Introduction to Computational Reasoning

Objectives: At the conclusion of this module, the participants will have

1. Acquired a working definition of computational reasoning
2. Used a simulation to collect data to understand the role of probability, random numbers, and averages in an agent-based model
3. Used a systems-based model to explore proportional relationships, change over time, and cycles
4. Acquired knowledge of sources for pre-built models
5. Discussed ideas for using models and simulations in their classrooms

Outline of activities:

1. Introductions – 15 min
2. Overview of the modules – 5 min
3. Definition of Computational Reasoning – Power Point – 10 min
4. Penny and Fire Activity – 50 min
5. Break – 10 min
6. Pan Water Model – 60 min
7. Websites to visit for pre-built models – 10 min
8. What next? –
    a. Ideas for using models in the classroom – 10 min
    b. The next module – 5 min

Standards:

National (NSES): As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- Systems, order, and organization
- Evidence, models, and explanation
- Constancy, change, and measurement
- Evolution and equilibrium
- Form and function

Pennsylvania:

- 3.1.12a - Apply concepts of systems, subsystems, feedback and control to solve complex technological problems.
- 3.1.12b - Apply concepts of models as a method to predict and understand science and technology.

- 3.1.12e - Evaluate change in nature, physical systems and manmade systems.
- 3.2.12c - Apply the elements of scientific inquiry to solve multi-step problems.
- 3.2.12d – Analyze and use the technological design process to solve problems.
- 3.8.12b - Apply the use of ingenuity and technological resources to solve specific societal needs and improve the quality of life.
- 3.8.12c – Evaluate the consequences and impacts of scientific and technological solutions.

Needed resources:

1. Intro Power Point
2. Computer with projection capabilities, internet access, Power Point, Excel and Vensim
3. Computers for participants with internet access, Excel and VenSim
4. Fire Activity handouts
5. Flipping Pennies Excel file
6. Fire Analysis Excel file
7. Pan Water Cycle handouts
8. Pan Water Cycle Vensim file
9. Pan Water Cycle Excel file
10. Standards-linked websites for electronic access