


Mathematics in Career and Technical Education



Our Purpose:


- ◆ *Career and Technical Education is an **essential component** of the high school curriculum. For many students, it represents as much as a third of their high school experience. It is a critical component in meeting the needs of students in academic achievement, career exploration, career preparation, and leadership development. Successful transition to postsecondary education, work, or the military is one of the goals of Kentucky's educational system. The percentage of students making successful transition is a component of the high school accountability index.*






High School Mathematics Exit Performance Standard 1:

- ◆ *Students will apply number sense and order relations in problem solving situations to perform estimations and/or calculations with equations, matrices, and sequences involving complex numbers (counting numbers, whole numbers, integers, rational numbers, irrational numbers, real numbers, etc.) with and without calculators and will communicate the reasoning used in solving these problems.*




High School Mathematics Exit Performance Standard 2:

- ◆ *Student will apply properties of measurement (ratio measures including slope, rate, indirect measurement, similarity; surface area and volume of prisms, pyramids, cylinders, cones, and spheres, etc.) and will use geometric concepts, properties and relationships (prove, use and apply theorems/conjectures involving lines, angles, triangles, quadrilaterals, regular, and non-regular polygons, circles, and transformations, etc.) in problem solving situations and communicate the inductive and simple deductive reasoning used in solving these problems.*



High School Mathematics Exit Performance Standard 3:

- ◆ *Student will use data collection and analysis, graphing of single-variable and two-variable data (line, bar and circle graphs, histogram, stem and leaf plots, box and whisker plots, scatterplot, linear regression and curve fitting), statistics (mean, median, mode, range, outliers, quartiles), and designing probability experiments and simulations to test theories about real world problems and communicate the reasoning used in solving these problems.*



High School Mathematics Exit Performance Standard 4:

- ◆ *Student will model, analyze, compare and apply linear and nonlinear algebraic functions (quadratic, polynomial, exponential, etc.) using tables, graphs in the coordinate plane, variables, expressions, equations, formulas, and inequalities in practical situations and communicate the reasoning used in solving these problems.*



*“Those who fail to learn from history
are doomed to repeat it.”*

-George Santayana

- ◆ Rigidity inhibits learning and cooperation.
- ◆ High standards must be maintained:
 - Program must be respected by the home school math departments.
 - Students must respect what they are doing.
 - Technical teachers must have confidence that high level mathematics is being taught.



The Base Line: Maintaining High Standards

- ◆ Rigorous application of the Program of Studies for each course
- ◆ Flexibility to meet the needs of each student without compromising content
- ◆ Flexibility to meet the needs of each technical course



Integration

- ◆ Defined as, “The act or process of making whole or entire.”
- ◆ Necessary to avoid disjointed education; helping students see how all the puzzle pieces fit together.
- ◆ Requires mathematical expertise and technology expertise; therefore, integration requires collaboration.



Collaboration

- ◆ *Teachers of different subject matters work together in the joint effort of improving student achievement in all areas.*
- ◆ *Mathematics teacher must communicate with each technical teacher in order to learn more about each technology area.*
- ◆ *Mathematics teacher must also communicate in order to allow technical teachers to learn more about the mathematics each student must know.*
- ◆ *Teachers in both areas must develop lessons and activities that incorporate technology and mathematics in both classes.*

Team Teaching

- ◆ *A necessary component of collaboration*
- ◆ *Randomly teaching a math lesson to a technical class will fail to deliver the desired results; Lessons must be coordinated so that students will immediately use the mathematics they have learned.*
- ◆ *It is extremely effective for a technical teacher to visit a mathematics class to teach a particular area to fit into a math unit.*





Application

- ◆ Diversify: expand applications beyond the technical areas students are studying.
- ◆ Reading emphasis: use students' desire for math application to create “buy in” to do word problems.
- ◆ Without technical teacher support, all efforts will fail: they are the lynchpin.



Strategies

- ◆ Align like terms and concepts so that students can see a relationship in the field they are studying in a technical area and mathematics.
- ◆ Utilize existing resources for application activities.
- ◆ Diversified assessment drives instruction.



Suggested Resources:

- ◆ Accelerated Math from Renaissance Learning
- ◆ Quest problem solving and group roles
- ◆ CORD Algebra 1 and Geometry Textbooks
- ◆ Internet provides many resources for applications of almost any topic.



Assessment:

- ◆ *Class work and homework can be paper based, computer based, activity based, project based, or a combination of sources.*
- ◆ *Traditional quizzes and tests are necessary in order to ensure that students are processing information correctly.*
 - ◆ *Labs, activities, and demonstrations allow students to learn how to take their knowledge to a higher level and to show their ability to do so.*



For More Information Contact:

- ◆ Larry Helphinstine, Career and Technical Education (502) 564-3472
- ◆ Michelle Walter, Boyd County Career and Technical Education Center (606) 928-7120
- ◆ Christopher Rakes, Eastside Technical Center, (859) 381-3740