

Unit Plan
MIT 512

One Sample Hypothesis Testing of the Mean
For
AP Statistics

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Description of the Unit

The mathematics course that this unit will be developed for is Advanced Placed Statistics. This course is a high school level course that contains seven students that range from the age of fifteen to eighteen. These students will receive college credit for Statistics if they pass the AP exam. The unit topic is one sample hypothesis testing about the mean. At this point in the course the students have studied probability, and descriptive statistics. The students know the different distributions (z and t distributions). They are able to manipulate the charts and graphs of these distributions to answer probability questions. This unit is their first interaction with using the distributions to conduct a test. Therefore, this unit will only cover one sample hypothesis testing of the mean. The goal for this unit is for students to be able to conduct a one sample hypothesis test of the mean, analyze and report the results. Before the students begin the web quest it is essential that they understand the purpose, procedure, and terminology involved with hypothesis testing. The procedure and reporting the results requires writing skills. Therefore, students will be asked to write throughout the unit. The students will be asked to read the chapter in their text on one sample hypothesis testing before they begin these lessons. The unit will take approximately ten one hour class periods.

Unit Objectives:

- 1) The student will be able to interpret the results of a hypothesis test about the mean.
- 2) The student will be able to analyze the given information to determine the appropriate testing method.
- 3) The student will be able to conduct a hypothesis test using SPSS or a TI-83 plus calculator.
- 4) The student will be able to apply hypothesis testing procedure on a study they create.

Lesson 1 - Day 1 & 2

Description of the lesson

This lesson will help students gain an understanding of the purpose and process of hypothesis testing. The students will be reading and discussing a multitude of information on hypothesis testing from several different resources.

Lesson objectives:

- 1) The student will be able to analyze given information to determine the appropriate testing method.

Materials and resources:

Statistics a first course textbook
Computer with internet access
Projector and laptop

Procedures:

Students should arrive at class having read their textbook chapter on hypothesis testing. They will be confused because the concept and terminology is new. Therefore, begin the class by projecting and discussing the one or more of the following websites that has nice clear definitions of the terminology used in hypothesis testing. It also gives a description of the purpose and procedure of hypothesis testing. The third website has great visual descriptions as well. (30 min)

http://www.ce.vt.edu/program_areas/environmental/teach/smprimer/hypotest/ht.html

http://www.cas.lancs.ac.uk/glossary_v1.1/hyptest.html

http://science.kennesaw.edu/~jdemaio/1107/hypothesis_testing.htm

<http://www2.sjsu.edu/faculty/gerstman/StatPrimer/Hyp-test.PDF>

After the discussion have the student's pair up in groups at a computer with internet access with the activity sheet in appendix A. This activity is a scavenger hunt. Students will have to find all of the things on their sheet and then describe why they chose the example or item they did for that item on the list. They will be given a list of resources to go by, but they may search outside of those resources if they wish. The list of resource sites are listed below. (20 minutes)

<http://www.richland.cc.il.us/james/lecture/m170/ch09-int.html>

<http://www-math.cudenver.edu/~ssain/stat/lec09.pdf>

<http://www.wlu.ca/~wwwk+pe/faculty/pbryden/kp262/Chapter%20Eight.htm>

http://davidmlane.com/hyperstat/logic_hypothesis.html

While students are completing the scavenger hunt, the instructor should set up the projector to show the following website and monitor the student's progress. Once the students are finished the instructor can wrap up the lesson by using examples that the students find to demonstrate the applet in the website below. During this activity the students can discuss different examples that the groups found.

<http://www.stat.sc.edu/~ogden/javahtml/power/power.html>

Assessment

Evaluation of retention of this material will be done by grading the activity sheet and the wrap up discussion.

Lesson 2 - Day 3-5

Description of the Lesson

This lesson is focused on testing procedure and interpretation of results. The testing procedure will be demonstrated using the data provided in the website. The students will interpret the results of the testing by writing a report that answers the question used to set up the test.

Lesson objectives:

- 1) The student will be able to interpret the results of a hypothesis test about the mean.
- 2) The student will be able to conduct a hypothesis test using SPSS or a TI-83 plus calculator.

Materials and resources:

Computer with internet access, and a word processor
Laptop and projector with internet access and SPSS
TI-83 calculators
Overhead TI-83 calculator
Overhead

Procedures:

Testing procedure using SPSS and the TI-83 will be demonstrated using the data chosen by the instructor. The students will follow the demonstration on the computer and the calculator with the instructor. The website for the activity of this lesson will then be projected so navigation of this website can be demonstrated. The website below contains resources data, and testing results. (30min)

http://www.aw-bc.com/weiss/e_iprojects/c09/chap09.htm

Once the demonstration is complete the students will conduct a test on SPSS or the TI-83 on their own using the data from the website. The resulting test statistic is provided in the website. Therefore, the students will know if their testing procedure is correct. They have the option of using the software or the calculator. They are not required to do both. (2.5 class hours)

Assessment

Evaluation of this activity will be done by the completion of a report that answers the question "*Is the skin cancer rate in the more extreme latitudes different from the rate for the tropic zones?*" The average value for the tropic zones is 4.367. The hypothesis, then, is that the mean for the skin cancer rate in the extreme latitudes is equal to 4.367. This data results in a t-statistic = 7.798. Is this evidence that skin cancers are more prevalent in areas closer to the poles?" This report will be done on a word processor and include research and statistical support for the argument the student is making (1-3 pages). The report will be graded with the following rubric.

CATEGORY	Excellent	Good	Satisfactory	Needs Improvement
Working with Others	Student was an engaged partner, listening to suggestions of others and working cooperatively throughout lesson. 5 pts	Student was an engaged partner but had trouble listening to others and/or working cooperatively. 4 pts	Student cooperated with others, but needed prompting to stay on-task. 3 pts	Student did not work effectively with others. 2 pts
Explanation	Explanation is detailed and clear. Paragraph FULLY answered the question and was well-written. 5 pts	Explanation is clear. Paragraph answered the question. 4 pts	Explanation is a little difficult to understand, but includes critical components. 3 pts	Explanation is difficult to understand and is missing several components OR was not included. 2 pts
Neatness and Organization	The work is presented in a neat, clear, organized fashion that is easy to read. 5 pts	The work is presented in a neat and organized fashion that is usually easy to read. 4 pts	The work is presented in an organized fashion but may be hard to read at times. 3 pts	The work appears sloppy and unorganized. It is hard to know what information goes together. 2 pts
Internet Use	Successfully uses suggested internet links to find information and navigates within these sites easily without assistance.	Usually able to use suggested internet links to find information and navigates within these sites easily without assistance.	Occasionally able to use suggested internet links to find information and navigates within these sites easily without assistance.	Needs assistance or supervision to use suggested internet links and/or to navigate within these sites.

Lesson 3 – Days 6-10

Description of the Lesson

Students will be conducting a test and reporting the results through a web quest activity. They will be assigned the role of statistician for a company that is looking for results about sales of their product. They are assigned by their boss to report on how their product is doing compared to the national average. They may choose the company and product that they are reporting on. The product could be food, electronic equipment, clothes, etc. They must compile data, analyze that data, and report the results. The results will be presented to their boss in report and presentation form.

Objectives

- 1) The student will be able to apply hypothesis testing procedure on a study they create.

Materials

Computer with internet access, SPSS, Word Processor, and PowerPoint
TI-83 Calculators

Resources

National Sales Averages

<http://www.bizstats.com/corpnnetincome.htm>

Data

<http://lib.stat.cmu.edu/modules.php?op=modload&name=Downloads&file=index&req=viewdownload&cid=2>

<http://it.stlawu.edu/~rlock/datasurf.html>

<http://faculty.babson.edu/turner/fish.html>

<http://www.oswego.edu/~economic/data.htm>

Testing

http://www.ce.vt.edu/program_areas/environmental/teach/smprimer/hypotest/ht.html

http://www.cas.lancs.ac.uk/glossary_v1.1/hyptest.html

http://science.kennesaw.edu/~jdemaio/1107/hypothesis_testing.htm

<http://www.richland.cc.il.us/james/lecture/m170/ch09-int.html>

<http://www-math.cudenver.edu/~ssain/stat/lec09.pdf>

<http://www.wlu.ca/~wwwk+pe/faculty/pbryden/kp262/Chapter%20Eight.htm>

http://davidmlane.com/hyperstat/logic_hypothesis.html

<http://camden-www.rutgers.edu/~wood/325microcase.htm>

Procedure

Students will access the web quest and read the task and procedure. They will access the national average site to choose their type of product first, then they will access the resources to find the company, product, and data they need to complete the test. Once students have located a data set they will enter it into SPSS or the TI-83 calculator, set up their hypothesis for the test, determine which test should be used, conduct the test, and report their results. They can refer back to the resources given on the first two days. (1 hours)

Assessment

Evaluation for this activity will be done through a report as well. The report will include the raw data, rationale for choosing to conduct the test they conducted, every step they took in conducting the test, and the results. The results will be reported by report and power point presentation. (4 class hours)

That report and Power Point Presentation will be evaluated based on the rubric below.

CATEGORY	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement(1)
Diagrams & Illustrations	Diagrams and illustrations are neat, accurate and add to the reader's understanding of the topic.	Diagrams and illustrations are accurate and add to the reader's understanding of the topic.	Diagrams and illustrations are neat and accurate and sometimes add to the reader's understanding of the topic.	Diagrams and illustrations are not accurate OR do not add to the reader's understanding of the topic.
Mechanics	No grammatical, spelling or punctuation errors.	Almost no grammatical, spelling or punctuation errors	A few grammatical, spelling, or punctuation errors.	Many grammatical, spelling, or punctuation errors.
Amount of Information	All topics are addressed and all questions answered with at least 2 sentences about each.	All topics are addressed and most questions answered with at least 2 sentences about each.	All topics are addressed, and most questions answered with 1 sentence about each.	One or more topics were not addressed.
Quality of Information	Information clearly relates to the main topic. It includes several supporting details and/or examples.	Information clearly relates to the main topic. It provides 1-2 supporting details and/or examples.	Information clearly relates to the main topic. No details and/or examples are given.	Information has little or nothing to do with the main topic.
Internet Use	Successfully uses suggested internet links to find information and navigates within these sites easily without assistance.	Usually able to use suggested internet links to find information and navigates within these sites easily without assistance.	Occasionally able to use suggested internet links to find information and navigates within these sites easily without assistance.	Needs assistance or supervision to use suggested internet links and/or to navigate within these sites.
Organization	Information is very organized with well-constructed paragraphs and subheadings.	Information is organized with well-constructed paragraphs.	Information is organized, but paragraphs are not well-constructed.	The information appears to be disorganized. 8)

Notes to Teachers

The some websites listed in the unit go over more tests than one sample testing about the mean. Make sure students concentrate on the one sample mean testing and not any of the others.

The last website provided for the first lesson plan is a java applet. The way the applet is set up is confusing, so play with it yourself before demonstrating it to students.

Demonstrate navigation of the website in lesson two and point out the questions that the student should focus on listed in the lesson plan above.

Lesson three will be frustrating to students because they will want you to walk them through the process. Be sure to support them and guide them instead of lead them.

Appendix A

Scavenger Hunt

Name _____

Date _____

1) Find an example of a study that would have to use a one sample hypothesis testing of the means for an upper-tailed test, a lower tailed test, and a two tailed test below. Write the examples below and provide rationale for choosing each example.

Lower Tailed Test	Upper Tailed Test	Two Tailed Test
Rational		

2) Find an example of the procedure of a hypothesis test about the mean that uses an upper tailed test, lower tailed test, and two tailed test. Write the results below.

Lower Tailed Test	Upper Tailed Test	Two Tailed Test
Rationale		

3) Find an example of the results of a one sample hypothesis test that uses an upper tailed test, a lower tailed test, and a two tailed test. Write the results below.

Lower Tailed Test	Upper Tailed Test	Two Tailed Test
Rationale		