Strategies and Mathematical Problem-Solving

Strategies and Heuristics
What are heuristics?
ars inveniendi - a means of discovery

Heuristics – can be thought of as procedures or processes to aid discovery
Strategies – more fixed and prescriptive; algorithmic

A mixture of both can aid Problem-Solving.

Examine Polya’s work and his 4-fold model of problem solving

Reflect:
Is this something that is evident in your work?
Reflect on the problem of the day with your colleagues. If it is not evident, could it act as an aid?

Methods for recording our problem-solving:
Written accounts
Retrospection – journaling
Verbal Reporting to each other
Think-aloud

What is the purpose of looking closely at our Mathematical Problem-Solving?
Why do mathematical problem-solving for long periods of time?
What makes a good problem?

From a student perspective:
Understanding how students think and proceed as well as strategies created, decisions made, and misconceptions overcome.

From a teaching perspective:
What did we learn from the process of going through the parallelepiped problem?
Why was a solution necessary?
What do you believe my intentions were as a teacher of you?
What is the role of an answer vs the process of solution?
How necessary is it that a solution exists and that the teacher knows the answer.

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Interplay between Affect and Cognition

Three main contributors to Mathematical Problem-solving, Cognition and Metacognition:

1. Knowledge that …
2. Regulation of …
3. Beliefs and Intuitions

Each have roots in many disciplines.

The role of constructive dialogue both scaffolds student inquiry and unravels how beliefs affect mathematical efficacy.

Examine excerpt of Classroom Dialogue from NCTM Standards: Problem-Solving Strand.

HMK: Analyze what NCTM Standards defines as Problem-Solving both grade 3-5 and 6-8. Contrast these grade bands – how do they differ? Does Problem-Solving in each grades band lay the foundation for future Mathematical Problem-Solving? Can you think of some examples.