

Learning Outcomes – A Summary of the Aug 27 Mathematics Discipline Meeting

Prepared By: Virginia Puckett, Discipline Convener

The meeting opened with a discussion about the need to have Learning Outcomes. In addition to the reasons presented at the morning sessions, we discussed the importance of getting students to recognize the value of a liberal arts degree and a well-rounded educational background. The Convener presented to the Discipline Committee a power point presentation (which was a summary of the PP presentation sent by the Learning Outcomes Assessment Committee), an example of a CHM 1033 syllabus containing learning outcomes statements, and the General Education Learning Outcomes web page. The Committee discussed the ten outcomes and the results of the assessments that were administered to measure our students' abilities related to the outcomes.

The members of the Discipline Committee were then presented with our “task” and were asked to complete the following worksheet. A distinction was made between outcomes met in general (intrinsically by way of the required competencies in the course) and outcomes met by an individual instructor’s own projects or other assignments. Discipline Committee members were given approximately 30 minutes for a roundtable discussion, to complete the worksheet, and to write some of their favorite suggestions on the flip chart style sheets of paper posted around the room with the Learning Outcomes written on them. In addition, Committee members were asked to list recommendations and concerns, and to volunteer for a College-wide Math Discipline Learning Outcomes Committee (Recommendations and concerns and the volunteers appear at the end of the table below). The items presented here represent a summary of those that the Committee members submitted. When possible, similar suggestions were combined. In the table, “gen” means that the competency is met intrinsically by the competencies defined for the course, and “indiv” means that the competency is met by an instructor’s individual assessments, and may not be met by all instructors teaching the same course.

Identified Learning Outcome #s:	To Achieve the Outcome, the Student Will:	Method of Assessment to Insure Mastery	Identified Course(s)
1	Use mathematical symbols to express mathematical ideas (mathematics as a form of communication).	All tests, quizzes, projects, but especially those that require words to be transformed into mathematical equations and expressions (applied problems).	All Courses (gen)
1, 5	Have students present an oral presentation or submit a written essay on a math topic. Topic could be History of Math, or biography of a mathematician. (Tartaglia’s method of solving quadratic equations was given as an example)	Could be peer graded as well as instructor graded. Use Grading rubric. Could be graded for grammar and spelling (esp if class is linked to a writing class like in a learning community)	Any course, but especially MGF 1107 (indiv)
1, 2, 3	Give students “short answer” or “free response” questions on tests that will require students to present an analysis of their answer. The process would involve using numerical data. Students should be able to explain what the answer means in	Homework, tests, quizzes, projects.	All Courses, but especially STA 2023 and MAC 2233 (indiv now, but should be gen)

	real life terms.		
1	<p>Write the goal of a problem and the process needed to achieve the solution, state conclusions.</p> <p>Ex. – Have students explain in writing how to determine the types of solutions of a quadratic equation.</p>	Homework, tests, quizzes, projects, short paper in which student must give the “recipe” or procedure in words.	All courses, but especially MAT courses. (indiv now, but should be gen), and MAC 1105.
1, 9	Have students write proofs, rationales or derivations or formulas, procedures or theorems presented in class. Words and symbols must be used to provide a clear explanation. Emphasize the beauty of mathematics and the elegance and creativity required.	Graded homework assignment. Tests or quizzes (but students should have advanced notice they will be asked – could also be Extra Credit). In some cases, such as with deriving the general formulas for the conics, classroom presentations could be used.	All courses. MAT 0002 (rationale for procedure for multiplying two decimals, for ex.), MAT 0024 (rationale using the distributive prop for “FOIL”), MAT 1033 (derive the quadratic formula). (indiv?)
1, 3, 9	Have students write a paper on the connection between art and mathematics. For example, students identify perspective in art works. Students could correctly identify “vanishing points” and 1, 2, or 3 point perspective. Students could also recognize the golden ratio or symmetry. Compare and contrast with other works.	PowerPoint presentation (grading rubric) or written report.	MAC 1105, MAC 1140, MGF 1107 (indiv)
1, 2, 3, 4, 5, 7, 8, 10	Use environmental issues such as the impact on the environment from CO ₂ . Use linear regression to simulate the impact. Students could be required to do research (via internet or library) to locate data. Student could be required to submit PowerPoint presentation. Student could be required to discuss the issue in terms of conflicting points of view about it that may exist. Global implications.	Classroom presentation or written project. The mathematics involved could be adjusted for the course (linear vs. exponential models, etc.). Grading rubric.	MAC 1105 and up (indiv)
1, 2, 3, 6, 9	Use design and budgeting related to architecture to create a service learning project in partnership with Habitat for Humanity. (Service Learning hours	Group projects (short presentations and written project). Grading rubric.	MAT 0002 (indiv)

	could count toward required lab hours?)		
1, 2, 3	Solve real life problems. Examples given included interest or decay problems and calculating the angle a ball should be hit to achieve maximum distance.	Written project. Tests, quizzes.	MAC 1105 and up (gen).
2	Analyze real life data and create model (could be of best fit using a graphing calculator, or a function, including piecewise functions). Verify that students correctly identify the independent and dependent variables, and the relationship between the two, and perform correct calculations.	Written project. Tests, quizzes.	MAC 1105 and up (indiv)
2	Correctly process numerical data; determine relevant procedures, formulas, and theorems to arrive at the correct results.	Tests, quizzes, projects, all assignments	All courses (gen)
2	Draw conclusions from graphs.	Tests, homework, quizzes	MAT 0024/0020 and up, including STA 2023. (gen)
2	Understand that variables represent numerical data. Be able to solve for a given variable in a formula in order to provide a different representation of the formula.	Tests, homework, quizzes	MAT 1033 and up. (gen)
2, possibly 5 and 1 if given as a project	Convert from one unit of measure to another. Could be using currency, or the English system (inches, feet, miles, etc.) versus the metric system, or Fahrenheit vs. Celsius measure. Use dimensional analysis.	Tests, homework, quizzes, or a project which would include information on countries that use the different systems.	MGF 1107, MAT 0002, MAC 1114 (gen?)
3, possibly 1	Compare and contrast procedures with respect to different mathematical operations (for example, a power of a sum vs. a power of a product; combinations vs. permutations). Students should understand that many common mistakes in math stem from incorrectly generalizing a procedure from one situation to another.	On tests with true/false or multiple choice (which of the following are true?) questions. Students could also be given a short answer question to explain why the statement or procedure is or is not true or appropriate.	All courses (should be gen – but may not be emphasized in all courses)
3	Understand that in mathematics, expressions can be represented in more than one way (equivalent expressions). This is especially useful when proving identities and in algebraic manipulation in calculus, however, it is also used in MAT courses such as when students rewrite rational expressions so that all have the same denominator.	Tests, homework, other assignments	All courses, but especially MAC 1114 and up (gen?).

3	Students will be able to reject extraneous solutions (when they appear in regular mathematical problems involving rational, radical, logarithmic or trigonometric expressions, or when they appear as a result of solving an applied problem). Student should be able to explain why the solution is rejected.	Tests, homework, quizzes, and other assignments	MAT 1033 and up (gen).
7	Recognize what constitutes biased or deceptive data.	Have students find or create adds or articles with deceptive graphs and present them written or orally.	STA 2023, MGF 1106, possibly MAT 0024 or 1033 as extra credit. (gen for STA and MGF, indiv for MAT or higher)
8	Have students perform calculations and create charts or graphs using software such as Excel.	Project could be collected.	STA 2023, MGF 1106, MAT 1033 (indiv)
8	Have students use educational software such as MyMathLab, EduSpace, Mathzone, etc., to submit homework	Homework graded by software.	All courses (indiv)
8	Have students perform calculations using graphing and non-graphing calculators.	Test and homework specific questions.	MAC 1105 and up (gen)
9, possibly 8 and 1	Students submit pictures of structures that include parabolas or geometric figures. Students could be asked to comment on the aesthetics.	Students submit pictures with geometric figure identified.	MAT 0002, MGF 1106, MTG 2204, MAC 1105 (indiv)
Recommendations and concerns: 1. The College must keep in mind that this is a long-term project. No arbitrary passing percentages should be imposed on the assessments. 2. We should be cautious not to artificially increase the number of students who pass the assessments – College would be in danger of inflating the abilities/quality of our graduates. 3. To promote the presence of the corporate sector, our “big graduate users” would strengthen our assessments for these topics. 4. General Ed assessments should not contain discipline specific vocabulary. 5. More than one task should exist for each outcome (outcome 2 was only tested with one task in the last round) – more views of the same outcome are necessary.			
Volunteers for Learning Outcomes Committee: Virginia Puckett (North), Jakeisha Thompson? (Kendall), Didi Quesada (Kendall), Alina Coronel (Kendall), Tony Alfonso (Kendall), Luis Martin (North), Manuel Carames (North).			