Essentials of teacher training sessions with GeoGebra

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Initiative from Danish GeoGebra Institute (DGI)

Training sessions offered to primary and upper secondary school teachers and teacher educators:

- Initiate and support professional development for groups of teachers, directed towards ICT integration
- Not ready – made courses – The training sessions must be taylored to meet the actual group's needs
- Four essentials of ICT integration into mathematics are captured in the design of training sessions

We use GeoGebra – other software might have been chosen as well

Background: New formal requests of ICT integration into mathematics

Put new demands on the teachers in primary and upper secondary school:

1. Required ICT knowledge and skills
2. Creation of new learning environment
3. Dealing with new media
4. Changed classroom norms and needs
5. Extended curriculum

New demands on pre-service and in-service teacher educators as well!

Why initiate professional development in stead of courses?

Lean upon Cobb, P., Zhao, Q. And Dean, C. (2009). Conducting design experiments to suport teachers' learning: a reflection from the field* adresses three conceptual challenges:

a) locate the teachers' learning in the institutional setting
b) to account for the collective learning of the teacher group
c) to relate teachers' activity in professional development sessions and in the classroom.

Concentrate on c) for our purposes:

*In: *Journal of the Learning Sciences,* 18:2, 165 – 199

c) To *relate teachers' activity in professional development sessions and in the classroom*. (Cobb et al. 2009 p186-1989)

- The relations between teachers' activity in *classroom settings* and *professional development settings* are conceptionalized bidirectional:
- Bidirectional interplay between the teacher's use of artefacts in the two settings
- Not only a mere two-way movement of for example GeoGebra training sequences and students' tasks.
- Consequently, the training session must offer more than just an opportunity for the teachers to prepare and discuss teaching materials to be used in their classrooms.

Our goal became to initiate collaborative professional development focused on integration of ICT in mathematics teaching, in groups of teachers with one or two experts from DGI as the group's partner.

Collaboration between DGI and the target groups, challenges:

- Levels of teaching: Primary and upper secondary school and teacher education
- Different levels of knowledge, skills, expertise and experience ask for a flexible design of the training sessions
- The DGI experts taylor the design to meet the interests and needs of the actual teachers and carry out the training session. Continue collaboration with the group after the session

Double aim of the training sessions

- The sessions aim to initiate and/or suport the teachers' professional development to meet the new demands, following from the introduction of formal requests of ICT integration.

Taking a step further from seeing new demands, this introduction, though, has huge potentials: We see the ICT integration having a profound impact on school mathematics. So, the DGI initiative also aim to

- Realise (at least some) potentials for curriculum development, enhanced learning, inclusive teaching, investigative and inquiry learning etc

Skott, J.(2004). The forced autonomy of mathematics teachers*:

A case of *'expected classroom practices and lerning outcomes formulated outside the classroom, but there is no set of well-defined methods for the teacher to carry out and only vague hints as to what kind of practice a certain situation may require.* '.

Skott argues that the notion of forced autonomy should be extended to encompass:
- Conceptions of mathematics
- Conceptions of mathematical learning
- The roles of the teacher when supporting students' learning in classrooms,
- The multitude of other obligations that emerge in the course of the classroom interactions,

All four complicate teacher decision-making. The extended notion of forced autonomy:
- Serves as a means for researchers to understand the teachers role for the enacted curriculum
- <u>Provide the teacher and his colleagues with an understanding</u> that prevents them from oscillating between either facilitating mathematical learning or pursuring broader educational aims.

*In: *Educational Studies in Mathematics* 55: 227-257, 2004. Kluwer Academic Publisher. Netherlands.

Content of the training sessions

Lean upon Skott, but focusing on the ICT integration:

- Conceptions of mathematics -» Mathematics with tools

- Conceptions of mathematical learning -» Potentials of mathematical learning with ICT

Extensions:

- ICT as a medium for mathematics

- Changes, experienced in practise, forced or deliberately realised

Four *essentials* of ICT integration

The model's designs are centred on four *essentials:*

- Tool (conceptions of mathematics & ICT)
- Medium (meta perspective)
- Vehicle for learning (meta perspective)
- Change agent (forced or chosen changes) with regard to
    a) Rethinking of teaching mathematics
    b) New perspectives
    c) New content

Content of the actual training session is weighted choice between issues, captured by the four

Tool

- Mathematical content
- Instrumentation (Task – student - computer)
- GeoGebra

Medium

- 'In and out of' the computer (translation and interpretation)
- Express meaning, read and write mathematics
- Mathematical work as manipulation of semiotic representations
- Potentials and restrictions in the actual cases

Vehicle for learning

- Flexibility of concepts
- Mathematical modelling and reflections
- Potentials for change of focus on concepts, processes and relations rather than on technical details
- Possibility of creating mathematical microworlds and games

Change agent

Experiences from practise as the starting point

- Rethinking of teaching mathematics: teamwork, interdisciplinary projects, professional development
- New roles for the teacher: No longer expert, teaching experiments
- New obligations regarding discipline: students downloading music, shared homework tasks etc.
- New perspectives: modelling aspects, applications, authentic models
- New content: Numerical methods, fractals intercisciplinary projects etc.

Leading to the other three esentials