

# Internal Factors of Statistical Learning Outcomes

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**Abstract:** Statistics Courses in higher education Known as compulsory subjects that students do not like. This research aims to identify internal factors of student were affected learning outcomes of statistics courses at education faculty, Jakarta state University. The population of this research are students who takes a statistics course. cluster random sampling used as technique Sampling. Data were collected from 320 students using perceptual instruments on statistics courses, interest in learning statistics, and learning outcomes in statistics courses. Result showed most of students (76,1%) have a negative perception on statistics course, and only 23,9% have a positive perception. Students also have a low self-interest on statistics courses. most of students (86,2%) have an average interest on statistics course, and 15,22% have a low interest on statistics courses, and only 0,2% students who have a high interest on statistics courses. these factors, which is perception and interest on statistics courses caused a low learning outcome on statistics courses. Results showed that only 4% students were passed the passing grade, and the others (96%) were not passed the passing grade. This result stimulating researcher to evaluate a statistics course comprehensively.

**Keywords:** education leadership, higher education, student character

## I. INTRODUCTION

In developed countries such as America and Japan, statistics has long been developing rapidly in line with the progress of economics and engineering. In fact, the development of a country is influenced by the application of statistical science in solving development problems and development planning. Japan is one of the countries that has succeeded in applying statistics in various fields such as car product design planning and marketing mastery strategies in various countries. Japan has successfully combined statistics with economics, product design, psychology and sociology in various countries to predict and analyze consumer behavior so that Japan has been able to master the world economy.

Japan's success in the application of statistics, especially the science of opportunity (probability) appears in designing and marketing its products such as cars, motorcycles, electronic goods and other products. According to Boediono and Koster (Bainar, 2004) the result was achieved because of the success of education in Japan in statistical subjects that were widely given from high school to college. In fact, to support statistics courses, Japanese universities require students in various majors to study mathematics. Thanks to the success of education and widespread publication in statistical knowledge, statistics has become part and culture of Japanese society.

Unfortunately, not all countries like Japan. At many universities still not able to produce students who can use statistics as an analytical tool in their research. Studies conducted by Bainar show that there is relation between complexity and miss analyzed conducted. More complex of using statistics as an analytical tool in research make miss analyzed more often (Bainar, 2004). The low quality of mastery and understanding of statistics and the sciences related to research, is thought to be the cause of the low intensity of the use of statistics as an analysis tool and the high level of error in the use of statistical methods in analyzing research data. In line with Baina's findings, Richard Hindls and Stanislava Hronová found that the

consequence of this lack of popularity is that statistics is not subsequently used sufficiently in practice. Even if it is, such use may be incorrect or much reduced, with problems such as inadmissible generalizations and naive or even erroneous interpretations of data (Hindls & Hronová, 2015). This reinforces the natural consequences of disappointment about the potential of statistics.

Badrujaman (2008) study of the relationship between statistical ability and statistical value obtained found that there was no relationship between the value obtained in statistics courses and statistical capabilities possessed. in statistics courses students generally graduate with good grades or even very good, but apparently have a low mastery of statistics courses.

Many researchers pay attention to the factors that influence learning outcomes in statistics courses. Most studies pay attention to external factors (outside of students) that affect learning outcomes. studies that seek to explore external factors focus primarily on the curriculum of the course, and its learning model (Carr, 2008; Ijeh, 2013; Kanyongo, 2011; Matthews, 1997).

Learning outcomes are an accumulation of various factors, both internal and external. Identification of external factors is not enough, because the problem may not only be on the external dimension, but also internal dimensions. For this reason, this study focuses on identifying internal factors that influence statistical learning outcomes in the eye. Statistics is a compulsory subject that is studied by almost all students in various study programs, including education (UNJ academic manuals, 2017). This "compulsory" course status makes students have no reason not to take it. Even so, it is no longer a public secret to know that many students do not like this statistics course. The author's experience teaching this statistics course, both in the undergraduate program and the Postgraduate Program shows the impression of "disliking" students towards this subject at the beginning of the lecture. Correspondingly, Ulpah revealed that many circles, especially students, viewed statistics as a subject that was very difficult, boring,

dizzying, creepy, even frightening so many students were trying to avoid the course (Ulpah, 2009). Even Richard Hindls and Stanislava Hronová said: we are not alone to realise, on the basis of long years of experience, that statistics is generally not a popular subject among university students. This seems to be the case in social sciences where we have most experience but also with the natural and technical sciences (Hindls & Hronová, 2015).

Based on the results of interviews with ten students of the Faculty of Education at the State University of Jakarta, it was found that students consider statistics courses to be difficult, full of numbers and calculations, and a tedious learning process. In fact, it is not only a negative response to statistics, interviews also show that most students do not have statistics and do not like to read statistics. The issue of interest in learning has long attracted the attention of academics and teachers included in statistics courses.

In general, discussions about interests can be divided into two major parts, namely individual interests and situational interests (Andreas Krapp & Manfred Prenzel, 2011). Individual interest refers to how the tendency of individual psychology to get involved in an object, event, or ideas from time to time along with their specific content. Individual interest is more eternal and tends towards behavior. This is the tendency that individuals carry from one thing to the next. For example, student A who has an interest in basketball and student B who has an interest in science has developed his interest in such a way that they carry this interest from one place to another.

In contrast, situational interest is an affective reaction that is triggered by certain stimuli in the environment. Research shows that situational interest can be increased through manipulation or modification of certain aspects of the learning environment and contextual factors such as teaching strategies, presentation assignments and structured learning experiences. Therefore, situational interest is a viable medium that can be used by teachers to motivate students who are not motivated and are not interested in learning. Unlike individual interests, situational interests are momentary and bound to the situation; in other words, it is a specific reaction in a situation such as a funny video clip, funny conversation, or colorful objects.

Schiefele, Krapp, Wild, & Winteler (1993) revealed that there are three main indicators in identifying learning interest, namely: (1) feeling-related valences; that is, conditions related to positive feelings (e.g. joy, pleasure, pleasant experiences); (2) value-related valences (degrees of value); referring to connecting the situation with personal interests; (3) intrinsic orientation (intrinsic orientation); that is, the motivations of beliefs expressed and demonstrated by one person and seen by others (Krapp, 1993).

However, individual and situational interests alike affect the learning process. In fact, research has shown that interest (both situational and individual) can increase attention, memory, perseverance in carrying out tasks, and efforts. In a meta-analysis of more than 150 studies examining the relationship between interests and performance, Schiefele, Krapp, & Winteler found that individual interests correlated with academic performance

and laboratory performance ( $r_s = 0.31$  and  $0.27$ , respectively). From this perspective, then, interest seems to play a very important role in the learning process and academic achievement (Krapp, 1993). Based on the above explanation, it is important to conduct research that can uncover internal factors. thus, the purpose of this study was to determine whether perceptions and interest in learning of statistics courses became an internal factor that influenced the learning outcomes of statistics courses at the Faculty of Education in Jakarta State University.

**II. METHODS**

Research on the internal factors of students that affect learning outcomes in statistics courses is carried out to identify some internal factors of students that affect learning outcomes in statistics courses, consist of; perceptions regarding statistics courses, and interest in learning statistics courses. There are 3 instruments that are used to measure 3 research variables, namely the instrument of perception of statistics courses, statistical interest in learning, and statistics learning outcomes.

**Instruments of Perception of Statistics Courses**

The instrument of perception of the statistics courses is in the form of a questionnaire with a 4-choice Likert scale of answer choices, namely; strongly agree, agree, disagree, and strongly disagree. The following is the instrument instrument’s perception of statistics courses (Table 1). The number of perception instruments is 18 items. The quality of perception instruments is in the good category as indicated by Cronbach’s alpha coefficient of 0.8.

**Table 1**  
**Blue print of perception of statistics courses**

<b>Indicators</b>	<b>Descriptors</b>
Student responses to the subject matter statistics	Expediency
	Difficulty level
	Learning activities
	Lecturer
	Study material

**Instrument of Interest in Studying Statistics**

The questionnaire used in this study was taken from the Study Interest Questionnaire (SIQ) compiled by Schiefele, Krapp, Wild, & Winteler, (1993). The validity and reliability of this questionnaire was tested on 298 students. The original version of the questionnaire consisted of 3 indicators and 27 questions, but in the basic factors and analysis Rach finally obtained a concise version consisting of only 18 question items. The revised version produced worth consistency (Alpha = 90) and re-reliability tests (67 times in a 2-year period). To test the convergence, discriminant, concurrent, and predictive validity of SIQ, a number of additional variables have been assessed, (for example: intrinsic orientation motivation, extroversion, use of learning strategies, and achievement).

The results confirm that SIQ is a fairly valid instrument (Andreas Krapp, 1993). Study Interest Questionnaire (SIQ) or in the original version titled Der Fragebogen zum Studieninteresse (FSI) was carried out in several processes. Following are the instrument adaptation steps according to Hambleton, namely;

translating instruments into new languages, synthesis in translated versions, evaluating instruments that have been synthesized by experts, evaluating by target populations, and re-translating, trials (Ronald K. Hambleton & Liane Patsula, 1999). After going through the instrument adaptation process, the following displayed the instrument study interest grid (Table 2).

**Table 2**  
**Construct of Study Interest Questionnaire (SIQ)**

Aspects	No. Item
Degree of feeling	16, 18, 2, 12, 7, 6
Degree of value	8, 15, 14, 11, 5
Intrinsic orientation	9, 17, 1, 3, 4, 10,

**Statistics Student Learning Outcomes**

The statistical learning outcomes instrument takes the form of a multiple-choice objective test with 4 answer choices. The following is an instrument study instrument lattice of statistics (Table 3).

**Table 3**  
**Construct**

Indicators	Descriptors
Concept of variable and data	Definition of variable
	Type of data
Tendency central	Mean
	Median
	Modus
Variability	Range
	Interquartile
	Variants
	Standard deviation
Distribution of Standardize score	Normal curve
	Standardize score
	Distribution of Standardize score
Population, sample, and Technique sampling	Definition of population
	Definition of sample
	Sampling
Hypothesis testing	Concept of probability
	Statistic hypothetic
	Decision making of Hypothesis testing
Parametric statistic	Using correlation and regression
	Using t-test
	Using ANAVA
Non parametric statistic	Using spearman dan Kendall tau formula
	Using Wilcoxon Mann Whitney formula
	Using Kruskal Wallis formula
Required data testing	Normality testing
	Linearity testing
	Homogeneity testing

The number of points in the learning outcomes of statistics courses is 56 items. The quality of the learning outcomes instrument is in the good category as indicated by the item discrimination index of 0.7.

**Subjects Research**

This research was conducted at the Faculty of Education, Jakarta State University. The population of this research is FIP UNJ students who have taken statistics courses. The following data is FIP UNJ students who have taken statistics courses (Table 4).

Based on the Slovin formula, the minimum number of samples to be taken is 252 students. The sampling technique used is cluster random sampling, where the class becomes a cluster. So, from the 17 classes that

became clusters in the population, as many as 7 classes were taken representing each Department. So, the research sample in this study is show Table 5.

**Table 4**  
**Number of Student FIP which has Taken Statistics Course**

Department	Grade	Number of class	Number of students
Guidance and counseling	2016	2	80
Community education	2016	2	80
Education technology	2016	2	80
Early childhood teacher education	2016	2	80
Primary teacher Education	2016	5	200
Special education	2016	2	80
Education management	2016	2	80
<b>Total</b>		<b>17</b>	<b>680</b>

**Table 5**  
**Sample**

Department	Grade	Number of Students
Guidance and counseling	2016	40
Community education	2016	40
Education technology	2016	40
Early childhood teacher education	2016	40
Primary teacher Education	2016	40
Special education	2016	40
Education management	2016	40
<b>Total</b>		<b>320</b>

**III. RESULT AND DISCUSSION**

FIP UNJ Students’ perceptions of statistics courses. Table 6 shows a description of the perceptions of students at the Faculty of Education, State University of Jakarta who have taken statistics courses (Table 6).

**Table 6**  
**Profile Perception to Statistics**

Category	Percentage
Positive perception	23,9%
Negative perception	76,1%
<b>Total</b>	<b>100</b>

Table 6 shows that the majority of FIP UNJ students have negative perceptions of statistics courses. The negative perception held by most of these students is certainly not a positive condition. As we know that perception has an influence on learning outcomes. Bernaus and Gardner found that students’ perceptions of teaching strategies (attitudes toward the learning situation) with their motivation and their achievements in a large-scale survey (Wesely, 2012).

The description of students ‘negative perceptions of statistics courses as the findings in this study, further strengthens the findings of other studies that also find the number of students’ negative perceptions of statistics courses. Perception is formed because of the cognitive and emotional responses of individuals to the experiences they have. It may be that the negative perceptions experienced by students are due to unpleasant experiences while studying statistics. Statistics teaching experts have long been aware of this and are trying to build positive student perceptions of statistics courses in certain ways. Student Learning Interest in statistics courses. Table 7

shows an overview of the learning interests of students at the Jakarta State University School of Education who have taken statistics courses (Table 7).

**Table 7**  
**Profile Learning Interest Statistic**

Category	Percentage
Learning Interest – High	0,2%
Learning Interest – Adequate	86,2%
Learning Interest – Low	15,22%
<b>Total</b>	<b>100</b>

Table 7 shows that the majority of FIP students have moderate learning interest in statistics, the rest, have low learning interest, and very little. interest in learning that is not high for most students is certainly not a positive condition. As we know that interest is an important variable that has an influence on learning outcomes. meta-analysis of more than 150 studies examining the relationship between interests and performance, Schiefele, Krapp, & Winteler found that individual interests correlated with academic performance and laboratory performance ( $r_s = 0.31$  and  $0.27$ , respectively) a description of students ‘interest in studying statistics courses as found in this study, further strengthens the findings of other studies that also find a lot of students’ low learning interest in statistics courses.

**Table 8**  
**Profile of Statistics Learning Outcomes**

Category	Percentage
A above Passing Grade	4%
Below Passing grade	96%
<b>Total</b>	<b>100</b>

Based on table 8 above, it is known that student learning outcomes in statistics courses are very low. With a passing grade of 50, only 4% of students passed the passing grade with a score of no more than 60. The rest, 96% were below the passing grade. The findings of this study are in line with the findings of various other studies. A study conducted by Bainar (2004) shows that the intensity of using statistics as an analytical tool in research is apparently still low, and there is a tendency that the more complex the analytical tools used, the more errors are made.

The low quality of mastery and understanding of statistics and the sciences related to research, is thought to be the cause of the low intensity of the use of statistics as an analysis tool and the high level of error in the use of statistical methods in analyzing research data. In line with Bainar’s findings, Richard Hindls and Stanislava Hronová (2015) found that the consequence of this lack of popularity is that statistics is not subsequently used sufficiently in practice. Even if it is, such use may be incorrect or much reduced, with problems such as inadmissible generalizations and naive or even erroneous interpretations of data. This reinforces the natural consequences of disappointment about the potential of statistics. Many experts are trying to propose alternative solutions to the low learning outcomes of this statistics course. Some experts argue the low statistical learning outcomes because statistics courses are not taught contextually. For this reason, statistics courses must be taught based on phenomena based on reality (Carr, 1997,

2008; Kanyongo, 2011)). Contextualization of statistical material is not enough, some experts argue, the use of learning models needs serious attention. Learning models that actively involve students, provide students with opportunities to develop critical analysis skills, and the use of mind-based media are key to the success of statistics courses ((Hindls & Hronová, 2015; Paul & David, 1996; Redington & Russell, 2011))

#### IV. CONCLUSION

Based on the discussion of the research results that have been presented, there are several conclusions that can be drawn. First, student learning outcomes in statistical subjects are still very low. The low learning outcomes of statistics is influenced by internal factors of students who take these statistics courses. Negative perceptions of statistics courses have a relationship with the low achievement of statistical learning outcomes. Learning interest is also a factor that contributes to low learning outcomes. Based on these findings, of course it is necessary to conduct a thorough evaluation of the statistics lectures held at FIP UNJ.

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