Module 1

**Topic: Using Mathematics as a Tool for Documenting Change**

The purpose of this professional development session is to provide coaches with a few opportunities to view mathematics as a tool for documenting events ranging from discrete to continuous models. The primary focus is on the use of multiple representations in expressing phenomena and the relationships among these multiple representations.

**Mathematical Elements**
- Using multiple representations
- The connections between symbolic and graphical representations
- Distinguishing cumulative and instantaneous change and ways in which graphs may represent each.
- Interpreting graphs without labels or scales.
- Learning about conventions pertaining to labeling coordinates.

**Pedagogical Elements**
- Mathematical Practice of modeling with mathematics
- Developing skills to express regularities using multiple representations.
- Developing flexibility in student thinking
- Anticipate student responses
- Assessing different models

**Activities**

**Tasks**
- **In & Out** – Add/remove a few coins from an envelope. This activity demonstrates several examples of change by putting in and taking out a number of coins each time. Highlight how to document instantaneous changes vs. cumulative change recordings and how we could draw information from each to describe the other.
  - Demonstration #1: Envelope is empty at the beginning
  - Demonstration #2: Envelope has an unknown quantity at the beginning
- **Toss ping-pong ball to partner** – Demonstrate a few examples of tossing a ball and ask the coaches to document the event. Highlight the different ways the event could be recorded according to height/time; distance traveled/time; velocity/time. Connections among these different representations should be made exclusive.
- **Describe a story** that could represent the graphs (on handout) without labels or scales.
- **Pour water into different** containers. Teachers record what they see and make a model that represents the volume.
- **Capture** the event: swimming in an Olympic pool.

**Guided Questions for Debrief**
What types of events have a discrete nature?
What types of events are continuous?
What types of graphs might be suitable for documenting each type of change?
How might you be able to connect children’s school experiences with change (identifying patterns) to more sophisticated forms (arithmetic and geometric growth)?

Materials

Technology

- Laptop
- Document Projector
- Document Camera

Supplies

- Chart Paper
- Markers
- Different coins/objects
- Envelope
- Different shape glass jars
- Ball
Always, Sometimes, or Never True

Interpreting Graphs without Labels or Scales
What kind of situation would result in the graph below? Make up a story that could explain the following graph. What units and numbers would you put on each axis to match your story?