CTTI Course Descriptions

Mathematics Courses

Making sense of numbers & symbols	The course will explore the development of arithmetic and algebra from elementary through advanced mathematics. The course will discuss how concrete exploration of number can help students make sense of the symbolic algebraic manipulations necessary for success in high school and early college mathematics.
Data analysis and Modeling	This course integrates science content with mathematics, building on classical experiments from 17th century physics and 18th century chemistry. Teachers will explore linear, exponential, quadratic, and power functions in data modeling and science, using graphing calculators and probes. The course will strengthen and deepen the teachers' knowledge of functions that are featured strongly in IDS curricula.
Logic across the high school curriculum	The course will emphasize the basic logical distinction between proof from axioms and truth in a mathematical structure. Using this framework we will discuss such specific topics as: Is the conclusion of a geometric proof true? How do we explain the roles of variables in the definition and evaluation of functions, description of algebraic curves, solution of equations, and statement of mathematical laws?
Integrating high school mathe-matics	During the course, teachers will identify and explore the mathematical themes that will form the content of 12th grade courses. This course will draw on the three content courses as well as the workshop on course planning and implementation. A key activity will be the teachers' own construction of knowledge based on the needs identified within course planning.

Science Courses

Energy	*Physical Science*: The "greening" of society requires the development of new materials to transform energy, especially solar energy, and to store it in the form of advanced batteries. The concept of a fuel will also be covered, including the potential for biofuels. *Life and Environmental Science:* This course uses the automobile to provide teachers with an integrated study of fundamental chemistry (thermodynamics, atmospheric chemistry, free radical reactions), industrial production, energy use, and public policy.
Synthesis and design or Systems in the environment	*Physical Science*: Research in the design and synthesis of materials. A unit on organic synthesis will cover emerging trends in target-oriented and diversity-oriented strategies. A unit on inorganic materials will cover current work in the design of nanoparticles for use in sensors. *Life and Environmental Science*: A systems perspective on the evolution of the planet, the emergence of life and biogeochemical cycles, and the role of humans as part of these cycles. Teachers retrace the time from when conditions were set only by physics and chemistry to our current biologically-determined homeostasis.
Detection and analysis	*Physical science*: This course will cover principles and applications within current problems in analytical chemistry. The physical principles behind separation and detection methods will be presented with applications drawn from neurochemistry, atmospheric chemistry, and genomics. *Life and Environmental Science:* Teachers will use qualitative and quantitative analytical tools to describe processes in natural and engineering systems, applying these methods to Chicago-area environmental scenarios, including lakes and reservoirs, streams and rivers, and environmental reactor systems.
Pedagogy and High School Science	For both tracks: Research in physics and chemistry education has advanced on many fronts through the formulation of overall conceptual frameworks and the development of research-based understandings of student learning. This final course will cover recent research in the teaching and learning of science.