Student and Teaching Practices

Built into the EMC^2 curriculum are NCTM's Teaching Practices and the Common Core Math Practices.

Students:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Teachers:

1. Establish mathematics goals to focus learning.
2. Implement tasks that promote reasoning and problem solving.
3. Use and connect mathematical representations.
4. Facilitate meaningful mathematical discourse.
5. Pose purposeful questions.
6. Build procedural fluency from conceptual understanding.
7. Support productive struggle in learning mathematics.
8. Elicit and use evidence of student thinking.

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Introducing EMC^2

Essential Math for College & Careers

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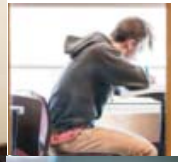
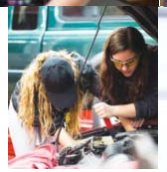
Practices

Vermont GEAR UP facilitated a collaboration between the Agency of Education (AOE) and the Vermont State College System (VSCS) to create an innovative high school math course.

The course, EMC^2, which was collaboratively designed by Vermont GEAR UP with high school teachers and postsecondary faculty provides high school seniors who are below proficiency in math an opportunity to improve their skills and alleviate the need for remediation in college.

The VSCS has agreed that successful completion of this course will qualify students to enroll in credit bearing college math at any VSCS school without the need for remediation or an Accuplacer test score.





16 Essential Concepts

1. Together, irrational numbers and rational numbers complete the real number system, representing all points on the number line.
2. Quantitative reasoning includes, and mathematical modeling requires, attention to units of measurement.
3. Expressions can be rewritten in equivalent forms by using algebraic properties, including properties of addition, multiplication and exponentiation, to make different characteristics or features visible.
4. Finding solutions to an equation, inequality or system of equations or inequalities requires the checking of candidate solutions, whether generated analytically or graphically to ensure that solutions are found and that those found are not extraneous.
5. The structure of an equation or an inequality (including, but not limited to, one-variable linear a nd quadratic equations, inequalities and systems of linear equations in two variables) can be purposefully analyzed (with and without technology) to determine an efficient strategy to find a solution, if one exists, and then to justify the solution.
6. Expressions, equations and inequalities can be used to analyze and make predictions, both within mathematics and as mathematics is applied in different contexts—in particular, contexts that arise in relation to linear, quadratic and exponential situations.
7. Functions shift the emphasis from a point-by-point relationship between two variables (input/output) to considering an entire set of ordered pairs (where each first element is paired with exactly one second element) as an entity with its own features and characteristics.
8. Graphs can be used to obtain exact or approximate solutions of equations, inequalities, and systems of equations and inequalities—including systems of linear equations in two variables and systems of linear and quadratic equations (given or obtained by using technology).
9. Functions can be described by using a variety of representations: verbal descriptions, algebraic expressions and equations, mapping diagrams, function notation (e.g., f(x) = x2), recursive definitions, tables, and graphs.
10. Functions can be represented graphically, and key features of the graphs, including zeros, intercepts, and, when relevant, rate of change, and maximum/minimum values, can be associated with and interpreted in terms of the equivalent symbolic representation.
11. Functions model a wide variety of real situations and can help students understand the processes of making and changing assumptions, assigning variables, and finding solutions to contextual problems.
12. Distributions of quantitative (continuous or discrete) in one variable should be described in the context of the data with respect to what is typical (the shape with appropriate measures of center and variability, including standard deviation) and what is not (outliers) and these characteristics can be used to compare two or more subgroups with respect to a variable.
13. Scatterplots, including plots over time, can reveal patterns, trends, clusters, and gaps that are useful in analyzing the association between two contextual variables including the differentiation of correlation and causation.
14. Data-analysis techniques can be used to develop models of contextual situations and to generate and evaluate possible solutions to real problems involving those contexts. Contextual situations may come from the use of the three main types of study designs which are: sample survey, experiment, and observational study. The role of randomization and bias will be recognized in each type of study design.
15. Areas and volumes of figures can be computed by determining how the figure might be obtained from simpler figures by dissection and recombining.
16. When an object is the image of a known object under a similarity transformation, a length, area, or volume on the image can be computed by using proportional relationships.