Analyzing Student's Errors in Resolving Questions of Statistics Education in Pokjar Boja, 2018.1

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Abtract

Lecturers are required to be able to analyze errors in working on the problem along with the causative factors. Through an analysis of errors in doing some exercises, it can be used as a basis in conducting the process of delivering material in the next learning. Through implementing true and mature concepts, students will not face difficulties in applying the material learned. Based on the observations, there are still many students who get difficulties in doing the exercises of Education Statistics course. Besides, students of Universitas Terbuka in Kaliwungu 2017.2 are lack of learning outcomes in education statistics courses, 2). many students, but do not apply it in learning , 3). Many students do not pass the Education Statistics course. Based on these problems, it is necessary to conduct research related to the analysis of student's errors and the causal factors in solving the Satistika Education problem. The purpose of this study is to find out the errors and causal factors in solving the questions in the Educational Statistics material. The subject of this research is UT students Semarang 2018.1 in Pokjar in Boja Subdistrict, Kendal Regency. The type of this research is descriptive qualitative research. Based on the analysis of student's errors in the Education Statistics subject, conclusions are obtained 1). There are 4 student errors, namely: a). conceptual error, b). procedural error, c). Computation / calculation errors, and d). Errors in drawing conclusions; 2). The most mistakes of the students happened on procedural errors; 3). The students'learning difficultiesare caused by the material is large and complex and the time is limited.

Keywords: Keywords: Error Analysis, Implementing Concepts, Educational Statistics

Introduction

Lecturers are required to be good facilitators in the learning process. In addition, the lecturer is responsible for evaluating learning outcomes and learning progress and making a careful diagnosis of the difficulties and needs of students (Kristayulitan and Nurhardiani, 2011). Analysis is not only a difficulty in learning but an error in working on the problem and its causes. Through an analysis of errors in working on the problem, it can be used as a basis in conducting the process of delivering the next learning material. Errors made by students generally lie in the use of formulas, understanding or the ability to digest mathematics, and the ability to apply concepts (Kristayulitan and Nurhardiani, 2011).

Mathematics is one of the disciplines that can improve the ability to think and argue, contribute to solving everyday problems and in the world of work, and provide support in the development of science and technology (Susanto, 2013). Mathematical characteristics have an abstract object of study in this case a teacher is required to be able to instill the concept correctly. Understanding of concepts in learning is important because concepts are building blocks of thinking and the basis for higher mental processes and are useful for formulating principles and generalizations (Dahar, 2006). If planting concepts is correct and mature, students will not experience difficulties in applying it. In mathematics learning there is some knowledge that must be mastered by students, one of them is conceptual knowledge and procedural knowledge. According to Ariska (2015) Conceptual knowledge is the basis of one's understanding of something including facts, concepts, definitions and formulas. Procedural Knowledge is the knowledge of algorithms or task completion procedures that can be given through demonstrations exemplified by the teacher (Ramlah et al., 2013). Both of these abilities must be possessed by students in studying the material at the Educational Statistics course.

Through the Education Statistics course students are expected to be able to apply statistics in everyday problems. The

application of statistical education can be done at 1). Learning statistics in elementary school, 2). Making statistical descriptions in school data, or 3). Implement statistics on student research such as PTK , quantitative research and the making of PKP. The subject of this lecture discusses basic knowledge of statistics, presenting data in the form of tables and diagrams, concentration measures, location, and dispersion, slope size and size of normal curve curves, hypothesis testing, simple regression analysis and correlation.

Based on observations on UT students in Kaliwungu teaching in 2017.2 it was concluded that 1). Students' learning outcomes in education statistics courses are lacking, 2). many students can only absorb theory, but do not apply it in learning, 3). Many students do not pass the Education Statistics course. Based on these problems there are several factors that cause these problems, namely 1). Material in the Statistics Education course has a high level of difficulty, especially in statistical test material, 2). Some statistical material has never been obtained before, 3). Statistical materials are not used directly in school learning. The student's difficulties are the same as those presented by Marron (1999), Statistics are wrong one subject that is considered difficult by students. So to overcome the problem of learning by emphasizing contextual learning through complex activities (Purnomo, Rohman & Budiharto, 2015)

In making student's mistakes there are some mistakes made. According to Kastolan (Sahriah, et al., 2012: 3) errors in mathematics are divided into two, namely conceptual errors and procedural errors. Whereas according to Putro and Darminto (2015) errors in completing basic statistical questions are: 1). Error understanding questions, 2). Errors in understanding / interpreting the command questions, 3). Computational errors / calculations in the form of errors in entering data in writing, 4) Errors in drawing conclusions. Based on previous errors, in this study focus on four errors, namely 1). Conceptual errors, 2)

procedural errors, 3). Computational errors / calculations, and 4). Errors in drawing conclusions. Based on these problems it is necessary to conduct research related to the analysis of student errors and causal factors in solving the Satistika Education problem.

Research Methodology

Based on the problems studied, this type of research is a qualitative descriptive study. The subject of this study was UT Semarang students 2018.1 who took Education Statistics courses. The implementation of the study used Pokjar in Boja district Kendal district. The data collection of this study used the following methods: 1). Interview method: interview is used as a technique of collecting data if researchers want to conduct a preliminary study to find problems that must be examined (Sugiyono, 2011). Researchers conduct interviews with students relating to the implementation of the subject matter of Statistics Education as well as its constraints, 2). Angles: questionnaires are data collection techniques carried out by giving a set of questions or written statements to respondents to answer them (Sugiyono, 2011). 3). Observation: observation is a complex process, a process that must be composed of various psychological and biological processes (Sugiyono, 2011). The observation is carried out on the Satistika Education lecturing process and the obstacles. Student's error analysis used the results of the tutorial 1, 2, and 3 assignments. The next steps in analyzing the data in this study include: data reduction, data presentation and drawing conclusion.

Finding and Discussion

In this study the data were obtained through triangulation techniques, both technical triangulation and source triangulation. The data was then analyzed through stages of data reduction, data presentation, and drawing conclusion. The data were descriptive of the types of errors in completing Tutorial Tasks 1, 2, and 3 along with the causes of the error. From the analysis of the errors then reinforced

by interviews with students related to the causes of errors. Furthermore, at the end of the student was given a questionnaire about the difficulties in studying the material in the Education Statistics course. Errors in Educational Statistics on the material of the basics of analysis are rounding numbers. Examples of errors made by students when rounding up the numbers are 74,500. Many students answer 75 Even though the correct answer is 74. This is because many students consider rounding 5 . Even though it is wrong because in rule 3: if the number of numbers omitted is equal to 5 and followed by zero all then the observed number of numbers that precedes if the number is even then fixed and if odd increases one (Hamid et al, 2011). This error is in the category of concept errors. In the material the number notation there are students who are less precise in the calculation process, for example in the problem $\sum_{i=2}^{5} 2x^2 - x + 2$. Conceptually, students can already, but in entering numbers in the calculation there is still something wrong. This error occurs which should include the value i = 2, but there are still students who start the number i from 1. In addition there are also students who are wrong in the calculation process. This error belongs to the category of computing / calculation errors.

The next mistake was made by students in searching for group data mode. In searching for group data using the formula $M_0 = Bb_{mo} + P\left(\frac{b1}{b1+b2}\right)$. Student's error is in determining b1 and b2. It should be that b1 is the frequency difference containing the class mode with the previous class frequency and b2 is the frequency difference that contains the class mode with class frequency afterwards. in this section it is categorized as procedural error. This error also occurs when searching for the median $M_e = Bb\,me + p\left(\frac{\frac{n}{2}-F_{me}}{f_{me}}\right)$. The mistake made by students is that there are some students who do not understand the frequency (f_{me}) and the cumulative frequency (F_{me}). This is categorized as a procedural concept and error.

Students' error in the material uses the chi square distribution ($\chi2$). Many students have difficulty finding the settlement area. Determining the values of χ^2 so that the total area from χ^2 to the left and χ^2 right is equal to 0.05 and it is known dk = 9! Many students think that the shape of the curve is sehingga2simetric so that it considers its area Area I = Area II. In this question many students have difficulty due to curves (χ^2) not symmetrical so that students have difficulty determining it. The broadest possible curve can be 1). Area I = 0.03 and Area II = 0.02, or vice versa, 2). Area I = 0.015 and Area II = 0.035, or vice versa, 3). Area I = 0.005 and Area II = 0.045 and there are many other possibilities. Therefore, in a more in-depth analysis is needed to determine the resolution. Student's errors in this case are categorized as procedural errors.

Errors in choosing and using hypotheses are experienced by students. In applying a problem students are still confused in using the test. Do you use the t test or z test? This error occurs which will cause students to misread the distribution table list. The results of reading the distribution list will then be used to operate with other data in search of confidence intervals. Errors in choosing and using problem solving concepts are caused by students not knowing when to use the concept of z test or t test. This is categorized as procedural error.

The next error is in the homogeneity test. In calculating homogeneity tests students have mastered the concept of testing and doing calculations well. But in making decisions there are some students who are wrong. Students have been able to calculate the variance (variety) of each class and can calculate Fcount. But in testing there are two criteria, namely 1). If the value of $F_{(1-\alpha/2)(v_1,v_2)} < F_{count} < F_{(\alpha/2)(v_1,v_2)}$ then H₀ is accepted which means both classes homogeneous and 2). If the value of $F_{count} < F_{(1-\alpha/2)(v_1,v_2)}$ atau $F_{count} > F_{(\alpha/2)(v_1,v_2)}$, then H₀ is rejected which means the two classes are homogeneous.

Many students have difficulty finding $F_{(1-\alpha/_2)(v_1,v_2)}$ and at this stage of drawing conclusions many students are turned upside down. This error can occur, because students are not careful in understanding the material of the Homogeneity Hypothesis Test. This homogeneity test includes errors in the category of procedural errors and conclusions. The causes of errors in the material of Educational Statistics can be categorized into 4, namely: 1). Concept errors made by students on rounding material This happens because students do not fully understand the concept of rounding numbers consisting of 3 propositions. The concept error also occurs in the concentration measure material (median and mode) this occurs because students have not mastered the concept of the median formula and mode.2). Error in the category of computing error / or calculation occurs in material number notation. This happens because students are not precise and thorough in the calculation process 3). Procedural errors are made by students on the concentration measure material (median and mode), this occurs because in the median material students cannot distinguish the frequency (f_{me}) and the cumulative frequency (F_{me}). In the material the student mode is still having difficulty finding b1 and b2. Procedural errors are also experienced in the material using khi squared distribution (χ^2) and hypothesis testing.

Based on the results of observations and interviews, many students have difficulty in learning the material of Education Statistics because 1). There are several Educational Statistics subject matter that have never been obtained by students, namely testing the research hypothesis (z test, t test, F test, χ^2 test), regression analysis and correlation and application. 2). In testing there are many tests including z test, t test, F test, and χ^2 test) along with their tables and curves each of these makes students unable to distinguish when to use the test in solving the problem. 3). There are many formulas such as searching for average,

mean, median, mode, quartile, decile and percentile values and there are single and group data types. 4). Statistics Material Education has a very high level of difficulty so it requires high analysis and long enough understanding, 5). Time limitations in studying the material because it was only held in 8 meetings.

Conclusion

Based on the analysis of student's errors in the Education Statistics course, it can be concluded that:
 a. There are four student's errors, namely: 1). conceptual error, 2). procedural error, 3). computation / calculation errors, and 4). Errors in drawing conclusions,
 b. Most mistakes are made by students on procedural errors,
 c. Difficulties of students learning the material of Educational Statistics because the material is large and complex and the time is limited.

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