Eastern West Virginia Community and Technical College
COURSE ASSESSMENT REPORT

Course Title and Number: **MTH 225 – Introduction to Statistics**	**Academic Term and Year of Assessment Activity (Ex: Fall, 2010)** **Fall 2013**
Report Submitted By: Andrea Williams	**Number of Students Assessed: 17**
Date Report Submitted:	**Number of Sections Included: 1**
Course Delivery Format (list all modalities used in sections assessed. Ex: web based, VDL, traditional section, hybrid course, etc.): **Traditional Section**	

Course Role in the Curriculum

Provide a description of the role the course serves in the curriculum (i.e. general education requirement, program technical core, restricted elective, etc.). Note all as appropriate.

This course is an introduction to the mathematical principles underlying statistical techniques for application in fields of economics, business, education, industry, and the sciences. Course topics include basic probability and statistics with emphasis on methods of gathering data, measures of central tendency, variability, correlation, graphical analysis, and hypothesis testing.

Prerequisites: RDG 90, MTH 90, MTH 95, and MTH 96 OR MTH 99 OR minimum acceptable test scores for placement in college-level math: 1) Math ACT score 19 or higher; 2) SAT math score 460 or higher; 3) Introductory Algebra Placement Exam score 80% or higher.

This course is provided to students as an additional transferable math elective. It will strengthen quantitative and mathematical abilities that will be useful to students in other disciplines.

Assessment Methods

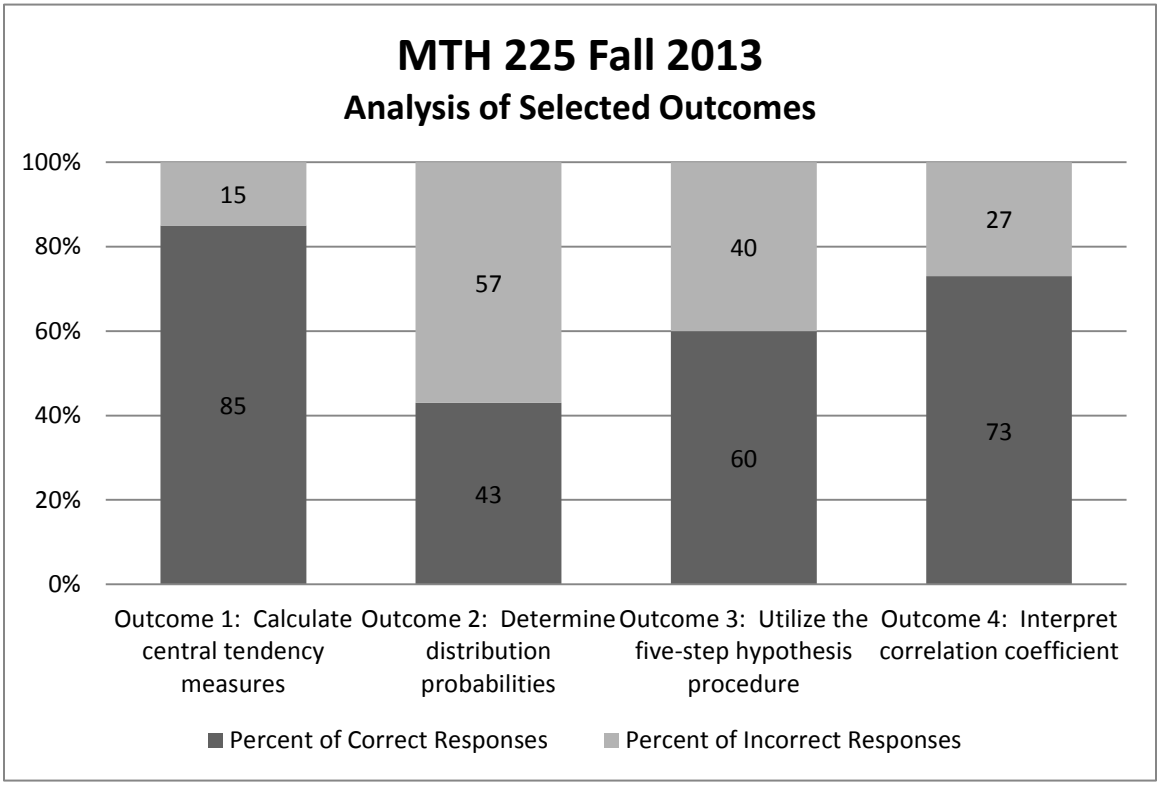
Provide a description of the assessment process used. Include description of instrument and performance standards in description. Note all methods.

Questions from unit tests throughout the semester are the basis for this assessment. Only short answer questions, for which it was possible to receive partial credit, were included in this assessment, but for purposes of this analysis, only questions receiving full credit are considered correct. Multiple questions may be included in one outcome for analysis. A minimum satisfactory percent of correct responses for the outcome is 75%.

Assessment Results

Provide a summary of results including tables/charts. Incorporate information from previous assessments as appropriate. Append additional pages if necessary. If appending, include notation in box to "See attached".

Four outcomes were analyzed, and only one met the 75% correct criterion. It appears that this is the first time MTH 225 has been assessed, so there are no results from previous semesters to compare. More details about the outcomes and the assessed questions are included in the conclusion.



Course Level Assessment Summary of Outcomes, Indicators and Results MTH 225 – Introduction to Statistics – Fall 2013 Number of students in assessment sample = 17 (although the number of students taking each test varied) Number of Sections in Assessment = 1 Add additional rows to table if necessary				
Learning Outcomes (Insert learning outcomes assessed during this cycle)	**Indicator (Insert indicators used for each outcome: exam question, scoring rubric, etc. Be specific)**	**Percent of Correct Responses**	**Percent of Incorrect Responses**	**Performance Standard Met (75%)* (yes or no)**
Outcome 1: Calculate central tendency measures	Test 1, Questions 9, 10, 11, 12 9) The students in Hugh Logan's math class took the Scholastic Aptitude Test. Their math scores are shown below. Find the mean score. 516, 608, 356, 352, 496, 349, 350, 525, 470, 482. 10) The ages (in years) of the eight passengers on a bus are listed below. 9, 1, 29, 11, 22, 46, 40, 35. Find the median age. 11) Find the mode(s) for the given sample data. The weights (in ounces) of 14 different apples are shown below. 5.0, 6.5, 6.0, 6.2, 6.6, 5.0, 6.5, 4.5, 5.8, 6.2, 5.0, 4.5, 6.2, 6.3. 12) Find the midrange for the given sample data. 3, 6, 9, 0, 4, 1, 11, 5, 9, 14, 3, 8, 2, 15, 0, 9	85%	15%	Yes
Outcome 2: Determine distribution probabilities	Test 3, Questions 1, 2, 5, 7, 8, 10 1) Assume that the weight loss for the first month of a diet program varies between 6 pounds and 12 pounds, and is spread evenly over the range of possibilities, so that	43%	57%	No

	there is a uniform distribution. Find the probability of the given range of pounds lost. Leave your answer as a simplified fraction. More than 10 pounds. 2) If z is a standard normal variable, find the probability that z is less than 1.13. 5) Assume that adults have IQ scores that are normally distributed with a mean of 100 and a standard deviation of 15 (as on the Wechsler test). Find the probability that a randomly selected adult has an IQ between 90 and 120 (somewhere in the range of normal to bright normal). 7) Assume that X has a normal distribution, and find the indicated probability. The mean is $\mu = 15.2$ and the standard deviation is $\sigma = 0.9$. Find the probability that X is greater than 16.1. 8) The incomes of trainees at a local mill are normally distributed with a mean of $1100 and a standard deviation of $150. What percentage of trainees earns less than $900 a month? 10) The amount of snowfall falling in a certain mountain range is normally distributed with a mean of 70 inches, and a standard deviation of 10 inches. What is the probability that the mean annual snowfall during 25 randomly picked years will exceed 72.8 inches?			
Outcome 3: Utilize the five-step hypothesis	Test 4, Questions 6, 7, 8, 9, 11, 13, 15 6) Identify the null hypothesis,	60%	40%	No

procedure	alternative hypothesis, test statistic, P-value, conclusion about the null hypothesis, and final conclusion that addresses the original claim. A supplier of digital memory cards claims that no more than 1% of the cards are defective. In a random sample of 600 memory cards, it is found that 3% are defective, but the supplier claims that this is only a sample fluctuation. At the 0.01 level of significance, test the supplier's claim that no more than 1% are defective. 7) Assume that a simple random sample has been selected from a normally distributed population and test the given claim. Identify the null hypothesis, alternative hypothesis, test statistic, P-value, conclusion about the null hypothesis, and final conclusion that addresses the original claim. A test of sobriety involves measuring the subject's motor skills. Twenty randomly selected sober subjects take the test and produce a mean score of 41.0 with a standard deviation of 3.7. At the 0.01 level of significance, test the claim that the true mean score for all sober subjects is equal to 35.0. 8) Use the P-value method to test the given hypothesis. Assume that the population is normally distributed and that the sample has been randomly selected. Identify the null hypothesis, alternative hypothesis, test statistic, P-value, conclusion about the null hypothesis, and final conclusion that addresses the original claim. The standard deviation of math test scores at one high school is 16.1. A teacher			

	claims that the standard deviation of the girls' test scores is smaller than 16.1. A random sample of 22 girls results in scores with a standard deviation of 12.9. Use a significance level of 0.01 to test the teacher's claim. 9) Use the P-value method to test the given hypothesis. Assume that the samples are independent and that they have been randomly selected. Identify the null hypothesis, alternative hypothesis, test statistic, P-value, conclusion about the null hypothesis, and final conclusion that addresses the original claim. A marketing survey involves product recognition in New York and California. Of 558 New Yorkers surveyed, 193 know the product while 196 out of 614 Californians knew the product. At the 0.05 significance level, test the claim that the recognition rates are the same in both states. 11) Test the indicated claim about the means of two populations. Assume that the two samples are independent simple random samples selected from normally distributed populations. Use the P-value method. Identify the null hypothesis, alternative hypothesis, test statistic, P-value, conclusion about the null hypothesis, and final conclusion that addresses the original claim. Two types of flares are tested and their burning times (in minutes) are recorded. The summary statistics are given below. <u>Brand X</u> <u>Brand Y</u> $n = 35$ $n = 40$ $\bar{x} = 19.4$ min $\bar{x} = 15.1$ min $s = 1.4$ min $s = 0.8$ min			

	Use a 0.05 significance level to test the claim that the two samples are from populations with the same mean. 13) Perform the indicated hypothesis test. Assume that the two samples are independent simple random samples selected from normally distributed populations. Identify the null hypothesis, alternative hypothesis, test statistic, P-value, conclusion about the null hypothesis, and final conclusion that addresses the original claim. A researcher was interested in comparing the amount of time spent watching television by women and by men. Independent simple random samples of 14 women and 17 men were selected, and each person was asked how many hours he or she had watched television during the previous week. The summary statistics are as follows. <u>Women</u> <u>Men</u> $\bar{x}_1 = 11.4$ hr $\bar{x}_2 = 16.8$ hr $s_1 = 4.1$ hr $s_2 = 4.7$ hr $n_1 = 14$ $n_2 = 17$ Use a 0.05 significance level to test the claim that the mean amount of time spent watching television by women is smaller than the mean amount of time spent watching television by men. Use the P-value method of hypothesis testing. 15) Test the indicated claim about the variances or standard deviations of two populations. Assume that both samples are independent simple random samples from populations having normal distributions. Identify the null hypothesis, alternative hypothesis, test statistic, P-value, conclusion about the null			

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<tr><td></td><td>hypothesis, and final conclusion that addresses the original claim. A random sample of 16 women resulted in blood pressure levels with a standard deviation of 23 mm Hg. A random sample of 17 men resulted in blood pressure levels with a standard deviation of 19.2 mm Hg. Use a 0.05 significance level to test the claim that blood pressure levels for women vary more than blood pressure levels for men.</td><td></td><td></td><td></td></tr>
<tr><td>Outcome 4: Interpret correlation coefficient</td><td>Test 5, Question 1

1) Find the value of the linear correlation coefficient r. Also find the P-value using a 0.05 significance level and use it to determine whether there is sufficient evidence to support a linear correlation between the two variables. The paired data below consist of the test scores of 6 randomly selected students and the number of hours they studied for the test.
<table><tr><td>Hours</td><td>5</td><td>10</td><td>4</td><td>6</td><td>10</td><td>9</td></tr><tr><td>Score</td><td>64</td><td>86</td><td>69</td><td>86</td><td>59</td><td>87</td></tr></table></td><td>73%</td><td>27%</td><td>No</td></tr>
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* Please note if using a different minimum performance standard.

Conclusions and Action Plan **Provide a brief summary of conclusions derived based on analysis of data. Identify action plan for improvement or maintaining current performance levels. Append additional pages if necessary. If appending, include notation in box to "See attached".**
Outcome 1: Calculate central tendency measures Since these questions had an 85% correct response rate, no adjustment in instruction is recommended at this time. Outcome 2: Determine distribution probabilities Of the six questions included in this assessment, one was about a uniform distribution, four were about the normal distribution, and one was about the normal distribution but involved a sample mean instead of an individual piece of data like the other four. The question about the uniform distribution had the lowest correct response rate, with only one

student getting the solution completely correct and the majority of the class not knowing how to even approach the problem. Since uniform distributions are the first topic covered in this unit, they clearly need to be reviewed before the test.

The problem about the sample mean had the next lowest correct response rate. Many students tried to solve it the same way they solved the other normal distribution problems, but this requires a different formula. More emphasis needs to be placed on the difference between problems involving an individual piece of data and problems involving a sample mean and the key words to look for to know which formula to use for a particular problem.

For the other normal distribution problems, many students approached the problem correctly, but left out the last step of finding the area, or, if they did find the area, it was the wrong way (i.e. they gave the area to the left when it should have been the area to the right or vice versa). In the future, the instructor should clarify how many steps are involved in these types of problems and how to know when the problem is complete. Students also need to be reminded of the key words to know whether a problem is asking for the area to the left, area to the right, or area in between two pieces of data.

Outcome 3: Utilize the five-step hypothesis procedure
Even though this outcome only received 60% correct responses, when taking partial credit into consideration, most students did well on these problems. Most of the problems that were not completely correct only had one or two parts wrong out of the multiple steps required for each problem, and most of the mistakes seemed to be careless errors rather than the result of not understanding the content. For example, there were several instances where students gave an incorrect test statistic or P-value, both of which can be found using the statistical software Statdisk, so most likely the students did not enter their data into Statdisk correctly. No revision of instruction on this outcome is recommended at this time other than reminding the students of the importance of checking their work.

Outcome 4: Interpret correlation coefficient
This outcome just missed the performance mastery at 73%, and, in fact, if one includes the responses that lost points only due to rounding errors, the percent of correct responses rises to 82%. For this reason, no adjustment in instruction on correlation coefficients is recommended, but further clarification on rounding answers may be needed as this seemed to be an issue not just for this objective but for all topics throughout the course. Unfortunately, even the text was not consistent in how it expected answers to be rounded, further confusing students on how to give their answers. I always tried to specify in test directions how many decimal places to use, but some students did not pay close enough attention to the directions. The next time this class is offered, it may be useful to create a reference sheet with all the different rounding rules that students can use throughout the semester on their homework and tests.

Effective Date for Changes or Curriculum Proposal Submission to LOT (if recommended)	**Proposed Date for Reassessment**
	Fall 2015

Assessment Committee Approval (To be posted by Assessment Committee Chair)	LOT Review (To be posted by Assessment Committee Chair)
Date: 02-19-14	**Date: 03-24-14**