Colorado Faculty-to-Faculty Horizontal Alignment

Development Template for Outcomes and Assessments

College Algebra GT-MA# Outcomes

Intro to Statistics GT-MA# Outcomes

Math for the Liberal Arts GT-MA# Outcomes

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The purpose of the Alignment

Guided by faculty expertise and philosophical intersegmental discussions, these discussions will dig deep into pedagogy (how we teach and the level of rigor at which we teach) to the agreed upon expectations of gtPathways College Algebra, Intro to Statistics and Math for the Liberal Arts courses. *Participants who have already embarked on local work in this regard will bring their local resources to share in the statewide vision, both as further information for the discussion and for use as additional resources to underlie the statewide work.*

This method of curriculum alignment is produced from the ground-up (coming from teachers in the classroom), and works within the parameters of the Core to College expectations. Eventually, faculty from high school and college may create joint assessments and grading rubrics that will: demonstrate expected levels of rigor, unpack shared vocabulary, and align with Common Core standards. It is the vision and goal of this project that deep curriculum alignment of this type will show a positive academic impact that supports seamless transfer and degree completion.

When the Outcomes document is complete, which will take more Faculty-to-Faculty Conferences and some regional meetings in between, faculty and departments will be expected to use the agreed upon student learning outcomes for approved gtPathways courses and to train other faculty (who may not have been part of these discussions, like adjunct instructors) around the use of these aligned expectations in their classrooms.

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Stage 1 – Development of Outcomes

Name of course ___Math for Liberal Arts_____

1. Create SMART Outcomes (use this page for each Outcome)

SMART OUTCOME
Consumer Mathematics A. Simple Interest B. Credit Card Finance Charge C. Compound Interest D. Effective Rate E. Inflation F. Doubling G. Annuities H. Future & Present Value I. Payment Size J. Amortization Schedule Student Loans Personal Budgeting Insurance

Statistics

- **A. Descriptive & Inferential**
- **B. Graphical Presentations**
- **C. Population & Sample (Sampling methods)**
- **D. Mean, Median & Mode**
- **E. Range, Variance & Standard Deviation**
- **F. Normal Distribution**
- **G. Probability & Percent**

Probability

- **A. Sample Space**
- **B. Probability**
- **C. Theoretical & Experimental**
- **D. Outcome**
- **E. Permutation & Combination**
- **F. Counting Rules**
- **G. Union & Intersection**
- **H. Odds & Expected Value**

Problem Solving
Visual
Numerical
Verbal
Symbolic

Set Theory and Logic

- **A. Notation and Terminology**
- **B. Subset**
- **C. Venn Diagram**
- **D. Union, Intersection & Complement**
- **E. Applications**
- **F. Inductive & Deductive**
- **G. Conjunction, Disjunction, & Negation**
- **H. Set Operations**
- **I. Logic: Conditional & Biconditional**
- **J. Logic: Converse, Inverse, & Contrapositive**

K. Truth Tables
Mathematical Modeling A. Function, Domain & Range B. Relationship C. Linear Graphs D. Linear Programming E. Linear Inequalities F. Quadratics G. Quadratic Applications H. Exponentials I. Exponential Applications J. (Optional) Logarithms K. (Optional) Logarithmic Applications
Euclidean Geometry. A. Point, line, & plane B. Angles C. Polygon D. Fibonacci Sequence E. Applications F. Golden Ratio G. Choose one of the following topics. 1. Fractal Geometry a. Fractal b. Applications c. Fractal Construction 2. Tessallations. a. Tessallation b. Regular Polygons that Tessallate a Plane c. Tessallate a small area. d. Applications
Numeration Systems A. Counting Numbers - Different Cultures B. Conversions C. Add & Subtract - Different Cultures

D. Origin of Our System E. Different Bases F. Calculating Devices G. Binary System
Mathematics of Social Choice A. Voting Systems B. Voting Methods - Election Results C. Logistics of Voting Systems D. Weighted Voting Systems E. Banzhaf Power Index F. Apportionment Methods G. Flaws & Paradoxes - Apportionment Methods
Management Science A. Euler circuit B. Algorithm C. Hamiltonian Cycle D. Heuristic Algorithm - Traveling Salesman Problem (TSP) E. Networking Applications F. Minimum Spanning Tree G. Network Linking H. Flowchart I. Scheduling Conditions

Outcomes are **learning objectives** that include:

- the ***behavior, knowledge or skills*** the student will demonstrate
- the ***way in which they will demonstrate*** the behavior, knowledge or skills

Competencies are ***Specific*** and ***Measurable***

See examples of SMART Outcomes on following page

OUTCOMES CHECKLIST

❒ Include action verbs
- ➢ What action (observable behavior) will the student perform? E.g., write, solve, compare

❒ Include a target or content area
- ➢ What will the action be performed *on* or *to* or *about* (the target of the behavior)? E.g. research paper, specific type of equation, a genre

❒ Include criteria
- ➢ What specific criteria may be applicable? E.g., Students will write a research report *in APA style*

❒ Keep *measurable* elements *separate*
- ➢ focus on a single outcome, expectation or understanding
- ➢ that can be assessed by a single measurement type

Examples of SMART Outcomes

Poor:
The student will do research

Better:
The student will write a research paper in APA style

Best:
The student will write a research paper in APA style using 3 outside references

SUGGESTED OUTCOME VERBS

Adapt
Argue
Compose
Conclude
Construct
Design
Evaluate
Formulate
Invent
Justify
Modify
Predict
Prioritize
Propose
Rate
Recommend
Revise
Teach

Poor **(this set of examples is from http://www.atlm.edu/irpa/publications/HowToWriteObjectivesOutcomes.pdf):**
Students should know the historically important systems of psychology.

This is poor because it neither says what systems nor what information about each system students should know. Are they supposed to know everything about them or just names? Should students be able to recognize the names, recite the central ideas, or criticize the assumptions?

Better:
Students should know the psychoanalytic, Gestalt behaviorist, humanist, and cognitive approaches to psychology.

This is better because it says what theories students should "know", but it still does not detail exactly what they should "know" about each theory, or how deeply they should understand whatever it is they should understand.

Best:
Students should be able to know and articulate the foundational assumptions, central ideas and dominant criticisms of the psychoanalytic, Gestalt behaviorist, humanist, and cognitive approaches to psychology.

This is the clearest and most specific statement of the three examples. It clarifies how one is to demonstrate what he/she "knows"… It provides faculty with a reasonable standards against which they can compare actual student performance.

2. Write a Brief Description of the OUTCOME (you may also address how it fits with the Colorado Academic Standards for Mathematics)

OUTCOME Description

3. Definition of Terms

Make sure a universal term in an Outcome has the same meaning for all instructors. A glossary of these terms will be a part of the Outcomes guide. You can refer to the Precalculus Glossary in the Dropbox for examples. The following are just samples from the Precalculus Glossary – they are not indications that you need to use them. Your faculty team can determine which terms need defining for consistency.

Term	Definition
E.g., **Quadratic equation:**	*(come up with an agreed-upon definition)* An equation that can be written in the form $ax^2 + bx + c = 0$ where a, b, and c are all real numbers and $a \neq 0$.
Quadratic formula:	A formula for finding the roots of a quadratic equation. Given an equation in the form $ax^2 + bx + c = 0$, the roots are given by: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.