| Course Outcomes Guide (COG) |
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**Course Title:**  **MAT109 (3 Credits) INRO TO STATS**

**Date:**   **8/25/17**

**Course Team:**  <u>**Tom Crawford**</u>**, Joseph Mason, Richard Campbell, Alicia Myers, Steve Lindsey**

## STUDENT LEARNING OUTCOMES:
### General Education/Program/Course Outcomes:
#### Upon successful completion of this course, students will learn how to:

G1. Apply mathematical methods involving arithmetic, algebra, geometry, and graphs to solve problems.

G2. Represent mathematical information and communicate mathematical reasoning symbolically and verbally.

G3. Interpret and analyze numerical data, mathematical concepts, and identify patterns to formulate and validate reasoning.

P/C1. Use computational techniques and algebraic skills essential for success in an academic, personal, or workplace setting. (Computational and Algebraic Skills)

P/C2. Use visualization, special reasoning, as well as geometric properties and strategies to model and solve problems. (Geometric Skills)

P/C3. Collect, organize, and display data as well as use appropriate statistical methods to analyze data and make inferences and predictions. (Statistical Skills)

P/C4. Critically analyze and construct mathematical arguments. (Proof and Reasoning)

P/C5. Use technology, where appropriate, to enhance and facilitate mathematical understanding, as well as an aid in solving problems and presenting solutions. (Technological Skills)

P/C6. Communicate and Understand mathematical statements, ideas and results, both verbally and in writing, with the correct use of mathematical definitions, terminology and symbolism. (Communication Skills)

P/C7. Work collaboratively with peers and instructors to acquire mathematical understanding and to formulate and solve problems and present solutions. (Collaborative Skills)

## Assessment:
1. A common assessment (CA) is delivered to all students across all sections and delivery modes. This common tool was first used at the conclusion of the Fall 2012 semester.
2. The CA consists of 19 MC questions selected from AP Stats and Praxis Exams.
3. The assessment is delivered in the classroom or Academic Testing Center at the conclusion of the course.

## Validation:
1. All previous and currently available assessment data has been entered into the "Mathy" database.
2. CA results are evaluated only after final course grades have been assigned by the instructor.
3. Correlation between students' course grade and composite CA scores are determined annually.
4. Correlation between students' final exam score and composite CA scores are determined annually.
5. Grade distribution and mean CA score by letter grade assigned will be used to compare on campus to off campus (HS) course offerings.

6. CA question results that differ significantly (alpha=.05) from HCC historical values will establish content areas in need of corrective action and those where previous efforts have proven un/successful.
7. CA question results that differ significantly (alpha = .05) from nationally normed exam results will establish content areas to be studied for systemic strength or weakness.

## Results:
1. A simple linear correlation between CA results and student letter grades is present.
2. A simple linear correlation between CA results and final exam score is present.
3. Disparity between HS AP students and HCC students is pronounced when considering the proportion of letter grades earned. HS AP students have a much more right-skewed distribution. Similarly, HS AP students significantly outperform HCC students on CA items.
4. During the 16/17 academic year no CA items deviated significantly from HCC historical values.
5. When collective HCC results (14 semesters) are compared to national results the proportion of HCC students answering each CA question correctly is significantly lower than the national norm nearly across the board.

## Follow-up:
1. Off campus sections of this course are offered in a strictly AP environment. A higher proportion of A and B grades is to be expected as the on campus students are not held to AP level entrance requirements. Similarly, higher scores on CA items is to be expected as the CA items are selected from AP and Praxis exams whereas the on campus sections do not rise to this level of rigor.
2. HCC results are remarkably consistent. Effort to address specific weaknesses are not currently indicated. However, efforts to address overall weakness are strongly indicated.
3. If the assessment tool has been well selected, HCC results are not sufficient and efforts to address systemic weakness should be undertaken.
4. Discussions with the MD State-wide Math Group indicate that the successful Intro to Stats college student should be able to achieve a measure of success when presented with the types of questions comprising the AP-Stats and Praxis Math Content Area statistics questions.
5. Discussions with WCPS indicate that the current HCC course offering is insufficiently rigorous for an Essence Dual Enrollment course intended for 4th Year College Ready HS students with exposure to Common Core mathematics.

## Closing the Loop:
1. Current curriculum materials, delivery methods, and performance expectations are not developing the depth of understanding and statistical thinking required for HCC students to successfully negotiate these types of assessment questions.
2. Current curriculum materials, delivery methods, and performance expectations are not consistent with the expectations of SWMG – Most notably 4-yr transfer institutions
3. Fall 2016 will bring with it the first group of "College Ready" freshman as determined by PARCC assessment of the Common Core Learning Standards.
4. Absent PARCC certification students will be placed into developmental transition courses so as to achieve "College Ready" status.
5. Beginning in SU17 MAT109 content (coursework, practice exercises, and exams) will be highly differentiated between Statistical Literacy and Statistical Reasoning. MAT109 delivery will be changed to a flipped classroom environment in which differentiated instruction is provided to student working groups engaged in active learning exercises appropriate to the students' level of performance on formative assessments. First exposure to course content and the completion of formative assessments will be conducted by the student in advance of class meetings. All course grading will be heavily weighted in favor of Statistical Literacy over the duration of the course.
   a. The intention is for Transfer and STEM students to demonstrate higher levels of Statistical Reasoning in order to earn A and B grades.

        **b.** Meanwhile, general studies students focused on mere course completion will no longer be able to do so via memorization. Rather, they must be able to demonstrate Statistical Literacy over time in order to earn a C grade.

6. Calculating and interpreting summary statistics, creating, reading, and using statistical graphics, and translating English mathematical and probability statements into mathematical symbols are Common Core items for which the "College Ready" freshman will have a demonstrated proficiency.

7. The course content of the newly revised MHEC Introductory to Statistics syllabus does not include the content items mentioned in #6 above.

8. MD SWMG believes that new MHEC Intro to Statistics syllabus is only appropriate for H&SS students and that a more rigorous course should be required of STEM students.
        **a.** At this time HCC does not have a sufficient demand to support two distinct courses of Introductory Statistics.

9. The Dana Center's NMW Statistical Reasoning has the items mentioned in #6 above listed as "Readiness Competencies".

10. There are 12 MD colleges participating in The First in The World (FITW) grant project administered by The U.S. Dept. of Education. The objective of this project is the creation of a Pre-Stats developmental course that would shorten the path to credit Introductory Statistics. This Pre-Stats course would include the content mentioned in #6 above.

11. For the time being the items in #6 above will be retained with the intention of phasing them out over time to increase depth/rigor on other current topics.

12. For the time being the continuum of critical thinking will end with Statistical Reasoning. However, the intention is to increase rigor in this area over time by extension into Statistical Thinking problems.

13. Taken together items 5, 11, & 12 will hopefully address questions of transferability for STEM students as well as the difficulty in supporting two distinct statistics courses.

14. Beginning FA17 MAT109 will use internal assessment items consistent with course expectations as a means to assessment the degree to which learning outcomes are being achieved.

15. The current CA instrument will continue to be used to evaluate the appropriateness of Dual enrollment in HS AP classes. This will be done by comparing current results to the long run average.

**Budget Justification:**
1. No extraordinary funding is required for this course at this time.

**Course:  MAT 109**                                          **Lead Faculty:     T. Crawford**

| | FA 2012 | SP 2013 | SU 2013 | FA 2013 | SP 2014 | SU 2014 | FA 2014 | SP 2015 | SU 2015 | FA 2015 | SP 2016 | SU 2016 | FA 2016 | SP 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # Active students | 147 | 176 | 106 | 173 | 221 | 120 | 214 | 234 | 90 | 225 | 212 | 94 | 267 | 236 |
| # Withdraw % Withdraw | 22 15% | 19 11% | 8 7.5% | 16 9.2% | 25 11.3% | 16 13.3% | 22 10.3% | 23 9.8% | 13 14.4% | 19 8.4% | 19 9.0% | 10 10.6% | 26 9.7% | 14 5.9% |
| # Walk-Away Fs* % Walk-Away Fs* | 21 14% | 23 13% | 0 0% | 15 8.7% | 29 13.1% | 9 7.5% | 24 11.2% | 25 10.7% | 0 0.0% | 19 8.4% | 29 13.7% | 3 3.2% | 25 9.4% | 25 10.6% |
| # Success (A,B,C) % Success (A,B,C) | 91 62% | 125 71% | 87 82.1% | 120 69.4% | 152 68.8% | 85 70.8% | 125 58.4% | 136 58.1% | 69 76.7% | 157 69.8% | 139 65.6% | 69 73.4% | 188 70.4% | 153 64.8% |
| Gen Ed SLOA | 68.0% | 70.0% | N/A | 64.6% | 63.3% | 66.1% | 64.4% | 66.0% | N/A | 64.9% | 63.8% | 62.0% | 61.8% | 59.0% |
| Course SLOA | 45.7% | 43.2% | 41.8% | 43.8% | 41.8% | 43.3% | 43.4% | 43.1% | N/A | 43.8% | 42.5% | 39.1% | 42.2% | 42.9% |
| SLOA Item Analysis | S – 1, 14 W - 2 | S - 12 | S - 16 | No Sig. Items | No Sig. Items | No Sig. Items | W - 12 | No Sig. Items | N/A | No Sig. Items | No Sig. Items | No Sig. Items | No Sig. Items | No Sig. Items |
| Mean Course Grade | 2.78 | 2.89 | 2.82 | 2.29 | 2.10 | 2.55 | 2.14 | 1.96 | 2.66 | 2.41 | 2.38 | 2.69 | 2.40 | 2.15 |

*Did not take the final exam and received a grade of F.