Perplexity and Learning

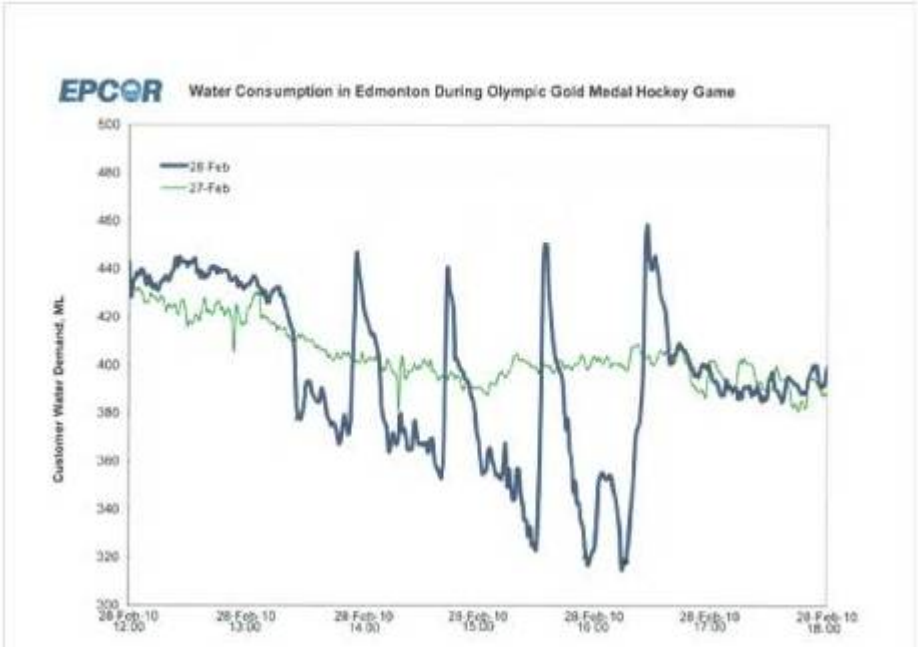
Dan Meyer's blog is one of my favorites to follow. His thinking about learning and teaching math frequently provides concrete examples for my work with focusing on student learning behaviors. In his recent blog, he links to the video of a keynote address that he delivered at the 2014 Computer-Using Educators annual conference in Palm Springs.

In the keynote Dan highlights why he works to bring **perplexity** to his students. He caught my attention as I frequently talk about bringing students **complexity**.

Meyer describes perplexity, first, by stating that it is not boredom or confusion. He suggests that when students are bored they don't know the answer and have no interest in knowing it. When they are confused they don't know the answer and lack a belief that they have the power to find out. **When students are perplexed they don't know the answer, they want to know the answer, and they believe finding out is within their power**.

Here's a great example from the video:

The graph below shows water usage in Edmonton, Canada during a Gold Medal Olympic Hockey game (blue) compared to the day before the game (green). How do you interpret the differences between the two days?



Dan has students offer possibilities; at times he counters their proposals. Discussion emerges. Emotional engagement is obtained. I'm convinced he has brought most students into "reading "a graph and thinking about its meaning. (Find an explanation at the end of this blog.)

When I googled perplexity and learning, I found a blog written by Debra Evans after she had attended a workshop by Dan Meyer at a Middle Years Conference. She summarized his approach like this: *"What we as educators need to do is to capture curiosity in our students. To do that, we need to be capturing perplexity, constantly."*

When I ask groups of teachers to identify student learning behaviors that would increase student achievement, curiosity is most often on the list.

Anne Murphy Paul in a blog post for **TIME, How to Stimulate Curiosity:**

Three practical ways to use information gaps to stimulate curiosity and promote learning cites the work of George Loewenstein, a professor of economics and psychology at Carnegie Mellon University, from the classic paper, "**The Psychology of Curiosity**."

Curiosity arises when attention is focused on a gap in one's knowledge. Such information gaps produce the feeling of deprivation, labeled curiosity. The curious individual is motivated to obtain the missing information to reduce or eliminate the feeling of deprivation." Loewenstein's theory helps explain why curiosity is such a potent motivator: it's not only a mental state but also an emotion, a powerful feeling that propels us forward until we find the information that will fill in the gap in our knowledge.

Anne Murphy Paul suggest three ways to use an information gap to stimulate curiosity (all of which I believe are present in Dan Meyers's presentation of perplexity).

#1 Start with the question- the question creates the information gap (Why is water usage so different on these two days?)

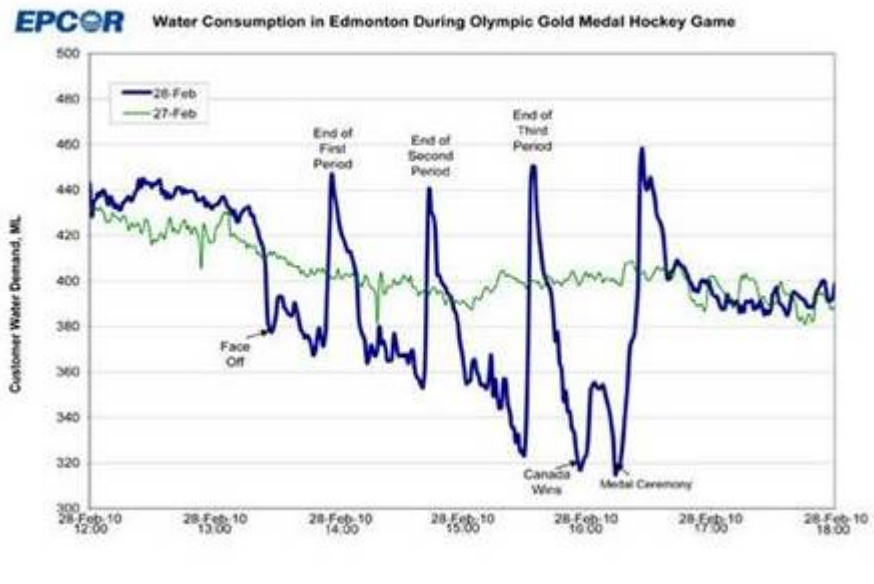
#2 Prime the pump with information- you need to know at least a little to be curious. (Hockey games have three periods)

#3 Bring in communication- (Meyer asks students to share their thoughts, make guesses, argue the possibilities)

As luck would have it, I got to observe a lesson built around perplexing students this week in a Bismarck, ND middle school science class.

When the teacher poured 400 ml of water into the funnel at the top of the box, nothing came out the bottom hose. When another 100 ml was added, 500ml came out the bottom.

After several repeats with the same results, students individually drew a diagram of what they believed to be the structure inside the box. Students took pictures of their drawings which were then projected for classmates to review as students explained their thinking and answered classmates' questions. Ninety minutes of strong engagement.

Perplexed, I remained until the end of the period to see inside the box. There was a container with a hose that looped before going down and out of the box. The 400ml of water rose near to the top of the loop so all the water remained in the container. Adding the 100 ml caused the water to pass the loop and flow down the hose creating a siphon that emptied the container of the 500 ml.

I will be exploring complexity, perplexing, and curiosity more consciously in my upcoming coaching conferences with teachers and in my classroom observations. I am also thinking that this all also applies to teachers in PLC's. Teachers who find an information gap between their students' current success and desired success are driven mentally and emotionally to learn in order to close the knowledge gap in their teaching and the resulting success gap for their students. Teachers need to want to learn what to do and believe that they are capable of learning it.