Course-Level Assessment Project
Final Report

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Division/Department: **Mathematics and Engineering**
Course Assessed: **MAT-095 Foundations for College Mathematics**

Step 1. Define

MAT-095 is a new course that began in Fall 2018. This course was designed to give students the mathematical foundation that they will need to be successful in one or more of three different credit level general education math courses: MATH-111, MATH-115, and/or MATH-121. Due to the changes being pursued in the area of transitional mathematics and because this is a new course, it was very important to assess.

MAT-095 objectives that will be assessed are:

5.   Create box-and-whisker plots, histograms, and ogives.
6.   Translate, solve, and graph linear equations.
10. Solve systems of linear equations by graphing and substitution.
13. Solve applications that can be modeled by linear equations, formulas, exponential functions, and/or proportions.

These specific objectives were chosen because these topics serve as the prerequisite base for future credit level courses. Objective 5 was selected because these topics were specifically included in the course to help prepare students for Statistics, MATH-115. Objectives 6 and 11, graphing topics, were selected because they link to topics covered in both MATH 121 and MATH 111. Objective 14 was selected because application questions reflect our student's ability to think critically and apply the concepts and skills that they have learned. The ability to think critically is expected in all general education courses. These objectives have been approved by both the Chair of the Mathematics and Engineering Division, Brianna McGinnis, and Dr. Michelle Kloss, Associate Vice President of Curriculum and Assessment.

Step 2. Design

After consulting with Dr. Kloss and the Data Review Team it was agreed upon that the Data Review Team will help to pull data for course success, student demographics, student persistence, and student success.

Historical data led to the creation of the new MAT-095 course to create a pathway for students whose degree path requires the specific general education math courses mentioned in step one. Since there is no longitudinal data for this new course, the course will have to run before we are able to set

benchmarks. Our first data collection for this assessment project will help us develop future benchmarks and decide if our Accuplacer range is too broad.

MAT-097 Accuplacer cut scores on the Algebra section was between 40 and 69 inclusive and for MAT-099 the Algebra score was 70 or higher. In order to place into MAT-095 students will need an algebra score of 40 or more and a college level score less than 45.

Each of the four objectives will be measured using common questions on unit exams, in addition to specific questions on the common final exam that will be recorded using student ID only. The questions will be mapped to appropriate course objectives. A rubric will be provided for all common questions and common final exam for consistency in scoring.

All instructors will administer unit exams within a five to seven-day period (with exception of the late start section which will not be included in this pilot year of the assessment).   All instructors will use the same textbook and will be given the option of using the same guided notes for instruction. All students will complete the same practice homework assignments in the Hawkes Learning System.

The first group of common questions will be developed in Summer 2018 prior to the start of the semester.   On August 16, all MAT-095 instructors will meet for training. This training will include information about the assessment project. Both oral and written directions will be provided explaining the purpose of the study and giving guidance for consistent data collection. Future common questions and the common final will be developed in a timely manner thought the Fall 2018 semester. This data will be processed and analyzed in January 2019 and possibly through the Spring 2019 semester if needed. Any necessary changes to the course will be identified during Spring 2019 and implemented in the Fall 2019 semester.

Step 3. Implement

On August 16, 2018 MAT-095 instructors attended a training that included information about the assessment project. Both oral and written directions were provided, explaining the purpose of the study and giving guidance for consistent data collection. Future common questions and the common final were developed in a timely manner throughout the Fall 2018 semester.

Instructors administered the assessments with the included common questions at the same relative time throughout the semester. All common final exams were administered during finals week.

All instructors used the same textbook and were given the option of using the same guided notes for instruction. All students completed the same practice homework assignments in the Hawkes Learning System.

In early November 2018 we asked MAT-095 instructors for feedback on the drafted assessment instrument, and the common final exam.

The biggest challenge in implementing the assessment was ensuring that all instructors executed the assessment in the same way. Ensuring that the common questions were included in instructors' exams as part of the test and not as an addendum was a challenge but was soon resolved. Assuring instructors recorded the data in a consistent manner was also a challenge. Some instructors forgot to collect data on some exams, and some forgot to collect data for individual students (for example, if a student took the exam late due to illness or accommodations). This fact had to be taken into consideration when analyzing the data.

Step 4. Analyze

Using the common questions, instructors collected the number of points earned for each student in their class. The points earned was recorded on a spreadsheet provided by the coordinators and then all sections were combined at the end of the semester in one master spreadsheet. As coordinators, we decided to analyze the data for only the students who completed the course. Completion was defined as those students who took the final exam. The mean, median, standard deviation and average score was recorded for all students who completed the course. Not all students who completed the course passed the course. To pass MAT-095, students must have earned an average overall course percentage of 75.

At the first round of data collection in the Fall 2018 semester, the data showed that we had four questions in which the average was below 70%.

FA18	Test 1	Test 1	Test 1	Test 2	Test 2	Test 2	Test 2	Test 3	Test 3	Test 3	Test 3
	Histogram	Ogive	BW Plot	Perimeter	Classic Car	Shirt/Sweater	Bike	Standard Graph	Point-Slope Graph	System Graphing	System Substituting
Possible	9 points	9 Points	12 points	5 points	4 points	4 points	5 points	2 points	2 points	4 points	4 points
Mean	7.5209091	6.937273	7.8527273	4.3298755	2.9585062	2.614107884	2.807054	1.656934307	1.598540146	2.848540146	2.947080292
Average Percent	83.57%	77.08%	65.44%	86.60%	73.96%	65.35%	56.14%	82.85%	79.93%	71.21%	73.68%
St Dev	1.9439615	2.252618	2.6617632	1.1565482	1.4456617	1.54057894	1.481522	0.644082176	0.677583013	1.323172478	1.397253539
Median	8	7.5	8	5	4	3	3	2	2	3	4

	Test 5	Test 5	Test 5	Test 5	Final Exam	Final Exam	Final Exam	Final Exam	FINAL COURSE GRADE	
	Investment	Map	Savings	Population	#21 Freq. Dist.	#22 Graphing	#23 Interest	#25 System		
Possible	4 points	4 points	4 points	4 points	5 points	5 points	5 points	5 points	percentage	
Mean	3.39156627	3.4760956	3.025896	3.19521912	3.525270758	4.462093863	3.92418773	3.2599278	81.00762899	
Average Percent	84.79%	86.90%	75.65%	79.88%	70.51%	89.24%	78.48%	65.20%		
St Dev	1.14401015	0.9292073	1.363205	1.18984749	1.532052598	1.328822059	1.50892027	1.89802071	12.8929816	

This data was shared with Dr. Kloss and with our instructors of the course to show what the data that they collected throughout the semester showed. We presented the data at our evening faculty meeting with our adjuncts and emailed the summary data to all of those currently teaching the course in Spring 2019.

Step 5. Modify/Maintain

As a result of the first analysis of the data in January 2019, the coordinators added an additional question about box-and-whisker plots and outliers to Worksheet 1 and the Book Review for Unit 1 to give students an additional opportunity to practice these skills. In addition, the coordinators separated the score reporting for this question to see if students were having difficulty with creating the box-and-whisker plot, identifying the boundaries on the outliers, or both. When sharing the data with our instructors, we asked them to present more examples on solving systems of equations in their instruction to address the low assessment score in that area.

In the month of January 2019, Kristin and Mary worked on making the guided notes clearer. They also went through the homework problems in the Hawkes Learning System and modified the types of questions students saw in the individual sections and in the final exam review WebTest. This helped to better align the guided notes and homework so there was more consistency for students.

A second round of data was collected in the Spring 2019 semester. Only three questions averaged less than 70% (the box-and-whisker plot outlier question averaged just below 70%, but many instructors did not separate out the reporting on this question as was instructed, so the validity of the scores are questionable).

Fifteen out of the eighteen questions that were assessed both semesters showed improvement. Of those questions whose average percentage increased, five showed a statistically significant improvement over the mean score ($\alpha = 0.05$, $n_{FA18} = 236$ and $n_{SP19} = 120$). When analyzing the data, the sample was adjusted to control for the variance in instructor reporting. Some instructors did not record data for all questions and/or all students, so the sample size was adjusted accordingly using the smaller sample size.

Three questions decreased from Fall to Spring, however, only one decrease was statistically significant ($\alpha = 0.05$, $n_{FA18} = 236$ and $n_{SP19} = 120$), the systems of equations question on the final exam.

SP19	Test 1 Histogram	Test 1 Ogive	Test 1 BW Plot	Test 1 BW Outliers	Test 2 Perimeter	Test 2 Classic Car	Test 2 Shirt/Sweater	Test 2 Bike	Test 3 Standard Graph	Test 3 System Graphing	Test 3 System Substituting
Possible	9 points	9 Points	9 points	3 points	5 points	4 points	4 points	5 points	2 points	4 points	4 points
Mean	7.87	7.18	7.15	2.04	4.42	3.19	2.91	3.01	1.67	2.65	3.09
Average Percent	87.46%	79.75%	79.41%	68.14%	88.34%	79.74%	72.74%	60.21%	83.39%	66.35%	77.31%
St Dev	1.73	2.16	1.41	1.06	1.22	1.26	1.41	1.50	0.60	1.35	1.38
Median	8	8	7	2.5	5	4	4	3.5	2	3	4

	Test 5 Investment	Test 5 Map	Test 5 Savings	Test 5 Population	Final Exam #21 Freq. Dist.	Final Exam #22 Graphing	Final Exam #23 Interest	Final Exam #25 System	FINAL COURSE GRADE
Possible	4 points	4 points	4 points	4 points	5 points	5 points	5 points	5 points	percentage
Mean	3.49	3.66	3.04	3.36	3.92	4.40	4.23	2.78	81.22
Average Percent	87.16%	91.47%	75.95%	83.88%	78.41%	88.00%	84.55%	55.52%	
St Dev	1.10	0.88	1.23	1.07	1.36	1.41	3.06	1.98	11.59
Median	4	4	4	4	4.5	5	5	3	82.13043

Final Results and Recommendations

After reviewing the second data set, another round of modifications was made to the guided notes to continue to provide clarity for students and consistency in instruction.   In addition, the order of topics was reorganized to provide a more seamless transition and flow. Looking at the data as a whole, the outlook is favorable, transitional students are performing well and improving on the objectives assessed. These objectives are specifically aligned to the credit level courses next in the sequence for students.

As stated above, our long-term goal is that students completing MAT-095 have the mathematical foundation to succeed in their credit level math course. Further analyzing of student success data in this course by the Director of Institutional Research, Natalie Crespo, found that "the new transitional Math pathways are working…students are more successful in 095 and do just as well in college math as those who took 099."

The coordinators will again meet with instructors prior to the Fall 2019 semester, to share data results, justify course modifications, and discuss recommendations. This will also give the coordinators the opportunity to share with instructors the implications of transitioning from Accuplacer to ALEKS for student placement.

It may be beneficial to collect one more round of data this fall to compare to the previous fall data to corroborate our results and see if there can be improvements made on the objectives that are still earning scores less than 70%. Our emphasis will be on solving systems of equations both by graphing and substitution and calculating the boundaries on outliers for a box and whisker plot. It is recommended that a smaller number of questions be used to collect data to focus our attention on the objectives that are in most need of improvement. Having two sets of fall data to compare will increase the validity of the data comparisons as the sample size will be more similar and the population of students will be more closely matched. One thing that will have to be taken into consideration with this new cohort of students is that the prerequisite will have changed with the implementation of the 3.0 high school GPA rule. This will also result in the decrease of the sample size.

Supervisor Signature _____ Date _____

Please forward a copy of the signed report to the Associate Vice President of Curriculum and Assessment.