Why Teach Math Process Skills?

"I just practiced the problems, and that was good enough for me!"

By Sam Shaneyfelt

Why is there an emphasis on teaching the process skills in mathematics? Why is there such an emphasis now on developing students' thinking skills? It is not uncommon to hear a classroom teacher state that there is so much content that:

"I have to cover. I just don't have time to deal with the processes. Besides, don't they **think** *when they solve those textbook problems or answer the word problem questions at the end of the chapter?"*

The answer, in too many cases, is a resounding **NO!**

In 1989, the National Council of Teachers of Mathematics published a set of strands for mathematics. These strands were divided into two categories:

• The absolutely necessary **CONTENT**---Number and Operations, Algebra, Geometry, Measurement, Data Analysis and Probability

• The equally necessary **PROCESSES**---Problem Solving, Reasoning and Proof, Connections, Communication, Representation

It is through the process strands that students learn the mathematics; the understanding of the content occurs when the two interplay.

So what?

The Co-Director of the Change Leadership Group at the Harvard Graduate School of Education, Tony Wagner, in his book, <u>The Global Achievement Gap</u>, stipulates that graduates from the K-12 systems of education, in order to be contributing members of the 21st Century environment, must possess strong skills related to:

• Content Understanding

• Critical Thinking

• Creative Thinking

• Communication

• Collaboration

Recently, one of the Math & Science Collaborative Teacher Leaders and past Math Coach for Charleroi School District, Shellie Shepherd, made the need for teaching the process skills more concrete by relating an experience that her husband encountered this spring. His company was being taken over by Google, and the employees had to go through an interview process to remain with Google. To his surprise, the interview process was totally different from the tradition process that he expected. Here is what Shellie writes:

Basically, he was told that they (Google) will ask his knowledge of formulas, but it is more about why they work and how to troubleshoot them. The interview is more about problem solving and the "whys" of his decisions about how solve those problems. Here is one sample question that I solved with him last night that is not a direct computer question. If you have 8 balls and they all weigh the same except one weighs a little more, how can you determine which ball weighs more? The rule is that you can only use a balance scale and you can only weigh two times. I assume that they are looking for how he attacks the problem.

Her major comment was, **"This is why we're teaching kids to think in math class."** The traditional approach to teaching math is in need of change to meet the demands of the world around us.

For the past 8 years, major companies have been interviewing candidates to determine not only their content understanding, but also their approach to problem solving and their capability to communicate how they attacked the problem. One of Microsoft's highly used questions is:

If you have a fishbowl with 200 fish and 99 percent are guppies, how many guppies do you need to remove to get to the point where 98 percent of the remaining fish are guppies?

As a secondary math graduate student at a local university stated, "When my brother was interviewed at Microsoft, the team was more interested in the explanation as to how he solved the problem, not so much as to whether his answer was correct."

Try solving the problem, and you will quickly recognize that the traditional algorithmic approach employed in those textbook word problems cannot be readily applied. Gee, this takes some **thinking!** Better yet, after you have solved the problem, explain it to someone who was not able to solve it. **Thinking is taken to another level!**

To find out more about what companies are asking, go to some of the following websites that provide problems used by Microsoft, Boeing, IBM, ect.:

• Acetheinterview

• Classic-puzzles

• Mathsisfun

• Businessinsider

Wendy Kaufman, a reporter for NPR, stated in a 2003 article titled, "*Job Interviews Get Creative,*" that companies ask these questions to find talented individuals who could fit into the culture of the corporation, and to see who could really do the job.

Yes, content is important! But just presenting it and having students regurgitate it does not work any longer in preparing our youth for the future. They have to develop an understanding of the content and use the content in problem situations where they have to think; critical and creative thinking skills are put to work. Students must be provided many opportunities to discuss the content with classmates and explain how they went about solving challenging problems; communication and collaboration skills are exercised. Our students must be lead to recognize that there is a real world application for the content that they are learning. It's a different world, and it requires different preparation of our youth for their future!