In-service training: Experiences with coaching and community building
**CMU**, a small center with 3 people in daily management and 5 coaches.

**Mission:** to support use of CAS respecting core mathematics qualities

**Workings:** In-service development projects, within curriculum, realized in teachers' own classes

- Based on teachers’ needs and possibilities for development
- Community building with Univ. as active partner in dissemination and reflective praxis

**Working modes:** Coaching of teachers based on action research model. Communal gatherings at start and end.
Dilemmas of the modern teacher with modern tools

The CAS-dilemma
- Dilution of mathematical content
- Descriptive, computational, explorative power

The CAS-MATH dilemma
- Outsourcing to CAS
- Insourcing from CAS

The systemic dilemma
- Educational production plans of society
- Core values and robustness of mathematics

The media dilemma
- Intentions of textbooks
- Intentions of CAS-worksheets
... and more
Circumstances and paths for the average teacher

- Few traditions to build on. Communal understanding must be constructed anew.
- Teachers’ university education ungeared.
- Didactical contracts in new disguises.
- ...

CASE: Sliders to illustrate change of slope of secants.
- Considerable time spent on teacher intentions
- Students done in minutes
- Teacher’s subsequent didactical analysis of math contents shows learning obstacles that were not (properly) addressed.
Challenges in teacher training

Great variation in teacher needs and competencies

CAS curious ↔ CAS cautious

**CAS curious**: Use CAS for concept building, more extensive modeling, short-cut to interesting but complicated math.

**Spontaneous reaction**: CAS’ify as much as possible to get to the “big picture”

**Training challenges**: To connect CAS with relevant math and student activities.

How to avoid CAS being a project for the teacher rather than for the students?
Challenges in teacher training (2)

CAS cautious: Feels somehow forced to use CAS

Spontaneous approach: Would like CAS to be a tool easy to use, see no great value in students mastering details in CAS. Eager to borrow sheets from colleagues.

Training challenges: Teacher’s own instrumentation and instrumentalization issues may prevail those of students.

What are the CAS-competencies that teachers need in order that CAS use become meaningful and worthwhile to students?
Challenges in coaching

There is not one specific approach to CAS. Coaching aims at giving teachers a co-ownership in development of math education.

- Many different CAS environments
- Teachers with various experiences and contributions
- Different classes, diverse group of students etc.

How can diversified coaching acknowledge striving for general qualities and standards?
Challenges in coaching (2)

CMU-project model: **Reflective practitioner** with dissemination of

- learning goals and teaching activities
- CAS material
- learning outcome and reflections.

Despite coaching, documentation often appears contrived to participants.

How does one utilize sharing of actual CAS experiences towards better education?
Community building

New learning circumstances call for a negotiation of CAS quality standards.

CAS standards are not naturally inferred from traditional discipline standards.

What is a good strategy towards establishing, if possible, a modern consensus of standards?
Teachers and didactics discourse

General appreciation in teachers’ common room of discussion of

- good ideas
- student activity
- intended and actual learning outcome

With home-spun discourse, risk of

- talking past each other
- false concord
- false progression.

The CAS perspective accentuates the need for professionalization of the discourse.

How do we overcome reluctance to theorizing? (more pronounced with CAS)

Is a CAS-encompassing discourse just addenda/new foci to discourse of math didactics?

If so, is there a tradition among colleagues on which to build?
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