Learning and Problem Solving Working Group

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The Learning and Problem Solving Working Group included many and varied discussions that extended beyond learning and problem solving as their foci. When looking back over the working group sessions, all agreed that this breadth made for a rich environment in which to think about learning and problem solving in particular. While problem solving was not addressed significantly overall in the sessions, learning and the components of learning identified as understanding and representation were meaningfully tackled throughout the conference.

Several dualities were discussed as of on-going importance. These included:

- Research ⇔ Practice
  Gulf between those who do research on teaching and learning and the practice of teaching.
- Developing Countries ⇔ Developed Countries
  Curricula different in different settings so implementation of developed world theory flawed.
  Developing countries need to contextualize what has been learned from developed world.
- Small scale studies ⇔ Large scale impact
  Problems with dissemination and funding issues.

Several concerns were raised that put a spotlight on our own responsibilities for the future

- Research on Student Beliefs => Research on how students and teachers develop detrimental beliefs about the study of mathematics and how to shift to beneficial beliefs.
- Crucial Role of the Profession in Students' Learning Process
  - Mathematics Teacher Ed (MTE) currently part of the problem rather than part of the solution
  - Need to contextualize MTE in schools; even locate MTE in schools when possible (e.g., Finland).
  - MTE teaching but not modeling good practice.
  - Gaps in teacher content knowledge continue to stymie efforts for improving student learning.
  - Whole teaching "package" of knowledge, skills, and disposition not being cultivated.
  - Professional development must address gaps in order to improve teaching force.
  - Doing projects can be an artificial way of preparing teachers; need to have ways to support teacher development over a career.
  - Need for professional culture that supports life-long learning.
  - Math Phobia is still a significant problem.

Some of the newer ideas that we would like to have investigated further:

- Constructivism
- Reformation of mathematics education
- Self-regulated learners
- Representation
- Classroom norms
- Cognitive and affective sides

Participants returned home with much to think about with respect to development of mathematical knowledge and the learning of mathematics. We suggest that future conferences include this important

aspect with foci on understanding and representation, as well as assessment of learning.