

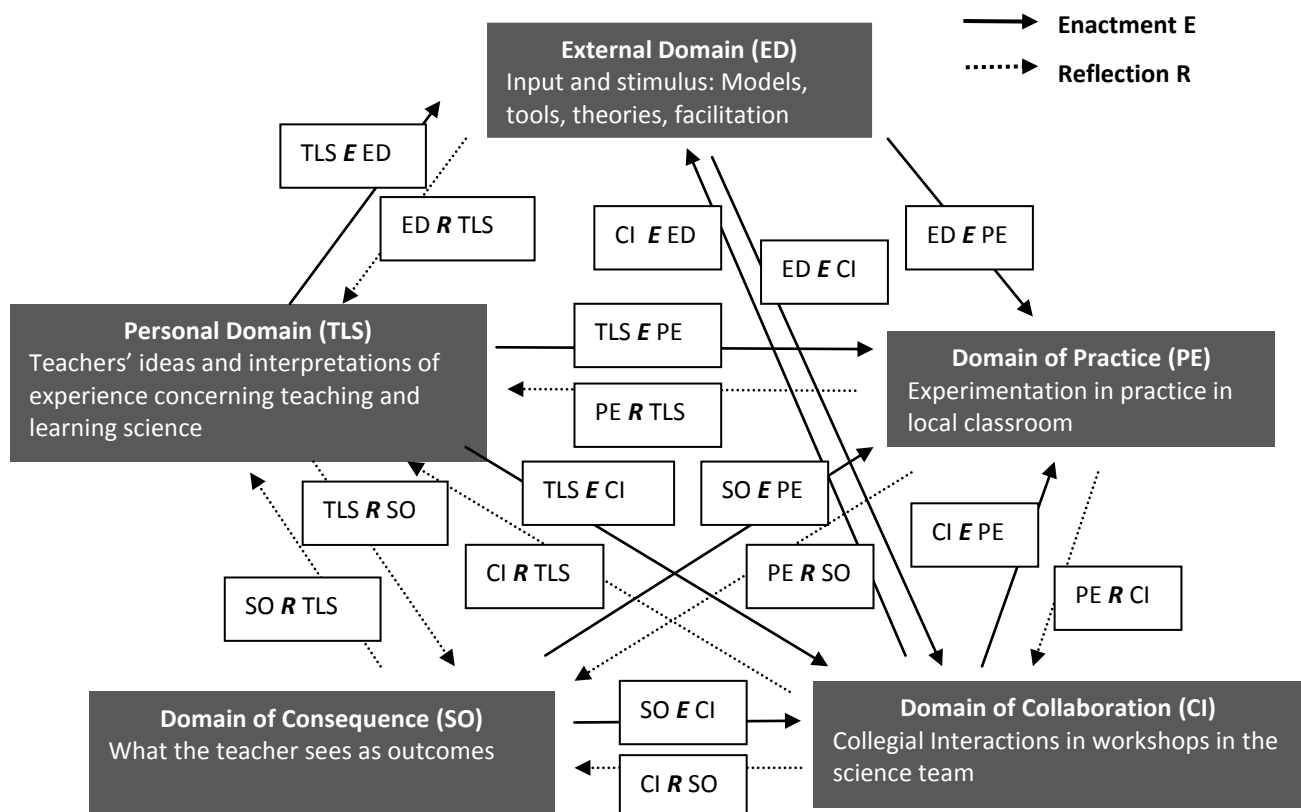
Codebook: Science teachers' meaning making (reference Nielsen, B.L. (2011))

Part A: Meaning making model

Step 1: Codes referring to the five domains in the meaning making model. The teachers' utterances might in this step of analysis have reference to more than one domain.

Code	Description
External Domain (ED)	Reference to new information, materials and stimulus from the facilitator, for example new teaching materials, tools to be used in classrooms to examine students' pre-conceptions and facilitation connected to video-recording and choice of clips to use in workshops
Domain of Practice professional experimentation (PE)	Reference to purposefully trying something new in practice, for example trying a new tool or teaching a new subject matter area or using a new pedagogical approach in the teacher's own classroom
Domain of Cooperation collegial interactions (CI)	Reference to collegial interactions in the PD workshops, for example discussion with colleagues, seeing something in colleagues practice or presentation of artefacts from own class
Domain of Consequence salient outcomes (SO)	Reference to something the teacher sees as an outcome from the project when being asked directly and something the teacher spontaneously refers to as an outcome
Personal Domain interpretations of experience concerning teaching and learning of science (TLS)	Reference to the teachers' ideas and interpretations of experience concerning the nature and content of science, science subjects and curriculum, the learners and learning of science and decisions and planning in relation to teaching science

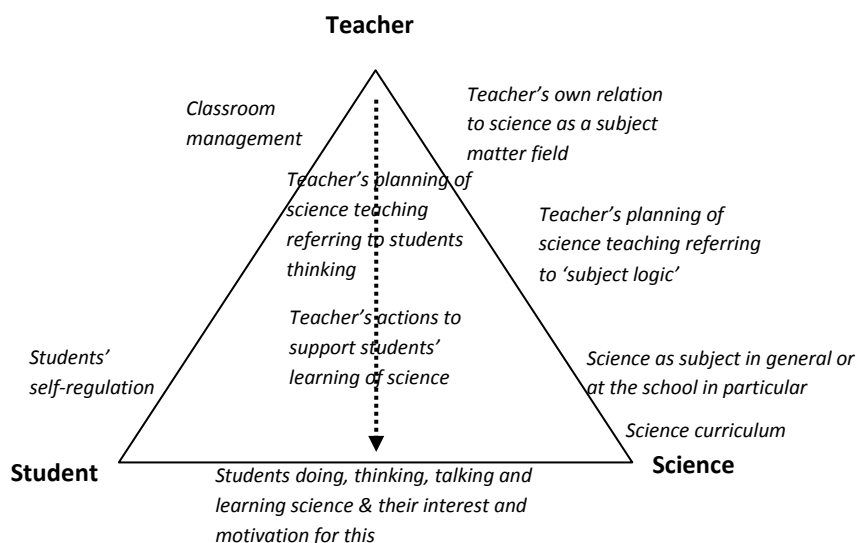
Meaning making model with naming of all domains and arrows (step 1 & step 2 coding):



Step 2: Codes referring to how change in one domain is connected to other domains, with reflection and enactment as mediating factors. Coding is used on utterances where *more* than one code is used in step 1.

Code	Description	Examples
TLS E ED	The teacher refers to personal request and search for new 'information' from ED	No examples
ED R TLS	The teacher reflects on personal use of input from ED	<i>yes concept cartoons [...] I have to try this out (Teacher A)</i> <i>this [the video and analysis of it] is the best sparring you can get (Teacher C)</i>
ED E PE	The teacher refers to start of experimentation based on input from ED or supported in other ways by facilitator	<i>this electrics as <u>we</u> used it (Teacher B)</i> <i>I actually think you can use these video recordings, I have to admit it (Teacher D)</i>
TLS E PE	The teacher refers to the ideas behind an initiation of experimentation in practice	<i>now when I have 6th grade, I try to challenge the students to combine concepts and discuss (Teacher C)</i>
PE R TLS	The teacher reflects on personal experiences from doing experimentation in classroom - experiences which may have verified or potentially changed ideas	<i>like for example in this electrics, to work with students pre-conceptions, how they catch the point (Teacher B)</i> <i>how you can remain asking question [...] it is easier to give the answers (Teacher C)</i>
ED E CI	The teacher refers to input or support by facilitator in relation to collegial interactions in the workshops	<i>I think it was a good refinement in the approach made after the first workshop [...] and now E tried it out [...] It is where you can see that things is now really on the track (Teacher C)</i>
CI E ED	Collaborative request and search for new 'information' from ED when involved in collegial interaction	No examples
CI E PE	The teacher refers to how discussions in workshops lead to/induced/started professional experimentation (or might do so looking forward)	<i>This [a method seen on C's video] I would really like to use, I think it is a really good approach (Teacher A)</i>
PE R CI	The teacher reflects on how experiments from her classroom were used in the workshops	<i>something, where I could contribute [...] it was more my field (Teacher B)</i>
SO E CI	The teacher refers to salient outcomes and how this entails (or might entail) new/changed/more/less collegial interactions	<i>I think it could be fine, if we could carry on with this in the team (Teacher B)</i> <i>We are going to make this project next year (Teacher C)</i>
CI R SO	The teacher reflects on something which happened in collegial interactions as being a salient outcome	<i>I think it was really good to see how it was done in other classes (Teacher A)</i>
SO E PE	The teacher refers to salient outcomes and how these entail (or might entail) new/changed/ more/less professional experimentation	<i>try new approaches, like this electrics, and work with students' pre-conceptions (Teacher B)</i> <i>This exemplary way of doing it we can use in other contexts (Teacher C)</i>
PE R SO	The teacher reflects on professional experimentation, things that happened during experimentation and/or results of experimentation as being a salient outcome	<i>I think it has been really good teaching electrics (Teacher B)</i> <i>students could discuss scientifically, use the concepts and stay on task (Teacher D)</i>
SO R TLS	The teacher refers to what is a salient outcome and when reasoning directly reflects on – or indirectly refers to personal ideas	<i>It makes them talk and think a lot (Teacher A)</i> <i>I think this is a good approach in 3rd grade, before I used this guy from the energy-center, this was a show [...] focus on entertainment (Teacher B)</i>
TLS R SO	The teacher uses conceptions of teaching and learning science directly in reflection on what she sees as salient outcomes	<i>I think it is best that you [as a teacher] see it yourself, instead of just being told (Teacher C)</i>
CI R TLS	The teacher reflects on personal development, conceptions of teaching and learning science, based on discussions in collegial interactions	<i>I think I have been thinking as a resource teacher in the workshops, the things we have discussed, I have gained a really good sense of where the colleagues are (Teacher C)</i>
TLS E CI	The teacher refers to conceptions of teaching and learning science and uses this as a argument for new/changed /more/less collegial interactions	No examples

Part B: Utterances about teaching and learning science (indications of teachers' conceptions)



Codes	Code description		Examples
Category: Teacher - science			
Teacher's relation to science	Utterances about teacher's relation to science as a subject matter field; the teacher's experience of subject matter knowledge in science	Feel secure	<i>oh this, I feel I know, and can handle</i> (Teacher D in 1. Interview)
		Feel a lack of subject matter knowledge	<i>Physics and chemistry this is not what I am strongest in</i> (Teacher A in 1. interview)
Teacher's reference to planning - subject logic as the starting point	Utterances about how and what the teacher plans with reference to the logic of the science sub-content field. See also the code 'Teacher's reference to planning-students thinking' as the starting point' below		<i>Earlier this year we had a theme about the geological circuit [...]and worked with various stones</i> (Teacher D in 1. Interview)
Science as a school subject	Utterances about science as a subject in the school system in general or at the local school	Positive comments	<i>I like teaching science [...]it is a subject where they have to touch and experience themselves</i> (Teacher B in 1. Interview)
		Negative comments	<i>In Science and Technology there are questions in south and north</i> (Teacher A in 1. Interview) <i>When you want to make an experiment you can use really long time to find some of the things</i> (Teacher A in 1. Interview)
Science curriculum	Utterances referring to the Danish science curriculum: 'Faelles Maal'		<i>I would like us to follow 'Faelles Maal 2', where it is actually stated that you must teach interdisciplinary themes</i> (Teacher D in 2. Interview)
Category: Teacher-student			
Classroom management	Utterances about how the teacher copes with classroom management (and why) and problems with handling classroom management	Is a big problem in science teaching	<i>and then there is some, ruining the teaching</i> (Teacher A in 1. Interview)
		Is an issue, but works ok for me	<i>It can still be a little hard, but it works and maybe you cannot avoid this</i> (Teacher A in 2. Interview)

			<i>you have to be really structured</i> (Teacher B in 1. Interview)
Students' self-regulation	Utterances about students deciding (or co-deciding) themselves how to approach something and/or what to do in science lessons (or teacher wanting/not wanting them to do that)	Freedom is important	<i>I want it to be as free as possible</i> (Teacher A in 1. Interview)
		Regulation is important	<i>I would never start a project like that, so un-regulated, I would make a structured manual of a kind</i> (Teacher D in 1. Interview)
Category: Student-science			
The teacher refer to as being important:	Students doing/activities in science	Utterances about students' activities: their hands on experiences, experiments etc. (or lack of activities)	<i>Science & technology is about , they feel, touch, experience</i> (Teacher B in interview 1)
	Students thinking in science	Utterances about how students understand/misunderstand science concepts and which concepts are easy/difficult for students	<i>to get their pre-conceptions on the table</i> (Teacher C in 1. Interview)
	Students talking science	Utterances about students talking and discussing in science (or lack of that)	<i>bring the things inside and put some words on, about science [...]symbolic language</i> (Teacher B in 1. Interview) <i>It is important to make them talk [...]about what they know, before starting</i> (Teacher B in 2. Interview)
	Students learning science	Utterances about students' learning or lack of learning in science (this code will often be used together with the codes above, in utterances about for example how students learn through talking or doing science)	<i>A long the year [...] taking pictures, 4th grade, they were not able to make those connections</i> (Teacher C in 1. Interview) <i>This about the lungs and the two circulatory systems was a little hard for them</i> (Teacher A in 2. Interview)
	Students' interest and motivation	Utterances about what interest and motivate students	<i>Students who discovered some things [...]and were interested</i> (Teacher A in 1. Interview)
Category: Teacher relating to student-science			
Teacher's reference to planning - students' thinking as the starting point	Utterances about how teachers plan and/or refine teaching based on knowledge of or considerations about students' thinking and learning See also the code 'Teacher's reference to planning - subject logic as the starting point' above		<i>I have planned it using the same groups again [...]because when you want them to express their thinking [...]there is an enormously span [...]in abstraction</i> (Teacher C in 1, interview)
Teacher's reference to other actions supporting students' learning	Other utterances about how teachers can support students' learning processes		<i>photosynthesis [...]all the time a poster with a great leaf was hanging in class, and this is what they refer to now</i> (Teacher C in 2. Interview)