Our paper and presentation will be about one of the most neglected types of representational media in mathematics education: *stories* (or experience-based structural metaphors). A variety of reasons explain why we observe the power of stories in our own research. First, we focus on learning and problem solving situations which are simulations of “real life” activities in which some significant types of “mathematical thinking” are needed. Consequently, students make sense of these situations based on extensions of their own personal “real life” knowledge and experiences; and, such knowledge tends to be organized around experience more than around abstractions. Second, such activities usually require students to go through a series of cycles in which they iteratively express, test, and revise (or reject) their existing ways of thinking; and, relevant ideas tend to be expressed using a variety of interacting representational media – which include not only written symbols, spoken language, and pictures or diagrams, but also experienced-based structural metaphors. Third, in realistically complex problem solving situations, where solutions often involve trade-offs (e.g., high quality but low costs), useful ways of thinking generally need to integrate ideas and abilities drawn from a variety of textbook topic areas. So again, useful knowledge tends to be organized around experience as much as around abstractions; and, stories tend to be useful for expressing such multi-topic and multi-media chunks of knowledge.

Another reason why stories tend to be especially useful is because they often express knowledge that is not reducible to simple declarative statements or simply condition-action rules. This is significant because, in virtually every field where studies have been conducted comparing experts and novices, one fact that emerges consistently is that experts not only DO things differently, they also SEE (interpret, describe, explain) things differently. That is, they not only do things right, but they also do the right things (at the right time and for the right purposes); and, stories tend to be especially useful media for expressing these interpretation abilities.

Beyond giving examples to illustrate a variety of ways that students use stories to advance their thinking during simulations of real life problem solving situations, we also will give examples to illustrate some ways that stories and accompanying language, imagery, and gestures provide alternatives to traditional ways that mathematics education researchers have thought about what it means to “understand” problem solving strategies and heuristics.

Polya-style problem solving heuristics – such as *draw a picture, work backwards, look for a similar problem,* or *identify the givens and goals* - clearly have descriptive power. That is, experts use such language when giving after-the-fact descriptions of past problem solving behaviors. But: *Are terms that are useful for describing past behaviors also useful for prescribing next-steps during ongoing problem solving activities?*
In efforts to enhance the prescriptive power of Polya-style heuristics, one approach that mathematics education researchers have used is to convert descriptive processes into longer lists of prescriptive processes. That is, Polya’s descriptive processes are treated as being more like names for large categories of skills rather than being well defined skills in themselves. But, what if the main function of Polya’s heuristics has more to do with enhancing students’ SEEING abilities rather than enhancing their DOING abilities! Our presentation will give examples to illustrate the power of stories to enhance students’ SEEING abilities related to the use of Polya-style heuristics.