SENIOR HIGH SCHOOL

Department of Education
National Capital Region
SCHOOLS DIVISION OFFICE
MARIKINA CITY

Practical Research 2

Second Quarter – Module 10
Statistical Techniques

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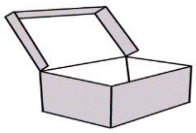


What I Need to Know

A pleasant day Senior High School Students! In this lesson, you are going to learn how to:

Use statistical techniques to analyze data-study of differences and relationship limited to bivariate

You can say that you have understood the lesson in this module if you can already:

1. describe common statistical tools;
2. illustrate the concept of statistical analysis or approaches for testing hypothesis; and
3. describe the formulation of central questions or hypotheses.

What I Know

Answer the question and circle the letter that corresponds to your answer.

1. The following are measure of central tendency/location **except**__.
   A. Kurtosis C. Median
   B. Mean D. Mode

2. It is defined to be the sum of the values of a group divided by the number of such items.
   A. Mean C. Mode
   B. Median D. Standard deviation

3. In which part of the research output are your results presented in a graphical form or through a diagram?
   A. Analysis of Data C. Presentation of Data
   B. Interpretation of Data D. Processing of Data

4. A sample of 15 families gave the following data on the number of children per family. 1, 2, 3, 3, 4, 3, 4, 4, 5, 7, 6, 4, 2, 1, 2. Find the mean.

5. What is the frequency in the interval 6.4 – 6.9

x	f
6.9	2
6.8	1
6.7	3
6.6	2
6.5	1
6.4	1
6.3	0

Lesson 1	Statistical Techniques to Analyze Data

What's In

In the previous discussion we study about presentation and interpretation of data using tabular and graphical methods, on how it is presented and interpret based on the data gathered. Hence, I want you to analyze the following questions before you proceed on the next topic to see if you can still remember what you've learned?

Let us see if you could do the tasks below as directed.

In your own words, do the following as directed.

A. Discuss the different methods in the presentation of data.

_____
_____
_____
_____
_____

B. Explain why is there a need to present results/data through graphs and tables.

_____
_____
_____
_____
_____
_____
_____
_____

C. What do you think is the best method to present the data? Justify your answer.

_____
_____
_____
_____
_____
_____
_____
_____

What's New

A. Before Reading Activity

Let us take an example: If we were to look at the age of Practical Research students 2 (a group of 21 students) when they start studying at Marikina High School, you might find that there are:

- 11 aged 18 Note: 11 x 18 = 198
- 5 aged 19 5 x 19 = 95
- 2 aged 20 2 x 20 = 40
- 1 aged 25 1 x 25 = 25
- 1 aged 33 1 x 33 = 33
- 1 aged 51 1 x 51 = 51 added together they give us a total of 442 years, since they are 21 students in the group (or n=21) therefore, we need to divide the 442 by 21, this will give you average of 21 years. So, we can see here that the average age of this group of Practical Research 2 when they started studying at MHS is 21 yrs. old.

B. During Reading Activity

Focus on the data and how it is being analyzed and evaluate to make decision.

C. After Reading Activity

Analyze the example problem above and answer the following questions.

The following are Larry' Statistics quizzes during the third quarter.

80, 82, 87, 88, 96, 94, and 89

1. Compute for the average of the scores.
   _____
   _____
   _____
   _____
2. Show that the average is greatly affected by extreme values if the lowest scores is 20.
   _____
   _____
   _____
   _____
3. What is your conclusion?
   _____
   _____
   _____

What is It

Dear learner, you are about to be done with the study you are conducting. In today's lesson, you will learn about the statistical techniques to analyze the data. Statistical analysis approaches have several things in common, each are based on a set of assumptions and/or have specific requirements related to the type of data analyzed, and assume that the sample was properly drawn from the population. Hence, having the large amount obtained from statistical analysis is by the thoroughness of data preparation and these are transformed into a suitable level for analysis. Therefore, you must prepare meaningfully the data you gather before it is analyzed using statistical techniques.

Statistical Techniques in Data Analyzing

Statistics has been defined as "a branch of mathematics that collect, analyze, interprets phenomena base on the facts or data gathered. It is a collection of data that needs to test and analyze in order to conclude and decide on a certain experiment. In analytical work, data collected should arrange, compare and quantify the values and its set for accuracy and preciseness of data.

As mentioned, statistics can either be descriptive or inferential since researchers rely on it and use it as a tool to decide based on the data gathered. Meaning, no matter what method of research is used, they must quantify the collected data. Statistical test is a major part of data interpretation. Sarno (2010) stresses that by statistical testing, a researcher can compare groups of data that shows the probability of the differences between results based on chance.

Analysis and interpretation become more plausible by submitting organized data to statistical treatment (Reyes, 2004). Descriptive statistics implies a simple quantitative summary of data that has been collected.

Descriptive Statistics

The application of statistical methods depends on population size, level of measurement, kind and number of samples, types of research problems, and power efficiency of the test. This summarizes data collected for a sample population. Whether your research is a survey type or an experiment, it is essential to describe what was observed. Measure of central location and variability are the common tools used in drawing conclusion for the data.

Example:

According to consumer Whirlpool washing machine owners reported 9 problem per 100 machines during 2019. The *statistics (*describes the number of problems every *100 machines. Meaning statistics) is a sample while 100 machines is a population.*

Inferential Statistics

Concerned with inferring or drawing data or phenomenon about the population based from pre-selected elements of that population. It usually tests the significant difference and between the two variables which has given more emphasis on inferential. Normal distribution, Sample distribution, testing of hypothesis (z/t test, Chi square, F-test, Analysis of variance) are the common tools in drawing the conclusion of the research result. It is the process of generalization about the whole called *population* by examining a portion called a *sample.*

- A population is the collection of whole objects, while
- A sample is a subset or part of the whole object.

Example:

Suppose that we wanted to know if there is a significant relationship between the mathematics attitude and the competency levels of second year Engineering students of the Mapua Institute of technology. There are two variables involved-the **mathematics attitude** and the **competency level** that require to be measured.

Common Statistical tools

Descriptive statistics has three aspect to consider: (1) frequency distribution, (2) measures of central tendency, and (3) measure of variability. However, there are common statistical tools used in analyzing the data.

1. ***Arithmetic mean*** more commonly known as "the average". This is the most familiar measure of central tendency wherein it is the sum of data divided by the list of items or adding the raw scores divided by the total number of scores. It represents a numerical average for a set of responses.

   Illustrative example:

   Determine the mean value of the final grades in 4th quarter of Grade12:

   90 + 89 + 94 + 92 + 87 + 91
   = 543 / 6
   mean = 90.5

2. ***Median*** – The data is in ascending order that refers to numerical midpoint of the data that lies on the 50 percent above and 50 percent below.

3. ***Mode*** – It is the most common or frequently occurred data or score.

4. ***Frequency***– It is used to express a set of data or scores as a whole. It is presented in tables or chart that show how many of your evaluation participants fall into various categories of interest (Wilder Research, 2009). Hence, frequency distribution is your first steps in arranging and analyzing which includes tallying of data in order to summarize and arrange it accordingly. There are several ways to present frequency distribution, and the two of the most common are the *bar or histogram, or a pie chart.*

Variable 2: Shell gas station is of good quality.			
Scale	**Frequency**	**Percent**	**Cumulative Percent**
SD	17	8.5	8.5
D	51	25.5	34
N	65	32.5	66.5
A	53	26.5	93
SA	14	7	100
Total	200	100	

5. ***Standard Deviation*** is a more suitable measure of variability. A high standard deviation signifies that data is spread more widely from the mean. Hence, the lower the standard deviation, the lower average distance between the scores and the mean.

Meanwhile, if you want to utilize the data to make inferences or prediction you will consider another step as follows:

6. ***T-Test*** – It is used to test if the difference of means is statistically significant. For example, if the mean for variable 1 is 50 and the mean for variable 2 is 66, you may say that the means are different. Meaning, the T-TEST may show that they are not significantly different, however researcher can't base the conclusion on the **means** since the sample is not a representative from population.

7. ***Pearson (r) Correlation*** is used to find correlation between the two variables. Correlations is a statistical tool used to measure the association or relationship between the two variables which concerned the movement and changes of two variables being tested. It is also the study of a linear relationship between the x and y variables. Hence, the nature of the relationship with two variables is: positive – they increase together or negative- one increases the other decreases.

Example:

Is there a relationship between the heights and the weights of the 30 senior high school students?

Ho: There is no relationship between the heights and the weights of the 30 Senior high school students.

Ha: There is a relationship between the heights and weight of the 30 Senior high school students.

8. ***Chi square test*** – The observed and expected data are involved to test the chi square with frequency count of what is expected in theory against what is observed. It is also known as chi square test for independence.

Questions and Hypothesis

In every scientific research question, it always considers the vital part which transform this into the form of statement known as *hypothesis*. It is a form of validity or a certainty of any statement or question which will be tested. With this module we will use the term hypothesis to address to the questions that has been used and rephrased to make it a statement. In statistics, a hypothesis is divided into two types: a "*null hypothesis (H_0)*" and an "*alternative hypothesis (Ha)*." Take the following question as an example:

Is there a partial significant difference in the mean life span between the Iphone and Samsung battery?

For this question we would write our hypothesis as follows:

Ho = There is no difference in the mean life span between the Iphone and Samsung battery.
Ha = There is a difference in the mean life span of Iphone and Samsung battery.

In testing the hypothesis, you will be able to choose what statistical analysis or techniques you will be using. The results will either be significant or not significant, that is, whether you are going to accept or not to accept the hypothesis. This is translated on the basis of your testing since the *null hypothesis* is either accepting or rejecting, it is also expressing a no relationship or no difference between two variables or an assertion that is hoped to be rejected. Thus, the opposite of the null is *alternative hypothesis.*
Insignificant Result – if your data does not provide sufficient evidence that there might be difference or significant.

Significant Result – the result supports the idea that there is a relationship, difference or significant between the measured variable.

Answer the activities that will follow to practice your knowledge and skill about statistical techniques to analyze data.

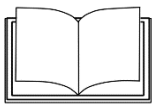
Activity 1. Multiple Choice

Encircle the letter of the best answer that satisfy the given questions.

1. In answering and making final report of statistical techniques, it is basically focused on _____.
   A. Ethnography study
   B. Qualitative research
   C. Quantitative research
   D. Phenomenological study

2. After reading this module or method of a quantitative research report, you should know _____.
   A. how the researcher analyzed the data
   B. the researcher's interpretation of the statistical results
   C. what the researcher did to collect the data
   D. which literature supports the researcher's hypotheses

3. The following are the advantages of data analysis **except** _____.
   A. analyzing the technique used
   B. determining the purpose of evaluation
   C. drawing conclusion
   D. presenting data



What's More

Answer the following activities to practice your knowledge and skill about statistical techniques to analyze data.

Activity 1- Identification

Identify the following topics whether it is a *Descriptive* statistics or *Inferential* statistics.

Topics	Types of Statistics
1. Internet availability at home and student's average sleeping time at night	
2. Social media involvement and practices of Grade 12 HUMSS students.	
3. The effect of the use of <a local packaging material> on the shelf life of a product	
4. The marketability of innovative product to SHS students	
5. Children of single parents and their level of Math anxiety	

Activity 2 – Application

Study carefully the given data and analyze.

Consider the following scores obtained by a group of 10 students on their assessment in Practical Research 2.

87, 93, 90, 90, 76, 95, 77, 72, 86, and 90.

Find the value of the following:

A. Compute for the mean or the average of the scores
_____

B. Solve for the median and mode of the data
_____

C. What is the frequency in the interval of 72 – 86?
_____

Activity 3 – Citing your ideas

A hypothesis statement can be defined as "A proposed answer to a question that can be verified or rejected through testing. A hypothesis statement is typically an educated guess as to the relationship between factors, and serve as the basis for an experiment to test whether the relationship holds true." (BusinessDictionary.com, 2017)

In the space provided construct your own hypothesis statement and cite the hypothesis.

RUBRIC
15 pts – Full Accomplishment- learners were able to write down hypothesis statement completely, and proper format on the null and alternative hypothesis.
10 pts. – Substantial Accomplishment – were the learners write down research statement and the hypothesis somewhat consistent manner.
5 pts. Little Accomplishment – barely able to write down their research statement and hypothesis.

Hypothesis 1: About Covid -19
Hypothesis Statement:
_____
_____
Ho:
_____
_____
Ha:
_____
_____
Hypothesis 2: About School Organization
Hypothesis Statement:
_____
_____
Ho:
_____
_____
Ha:
_____
_____
Hypothesis 3: About Family Bonding
Hypothesis statement:
_____
_____
Ho:
_____
_____
Ha:
_____
_____

What I Have Learned

In this lesson, we focused on the use of statistical instruments of data and now that you have finished the lesson, you may have learned that:

1. _____ an analytical work wherein data are collected arrange, compare and quantify the values and its set for accuracy and preciseness of data.

2. According to Reyes (2004) _____ and _____ become more plausible by submitting organized data for statistical treatment.

3. It is understood that the _____ is the first step to be used in analyzing the data gathered.

4. _____ is an instrument used in order to find out the difference and significant of the two or more variables.

5. This is the most familiar measure of central tendency wherein it is the sum of data divided by the list of items or adding the raw scores divided by the total number of scores. _____

What I Can Do

Apply what you have learned about the use of statistical techniques to analyze data.

Write your concise learning about the following:

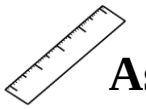
1. Correlation
   _____
   _____
   _____

2. Organizing Data
   _____
   _____
   _____

3. Measure of Central Tendency
   _____
   _____
   _____

4. Common methods used in statistical analysis
   _____
   _____
   _____

5. What is the difference between Descriptive and Inferential statistics?
   _____
   _____
   _____



Assessment

Showcase the knowledge and skills you have learned in this lesson by answering the assessment activity.

Read and download at least (3) research articles about the topic you have chosen for your research output and identify their research statements and hypothesis and the statistical techniques use.

Research Article/Title	Hypothesis	Statistical analysis use

Additional Activities

Please answer the questions concisely.

1. What do you think is the best statistical tools to be used in analyzing data?

_____
_____
_____
_____
_____
_____
_____
_____

2. Why is there a need to organize data?

_____
_____
_____
_____
_____
_____
_____
_____

3. Briefly discuss the difference between descriptive and inferential analysis.

_____
_____
_____
_____
_____
_____
_____
_____

Post Test

Read the following questions carefully and encircle the letter of the correct answer.

1. Which is the most common stable measure of central tendency that is commonly used by researchers in analyzing the data gathered?
   A. Bar graph
   B. Mean
   C. Median
   D. Pie graph

2. Simply a statement that something is true. It is a tentative claim or explanation.
   A. Alternative hypothesis
   B. Hyphotesis
   C. Hypothesis testing
   D. Null Hypothesis

3. What is the frequency in the interval 6.5 -6.8?

x	f
6.9	2
6.8	1
6.7	3
6.6	5
6.5	3
6.4	1

A. 9 B. 10 C. 11 D. 12

4. Define as the middle variable in the distribution when all the variables have been arranged in ascending or descending order, usually from left to write.
   A. Frequency
   B. Quartile
   C. Median
   D. Mode

5. The most common variable or middle variable with the highest frequency.
   A. Mode
   B. Quartile
   C. Percentile
   D. Standard deviation

6. Conclusion are based on which of the following?
   A. Hypothesis
   B. Mean
   C. Range
   D. Results

7. We refer to this in the conclusion, and sate whether the results agree.
   A. Data
   B. Mean
   C. Objective
   D. Prediction

8. It is a single value that attempts to describe a set of data by identifying the central position within the set of data.
   A. Measure of central location
   B. Measure of dispersion
   C. Kurtosis
   D. Standard deviation

9. Statistical analysis is heavily focused in making the final report of a _____.
   A. Qualitative research
   B. Quantitative research
   C. Ethnographic study
   D. Phenomenological study

10. Quantitative research only works if _____.
   A. You talk to the right people
   B. You talk to the right number of people
   C. You ask the right questions to the number of people
   D. You ask the right questions and analyze the data you get in the right way.

References

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Answer Key

What I Need Know

1. A
2. A
3. C
4. 3.4
5. 10

What's In

(answers may vary)

What's New

(answers may vary)

What Is It

1. C
2. B
3. B

What's More

Activity 1- Identification

1. Inferential Statistics
2. Descriptive Statistics
3. Inferential Statistics
4. Descriptive Statistics
5. Descriptive Statistics

Activity 2 – Application

1. 85.6
2. Median – 88.5, Mode – 90
3. 4

Activity 3 – Citing your ideas

(answers may vary)

What I Have Learned

1. Statistics
2. Analysis and Interpretation
3. Measure of Central Tendency
4. Inferential Statistics
5. Arithmetic Mean

What I can do

(answers may vary)

Assessment

(answers may vary)

Additional Activities

(answers may vary)

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