


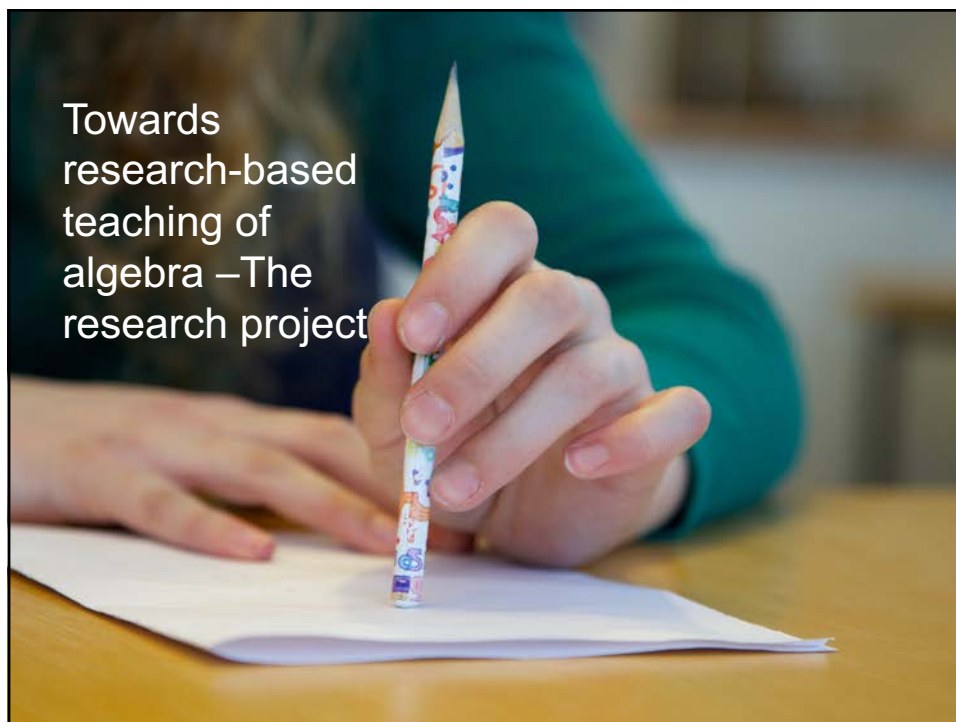

Resources for algebra teaching and the teachers' openness for change: The Swedish case

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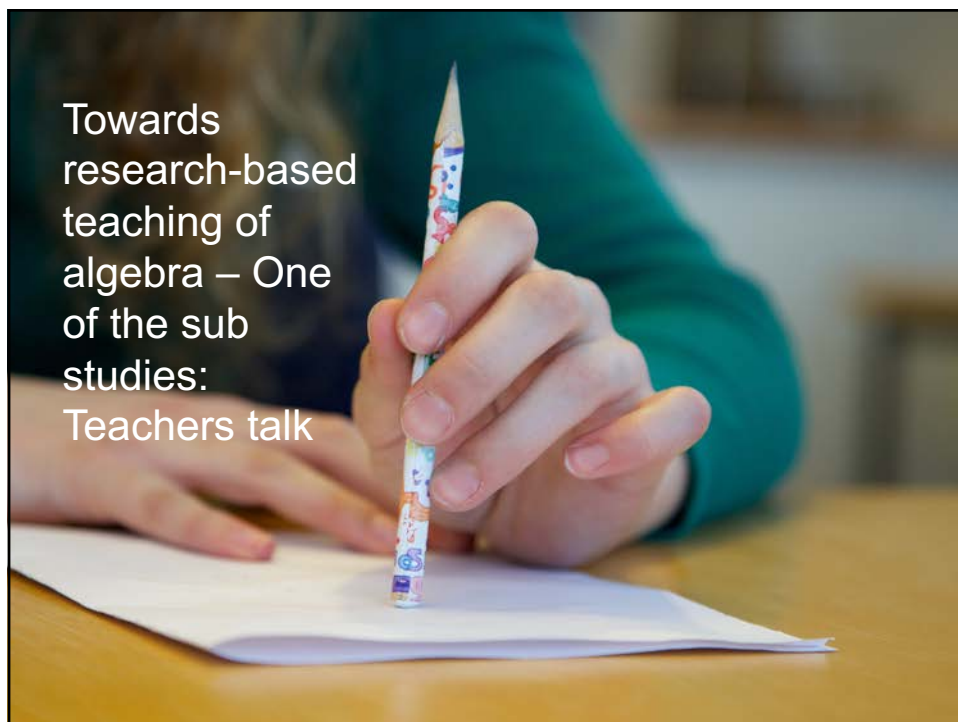
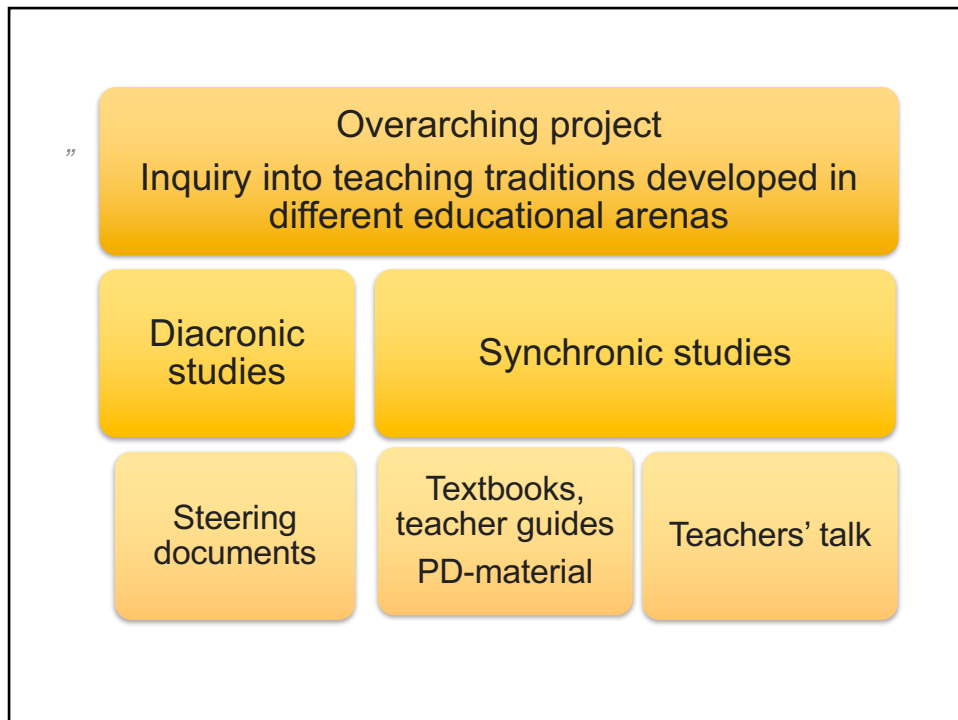
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Towards research-based teaching of algebra – The research project



The study

- Aim

The aim is to find out how teachers talk about algebra progression, and texts and tasks produced in the formulation arenas

The study

- Method

Eight focus groups (2 hours) from different schools

- 38 teachers (mean 16 years of practice, SD=9.4)
- 30 teachers from primary school (6 to 12 year olds), and 8 from lower secondary (13 to 16 year olds)
- All participants were certified teachers
- Schools in different socio-economic settings, countryside, as well, as inner city schools.

Interview guide, 14 open questions, two themes

- what is algebra(pre-algebra)
- what mathematical tasks are suitable for teaching algebra (at some specific school level)

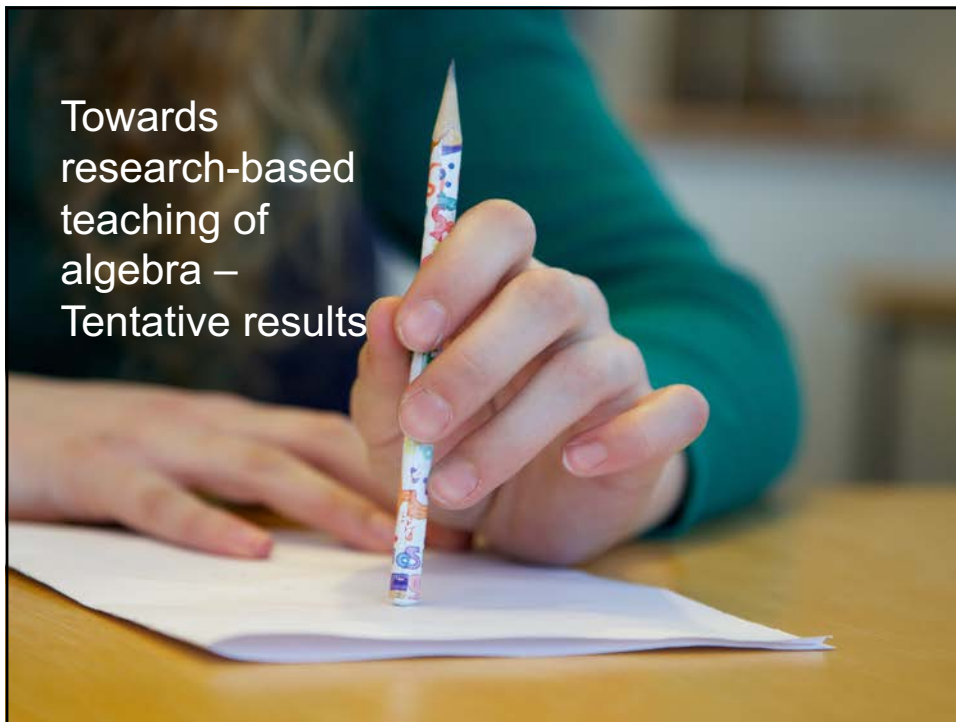
The study

- Analytical framework
 - “Big ideas” (e.g. Blanton et al.,2015)
 - 1) Equivalence, expressions, equations & inequalities;
 - 2) Generalized arithmetic;
 - 3) Functional thinking;
 - 4) Variable.
- >Interview guide, tasks -> a-priori categories

The study

- Analytical framework
- Representations of practice (Little, 2002)

What are made visible? (topics, materials, planning, etc.)
 What parts of practice becomes described, demonstrated, rendered? (what face of teaching is available as a resource for development)
 The portrayal: simple-complex, static- dynamic, certain-ambiguous
- Thematic analysis -> a posteriori categories (Nvivo)



Towards research-based teaching of algebra – Tentative results

Tentative results

- Teachers understanding of algebra and its place in school mathematics
 - Equal sign, informal and formal methods for equation solving (Equivalence, expressions, equations & inequalities) patterns and finding a rule (functional thinking)
- Teachers feelings towards algebra
- Teachers working together and support
- The teachers are open for change and interested in developing their algebra teaching
 - Communication in classroom, use of teaching resources, teaching for all.

Tentative results

- The teachers are open for change and interested in developing their algebra teaching, however...
- In schools where the support from the local school authorities is **described as structured** (i.e., assessments, and outspoken local learning goals), and where the teachers cooperate within and between schools (i.e., from primary to lower secondary), the teachers talk is more precise and the resources seems to have a clear role in their teaching.
- In schools where the support from the local school authorities is **described as weak** (i.e., unclear local goals, and absent plans for compulsory school as a whole, and low attendance in professional development programs), the teachers talk is more tentative and the teachers display a more uncertain picture of available resources and artefacts.

Tentative results

- More supportive local environment:

[Lower secondary teachers speaks about mathematical tasks and learning progression]

T1: Well, yes, then we think it will be better

T2: Yes, we also work with... we have an assessment tool in the county... and mathematical tasks we developed. We have extra material not only the textbooks... and we share problem solving tasks with each other

T1: or from "RUC" [PD organised by the university], wasn't it?

T3: yes, we also have it from the "Mathematical boost" [PD organised at state level] or, yes, so it was.

Tentative results

- Weak support in local environment:

[Primary teachers speaks about mathematical tasks and learning progression]

T2: It is.. oh I don't know what the steering documents say about this, because I just look at the National tests to keep myself on track and there are never those kinds of tasks

T1: But there never are in the National test grade 3! They are very basic. The textbook I use is far ahead one could say [...]

T3: yes, and if they [the pupils] shall manage algebra in lower secondary, then they should be acquainted with it a bit, as they anyhow must learn it then... as well as one play around a bit with it in in grade 1–3 one should try a bit of the thinking from lower secondary in grades 4–6..

[...]

T2: ...I probably shouldn't teach algebra (laughs)

T1: I feel so to (laughs)

Tentative results

- Goals and progression:

“Often, I think, that we lack this, what one expects of the students when they leave the 3th grade... and also the other way around, what I can expect when the students come to me in the 4th grade. What have they done? What skills do they have? I can't start somewhere the students have not yet arrived at. And yet, we [the teachers] are often in the same building... what about when the students leave for the 7th grade, and they change the school completely. Then it's even more difficult to know what we teachers can kind of expect from each other”

Tentative results

- Different artefacts is used as an agent for change
 - ✓ National steering documents
 - ✓ Tools for assessment (national, local)
 - ✓ Teacher education
 - ✓ Teacher PD-courses
 - ✓ Curricular material (textbooks, teacher guides, etc.)

Tentative results

- The artefacts are, however, also described in terms of limitations in relation to how useful they are for teaching development and the every-day practice

[Primary teachers speaks about mathematical tasks and learning progression]

T2: It is.. oh I don't know what the steering documents say about this, because I just look at the National tests to keep myself on track and there are never those kinds of tasks

T1: But there never are in the National test grade 3! They are very basic. The textbook I use is far ahead one could say [...]


Some issues...

T2: well, this textbook in maths [...] My opinion is that it takes far too much time [...] a couple of lessons on rational numbers .. They learnt more than four weeks working in the book... no just joking.. but ..this communication thing is so important.

T4: I recognise that.. I have also had the need to sort of just take some parts [of the book].. And sometimes i make worksheets on my own, because some sections in the book takes too long time if one shall do it all.

[...].. But I also try to work a lot... hands on ... and show..

T1. well, you also have to see this hands on and practical maths, and all kinds of what we are doing... because.. It has to lead forward to something also. So it becomes some sort of... progresion... Otherwise we might sit there with a shoe. Shoe plus shoe equals.. [refers to a discussion on how the textbook represent equality and equations]



To be continued..

