Course Assessment Report
Washtenaw Community College

Discipline	Course Number	Title
Business Management	265	BMG 265 04/15/2021-Business Statistics
College	Division	Department
Business and Computer Technologies	Business and Computer Technologies	Business
Faculty Preparer		Rosemary Wilson
Date of Last Filed Assessment Report		04/10/2014

I. Review previous assessment reports submitted for this course and provide the following information.

1. Was this course previously assessed and if so, when?

   Yes

   Fall 2017

2. Briefly describe the results of previous assessment report(s).

   Students met 3 of 5 learning outcomes, with the most difficulty experienced in inferential statistics and regression analysis.

3. Briefly describe the Action Plan/Intended Changes from the previous report(s), when and how changes were implemented.

   A syllabus change was completed and approved to revise learning outcomes and course objectives to align with changing university transfer partner requirements, but the prerequisites were not changed to allow a 3-year phase in period in line with EMU.

   In 2017 dates were changed to allow more time between homework and quizzes. This continued until the start of 2019, when quizzes were dropped to make room for discussion board requirements in the online sections in an effort to increase student engagement in an attempt to improve course completion/student success rates.

II. Assessment Results per Student Learning Outcome

Outcome 1: Recognize the conditions, limitations, and risks associated with the selection of specific statistical methods and models to analyze data sets and make business decisions.

- Assessment Plan
    - Assessment Tool: Departmentally-developed final exam
    - Assessment Date: Fall 2020
    - Course section(s)/other population: All sections
    - Number students to be assessed: All enrolled students
    - How the assessment will be scored: Answers will be scored against an answer key.
    - Standard of success to be used for this assessment: 70% of students must achieve a score of 70% or higher on the exam.
    - Who will score and analyze the data: Answers will be blind-scored using software. Data will be analyzed by the lead instructor for the course.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2020		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
112	82

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

The difference was a result of a large number of students withdrawing from the course or failing to complete the course. The majority of students who requested a withdrawal identified the following as factors resulting in withdrawal: 1. Too heavy workload with classes, supervising children taking online classes, working from home, or erratic hours working as an essential worker during Covid-19. 2. Inability to adjust to virtual or online classes. 3. Illness or death in family due to Covid-19.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

Fall 2020 BMG 265 classes included in this assessment included three fully online sections, one evening virtual section, and two daytime virtual sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

This outcome was assessed through a blind-scored final exam in which 13 of the 53 questions required students to identify conditions, limitations, or risks associated with the statistical method or model. The thirteen questions were short-answer or multiple choice. All questions on the exam provided a business context for the calculations and interpretation of results. The text of the questions are provided on the spreadsheets used to summarize the results and can be found on the tab labeled Outcome 1.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes
Standard Met: At least 70% of students achieved a score of 70% or higher on the final exam. Across all sections combined, 81.7% of students (67/82) achieved a score of at least 70%. Across all sections combined, at least 70% of students correctly recognized conditions, limitations, or risks associated with specific statistical methods or models in 85% of the questions for this learning outcome. The online sections did not meet this outcome, although they were within 1% of the target, with at least 70% of online students having achieved the minimum standard on 69% of the questions for this outcome.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students were able to respond correctly for those statistical methods for which they had been given a list of conditions or limitations in the textbook or in the supplemental materials provided by the instructor.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Students did not perform as well for those problems which required deeper thinking about limitations or risks, such as reasoning why a company would choose to set alpha, the level of significance higher or lower based on the consequences of a Type 1 vs. Type 2 error, or whether a given level of significance would result in a different outcome. More application questions of this nature may be added to get students into the habit of thinking about limitations, conditions, and risks. In addition, the fully online classes did not meet the target. More specific and dramatic examples in the online lectures will be added to stimulate student thinking. Also, the instructor-designed supplements called Statistics Shortcuts, which normal focus on Context, Calculation, and Conclusion, will have another "C" added to the list: Checks. Under Checks, specific cautions and reminders will be added to ensure that students make checking whether conditions have been met, limitations have been considered, and risks have been weighed when selecting and using a particular statistical method or model.

Outcome 2: Use statistical software in the calculation of confidence intervals, hypothesis tests, and regression analysis.

- Assessment Plan
    - Assessment Tool: Departmentally-developed final exam
    - Assessment Date: Fall 2020
    - Course section(s)/other population: All sections
    - Number students to be assessed: All enrolled students
    - How the assessment will be scored: Answers will be scored against an answer key.
    - Standard of success to be used for this assessment: Seventy percent of students must achieve a score of 70% or higher on the exam.
    - Who will score and analyze the data: Answers will be blind-scored using software. Data will be analyzed by the lead instructor for the course.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2020		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed

112	82

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

The difference was a result of a large number of students withdrawing from the course or failing to complete the course. The majority of students who requested a withdrawal identified the following as factors resulting in withdrawal:

1. Too heavy workload with classes, supervising children taking online classes, working from home, or erratic hours working as an essential worker during Covid-19.

2. Inability to adjust to virtual or online classes.

3. Illness or death of family member due to Covid-19.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

Fall 2020 BMG 265 classes included in this assessment included three fully online sections, one evening virtual section, and two daytime virtual sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

This outcome was assessed through a blind-scored final exam in which 24 of the 53 questions required students to use statistical software (Excel) to calculate confidence intervals, hypothesis tests, and regression analysis. The 24 questions were short-answer or multiple choice. All questions on the exam provided a business context for the calculations and the interpretation of results. The text of the questions is provided on the spreadsheets used to summarize the results on the tab labeled Outcome 2. These results are based solely on whether the student correctly calculated the answer.

As part of the final exam, students were required to submit their Excel workbooks, with separate tabs for each question. These results were analyzed using a simple rubric for each question that required Excel use:

Correctly used the appropriate Excel function

Did not use correct Excel function

Used correct Excel function but entered an incorrect argument or value

Incorrectly read/used correct Excel output

No evidence of Excel use

The results of this analysis can be found on the Excel summary of results on the tab labeled Outcome 2 part 2.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

Standard Met: At least 70% of students achieved a score of 70% or higher on the final exam.

An analysis of the 24 questions on the exam that required calculations using the software (Excel) showed that at least 70% of students across all sections correctly answered 75% of the questions. However, the late-start online section did not meet the target. Finding p-values and constructing confidence and prediction intervals for the estimate of y in regression were the most common errors.

A closer look at the errors was conducted by a review of the Excel spreadsheets that students were required to submit with their exams. This analysis showed the following breakdown in the errors using the software:

Only 4% of errors were due to selecting the wrong Excel function.

Entering an incorrect argument or value accounted for 34% of the errors. Frequently these wrong values were due to a mistake in an earlier step, such as incorrect degrees of freedom, miscalculating a test statistic, or having set up a hypothesis incorrectly.

Incorrect reading of Excel output accounted for 28% of the errors. These occurred most frequently in reading/interpreting Regression output, which is not surprising given the volume of output from a single function.

No evidence of Excel use accounted for 34% of the errors, which were either left blank or clearly were guesses. This is concerning because students tend to be Excel-phobic and resist using the software, which is disastrous if they intend to be employable in business.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students are using Excel, with at least 70% of students achieving the correct answers in Excel for 75% of the questions. The review of the student Excel workbooks submitted with the final exam for those questions that required the use of specific Excel statistical functions revealed that at least 70% of students correctly used Excel 79% of the time.

Students performed well in the use of the descriptive statistics functions and the regression analysis functions.

Of the students who did not answer correctly, only 4% of the time was the error due to selecting the wrong Excel function.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

The analysis of the student workbooks revealed that when students did not get the correct answer using software, 34% of the time the problem was an incorrect argument or value was entered, 28% of the time students did not correctly read the output (particularly regression output), and that 34% of the time it did not appear that Excel was used.

Most often the problem of an incorrect argument or value entered was a result of an error in an earlier step in a problem, primarily miscalculation of standard error, incorrectly identifying degrees of freedom, or incorrectly setting up a 2-tail test when a 1-tail test was appropriate.

Incorrect reading of Excel output occurred most frequently in regression analysis, which is not surprising given the wealth of statistics in the output. Work has already been completed to update the Statistics Shortcuts supplemental materials to create graphics to show students exactly where to find key statistics on the spreadsheets.

Of the most concern is that, for those problems requiring Excel use where students did not correctly answer, in 34% of the cases no evidence of Excel use was provided. In some cases, students may have attempted some of the calculations by hand; in other cases, some of the students may have not answered the question or simply guessed at an answer. Students tend to be Excel-phobic and resist using Excel, especially if they have used advanced statistical calculators in the past. More research will be conducted to find more online demos of specific Excel statistical functions.

Areas for improvement include finding p-values (particularly remembering when to subtract from 1 and when to double the p-value). More practice exercises or homework problems will be added.

Outcome 3: Interpret the results of statistical analysis in context of the business situation or business decision, from both statistical and practical perspectives.

- Assessment Plan
    - Assessment Tool: Departmentally-developed final exam
    - Assessment Date: Spring/Summer 2020
    - Course section(s)/other population: All sections
    - Number students to be assessed: All enrolled students
    - How the assessment will be scored: Answers will be scored against an answer key.
    - Standard of success to be used for this assessment: Seventy percent of students must achieve a score of 70% or higher on the exam.
    - Who will score and analyze the data: Answers will be blind scored using software. Data will be analyzed by the lead instructor for the course.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2020		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
112	82

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

The difference was a result of a large number of students withdrawing from the course or failing to complete the course. The majority of students who requested a withdrawal identified the following as factors resulting in withdrawal:

1. Too heavy workload with classes, supervising children taking online classes, working from home, or erratic hours working as an essential worker during Covid-19.

2. Inability to adjust to virtual or online classes.

3. Illness or death in family due to Covid-19.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

Fall 2020 BMG 265 classes included in this assessment included three fully online sections, one evening virtual section, and two daytime virtual sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

This outcome was assessed through a blind-scored final exam in which 20 of the 53 questions required students to interpret the results of the statistical analysis in a business context. The 20 questions were short-answer or multiple choice. All questions on the exam provided a business context for the calculations and interpretation of results. The text of the questions are provided on the spreadsheets used to summarize the results and can be found on the tab labeled Outcome 3.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

Standard Met: At least 70% of students across all sections scored 70% or higher on the final exam. Across all sections, 81.7% of students scored 70% or higher.

Looking more closely at the 20 questions that required students to interpret results of statistical analysis in a business context, at least 70% of students correctly interpreted the results of the statistical analysis on 85% of the questions that required interpretation. All sections, both fully online and virtual, met this learning outcome.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

All sections met this learning outcome. In the majority of cases in which the interpretation was not correct (marked wrong), it was due to an incorrect calculation in a previous step. In other words, students correctly interpreted their

results based on their calculations, but their calculation was wrong (usually due to an incorrect calculation of standard error or forgetting when to subtract the p-value from 1 or double it).

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

The biggest area of difficulty for students was in the calculation and interpretation of confidence intervals for the average value for the estimate of y and of prediction intervals for specific values for the estimate of y in regression analysis. Again, most of the problem in interpretation was due to miscalculation. Given the extremely long and complex formulas for these intervals, with only two parts of the formula which can be found using Excel functions, this result was not surprising.

Revisions to the supplemental materials, Statistics Shortcuts, have already been revised for future use. These break down the formula into 4 major parts and list the steps sequentially for each part of the calculation.

III. Course Summary and Intended Changes Based on Assessment Results

1. Based on the previous report's Intended Change(s) identified in Section I above, please discuss how effective the changes were in improving student learning.

Syllabus Change: In the previous assessment, only three out of five learning outcomes were met. In the current assessment, students met each of the three learning outcomes, which are tailored to meet the requirements of our major transfer partner. The previous low performance in inferential statistics has been at least partially overcome.

However, meeting all of the course objectives has been problematic because the prerequisites were not changed in order to phase in the changes in step with EMU. Students are entering BMG 265 with greatly varied experience with statistics: some have completed MTH 160, others have completed MTH 125 and have little or no prior learning in statistics. Consequently, the latter students are not prepared to jump into inference. Valuable time in the course must then be devoted to descriptive statistic and basics of probability and probability distributions, taking time away from the more challenging inferential statistics.

The change to homework and quiz dates did improve performance as measured by quiz scores, through lessening the likelihood that students would attempt to cram homework and quizzes into a single time block with no time to process mistakes. This change continued until weekly quizzes were dropped at the start of 2019 to make room for discussion board requirements in the online sections, in an effort to

increase student engagement, as part of the goal to improve student completion/success rates in the online sections.

2. Describe your overall impression of how this course is meeting the needs of students. Did the assessment process bring to light anything about student achievement of learning outcomes that surprised you?

Overall, I think the course is meeting the needs of students. The students who take BMG 265 Business Statistics intend to transfer, and the current learning outcomes and objectives meet the university transfer requirements set by Eastern Michigan University College of Business.

3. Describe when and how this information, including the action plan, was or will be shared with Departmental Faculty.

This information has been shared with the department via email for recommendations and comments.

4. Intended Change(s)

Intended Change	Description of the change	Rationale	Implementation Date
Assessment Tool	Replace the use of a final exam with a capstone project designed to demonstrate that the student has achieved each of the learning outcomes. A rubric will be used to assess the student achievement of each outcome.	To fully assess each outcome well, the final exam becomes an extremely lengthy, stressful, high stakes exam. By replacing the exam with a capstone project that encompasses all learning outcomes, students will have more time for deeper analysis, larger data sets to work with, greater context to deal with a larger business problem, an opportunity to select some of the statistical methods for analysis, and the ability to do research to provide recommendations based on conclusions/interpretations. It may also reduce some of the stress that comes with a	2023

		high stakes cumulative final exam taken under time pressure, which may be causing some of the errors.	
Pre-requisite	Current prerequisites: MTH 125 or MTH 160 or Math level 4 and CIS 100 or CIS 110 Remove MTH 125 or Math level 4 as options. Require MTH 160.	When students take BMG 265 with only MTH 125 as their prerequisite, they have had very little statistical background, usually a few descriptive statistics at most. Consequently, they are not prepared to jump into inference. Valuable time in the course must then be devoted to descriptive statistic and basics of probability and probability distributions, taking time away from the more challenging inferential statistics.	2022
Course Materials (e.g. textbooks, handouts, on-line ancillaries)	Change to ancillaries: Statistics Shortcuts are instructor-created materials that focus on 3 C's for each statistical method: Context, Calculations, and Conclusions and serve as a reference tool for students as they complete assignments and study. A fourth C will be added: Checks. This new section will stress conditions, limitations, and	These materials are heavily used by online students. The online students performed below the target for Outcome 1. Placing the Checks in the Statistics Shortcuts will provide greater emphasis on the need to ensure that the conditions, limitations, and risks are identified before statistical analysis begins.	2021

	risks of each method.		

5. Is there anything that you would like to mention that was not already captured?

6.

III. Attached Files

Course Assessment Final Exam Results

Faculty/Preparer:	Rosemary Wilson	**Date:**	06/22/2021
Department Chair:	Douglas Waters	**Date:**	06/22/2021
Dean:	Eva Samulski	**Date:**	06/24/2021
Assessment Committee Chair:	Shawn Deron	**Date:**	10/26/2021

Course Assessment Report
Washtenaw Community College

Discipline	Course Number	Title
Business Management	265	BMG 265 08/03/2017-Business Statistics
Division	Department	Faculty Preparer
Business and Computer Technologies	Business	Rosemary Wilson
Date of Last Filed Assessment Report		

I. Assessment Results per Student Learning Outcome

Outcome 1: Interpret and develop ways to describe data in a meaningful way.

- Assessment Plan
    - Assessment Tool: Departmentally-developed exam
    - Assessment Date: Winter 2014
    - Course section(s)/other population: All sections
    - Number students to be assessed: At least 50% of those enrolled
    - How the assessment will be scored: Answer Sheet
    - Standard of success to be used for this assessment: At least 60% of the class should receive score of 70% or better.
    - Who will score and analyze the data: Exam will be scored by selected members of the School of Business and Entrepreneurial Studies Advisory Board; Lead instructor will analyze the data.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2016		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
159	98

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

Two reasons account for the difference between number of students enrolled and number of students assessed: 1. Lack of student completion of the course, through official withdrawal or failure to show. 2. One part-time faculty member did not submit results for one section.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All students in four on-campus sections who attempted the cumulative final exam, which included 3 day sections and one evening section, were included in the assessment. All students who attempted the cumulative final exam in all online sections, including one late-start online section, were also included in the assessment.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

This outcome was assessed through an item analysis of the seven questions pertaining to descriptive statistics on the cumulative final exam. The exam consisted of 33 questions which required calculations and/or interpretation of data to select the appropriate multiple choice answer in MyStatLab, the online program for testing in BMG 265. Because scoring in MyStatLab is blind-scoring completed through software based on an answer key, it was not necessary to request that scoring be completed by advisory board members to ensure objectivity, as stated in the original assessment plan.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes
Students met expectations: more than 60% of students achieved a correct score on each of the 7 questions. Eighty-one percent or more of students correctly answered each of the seven questions.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

The students excel in the calculation of descriptive statistics.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

The students have little to no difficulty with descriptive statistics and data presentation, likely due to the use of Excel in the course and prior coursework. Interpretation of descriptive statistics is a bigger challenge to a small percentage of the students, as evident in the lower scores for questions requiring interpretation of coefficient of variation and skew. More emphasis will be placed on interpretation through sample problems and PowerPoint slides will be updated to reflect a stronger emphasis on interpretation.

Outcome 2: Apply the principles of statistics to calculate probabilities in real-life situations.

- Assessment Plan
    - Assessment Tool: Departmentally-developed exam
    - Assessment Date: Winter 2014
    - Course section(s)/other population: All sections
    - Number students to be assessed: At least 50% of students enrolled
    - How the assessment will be scored: Answer Sheet
    - Standard of success to be used for this assessment: At least 60% of the class should receive score of 70% or better.
    - Who will score and analyze the data: Exam will be scored by selected members of the School of Business and Entrepreneurial Studies Advisory Board. Lead instructor will analyze the results.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2016		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
159	98

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

Two reasons account for the difference between number of students enrolled and number of students assessed: 1. Lack of student completion of the course, through official withdrawal or failure to show. 2. One part-time faculty member did not submit results for one section.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All students in four on-campus sections who attempted the cumulative final exam, which included 3 day sections and one evening section, were included in the assessment. All students who attempted the cumulative final exam in all online sections, including one late-start online section, were also included in the assessment.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

This outcome was assessed through an item analysis of the five questions pertaining to calculating probabilities using contingency tables, the Binomial distribution, and the Normal distribution on the final exam. The context for all problems on the exam was a business setting or problem. The exam consisted of 33 problems which required calculations and/or interpretation of data to select the appropriate multiple choice answer in MyStatLab, the online program for testing and homework. Because scoring in MyStatLab is blind-scoring completed through software based on an answer key, it was not necessary to request that scoring be completed by advisory board members to ensure objectivity, as stated in the original assessment plan.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes
Students met expectations: more than 60% of the students taking the assessment answered 70% correct on all questions within the learning outcome.

Seventy-two percent or more of students scored correct responses on each of the five questions.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students excelled in finding probabilities using contingency tables and also performed well using the Normal distribution to find probabilities.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Although the standard was met overall, the late-start online class did not meet the standard for the question requiring the use of the Binomial distribution to find probabilities, and students overall barely achieved 70%. This may be due in part to the limited use of the Binomial distribution after the learning module in which it is introduced. A review of student responses also showed that students have a tendency to struggle with determining whether a situation is asking for the probability of a random variable taking on a value that is less than or less than or equal to a particular number of successes. The same is true for finding probabilities that are greater than or greater than or equal to. More attention will be given to working with students on sample problems and physically demonstrating the number of successes a problem is trying to predict.

Outcome 3: Identify how to interpret and make decisions based on random samples.

- Assessment Plan
    - Assessment Tool: Departmentally-developed exam
    - Assessment Date: Winter 2014
    - Course section(s)/other population: All sections
    - Number students to be assessed: At least 50% of students enrolled
    - How the assessment will be scored: Answer Sheet
    - Standard of success to be used for this assessment: At least 60% of the class should receive score of 70% or better.
    - Who will score and analyze the data: Exam will be scored by selected members of the School of Business and Entrepreneurial Studies Advisory Board. Lead instructor will analyze the results.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2016		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
159	98

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

Two reasons account for the difference between number of students enrolled and number of students assessed:

1. Lack of student completion of the course, through official withdrawal or failure to show.

2. One part-time faculty member did not submit results for one section.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All students in four on-campus sections who attempted the cumulative final exam, which included 3 day sections and one evening section, were included in the assessment. All students who attempted the cumulative final exam in all online sections, including one late-start online section, were also included in the assessment.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

This outcome was assessed through an item analysis of the 12 questions pertaining to sampling distributions and the Central Limit Theorem, confidence intervals, hypothesis testing, and chi-square analysis on the final exam. The context for all problems on the exam was a business setting or problem. The exam consisted of 33 problems which required calculations and/or interpretation of data to select the appropriate multiple choice answer in MyStatLab, the online program for testing and homework. Because scoring in MyStatLab is blind-scoring completed through software based on an answer key, it was not necessary to request that scoring be completed by advisory board members to ensure objectivity, as stated in the original assessment plan.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: No
Students did not meet expectations. Out of 12 questions, 70% or more of students answered correctly in only 5 questions. In other words, the goal of 70% was met in only 58.3% of the questions pertaining to this outcome.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students performed acceptably in the mechanics of setting up hypothesis tests and calculating test statistics.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Students have difficulty with inference and interpretation. Part of the difficulty may be in the language used to state conclusions in textbook problems. New slides and coverage that explain how to decipher stated conclusions and relate them back to the hypothesis will be developed. For confidence intervals, new materials will be developed to graphically show students when to choose the t-distribution or the normal distribution, as well as more sample problems that require students to compare a claimed value against the confidence interval and make a decision.

Outcome 4: Model the relationship between two variables and assess the strength of that model.

- Assessment Plan
    - Assessment Tool: Departmentally-developed exam
    - Assessment Date: Winter 2014
    - Course section(s)/other population: All sections
    - Number students to be assessed: At least 50% of enrolled students
    - How the assessment will be scored: Answer sheet
    - Standard of success to be used for this assessment: At least 60% of the class should receive score of 70% or better.

- Who will score and analyze the data: Exam will be scored by selected members of the School of Business and Entrepreneurial Studies Advisory Board. Lead instructor will analyze the results.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2016		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
159	98

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

Two reasons account for the difference between number of students enrolled and number of students assessed:

1. Lack of student completion of the course, through official withdrawal or failure to show.

2. One part-time faculty member did not submit results for one section.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All students in four on-campus sections who attempted the cumulative final exam, which included 3 day sections and one evening section, were included in the assessment. All students who attempted the cumulative final exam in all online sections, including one late-start online section, were also included in the assessment.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

This outcome was assessed through an item analysis of the nine questions pertaining to correlation and regression analysis on the final exam. The context for all problems on the exam was a business setting or problem. The exam consisted of 33 problems which required calculations and/or interpretation of data to select the appropriate multiple choice answer in MyStatLab, the online program for testing and homework. Because scoring in MyStatLab is blind-scoring completed through software based on an answer key, it was not necessary to request that

scoring be completed by advisory board members to ensure objectivity, as stated in the original assessment plan.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: No
Standard was not met. 70% of students scored the correct answer on only 5 out of 9 (55.55%) of questions. The on-campus F2F sections met the standard, but the online sections did not.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students performed well in calculating the coefficient of correlation and correctly interpreting it. Students also were able to calculate the regression equation and use it to predict the average value for the dependent variable based on a given value for the independent variable.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

The F2F sections met the standard, but the online sections did not. One variable that might have influenced these results is that in the F2F sections regression analysis and correlation were moved in the schedule to immediately follow hypothesis testing and chi-square analysis was moved to the final module in the course. This was an experiment to see if moving the regression module right after hypothesis testing would help students connect the three hypothesis tests that are part of regression and correlation to the hypothesis testing process. This appears to have made some difference, and changes will be made to online sections to see if it has a similar impact on student performance.

The performance was lowest on the hypothesis tests for the correlation coefficient, the coefficient of determination, and the slope of the regression equation. To improve performance, several steps will be taken:

1. Students will be required to submit their Excel worksheets with their homework or quizzes. Students appear to be making too many calculation errors when doing the work using their calculators. This will allow more time for interpretation.

2. Additional materials (slides, handouts) are being created for students to help them determine which test requires which test statistic and critical value, how to

find the p-value and how to apply decision criteria, and finally how to interpret the results of the three hypothesis tests in correlation and regression.

II. Course Summary and Action Plans Based on Assessment Results

1. Describe your overall impression of how this course is meeting the needs of students. Did the assessment process bring to light anything about student achievement of learning outcomes that surprised you?

This assessment confirmed concerns that have arisen through review of student tests, homework, and quiz results. Analysis of the results led us to look at a sample of students at different performance levels and delve a little deeper into the results in MyStatLab. That analysis has shown that a strong positive correlation ($r = .88$) exists between student weekly quiz scores and their exam scores. It has also shown that the majority of students (over 90%) attempt to complete all of their chapter homework and their chapter quiz on the same day/night. Although students have the opportunity to complete homework as many times as they choose and take each quiz up to 3 times, most only complete them once before running out of time. We plan to rearrange the student work schedule to force students to pace themselves more realistically, by putting homework and quiz deadlines in a different sequence. The assessment also confirmed concerns that students struggle with inference.

2. Describe when and how this information, including the action plan, was or will be shared with Departmental Faculty.

The assessment results including the action plan will be shared with the Business Department for comments and discussion in August of 2017.

3. Intended Change(s)

Intended Change	Description of the change	Rationale	Implementation Date
Objectives	Major changes will be made to the course syllabus, learning outcomes and course objectives as a result of this assessment and meetings with the College of Business faculty at	Low completion rates combined with the obvious difficulties students experience with inferential statistics call for changes. EMU has been experiencing low student success rates in their Business Statistics course and their faculty	2018

	our primary receiving transfer institution, Eastern Michigan University. Ultimately, this will also result in the development of new course materials and changes to the common final exam, which is used as the assessment tool.	believe the students need more time to understand and practice the material. Consequently, EMU is breaking their Business Statistics course into a two-course sequence. EMU has agreed to accept WCC's MTH 160 as the equivalent of the first course in the sequence. As BMG 265 is primarily a transfer course, it will be revised to meet the requirements of the second course in the sequence. This change will allow more time and focus on inferential statistics.	

4. Is there anything that you would like to mention that was not already captured?

5.

III. Attached Files

BMG 265 Final Assessment All Sections Combined

Faculty/Preparer:	Rosemary Wilson	**Date:**	08/18/2017
Department Chair:	Julianne Davies	**Date:**	08/21/2017
Dean:	Eva Samulski	**Date:**	08/22/2017
Assessment Committee Chair:	Michelle Garey	**Date:**	10/31/2017

Course Assessment Report
Washtenaw Community College

Discipline	Course Number	Title
Business Management	265	BMG 265 02/16/2014-Business Statistics
Division	Department	Faculty Preparer
Business and Computer Technologies	Business	Julianne Davies
Date of Last Filed Assessment Report		

I. Assessment Results per Student Learning Outcome

Outcome 1: Interpret and develop ways to describe data in a meaningful way.

- Assessment Plan
    - Assessment Tool: Departmentally-developed exam
    - Assessment Date: Winter 2014
    - Course section(s)/other population: All sections
    - Number students to be assessed: At least 50% of those enrolled
    - How the assessment will be scored: Answer Sheet
    - Standard of success to be used for this assessment: At least 60% of the class should receive score of 70% or better.
    - Who will score and analyze the data: Exam will be scored by selected members of the School of Business and Entrepreneurial Studies Advisory Board; Lead instructor will analyze the data.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2012		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
109	76

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal,

or did not complete activity.

All BMG 265 students who took the final were assessed. Students from all four classes offered were assessed. Attrition rate for this course is normally between 20-25%.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

Instructors for all four sections gave the same exam. All completed exams were part of the assessment.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

A scoring rubric was developed. Instructors graded each question using the rubric.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes
61.5% of students received a score of 70% or higher.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students performed well for course objective #1--Interpret and develop plots and histograms of data and #2--Calculate mean, median, mode, quartiles, thresholds for outliers, standard deviation, and indicators of relative value.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

For course objective #3--Discriminate between discrete and continuous variables, 51.7% of students obtained a 70% achievement level. This material is presented early in the term. Review of this material at the end of the term will reinforce students' comprehension of the topic.

Outcome 2: Apply the principles of statistics to calculate probabilities in real-life situations.

- Assessment Plan

- Assessment Tool: Departmentally-developed exam
- Assessment Date: Winter 2014
- Course section(s)/other population: All sections
- Number students to be assessed: At least 50% of students enrolled
- How the assessment will be scored: Answer Sheet
- Standard of success to be used for this assessment: At least 60% of the class should receive score of 70% or better.
- Who will score and analyze the data: Exam will be scored by selected members of the School of Business and Entrepreneurial Studies Advisory Board. Lead instructor will analyze the results.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2012		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
109	76

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

All students who took the final were assessed.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

Instructors for all four sections gave the same exam. All completed exams were part of the assessment.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

A scoring rubric was developed. Instructors graded each question using the rubric.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this

outcome and tool.

Met Standard of Success: Yes
72.0% of students received 70% or higher.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students performed well above the standard (80.2%) for course objective #5--Distinguish between population and sample mean situations.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Students performed at the standard for course objective #4--Identify and appropriately use the correct probability determination methods coming in at 70.9%. Additional homework problems on this topic will be instituted.

Outcome 3: Identify how to interpret and make decisions based on random samples.

- Assessment Plan
    - Assessment Tool: Departmentally-developed exam
    - Assessment Date: Winter 2014
    - Course section(s)/other population: All sections
    - Number students to be assessed: At least 50% of students enrolled
    - How the assessment will be scored: Answer Sheet
    - Standard of success to be used for this assessment: At least 60% of the class should receive score of 70% or better.
    - Who will score and analyze the data: Exam will be scored by selected members of the School of Business and Entrepreneurial Studies Advisory Board. Lead instructor will analyze the results.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2012		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed

109	76

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

All students who took the final were assessed.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

Instructors for all four sections gave the same exam. All completed exams were part of the assessment.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

A scoring rubric was developed. Instructors graded each question using the rubric.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes
76.1% of students received 70% or higher.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students performed above the standard for course objective #8--Determine correct sample sizes for a specified error and confidence level and #9--Calculate the correct p-value associated with a hypothesis test.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Students performed less well on course objective #10--Interpret and state hypothesis test conclusions. Additional homework problems will be assigned on this topic.

Outcome 4: Model the relationship between two variables and assess the strength of that model.

- Assessment Plan
    - Assessment Tool: Departmentally-developed exam
    - Assessment Date: Winter 2014
    - Course section(s)/other population: All sections
    - Number students to be assessed: At least 50% of enrolled students
    - How the assessment will be scored: Answer sheet
    - Standard of success to be used for this assessment: At least 60% of the class should receive score of 70% or better.
    - Who will score and analyze the data: Exam will be scored by selected members of the School of Business and Entrepreneurial Studies Advisory Board. Lead instructor will analyze the results.

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2012		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
109	76

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

All students who took the final exam were assessed.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

Instructors for all four sections of the course gave the same final. All completed finals were assessed.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

All instructors used the same rubric to grade the exams.

6. Briefly describe assessment results based on data collected for this outcome and tool

during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes
73.7% of students received 70% or higher.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students performed above the standard for all course objectives.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Since results were above the standard required, continue current coverage of this material.

II. Course Summary and Action Plans Based on Assessment Results

1. Describe your overall impression of how this course is meeting the needs of students. Did the assessment process bring to light anything about student achievement of learning outcomes that surprised you?

All course objectives are being covered by all instructors teaching BMG 265. The attrition rate of students is of concern.

2. Describe when and how this information, including the action plan, was or will be shared with Departmental Faculty.

Information was shared in manual form at the September 2013 Business Department meeting. This is the electronic submission of the information.

3. Intended Change(s)

Intended Change	Description of the change	Rationale	Implementation Date
Assessment Tool	The points distribution of questions on the exam will be redone.	Grading questions using fractions of points was difficult to evaluate.	2015
Course Materials (e.g. textbooks,	Discriminating between discrete	Students need a review of this	2015

handouts, on-line ancillaries)	and continous variables, which is covered early in the term, will be reviewed at the end of the term before the final exam.	material later in the term.	

4. Is there anything that you would like to mention that was not already captured?

III. Attached Files

Business Statistics Assessment

Faculty/Preparer:	Julianne Davies	**Date:** 02/16/2014
Department Chair:	Colette Young	**Date:** 02/20/2014
Dean:	Rosemary Wilson	**Date:** 03/14/2014
Assessment Committee Chair:	Michelle Garey	**Date:** 04/09/2014