12th Grade – Sample Math Lesson Starter 1

Sample Student Outcome: **Students work in teams to solve mathematical problems; they listen to the reasoning of others and offer correction with supporting arguments; they modify their own arguments when corrected; they learn from mistakes and make repeated attempts at solving problems.**

EXAMPLE: Students form teams to compete in modeling competitions such as the Mathematical Competition in Modeling run each year by COMAP. For example, the following problem is from the 2009 competition:

Many cities and communities have traffic circles – from large ones with many lanes in the circle (such as at the Arc de Triomphe in Paris and the Victory Monument in Bangkok) to small ones with one or two lanes in the circle. Some of these traffic circles position a stop sign or a yield sign on every incoming road that gives priority to traffic already in the circle; some position a yield sign in the circle at each incoming road to give priority to incoming traffic; and some position a traffic light on each incoming road (with no right turn allowed on a red light). Other designs may also be possible.

Student teams use a model to determine how best to control traffic flow in, around, and out of a circle. They state clearly the objective(s) they use in their model for making the optimal choice as well as the factors that affect this choice. . . . Teams summarize the conditions under which each type of traffic-control method should be used. When traffic lights are recommended, they explain a method for determining how many seconds each light should remain green (which may vary according to the time of day and other factors). Each team illustrates how their model works with specific examples.

MATH CONTENT STANDARD

N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

N-Q.2. Define appropriate quantities for the purpose of descriptive modeling.

S-IC.3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

S-IC.5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

MATHEMATIC PRACTICE

- Reason abstractly and quantitatively
- Make sense of problems and persevere in solving them
- Construct viable arguments and critique the reasoning of others
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

P21 SKILLS

- Critical Thinking
- Problem Solving
- Collaboration
- Communication
- Creativity and Innovation

Source: COMAP, as cited in 21st Century Skills Map – Math (forthcoming from www.p21.org)