

International Online Course

September 27th – December 27th 2021

Course title: Statistical Analysis in Educational Research

Number of Credit: 3

Introduction

Statistical analysis ability is one of the most important fundamental skills that should be possessed by today's students in higher education. This ability is very important because it is influential in the decision-making process both in daily life and its application in academic activities such as research. Statistics were used in education because of their statistical abilities related to evidence-based reasoning, especially with data analysis. Therefore, statistical analysis is very important to apply in a research procedure.

The Faculty of Education, State University of Malang present this course to provide participants with the knowledge and skills to understand statistical techniques and data analysis in educational research. The scope of this course will cover theories of descriptive statistics, basic concept of hypotheses testing, analysis of variance, inferential statistics, and parametric statistics as well as basic skill of SPSS (Statistical Product and Service Solutions). All the theories of the statistical technique will be equipped with study cases that relate to educational research context. This course will be started from September 27th, 2021 until December 27th, 2021.

This course is running during the covid-19 outbreak, therefore the course process will be presented through a full online learning system. The learning strategy that will be applied has been designed with an instructional system design approach that yield the learning process will run effectively and efficiently. Participants will get a different learning experience through the combining several platforms such as a web conference meeting platform, messaging platform, and learning management system platform.

Pre-requisite:

- 1) Have a personal computer or laptop
- 2) Have basic mathematical knowledge
- 3) Have stable internet connection

Credit Transfer and Non-Credit Program

This course offers credit transfer and non-credit programs. Participants who register for the credit transfer program will receive a transcript of credit and a certificate of completion. Participants registered in the non-credit program will only receive a certificate of completion. In order to pass this course, a participant must meet certain requirements.

Transcript for Credit Transfer

The transcript will be granted to participants who complete the assessment requirement below:

- 1) Attendance = 20%
- 2) Assignments= 20 %
- 3) Tutorial and practice = 30 %
- 4) Quiz = 30 %

Note: Participants registered in the credit earning program must participate in 80% of all activities.

DETAILED COURSE SYLLABUS

Theme 1 : **Statistics for Education**
Lecturer : Prof. Dr. I Nyoman S. Degeng, M.Pd
Position : Professor at Educational Technology Universitas Negeri Malang



Synopsis Statistics were used in education because of their statistical abilities related to evidence-based reasoning, especially with data analysis. The statistical technique used in data processing consists of many data analysis techniques. However, at this time there's still a need for classification and rules for determining the appropriate data processing method for "direct" experiments. This session aims to describe how statistical methods can present educational research data based on the purpose of data processing. The statistical data processing process doesn't stop at the statistical results stage, but the next process that must be continued is how to interpret statistical data. This session is expected to provide further understanding, not only related to statistical rules in educational research, but this session can improve the ability to interpret statistical data based on exposure to results and experience.

Learning Objective

1. Participant are able to discuss the role of statistics in educational research
2. Participant are able to discuss types of data in statistics and educational research
3. Participant are able to present an understanding of the relevance of statistics for educational research
4. Participant are able to analyze and interpret the meaning of statistical tests

Class Format : Presentation/Lecture
Learning Mode : Synchronous and Asynchronous Mode
Platform : Web conferencing platform, web messaging platform, learning management system
Learning Duration : 90 min
Meeting Frequency : 1

Theme 2 : Descriptive Statistics: Measures of Dispersion and Central Tendencies

Lecture : Prof. Dr. Bambang Budi Wiyono, M.Pd

Position : Dean at Faculty of Educational Universitas Negeri Malang



Synopsis Descriptive statistics are used to describe the basic characteristics of data in a study. Statistics provides a simple summary of the sample and is followed by the steps. Together with simple graph analysis, they form the basis of almost every quantitative analysis of data. Descriptive statistics can describe what is or what the data indicates. In conclusion, the use of descriptive statistics is only to describe what happens in the data collected. Descriptive statistics aim to: (1) provide basic information about the variables in the data set; and (2) highlighting the potential relationship between variables. Usually, there are two general types of statistics used to describe data: (1) A measure of central tendency that describes the central position of the frequency distribution for a data set; (2) A measure of spread that summarizes a group of data by explaining how to spread the scores.

Learning Objective

1. Participant are able to describe frequencies and descriptive statistics
2. Participant are able to explore function
3. Participant are able to use the data transformations

Class Format : Presentation/Lecture

Learning Mode : Synchronous and Asynchronous Mode

Platform : Web conferencing platform, web messaging platform, learning management system

Learning Duration : 90 min

Meeting Frequency : 1

Theme 3 : Basic Concepts of Hypothesis Testing in Educational Research
Lecture : Prof. Dr. H. Punaji Setyosari , M.Pd, M.Ed.
Position : Professor at Educational Technology Universitas Negeri Malang



Synopsis In general, a hypothesis is a tentative assumption in research that contains a prediction of the research findings. A hypothesis is not just an assumption, it should be based on existing theories and knowledge. After the hypothesis is formulated, then it must be tested and analyzed through statistical techniques. In hypothesis testing, the decisions contain uncertainty, the decision could be taking a risk, it could be right or wrong. The size of the risk is expressed in the form of probabilities. Hypothesis testing is the most important part of statistical inference. As on the test, decision-making or problem-solving as the basis for further research can be completed. Thus, one of the important things is drawing conclusions that can be done when the hypothesis is formulated correctly. Therefore, in this course, the basic concepts of hypothesis testing in Educational Research will be introduced and taught.

Learning Objective

1. Participant are able to understand the concept of hypothesis testing in a research
2. Participant are able to categorize the types of hypothesis testing formulations
3. Participant are able to formulate the hypotheses
4. Participant are able to conduct the hypotheses testing procedure in simple case examples
5. Participant are able to draw conclusions

Class Format : Presentation/Lecture
Learning Mode : Synchronous and Asynchronous Mode
Platform : Web conferencing platform, web messaging platform, learning management system
Learning Duration : 1 x 90 min
Meeting Frequency : 1

Theme 4 : **Analysis of Variance**
Lecture : Assoc Prof. Drs. H. Burhanuddin , M.Ed., Ph.D.
Position : Associate Professor at Educational Administration Universitas Negeri Malang



Synopsis Analysis of variance (ANOVA) is a statistical analysis that examines the mean difference between groups. ANOVA is based mathematically on linear regression and general linear models that quantify the relationship between the dependent variable and the independent variable. The analyst utilizes the ANOVA test results in an f-test to generate additional data that aligns with the proposed regression models.

Learning Objective

1. Participant are able to identify the concept of analysis of variance
2. Participant are able to analyze data using one-way analysis of variance
3. Participant are able to analyze data using two-way analysis of variance
4. Participant are able to analyze data using multivariate analysis of variance

Class Format : Presentation/Lecture
Learning Mode : Synchronous and Asynchronous Mode
Platform : Web conferencing platform, web messaging platform, learning management system
Learning Duration : 90 min
Meeting Frequency : 1

Theme 5 : Inferential Statistics: Regression
Lecture : Assoc. Prof. Dr. Adi Atmoko, M.Si
Position : Associate Professor at Guidance and Counseling Department Universitas Negeri Malang



Synopsis Regression is one method to determine the causal relationship between variables with other variables. In simple regression analysis, the relationship between variables is linear, where changes in the variable X will be followed by changes in the variable permanently. Whereas in nonlinear relationships, changes in X are not followed by changes in variable Y proportionally. The regression analysis method is used to produce a relationship between two or more variables in numerical form. The regression equation is the line equation that represents the relationship between the two variables. Regression is divided into several types, namely simple regression, nonlinear regression, and multiple regression.

Learning Objective

1. Participant are able to identify the concept of analysis of regression
2. Participant are able to analyze data using simple regression
3. Participant are able to analyze data using nonlinear regression
4. Participant are able to analyze data using multiple regression

Class Format : Presentation/Lecture
Learning Mode : Synchronous and Asynchronous Mode
Platform : Web conferencing platform, web messaging platform, learning management system
Learning Duration : 90 min
Meeting Frequency : 1

Theme 6 : Parametric Statistics

Lecture : Assoc. Prof. Dr. Dedi Kuswandi, M.Pd.

Position : Associate Professor and Study Program Coordinator at Educational Technology Universitas Negeri Malang



Synopsis Parametric statistics is a statistical technique that can be used to test hypotheses by involving population parameters. Parametric statistics have limitations in the use of data types, namely at least using interval and ratio data. We can use parametric statistics if we know the distribution of the population we are observing is normally distributed. Parametric statistics is the most recommended because it has many advantages in terms of results but is difficult to do.

Learning Objective

1. Participant are able to identify the concept of Parametric statistics
2. Participant are able to analyze data using correlation
3. Participant are able to analyze data using T-Test

Class Format : Presentation/Lecture

Learning Mode : Synchronous and Asynchronous Mode

Platform : Web conferencing platform, web messaging platform, learning management system

Learning Duration : 90 min

Meeting Frequency : 1

Theme 7 : Introduction SPSS

Lecture : Assoc. Prof. Saida Ulfa, M.Edu., Ph.D.

Position : Associate Professor at Educational Technology Universitas Negeri Malang



Synopsis Statistics were used in education because of their statistical abilities related to evidence-based reasoning, especially with data analysis. One of the statistical computer programs known among researchers as a data processing program that is easy to use and easy to interpret is the SPSS "Statistical Product and Service Solution". SPSS can take data from almost any type of file and use them to generate tabulated reports, charts, and plots of distributions and trends, descriptive statistics, and conduct complex statistical analyses. SPSS helps researchers solve various problems in research, especially research using quantitative methods and experimental methods. In module 1, it is divided into 3 parts, namely how to install SPSS 28, introduction to SPSS 28 interface and features and how to enter data in SPSS.

Learning Objective

1. After studying in Online Lecture, students should be able to install the SPSS 28 correctly
2. After studying in Online Lecture, students should be understand SPSS 28 interface and features correctly
3. After studying in Online Lecture, students should be able to enter basic data into SPSS 28 correctly

Class Format : Presentation/Lecture

Learning Mode : Synchronous and Asynchronous Mode

Platform : Web conferencing platform, web messaging platform, learning management system

Learning Duration : 90 min

Meeting Frequency : 1

Theme 8 : Statistical Graphic**Lecture** : Assoc. Prof. Saida Ulfa, M.Edu., Ph.D.**Position** : Associate Professor at Educational Technology Universitas Negeri Malang

Synopsis The statistic data needs to be presented in a readable and understandable form. This data presentation may be in the form of a chart or chart with the advantage that it will be sooner captured and understood than presented in the form of words. Charts are visually indicating data in Numbers (perhaps also with symbols) that are usually derived from tables already made. The types of charts to be discussed include barcharts, histograms, fofails, box plots and chart pie. Barcharts are a collection of activities that are shown in the form of a chart with a bar chart. Bar diagrams are commonly used to describe the value of a particular study object over a given period of time. Histograms is a chart of bars that shows data frequencies. A scatter plot is a diagram that shows a cluster of dots after the grid coordinates as a link is removed. Scatter plot is used to describe a correlation or regression data point made up of free variables and bound variables. Boxplots are functioning diagrams to show some of the characteristics of a data, such as the median and the quiz. A boxplot containing a box, whiskey, and outliers. A circle diagram is a diagram that serves for a category - shaped data presentation expressed in the percentage.

Learning Objective

1. After studying online, it is expected that students will be able to understand the material being taught
2. After learning how to make a chart through a bar chart, a histogram, a scatter plot, a box plot and a student chart pie are expected to be able to do the exercises that have been provided

Class Format : Presentation/Lecture**Learning Mode** : Synchronous and Asynchronous Mode**Platform** : Web conferencing platform, web messaging platform, learning management system**Learning Duration** : 90 min**Meeting Frequency** : 1

Theme 9 : Descriptive Statistic

Lecture : Dr. Citra Kurniawan, S.T., M.M

Position : Lecturer at Educational Technology Universitas Negeri Malang



Synopsis The term "Descriptive Statistic" refers to the analysis, summary, and presentation of findings related to the data set studied through sample or population data, without conducting analysis and making conclusions that apply to the public. Descriptive Statistics are used to describe the basic features of the data in a study. Descriptive statistics help us to simplify large amounts of data in a sensible way. Each descriptive statistic reduces lots of data into a simpler summary. For example, A student's grade point average (GPA), provides a good understanding of descriptive statistics. The idea of a GPA is that it takes data points from a wide range of exams, classes, and grades, and averages them together to provide a general understanding of a student's overall academic performance. In this Descriptive Statistic, there will be proposed types of Data (Nominal, Ordinal, Interval, and Ratio). Descriptive Statistics consists of three measurement categories, namely Frequency Distribution, Central Tendency, and Variability.

Learning Objective

1. Participants are able to find out the differences kinds of Data in descriptive statistics correctly.
2. Participants are able to identify Descriptive Statistics problems correctly
3. Participants are able to apply central tendency and variability in the SPSS application correctly

Class Format : Presentation/Lecture

Learning Mode : Synchronous and Asynchronous Mode

Platform : Web conferencing platform, web messaging platform, learning management system

Learning Duration : 90 min

Meeting Frequency : 1

Theme 10 : Hypothesis Testing

Lecture : Dr. Citra Kurniawan, S.T., M.M

Position : Lecturer at Educational Technology Universitas Negeri Malang



Synopsis In research, a hypothesis is known as a temporary answer made by a researcher on the formulation of a research question. Judging from the type, there are two types of hypotheses, namely (1) alternative hypothesis (H_a) and (2) null hypothesis (H_0). Looking from its shape, there are three kinds of hypotheses, namely (1) Associative Hypothesis is a hypothesis that discusses one or more relationships. For example, "There is a positive and significant relationship between principal leadership and school work climate"; (2) Descriptive Hypothesis shows an implicit relationship between variables. For example, "How long can a store employee hold a vocational high school graduate?"; and (3) Comparative Hypothesis is a statement that shows the estimated value in one or more variables in different samples. For example, "How is the student achievement of state university X compared to state university Y?". In addition, the three forms of hypotheses will be the topic of study on hypothesis testing in research.

Learning Objective

1. Participants can define the hypothesis correctly.
2. Participants can name and explain the differences in the three types of hypotheses in research correctly
3. Participants can mention and explain the three types of hypothesis testing in research.
4. Participants can perform three forms of hypothesis testing correctly.

Class Format : Presentation/Lecture

Learning Mode : Synchronous and Asynchronous Mode

Platform : Web conferencing platform, web messaging platform, learning management system

Learning Duration : 1 x 90 min

Meeting Frequency : 1

Theme 11 : ANOVA (Analysis of Variance)
Lecture : Dr. Fikri Aulia, M.Pd.
Position : Lecturer at Educational Technology Universitas Negeri Malang



Synopsis ANOVA (Analysis of Variance) is a data analysis technique used to determine the difference between three or more groups of variations through the average value. There are two kinds of ANOVA data analysis techniques, namely one-way ANOVA and two-way ANOVA. One-way ANOVA is ANOVA based on the observation of one criterion of factors that cause variation. While the two-way ANOVA is based on the observation of more than one criterion of factors that cause variation. Two-way ANOVA is divided into 2, namely without interaction and with interaction. Two-way ANOVA without interaction is a hypothesis test of three or more average differences with two influencing factors and the interaction between the two factors is omitted. While the two-way ANOVA with interaction is a different test of three or more averages with two influencing factors and the effect of the interaction between the two factors is taken into account. The ANOVA data analysis technique is often used in educational research, for example to analyze the differences in the application of several learning methods in the control class and the experimental class.

Learning Objective

1. Participants are able to understand the concept of ANOVA.
2. Participants are able to analyze hypotheses using ANOVA
3. Participants can analyze the data using a two-way ANOVA technique
4. Participants can analyze data using one-way ANOVA technique

Class Format : Presentation/Lecture
Learning Mode : Synchronous and Asynchronous Mode
Platform : Web conferencing platform, web messaging platform, learning management system
Learning Duration : 2 x 90 min
Meeting Frequency : 2

Theme 12 : Regression analysis in educational research

Lecture : Dr. Fikri Aulia, M.Pd.

Position : Lecturer at Educational Technology Universitas Negeri Malang



Synopsis Regression analysis is the most commonly used method to answer questions regarding relationships between variables and groups. This technique is valuable and fundamental to empirically address many educational research questions. This analysis technique attempts to determine the strength and character of the relationship between one dependent variable (usually denoted by Y) and a series of other variables (known as independent variables). Depending on the measurement level of the outcome variable, the lecture focuses on two different types of regression models, namely, linear regression analysis which consists of two kinds of analytical model, they are Simple Linier Regression and Multiple Linier Regression.

Learning Objective

1. Participant are able to understand the concept of analysis of regression
2. Participant are able to understand simple regression and it's analytical processes in SPSS
3. Participant can analyze data of simple regression technique using SPSS
4. Participant are able to understand linear regression and it's analytical processes in SPSS
5. Participant can analyze data of linear regression technique using SPSS

Class Format	: Presentation/Lecture
Learning Mode	: Synchronous and Asynchronous Mode
Platform	: Web conferencing platform, web messaging platform, learning management system
Learning Duration	: 2 x 90 min
Meeting Frequency	: 2