

## Assessment Report for GSU Core Curriculum

Discipline: Mathematics	Contact person(s): Atlanta campus: Dr. Leslie Meadows Perimeter College: Todd Hendricks	Telephone/Email: (404) 413 - 6406 (770) 278 - 1397
Course(s): MATH 1070	Cycle/year: 2016-2017	Submission date:

### Core Curriculum Area Learning Outcome

Area D: Essential Skills: Quantitative

Students demonstrate the ability to interpret and analyze quantitative information; to apply mathematical principles and techniques; and to use mathematical models to solve applied problems.

### Assessment Measures and Targets

Four skills were included on the assessment for all GSU Math 1070 students on the Atlanta and Perimeter campuses. A fifth skill was assessed for the students on the Perimeter campuses, but was not evaluated on the Atlanta campus for reasons explained in the Assessment Administration section of this report. Although not accurately assessed for all students, the faculty at Perimeter wished to include this skill for purposes of discussion. Each of the skills assessed is listed below:

- Finding a probability value based on data organized in a two-way table. (Students will interpret quantitative information)
- Finding a probability value based on a normally distributed variable over a population. (Students will apply a mathematical model: a bell shaped normal curve)
- Calculate a confidence interval for a population proportion. (Students will analyze quantitative information.)
- Select a boxplot that fits the distribution of a sample data set (Students will apply mathematical principles and techniques)
- *\*\*\* Calculate a confidence interval for a population mean with an unknown population standard deviation. (Students will analyze quantitative information.)\*\*\**

Please note that ALL of the problems on the assessment instrument are applied problems.

For each question/skill, the target is that more than 65% of students answer the question correctly.

*\*\*\* The original intent was to evaluate this fifth skill for all students, including those on the Atlanta campus. However, this skill was not included in the course material for eight sections of students participating in a pilot of new material and was, therefore, not included on the final exam. For the remaining Atlanta sections, extraneous data that downloaded (due to instructor/coordinator error) caused students to use the wrong data and, therefore, invalidated their results.*

## Assessment Administration (Data Collection and Sampling Plan)

As noted above, 4 questions (each of which addressed a particular skill) was administered as a part of the final exam for all of the GSU Math 1070 students. A fifth skill was also tested for all of the students on the Perimeter campuses.

A total of 1,145 students completed the assessment on the Atlanta campus in a proctored environment. The assessment questions were delivered electronically via two different course management systems. The common technology used by all Atlanta students during the course and the final exam was *Microsoft Excel*.

The group of Atlanta students whose course content, assignments and exams were delivered by *MyStatLab*, a course management system developed by Pearson (837 students), addressed these skills electronically via *MyStatLab*, as well, by answering free-response, decimal point accuracy questions that were included as a part of their final exam. These questions can be viewed in the attached document entitled, "Atlanta MyStatLab Math 1070 Spring 2017 Assessment Questions". The fifth question in this document, which was intended to assess the fifth skill listed in the "Assessment Measures and Targets" section, was formed from a previously existing *MyStatLab* question which was edited for purposes of the assessment. Unfortunately, due to instructor error, the students viewed one set of data in the statement of the problem, but two sets of data downloaded on their Excel sheet; this caused some students to use the wrong set of data and invalidated the assessment for this skill.

Another group on the Atlanta campus (308 students) participated in a pilot of the "Probability and Statistics" course material from the *Open Learning Initiative (OLI)* delivered through the *OpenEdX* platform, *Lagunita*, at Stanford University. The first four (of five) multiple-choice questions listed in the attached document entitled, "Perimeter and OLI Math 1070 Spring 2017 Assessment Questions" was delivered electronically to these students via a course management system entitled, *eMath*. The fifth question/skill listed in this document was not included in the OLI piloted course material and was, therefore, not included on the final exam.

A total of 957 students completed the assessment on the Perimeter campuses where each student was tested in a proctored environment using the same multiple-choice questions that are attached in a document entitled, "Perimeter Math 1070 Spring 2017 Assessment Questions". Students who met in a traditional "face-to-face" classroom submitted responses on a scantron and were machine graded. Perimeter's 264 online students were tested electronically (using *Respondus* in *iCollege*). It is worth mentioning that most online students took the majority of their regularly scheduled exams using *MyStatLab* throughout the semester. The common technology used by all Perimeter students during the course and the final exam was the TI-84 calculator.

There was also a relatively small group of Perimeter students on the Clarkston and Newton campuses (73 students), who participated in the pilot of the OLI course material during the Spring 2017 semester. Although the fifth skill was also not addressed in the OLI course material for these students, their instructors created hand-outs/worksheets to familiarize students with this skill and, therefore, felt comfortable including it on the final exam.

At all campuses, students that tested electronically had additional security features enabled to prevent dishonest behavior. “Lock-down” browsers were used during exams.

### **Assessment Findings**

An attached spreadsheet will provide specific results, below is a general discussion of the results.

University wide results demonstrate that the target of 65% correct responses was met for the questions that tested the four skills below: (One question was posed for each skill.)

- Finding a probability value based on data organized in a two-way table. (Students will interpret quantitative information)
- Finding a probability value based on a normally distributed variable over a population. (Students will apply a mathematical model: a bell shaped normal curve)
- Calculate a confidence interval for a population proportion. (Students will analyze quantitative information.)
- Select a boxplot that fits the distribution of a sample data set (Students will apply mathematical principles and techniques)

As noted a fifth skill was tested, but due to difficulties discussed above, a reliable conclusion for the assessment results cannot be made.

### **Analysis/Interpretation of Assessment Findings**

Overall General Analysis:

Based on the assessment results which are presented above, it is determined that Georgia State University is meeting its target for this area of the Core Curriculum.

Comparison of Atlanta Campus to Perimeter Campuses:

For each of the four skills that were evaluated for all GSU students taking a Math 1070 final exam, students met the target at each campus. Although the majority of the sections on the Atlanta campus were taught via an Emporium model (which includes a once-a-week lecture with 3 additional academic hours being scheduled in the Commons MILE laboratory) and most Perimeter students (except for the online students) are taught using a traditional, 3 academic-hour classroom model, there is consistency in the achievement of the Area D quantitative goals for each campus.

Comparisons of the Atlanta Campus Groups:

The students who were taught via the Emporium-type model and utilized the *MyStatLab* course management system, had a performance that was much the same as the online students on the Atlanta campus (who also utilized *MyStatLab*) and the target was met for each of the four skills that were assessed. However, the OLI group of students (who were also taught utilizing an Emporium-type model) outperformed each of the other Atlanta groups for each target.

#### Perimeter Campuses:

The much discussed 5<sup>th</sup> question was included for all sections on the Perimeter Campuses. On this question, the assessment target was not reached. Only 61% of students responded correctly. This result is puzzling for a number of reasons.

1. Question 3 and Question 5 both ask the student to find a confidence interval from data. One is for a population proportion and one is for a population mean with an unknown population standard deviation. For both of these questions, students at Perimeter are instructed in the use of the TI-84 calculator to find the solution. For such similar skills to have different results over a common set of students calls into question the validity of the test items to accurately measure the skill. That is, is Question 3 a poor question and over-estimates the student ability or is Question 5 the poor question and under-estimates the student ability?
2. Is it possible that the questions are valid and students are having a difficult time differentiating between two similar skills? It seems highly unlikely for this to be the case. However, this possibility cannot be discounted from this assessment.

Students on the Dunwoody campus did not miss the target on any of the five skills that were evaluated on the Perimeter campuses.

Students on the Alpharetta and Clarkston campus missed one target: \*\*\*Skill 5.

Students on the Newton campus missed one target: skill 2.

Students on the Decatur campus missed two targets: skill 3 and \*\*\*Skill 5.

The Online Perimeter students missed two targets: skill 2 and \*\*\*Skill 5.

The Perimeter students who were participating in the pilot of the OLI course material missed one target: \*\*\*Skill 5.

As a reminder, this particular skill was not included in the OLI course material but was introduced to these students via a handout/worksheet created by their instructors.

*\*\*\*Skill 5 was not assessed on the Atlanta campus and is only included, here, with the Perimeter campuses for the purpose of discussion.*

The performance by the group piloting the OLI material on the Perimeter Campuses demonstrates that students in these sections performed at a slightly higher level than students in the remaining sections. These students were limited to two instructors and are a small sample size compared to the rest of the students at Perimeter.

### **Impact of Past Changes Based on Assessment Findings**

This was the initial assessment performed since the consolidation of Perimeter and Georgia State University. As such, there is no prior common assessment to discuss.

### **Sharing and Discussion of Assessment Findings**

General:

The results of the assessment have been shared with the faculty that teach the course on each campus as well as the administrators that have oversight over Mathematics. Faculty from the Perimeter and Atlanta campuses have met to discuss the findings as well. There is general agreement to the content of the evaluation of this assessment as found in this report.

There are no recommendations to make changes to the Core Curriculum as a result of this assessment.

### **Intended Changes Based on Current Assessment Findings (Action Plan)**

Atlanta Campus Changes:

Based on these assessment results and increased pass rates for the Academic Year 2016/2017, the Atlanta campus has decided to fully adopt the OLI course material coupled with the *eMath* course management system that was piloted during that time.

Perimeter Campus Changes:

Faculty on the campuses where a target(s) other than Skill 5 was missed, will be asked to examine their methods on that/those skills. They should be encouraged to attend conferences that emphasize the teaching of the material in MATH 1070 and make adjustments in an effort to better reach the students. This is not a statement of an overall lack of quality. Recall that if Skill 5 ignored, these campuses met the target except for a single skill/question each.

While the results for the OLI group at Perimeter were better than the general student population, there is no current plan for wholesale changes. This group is small and this was not a designed experiment comparing the techniques. There is also the concern that there is not enough computer classroom space to hold these courses.