

CAME 2005
Theme Group 3: Teachers and CAS
Summary of the Theme Group Discussion
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Discussion within Theme Group 3 began with the identification of questions that arose from individuals' interests and reflected ideas from the CAME plenary papers, reaction papers, and short presentations. The group began with four general question areas:

1. What kinds of tasks do we promote? How do we support teachers in implementing those tasks?
2. Why do some teachers start to use CAS? Not start to use CAS? Continue using CAS? Stop using CAS?
3. What do teachers really need (beyond one-time training)? How do we influence their thinking?
4. How do teachers balance learning CAS with learning mathematics in the curriculum?

The ensuing discussion intertwined the topics of these questions and several other issues. The substance of the discussion can be summarized around a few key questions.

What do teachers need to be strong users of CAS in their classrooms?

We propose there are materials and visions that would help teachers in their CAS implementation efforts. Good tasks seem to be necessary. Beyond tasks, teachers need ways to incorporate those tasks into lessons that address curriculum needs. Teachers benefit further from having an image or vision of what teaching (and learning) with CAS might be. Strong tasks and lesson ideas might contribute to the images or visions that teachers develop. In addition, teachers need to see CAS beyond its potential for generating mathematical answers and develop an image of CAS as a tool for learning

What is good training or professional development for teachers?

Related to our assumptions about what teachers need are features we propose would be characteristics of good teacher training. Good training would provide appropriate tasks and ways to use those tasks in classrooms. It would also include experiences that help teachers to develop a rich vision of CAS and teaching with CAS. Trainers would listen to what teachers are saying and thinking about CAS and about other aspects of mathematics, curriculum, and teaching. Training sessions would help teachers develop personal comfort with CAS and would help them to analyze what students do with CAS and what mathematical understandings students develop through CAS use and the blending of CAS use with non-CAS activities.

How might CAME researchers and teachers view teachers in thinking about teachers and CAS?

We found it inappropriate to talk about teachers and CAS without stating what we believed to be true about teachers. We assumed teachers were essentially good professionals who will be making choices in their classrooms. Those decisions will be

affected by external influences, but teachers' decisions also reflect their internal influences or drive. We therefore place high value on training and materials that help teachers to make informed decisions and to act on those decisions. In addition, teachers offer their experiences to us and we have the responsibility to use their input to frame and refine materials, training, and how we research teachers and teaching with CAS. This perspective pairs teachers and researchers as collaborators in extending and understanding CAS use.

What might researchers offer to teachers?

As researchers, we might offer teachers several things to inform their decision making and to enrich their classroom work. Theories may provide a way to think about learning and other aspects of CAS use. Theories may be part of a vision of CAS and of teaching with CAS. We also may offer empirically tested examples of the potential of CAS for particular topics, including collections of tasks and lessons.

What insights or implications for research do we note?

While we had strong opinions and beliefs about what teachers need and what training would be helpful to them, we recognize the need to develop further a body of research to understand more fully the nature of teaching with CAS. Areas on which that research might focus are the design of tasks and lesson sequences and the impact of training events on what teachers do in the classroom. We also need ways to evaluate interventions. There is a need to study how teachers think about CAS and teaching with CAS and to use or develop theories and constructs to explain the phenomenon. For example, we may extend instrumental genesis to explain how teachers develop their relationship to CAS as a pedagogical instrument as well as a mathematical instrument. In all matters of research and practice, we continue to note that CAS is only one type of technology that merits attention.