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STUDENTS' DIFFICULTIES IN USING STATISTICS FORMULA TO ANALYZE RESEARCH

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ABSTRACT

The paper entitled *Students' Difficulties in Using Statistical Formula to Analyze Research Data* is written to analyze the students' difficulty in using statistical formula and the causes of it. This research is conducted to the last semester students of English Education Study Program, Faculty of Teacher Training and Educational Sciences, Pakuan University. Nine students are chosen as the participants. In conducting this research, descriptive method is used. Documentation, questionnaire, and interview are used to collect the data of this research. The result of the research shows that the students get difficulties in using statistical formula especially in calculating and interpreting research data. It can be seen from the data of students' paper. Besides, they get difficulties in using comma in the high number. In addition, they also get difficulty in comparing between r table and r calculated. Moreover, there are some causes of their difficulties in using statistical formula to analyze research data. First of all, the students calculate the research data carelessly. Second, they are rarely read book about statistics and research. Third, they rarely practice calculating research data and they rarely ask the lecturer about what they do not understand.

Keywords: *difficulties, statistical formula, research data*

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ABSTRAK

Skripsi yang berjudul "Students' Difficulties in Using Statistical Formula to Analyze Research Data" ditulis untuk menganalisis kesulitan mahasiswa dalam menggunakan formula statistik beserta penyebabnya. Penelitian ini dilakukan pada mahasiswa semester akhir program studi Bahasa Inggris, Fakultas Keguruan dan Ilmu Pendidikan, Universitas Pakuan. Sembilan mahasiswa terpilih menjadi responden penelitian. Metode deskriptif digunakan dalam melakukan penelitian ini. Dokumentasi, questionnaire dan wawancara digunakan untuk mengumpulkan data dalam penelitian ini. Hasil penelitian menunjukkan bahwa mahasiswa mendapat kesulitan dalam mengkalkulasikan dan menginterpretasikan data penelitian. Hal itu dapat dilihat dari data skripsi mahasiswa. Selain itu, mereka mendapat kesulitan dalam menggunakan koma dalam empat digit number. Sebagai tambahan, mereka juga mendapat kesulitan dalam membandingkan antara r table dan r kalkulasi. Bahkan, ada beberapa penyebab atas kesulitan mereka dalam menggunakan formula statistik untuk menganalisis data penelitian. Pertama dari semua, mahasiswa kurang hati-hati dalam mengkalkulasikan data penelitian. Kedua, mereka jarang membaca buku mengenai statistik dan penelitian. Ketiga, mereka jarang berlatih mengkalkulasikan data penelitian dan jarang bertanya kepada dosen mengenai hal apapun yang mereka tidak pahami.

Kata Kunci: kesulitan, formula statistik, data penelitian

BACKGROUND OF THE STUDY

Most people would already quite familiar when hearing the word of statistics. Huang (2012) in his journal indicates that statistics can be interpreted as a way or rules relating to the collection, processing (analysis), conclusion on data that form the numbers using a certain assumption. It means that statistics is the science that relates to the numbers. Statistics have many benefits for life, science, law, health, business, social, government and education. Nowadays, statistics is used in education to measure the students' achievement.

Statistics subject in education is needed, especially for university students. They need statistics to interpret data for writing paper, thesis or dissertation and the knowledge of statistics is used in preparing the research methodology. This subject is not very important for students of Economics or Math faculty, but also important for students of English Education Study Program, mainly for students of sixth semesters, particularly in the material of quantitative research of Research on ELT subject. Although study of statistics is very important for them, but they still find difficulties to understand it.

Most of the students of English Education study Program still find it difficult to calculate statistical formula for their research paper, and their difficulties, it causes of some reasons. First, they calculate

the research carelessly. Second, they rarely read books about statistics. Third, they rarely practice in calculating the data. Then, they rarely ask the lecturer about what they do not understand about statistical formula.

This research focuses on investigating students' difficulties in calculating and interpreting statistical data of quantitative research using product moment correlation.

In choosing the topic, there are two reasons of it. First, the research is inspired by other researchers such as Ghinis, Korres, and Bersimis who have done this research previously at Piraeus University. The research of Ghinis, Korres and Bersimis becomes the reference to conduct the same research to the students of last semester of English Education Study Program, Faculty of Teacher Training and Educational Sciences, Pakuan University. Besides, based on the writer's pre-observation, some students of English Education Study Program said that statistic subject is one of difficult subjects. So, the writer want to know the difficulties and the causes of their difficulties in using statistical formula to analyze research data.

The research questions of this study are :

1. What are the students' difficulties in using statistical formula of product moment correlation to analyze research data?

2. What are the causes of students' difficulties in using statistical formula of product moment correlation to analyze research data?

Difficulties in Using Statistical Formula

Difficulties are the state or quality of being difficult in doing something that hard to be understood because of the obstruction. Students who face difficulties mean they are in trouble or have problem on their behavior about something that they think hard to do or to understand.

Bird in Rumayati (2011: 05) "Difficulty is something hard to do or to understand". It means that difficulty is factor that makes someone not easy to do or to understand something.

According to Irdiyansyah (2015: 227) in *Jurnal Ilmiah Pendidikan*, entitled "Students' Difficulties in Analyzing Experimental Statistics Data" negative response to statistics are common among undergraduate students enrolled in a statistics lecture. Moreover, they are confused to calculate statistical formula into their research paper especially for those who conduct quantitative research. They still do not understand how to use statistical formula accurately and do not understand how to use statistical formula to analyze their research data. Students do not only get difficulties in calculating the data, but they also get difficulties in collecting the data that relates to their research data. According to Ghinis et al (2009: 5), there are some difficulties that students face in using statistics. They are:

- a. Difficulty in understanding basic statistical concept
- b. Difficulty in understanding assumptions and conclusions in statistical problems,
- c. Difficulty in designing a method of solution,
- d. Difficulty in applying the appropriate statistical methodology and formulas,
- e. Difficulty in checking the validity of the method of solution,
- f. Difficulty in applying known statistical methodology in real life situations and problems,
- g. Difficulty in interpreting statistical results,

- h. Difficulty in performing mathematical operations for obtaining results.

Besides that, there are other factors that affect students finding or having difficulties on their behavior in learning something. They are internal and external factors. According to Wirawan (2009) in Wahyono (2015: 1) the factors of learning difficulty is divided into two kinds: Internal factor such as physiology and psychological, and external factor such as social and non-social factor. It means that the internal factor that make students get difficulty is caused of lack of knowledge base, poor problem solving ability, difficult in organizing information, and poor behavior such as tardiness, absence, lack of enthusiasm or commitment, and poor motivation.

Statistics of Education

Statistics of education is a science which specifically discuss about the way how to collect, analyze and interpret the data and also a science that studies and develops numeric information material relating to education and conclusion of making predictions and scientific forecasts. Sudijono (1999: 8) states the term of statistics can be made to understand as statistical data, statistical activities, statistical methods and statistical science. The word statistics in the term of statistics of education is a science that discuss or study and develop the principles, methods and procedures that need to be taken or used, in the framework of collecting, preparing, presenting, analyzing material information used for the collecting, preparation, presentation, analyzing numeric information material on matters that relating to education.

The Characteristics of Statistics

In education, every subject has the characters, including statistics. Basically, statistics as science has three characteristics. According to Sudijono (1999: 5) indicates some important characteristics of statistics are as follow:

- a. Statistics always linked with numbers or calculation (Quantitative data). In other word, to carry out the duties, statistics need material

information, and it is quantitative. In that regard, if statistics desired to be used as a tool to analyze qualitative data (example material information that is not tangible number or calculation), the first qualitative data should be changed or converted into quantitative data.

- b. Statistics are objective. It has the sense that statistics always correspond to its object. The conclusions being addressed by the statistics as a science based purely on numerical data encountered and processed, and not based on subjectivity or other outside influences. That is why the statistics are often said to be a true assessment tool.
- c. Statistics are universal. This implies that the scope or space and the field of statistics is not narrow, statistics can be used in almost all branches of human life activities. It means that three characteristics are the important things in statistics that should not be forgotten.

It can be concluded that statistics has three characteristics: statistics is always linked with the number, statistics is objective and statistics is universal.

The Function of Statistics in Research

One of characteristics of quantitative research is the function of statistics. The functions of statistics in research are various. Budi Yuwono (1987, in Subana, Rohadi and Sudrajat, 13: 2000) mentions some functions of statistics:

- To describe the data in some form, so obviously simplifying complex data easy to understand (graphs, charts, on average, percentage, or in the coefficients),
- To make a comparisons
- To measure the magnitude of phenomenon (social, economic)
- To determine the causal of relationship (for prediction).

It means that, the function of statistics is that it can solve research problems such as describing the data, comparing the data, measuring and determining the sample, so the research can

be conducted efficiently in accordance with the object that will be observed.

Analysis

In research, an analysis is needed to investigate the information that is going to be observed. Therefore, any information is investigated to find out relation, causes, and solutions. Rosset et al (2001: 25) An analysis is getting information to solve problems in the cooperation, going out and seeking opinion on optimal, actual, feeling causes and solution. It means that an analysis is investigating the information to gain the solution by find out the opinion and causes.

On the other hand, an analysis is one of qualitative research which is conducted with human relations in real situation. According to Miles (1994: 6), "Qualitative research is conducted through an intense and/or prolonged contact with a field or life situation". It means that an analysis is one of qualitative research which is communicated with people in real life situation.

As a point of the statement above, analysis is one of qualitative research and it is the process of research where the investigation requires the data collected and observed to obtain results and an accurate understanding.

Research Data

Research is a search, an inquiry or investigation of new knowledge, or at the least and a new arrangement or interpretations (exegesis) of new knowledge. The method may be used scientific or not, but the views must be critical and procedural. According to Emzir (2010: 10) research is an investigation that is careful and critical in finding facts and principles, a very astute inquiring to establish something. It means that research is an investigation that should be done very carefully and critically to obtain facts.

RESEARCH METHODOLOGY

Descriptive method is used in this research. The instruments to collect the data are documentation, questionnaire and interview. The documentation is taken from

the students' paper. Questionnaire is used to find out students' difficulties in using correlation statistical formula. The interview is recorded and transcribed, and it is collected to enrich the data that are obtained.

This research is conducted to the students of English Education Study Program, Faculty of Teacher Training and Education Sciences, Pakuan University who are done the research. To choose the participants, purposive sampling technique is applied and the students who write the paper with quantitative approach are chosen as the participants.

RESEARCH FINDING

1. Data from the Documentation

Chapter IV from students' paper as documentation is collected to obtain the data. The writer analyzes the mistakes made by the students. The analysis shows that the respondents still had some difficulties. They are: difficulties in calculating or counting the number, difficulties in using comma, and difficulties in getting the appropriate result.

The highest total in calculating the number is 336 from Respondent #4. There are 274 numbers that did not using comma from Respondent #1. There are six incorrect result made by respondent #7. The result of this table is divided into three types: the result of calculating the data, calculating the mean, and calculating the calculating the correlation coefficient.

2. Data from the Questionnaires

Closed questionnaire is used to gain the other data. It is distributed to the nine participants. It consists of 11 statements which have two alternative answers, *yes* or *no*. It is done to obtain the information about students' difficulties in using statistical formula to analyze research data. There are four indicators in the questionnaire. First, students' difficulties. Second, the causes of students difficulties. Third, students' motivation. Last, students' understanding.

a. Students' Difficulties

The first indicator is students' difficulties in using statistical formula to analyze research data. The purpose of this category is to find out its

difficulties. In this category the writer divides it into five statements where almost all of the respondents agree with each statements.

b. The causes of students' difficulties

The second indicator is the causes of students' difficulties in using statistical formula to analyze research data especially in calculating and interpreting. The purpose of this category is to know the causes of its difficulties. The writer divides the indicator into six statements where the respondents are agree with four questions and disagree with two questions.

c. Students' motivation

The third indicator is students' motivation. There are fifth statements in this category where almost all of the students disagree with those questions.

d. Students' understanding

The fourth indicator is the students' understanding. in this category, there are four statements where almost all of the respondents disagree with those questions.

DISCUSSION

The first difficulty in using statistical formula to analyze research data using product moment correlation is the difficulty in calculating the numbers of data. For example, some of them still difficult in multiplying the number of variable X and Y. It can be seen from their work.

No.	X	Y	X ²	Y ²	XY	r
1	42	82	-12.2	1.5	-17.8	149.63
2	53	77	-1.2	-5.5	4.4	1.52
3	38	82	-16.2	1.5	-23.6	265.44
4	47	75	-7.2	-5.5	40.1	52.50
5	44	80	-10.2	-0.5	5.6	104.70
6	58	82	3.8	1.5	5.5	14.20
7	51	80	-3.2	-0.5	1.8	10.45
8	44	80	-10.2	-0.5	5.6	104.70
9	47	82	-7.2	1.5	-10.5	52.30
10	68	82	3.8	1.5	5.5	14.20

Figure 4.1
Example of students' work

It is supported by the statement of the questionnaire that seven students (77.77%) admit that they find difficulties because they rarely practice to calculate the data.

Using coma in numbers is the second difficulty that the students face in calculating and interpreting the data. Some of them still confuse in differ between coma and point. Student should use a comma for four digit numbers, but some of them still use point. It can be concluded that they still confuse the use of comma and point in numbers. The factors affecting their difficulty in using comma is they have using statistics and research book. It can be seen from students' work:

The Students' Understanding of Pattern Organization in Writing and Translating Score

N	X	Y	X ²	Y ²	XY
1	75	92	5625	8464	6900
2	75	70	5625	4900	5250
3	88	84	7744	7056	7392
4	66	90	4356	8100	5940
5	75	80	5625	6400	6000
6	75	88	5625	7744	6600
7	75	88	5625	7744	6600
8	58	93	3364	8649	5394
9	83	84	6889	7056	6972
10	58	76	3364	5776	4408
11	75	88	5625	7744	6600
12	75	92	5625	8464	6900
13	75	80	5625	6400	6000
14	75	92	5625	8464	6900
15	75	88	5625	7744	6600
16	66	93	4356	8649	6138

Figure 4.2
Example of students' work 2

It is also proven from the percentage, there are 77.77% students who answered that they rarely read statistics book so they have lack of knowledge.

The third difficulty is getting the appropriate result. Most of the respondents doing the mistake by getting inappropriate result. It cause that they are wrong in calculating the previous number, it can be seen from the respondent 2, 4, 5, 6, 7, 9. Then, they are also wrong in calculating the square root. As shown in students' work of respondent 1, 4, 6, 7, 9. This is one of students' work from respondent #6.

$$\begin{aligned}
 r_{xy} &= \frac{N(\sum XY) - (\sum X)(\sum Y)}{\sqrt{[N(\sum X^2) - (\sum X)^2][N(\sum Y^2) - (\sum Y)^2]}} \\
 &= \frac{73(339,925) - (5,028)(4,837,5)}{\sqrt{[73(352,496) - (5,028)^2][73(332,656,25) - (4,837,5)^2]}} \\
 &= \frac{24,814,525 - 24,322,950}{\sqrt{25,732,208 - 25,280,784} \cdot \sqrt{24,283,906,2 - 23,401,406,2}} \\
 &= \frac{481,575}{\sqrt{451,424} \cdot 882,500} \\
 &= \frac{481,575}{631,283,52} \\
 r_{xy} &= 0,762
 \end{aligned}$$

Figure 4.4
Example of students' work 3

On the other hand, it is also supported by the statement of the questionnaire where 5 students (55.55%) admit that they find difficulties because they do not carefully and serious in calculating, interpreting and analyzing the data.

3. Data from Interview

a. Interview with the students

The last step of collecting the data ware interview to get more information. It was used to assure students' answer in the questionnaire. The result of the interview is described as follow.

1) Students' difficulties

In this category, students' difficulties are classified into two questions. These question shows the confession from students where they find difficulties in calculating and interpreting the research data using product moment correlation. They find any different difficulties. Many samples make the students difficult to count them in detail. Besides, counting or calculating the data should be done careful, but they found different result when recount them. There are a lot of formulas that make them feel confused to take. The difficulty also comes in analyzing the students' work. The next one is calculating rubric score because of many

samples. it can be conclude that they get difficulty in calculating and interpreting the research data using product moment correlation.

2) **The causes of students' difficulties**

The question concern in the factors that make students difficulties in calculating and interpreting research data using product moment correlation. They answered that they rarely read about the formula, they careless in calculating and interpreting the data, lack of information and lack of sources. They also do not have a lot of practices and the formula of correlation is too long. It can be concluded that all respondents have different answers and different factors of their difficulties.

The second question shows that most respondents have the same answer that they often misused the statistical formula in calculating and interpreting research data. It can be concluded that from the second question of this category most participants still make a mistake and they still confuse in using formula statistics.

The third question tells about students' experience in learning statistics especially about product product moment correlation. They have statistical lecture but it is only taught once and easy to forget. It makes them hard to apply it.

Furthermore, another factor that can make students get difficulties. It is difficulty in counting the numbers where they need to compare the result of research with r table to find the relation between variable X and Y .

3) **Students' Motivation**

The question shows that most respondents do not have

quite enough to learn the subject only one semester. They also do not quite enough like it and make them have low motivation. The lecturer also only gave the material at a glance and rarely taught them. It makes them still find difficulty in using statistical formula to analyze research data.

4) **Student's Understanding**

In this category, students' understanding are concerned. Based on the result of interview they are able to interpret the data if the answer is correct and appropriate. They may find it right if they are helped by lecturer and their friends. They also ensure the result of their research by checking it more than once.

CONCLUSION

After conducting the research entitle "Students' Difficulties in Using Statistical Formula to Analyze Research Data", the researcher concludes that there are some students who still get difficulty in using statistical formula. It can be seen from students' paper in calculating and interpreting the data. There are some difficulties found by the students. They are: difficulty in counting the numbers, difficulty in using comma, difficulty in comparing r table and r calculated, difficulty in applying formula statistics, and difficulty in getting the appropriate result.

There are some causes of these difficulties. The first, many samples that should be calculated by students. So, it makes them are not carefully. The second, some students are have lack of reading the statistics book. The third, some students are still lack in counting the numbers and lack in practice calculating the research data. To apply the appropriate formula. The last, they rarely ask the lecture about what they do not understand. Timing to learn statistics is not enough if it is given only one semester also become the causes of students' difficulties.

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BIOGRAPHY

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