concepts) underlying the estimation formula used, using estimation formulas in problem solving, choosing the right sampling method in problem solving.
3. The Reasons of Students Why They Have Difficulty respectively: rarely study at home, Textbooks (teaching material) are difficult to understand, few learning resources, and the other reasons.

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