Transitions Course: Algebraic Literacy

New Life Project

AMATYC Developmental Mathematics Committee (New Life Subcommittee)

Purpose of course:

The Algebraic Literacy course prepares students for mathematics pathways which include college algebra, pre-calculus, finite mathematics, and/or statistics. The focus is on building understanding of mathematical systems, with a dual emphasis on symbolism and application; some symbolism is presented without context. Some students will enter the Algebraic Literacy course as their first experience with mathematics at college, while others will be coming from the Mathematical Literacy for College Students course. For students about to enter a STEM pathway, additional topics might be needed (as identified in the outcomes). Use of graphing technologies is assumed throughout.

GOALS

1. Numbers and Polynomials: Students will develop and apply concepts of polynomials to investigate and describe relationships and solve problems.

Students will:

A. **Understand the use of parameters and variables, including appropriate replacement sets.**
For example: Students will identify which symbols represent parameters and which represent variables. Students will represent situations with polynomials or equations, and identify appropriate replacement sets for the variables, and connect these to domain & range for equations. For classes of situations, students will also identify appropriate replacement sets for the parameters.

B. **Show procedural fluency with polynomial expressions focusing on basic operations and simple factoring.**
For example: Students will use fundamental properties of numbers to simplify and expand polynomial expressions. Students will identify the equivalence between a polynomial and its factored form. Students will write limited types of polynomials in factored form, such as common factor and difference of squares.

C. **Use equations, inequalities, and systems of equations & inequalities to represent situations and find solutions via symbolic, numeric and graphic methods.**
For example: Students will represent a situation with an equation or inequality in one variable, and find solutions by multiple methods (symbolic, numeric, and graphic). Students will represent a situation with a system of linear equations or inequalities involving two or three variables; the resulting system is to be solved by multiple methods for two variable systems of equations (all 3 – numeric, symbolic, and graphic) … for other systems, numeric and graphic methods will be used.

D. **Use exponential and power equations to represent situations and find solutions via numeric and graphic methods.**
For example: Students will represent a situation with an exponential equation or power equation in one input variable, and find solutions by numeric & graphic methods. Students will recognize when an exponential equation is appropriate, when a power equation is appropriate, or when a linear equation is an appropriate model. Optional: Inclusion of comparable logarithmic equations.

E. **Use symbolic procedures to manipulate simple formulas and literal equations.**
For example: Students will solve for another variable with formulas employing the 4 standard operations on variables. Students will paraphrase a given equation into alternate forms (with or without parentheses, with or without fractional expressions).

F. **To prepare for STEM pathways, these outcomes can be added:** Algebraic solution of power equations; basics of radical expressions; basic simplification of roots (indices 2 and 3); rational exponent notation; algebraic solution of radical and rational equations with limited complexity; additional factoring, such as trinomials.

2. Functions: Students will understand the basic algebraic functions in terms of fundamental concepts such as rate of change, input/output variables, domain & range, and parameters, and use multiple representations of functions.

Students will:

A. **Understand basic algebraic functions (linear, exponential, and power).**
For example: Students will represent exponential, linear, and power functions in symbolic, graphic, and numeric forms. Students will identify the input and output variables, including correct measurement units and proper replacement sets when appropriate.

B. **Represent situations with either a discrete or continuous model, as appropriate.**
For example: For a given situation, students will identify when the replacement set for the input consists of integers, rational numbers, or some other set, and whether this set is finite(bounded) in size.

C. **Understand basic properties of functions, such as rate of change and the effect of parameters.**
For example: Students will describe the rates of changes of each basic function. Using technology, students will find a rate of change at a given input value and a given delta x. Students will understand the effect of changing basic parameters in each function type.

D. **To prepare for STEM pathways, these outcomes can be added**: Identifying relations that are not functions; understanding radical functions (indices 2 and 3) including domain & range; understanding rational functions (generally limited to quotients of two terms) including domain; understanding basic conic sections (parabola, circle and ellipse in particular).

3. Geometry & Trigonometry: Students will apply basic relationships of shapes and angles to investigate, represent and solve problems.

Students will:

A. **Use properties of basic geometric shapes.**
For example: Students will use properties of rectangles, triangles and circles to represent and solve problems dealing with perimeter (or circumference) and area.

B. **Use the three basic trigonometric functions in the context of right triangles.**
For example: Students will use technology to compute the values of the trig functions for an acute angle. Students will use the basic functions to solve right triangle problems given a second angle and one side.

4. Modeling and statistics: Students will develop and apply basic concepts of modeling and statistics to investigate and describe situations and solve problems.

Students will:

A. **Use basic concepts of measurement and data.**
For example: Students will determine the precision and accuracy of basic measurements. Students will identify a statistical measure as being nominal, ordinal, or interval.

B. **Understand theoretical relationships and modeled relationships.**
For example: Students will identify a given relationship as being theoretical (not an approximation based on data) or modeled (approximation based on data). Students will understand the predictive validity and reliability of the two relationships. Students will identify the parameters and the variables in a given model, and appropriate replacement sets.

C. **Use technology to generate basic models given appropriate data (linear, exponential, and power models as a minimum).**
For example: Students will separate correlation and causation in the use of models. Students will generate regression models for data and identify the one that is most appropriate based on the data and the correlation. Students will use modeled relationships to make predictions for a given input or output, and use this to solve problems in context.