

## Geometry and Technology Working Group

### *Working Group History*

The working group on Geometry and Technology has met since the PME-NA conference in 1998. The objectives were to explore the technology environment, student perspectives, and teacher perspectives. Since this initial year, we have discussed the student in an environment created and caused by micro worlds (PME-NA XXI), preservice teachers' understanding about the role of proof in mathematics and the impact of dynamic geometry software on their understanding of proof and proof-writing skills (PME-NA XXII), and the role of software in moving students from conjectures about drawings to the theoretical work of proof (PME-NA XXIII).

In 2001, the group leaders developed a format that would require participants to actively work on instruments and discuss potential student responses that would be meaningful to research. They presented two tasks from the Balanced Assessment Project and used *Rethinking Proof* (de Villiers, 1999) as a model for developing new performance tasks in research.

In 2002, the group focused on an underlying theme in de Villiers' work, the idea of making sense of geometry through verification, explanation, discovery, and systematization. A key reading for this working group session was "Sense Making: Changing the Game Played in the Typical Classroom" (Flewelling, 2002). Participants shared and created sense-making tasks for various levels of students and discussed the implications such tasks/activities have for research. The group also discussed how the tasks/activities might differ in design for preservice and inservice teachers. We plan to report further on these activities in the proceedings paper. Those present in 2002 voted to suspend meeting in 2003 and resume the working group in 2004.

### *Plans for PME-NA XXVI*

In order to build on the work we have done in the past on sense-making activities and proof, the organizers now propose that the focus be on analysis of student work in a dynamic geometry environment—in particular in Geometer's Sketchpad (GSP). In preparation for these activities, past working group participants will be contacted via email and invited to participate in a pilot study designed to begin to answer the following research questions:

1. In what ways does a dynamic software environment facilitate the assessment of student understanding?
2. In what ways does this assessment differ from the ways such understanding can be assessed in a non-technology environment?

Each willing past participant will receive an array of GSP tasks and be asked to use them with students (at various school and university levels), collect their work, and bring this data in electronic form to the working group.

Working group sessions will be spent doing these activities:

- Discussing theoretical frameworks from the literature (Laborde, 2001; Laborde & Laborde, 1995; van Hiele, 1986) that can guide research on student understanding in a technology environment.
- Analyzing data using ideas from the theoretical discussions.
- Discussing implications of the preliminary findings of this analysis.

- Articulating and refining researchable questions on the use of technological environments to assess students' understanding of geometry concepts.

#### *Anticipated Follow-up Activities*

We view these activities as essentially making up a pilot study for researching the use of a technology environment to assess students' understanding of geometry concepts. Working group activities will end with proposals for conducting further research in these areas. Time will be given for small groups to discuss their plans for this collaborative research over the coming year. Leaders will be chosen for each of these groups. These leaders will be committed to organizing the next years' research and bringing research data and results to next years' working group.

#### *References*

- de Villiers, M. (1999). *Rethinking proof*. Emeryville, CA: Key Curriculum Press.
- Flewelling, G. (2002). Sense making: Changing the game played in the typical classroom. *Australian Mathematics Teacher Journal*, 58(1), 8-16.
- Laborde, C. (2001). Integration of technology in the design of geometry tasks with Cabri-Geometry. *International Journal of Computers for Mathematical Learning*, 6, 283-317.
- Laborde, C., & Laborde, J. M. (1995). What about a learning environment where Euclidean concepts are manipulated with a mouse? In A. A. diSessa, C. Hoyles & R. Noss (Eds.), *Computers and exploratory learning* (pp. 241-262). Germany: Springer-Verlag.
- van Hiele, P. M. (1986). *Structure and insight: A theory of mathematics education*. Orlando: Academic Press.