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Subject Didactics in Practice – Hidden in the Process
A Study of Teaching Logics and Classroom Cultures

Glenn Hultman*, Ragnhild Löfgren** & Jan Schoultz*

Abstract
This study concerns teachers’ professional knowledge. Sixteen teachers, all with more than 25 years’ experience in the profession, participated in the study in which they were given three different opportunities to show and formulate their professional skills. We initially asked the teachers to answer questions via e-mail. In the second part, the teachers were filmed in various teaching situations that allowed stimulated recall conversations afterwards. The analysis of this data then formed the basis of so-called dialogue seminars. The participating teachers show a great ability to create contexts for student learning. It was evident when they introduced new tasks and areas of work. Other important skills are, according to the participating teachers, dealing with students in groups and individually, organising, being leaders, and understanding students. The results also show there were only few occasions when the teachers touched upon subject didactics and learning theories in their discussions.

Keywords: subject didactics, school, teacher’s, professional knowledge, science education

Introduction
Subject didactics and subject knowledge are two priorities in the current Swedish schools debate. It stresses that teachers need more knowledge of their teaching subjects and deeper knowledge of subject didactics. In the new teacher training directive the Ministry of Education (2007) states that the starting point shall be deeper subject knowledge and more subject didactics than in the previous training programmes. It also follows that teaching proficiency must be increased through in-service training with a focus on academic and professional training and subject didactics. The Ministry of Education (2008) emphasises that the purpose of in-service training is to improve teachers’ competence in order to increase students’ achievements. The focus should be on strengthening teachers’ skills in both subjects and subject didactic theory.

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Therefore, in the present study we analyse what teachers consider to be important professional knowledge and professional skills. Our research questions are:

*In what way do teachers talk about their professional skills in the classroom?*

*How do teachers express their own professional development?*

We start by briefly accounting for the concepts – didactics, subject didactics and pedagogical content knowledge – and the relationship between them. In the following section, we present and discuss some studies about teachers’ learning.

**Didactics**

Didactics is a comprehensive yet quite unclear key concept in Swedish education and teacher training and it is therefore difficult to conclude what we mean by didactics and how this area of knowledge will affect Swedish schools. Yet the word didactics has a long history and many believe it comes from the Czech John Amos Comenius. He wrote his famous work Didactica Magna (1628–1632) on the art of teaching. The concept of didactics can be described as the theory and practice of teaching and learning (Gundem, 2008). According to Lundgren (in Bengtsson, 1997), didactic research tries to understand and explain teaching and how it affects the individual’s thinking and memory and the relationship between teaching and learning. The purpose of introducing the concept of didactics into Swedish schools was, among other things, to provide teachers with tools to help them reflect on their teaching (Andersson, 2001). Schüllerqvist (2001) compares researchers’ different ways of describing didactics and didactic reflection. Imsen (1999) points to three levels of reflection.

![Figure 1. Theories of the first, second and third order according to Imsen (1999: 49)](image)

The first is in the practice. But even here, there is a theory, even if it is a tacit theory. On the second level the teacher has a more explicit theory based on experience. The third contains, for example, learning theories and is called meta-theoretical reflection by Imsen.
In his description of didactics, Uljens (2009) also has three levels: practice, theory and epistemology.

Figure 2. Didactical thinking and its levels and different characteristics according to Uljens (2009: 10)

In his model, classroom practice is at level one. At level two, the teacher creates subjective theories about his or her own teaching. But those theories can be challenged in meetings with others, which can be a colleague’s way of understanding teaching or scientific theories. Uljens’ second level lies between Imsen’s everyday level and her meta-theoretical reflection and could be regarded as a tool for didactic analysis to understand what happens in the classroom. General didactics deals with important questions about teaching and learning while subject didactics goes deeper into school subjects.

The relationship between subject didactics and didactics
Klafki (1994) in Kansanen & Meri (1999) summarises this relationship in five statements:

1. The relation between general didactics and subject didactics is not hierarchical by nature. Their relation is, rather, reciprocal. It is not therefore possible to deduce subject didactics from general didactics. They both deal with the same problems and although naturally a certain subject has its typical characteristics their difference lays predominantly in the possibility of generalising their solutions and decisions. Reduction of subject didactics to general didactics is not possible and general didactics has no immediate consequences in subject didactics.
2. The relation of general didactics and subject didactics is based on equality and constructive co-operation. Their approach may, despite that, be divergent.

3. General didactics and subject didactics are necessary to each other.

4. The role of subject didactics between the discipline and education is not only mediatory, it must be seen also as independent with its own contributions to the common area of education and the subject.

5. General didactics aim at as comprehensive a model as possible but that does not mean that those models could include the entire instructional process. The models in subject didactics may, however, be made in more detail (Kansanen & Mer, 1999: 110).

Gundem (2008) illustrates the tension between general didactics, special didactics and subject didactics. According to Gundem, general didactics is the most abstract. It is not bound to a concrete and specific teaching situation, but is focused on teaching and learning situations in general. Special didactics has a higher specification. Here didactics are designed and applied in certain types of schools or educational institutions. Preschool education, for instance, will have different didactics than adult education and special education. Finally, subject didactics is connected to a specific subject or subject area. Here we find the didactic theory at the highest level of specification used to illuminate problems concerning the selection of content and implementation of teaching a specific subject.

Subject didactics is considered to have the potential to develop learning and teaching processes in schools. The student and the content are in focus. The formation of subject didactic knowledge takes place in both a professional (the school) and scientific (the university) context. These two aspects are complementary. Researchers and teachers may have an interest in the same questions, but may consider them from different

\[\text{Figure 3. The tension between general didactics, special didactics and subject didactics according to Gundem (2008: 9)}\]
Subject Didactics in Practice – Hidden in the Process

didactics has three links to the outside world: the first is the scientific discipline of education, the second is the practical teaching in schools, and the third is the different subjects such as chemistry, physics and social sciences (Sjøberg, 2000). Sjøberg (2000) describes science didactics as a bridge between science and the theory of learning and education, a bridge that requires a good foothold on both sides. Sjøberg clearly shows how extensive the area of subject didactics is and how many different contexts the didactic questions can be addressed within. Sjøberg emphasises a number of important issues that can be addressed in the area of subject didactics:

- How does it become a school subject?
- How is the substance legitimized and justified? How can it defend its place in schools?
- What is the specific nature of the school subject, the discipline? What is the key conceptual content? What are the key processes?
- What kinds of values, norms, and ideals are implicit in the subject?
- How can the subject matter be structured and added so that learning can take place?

According to Sjøberg (2000), these questions can be used by teachers when reflecting on teaching and learning by themselves or together with their colleagues and students. Björkqvist, Hertzberg & Sumfleth (2006) define subject didactics in the following way.

![Image of a page from a book](image.jpg)

Kansanen & Meri (1999) believe the core of subject didactics lies in the teachers’ relation to the relation between the student and the content. We are aware that didactics and subject didactics have been thoroughly discussed in the research literature and that there are many different definitions (Hamilton, 1999). Over time the meaning of the term has changed and in this article we employ the above definition of Björkqvist, Hertzberg & Sumfleth (2006) whereby subject didactics refer to some specific school subject. Timperley and Alton-Lee (2008) refer to Lee Shulman when they discuss teachers’ professional learning.

Shulman (1986, 1987) argued for specialized subject matter for teachers comprising pedagogical content knowledge that enables teachers “to transform the content knowledge he or she possesses into forms that are pedagogically powerful and yet adaptive to the variations in ability and background presented by students (p. 341).

Lee Shulman (1986) introduced his term “pedagogical content knowledge” that is quite close to the German Fachdidaktik (Nordenbo, 1997). Pedagogical content knowledge, according to Shulman (1986), is like Sjøberg’s definition of subject didactics, a combination of pedagogy and theoretical knowledge of a subject. This shows that
the concepts of pedagogical content knowledge ("PCK") and subject didactic are very close to each other. Shulman defines PCK as "knowledge to make a subject comprehensible to others". Grossman (1990) develops Schulman’s ideas and describes four cornerstones on which teachers’ knowledge is based. The four cornerstones are the subject, general pedagogical knowledge, knowledge of context, and, as an “amalgam” of these elements, PCK. Since PCK was introduced, various aspects of the concept have been discussed. Van Driel et al. (1998) presented an overview of different research definitions of PCK. They found two common elements that are considered essential for all researchers in the field of study. The first is the teacher's knowledge of how subject knowledge should be represented in order to help students to understand the subject. The second element is the teacher’s knowledge of the students’ performances and difficulties with science. Nilsson (2008) describes PCK as a complex entity built on definable knowledge bases.

a dynamic knowledge generated in practice through the capability of the teacher to combine the individual knowledge bases; Pedagogical Knowledge (PK), Subject Matter Knowledge (SMK) and, Contextual Knowledge (CK) (ibid. 37).

An interesting study by Broadfoot et al. (2000) compares teachers’ perspectives and practices in primary schools in England and in France. In England, the teachers are more concerned with the social integration of the pupils, whereas in France the pupils’ efforts in different subjects are in focus. This shows that a different cultural characterisation of education allows different classroom considerations. Every teacher has didactics of his/her own. Didactical theories can help but they cannot remove from the teacher a personal responsibility to make educational decisions (Kansanen, 1999).

Teachers’ learning in classrooms
An important issue in this study is teacher learning. According to Hultman (2008), the teacher can be regarded as an actor who creates meaningfulness in the classroom context and learning can be seen as an “apprenticeship-in-context”. In a recent study of teachers, Ainley and Luntley (2007) note that the ability called attention-dependent knowledge enables an experienced teacher to act in a more effective way. The ability to see, interpret and evaluate classroom situations is crucial to the quality of teaching. The experienced teacher, who seems to understand more, be better at assessing, and often acts automatically, has caught the attention of several researchers (Kroksmark, 1997; Krull, Oras, & Sisask, 2007). Teachers are responding to invitations and signs that gradually increase their understanding of the complex environment. They acquire knowledge via a number of episodes unfolding during their workday. Eraut (2002) notes that this kind of knowledge is hard to find because it is created in the middle of a hectic and overpopulated environment. Freund (2009) discusses teachers’ work from a classroom perspective and uses the concepts “wisdom of practice” and “recipe knowledge” to explain the process of socialising. She gives an example by illustrating recipe knowledge:
... you learn on the job and you get ideas from other teachers and you learn from them and if something works well then you can do it again and again and if it doesn’t work or it’s not right, then I say forget it and go on and do something else. You learn from your mistakes (p. 307).

Teachers learn from their mistakes and have to live with a limited understanding of the classroom situation. Grimmett and MacKinnon (1992) discuss teachers’ professional skills as some sort of art and craftsmanship. An analysis of teachers’ learning and the environment shows that teachers spend most of their time with students and that can be perceived as an interaction between individuals and different contexts (“apprenticeship-in-context”, cf. Hultman, 2008). Östrem (2009) shows that novice teachers appreciate the field part of teacher training, while they regard the academic parts (subject matter) as irrelevant.

According to Joyce and Calhoun (2009), teachers take part in a process of socialisation but, at the same time, one is given the impression that work and the style of teaching are grounded in experience and research. They draw a parallel with people at the policy level – they also follow their own ideals, without taking research too seriously. Craig (2009) understands teachers as “curriculum makers” paying attention to e.g. students’ needs and interests and describes teachers as agents of education, not of subject matter. This dualism is of interest to us in this paper. One interesting focus in the present study is to consider what kind of subject didactic considerations teachers engage in during complex interactions (Weick, 1995). Another focus is the development of teachers’ professional knowledge. In the following section we present the method used in the present study.

**Method**

The central questions of this study concern teachers’ professional knowledge. Sixteen teachers, all with more than 25 years’ experience in the profession, participated in the study in which they were given three different opportunities to show and formulate their professional skills. We initially asked the teachers to answer questions via e-mail, after which we compiled the responses and distributed them among the teachers, again asking them to develop the text with a focus on practical teaching skills.

In the second part of our study, the teachers were filmed in various teaching situations and on the same day they looked at the video recordings. This stimulated recall conversations that were transcribed and used in this study. The analysis of our data collection then formed the basis of so-called dialogue seminars (Göranzon, 2006) in order to develop the formulation of teacher professional knowledge. Each seminar was recorded, transcribed and sent to the teachers for reading and as inspiration for the next seminar. In the seminars, we developed common concepts, but the structured talks which included both writing and reading the texts proved to be a tool for perceived professional knowledge. A selection of the data from our study will be used in this paper to illustrate how the teachers expressed and described their profes-
sional skills and how they felt they had developed them. During the analysis of the empirical material we identified two themes. One focuses on the teachers’ discussion of the pupils and the classroom situation. We called this theme teacher and pupils. The second theme is called teachers’ learning and focuses on how teachers talk about their own development and learning.

Results
In this section we present the results according to the above thematic headings and offer comments and interpretations in line with them.

Teacher and pupils
The social context – an important starting point
During our visits, the teachers showed a great ability to create safe environments and social contexts for students, which they then expressed in our talks and seminars.

And those who have rushed to school and those who have had an argument at home, they will get an opportunity to sit and collect themselves. Children can fare badly; it can be chaotic. Then it is good to calm down a moment before we begin (Teacher 4–6).

Teachers reinforce the importance of the interaction in starting and ending the school day. What you do influences the rest of the day. And this is mostly about relationships.

Creating space for learning
The teachers carefully tried to build situations for teaching and learning.

I work a lot on creating confidence. I want the pupils to work together and learn from each other. I do not like what we call “privatisation” (Teacher 4–6).

They try to create relationships with all the pupils in the classroom. These relationships seem to be the building block for learning. We gain the impression from our conversations with them that a failure to connect can create other types of problems for them, for example conflicts and the low motivation of some pupils.

Managing groups and individuals
Important professional teacher knowledge was being able to switch between dealing with pupils in groups and as individuals. The following conversation between two teachers in a dialogue seminar highlights the complex classroom situation.

But we must also be able to handle a group, not just individuals. It is not only the relationship between me and the child that is being worked out, but also the relationship between the children in the class and all the conflicts that it entails, making demands on the child (Teacher 4–6).

In this conversation, we can see an even more complex picture of the abovementioned relationships. It involves a multiple network of relationships in a single classroom.
And the teachers seem to manage all of them at the same time. The teachers handle the individual in the class as part of that class, interwoven in visible relationships and invisible “relatedness”.

**Giving priority to the pupil or the subject**
The teacher’s role is complex and essential for the pupils’ learning. According to the teachers in this study, it is important to have a social environment in which the pupils feel comfortable and safe. The following dialogue highlights a teacher’s priority when it comes to the social environment and the school subject.

> What is our attitude towards the school subject? We teach all the subjects. We must know a bit of everything, English and mathematics; mathematics is the foundation, and then the others are in the background (Teacher 4–6).

Somehow the teachers in our study give priority to the child and one possible reason for this is that they teach all the subjects and do not have time to go deeper into the subject. Another possible reason is that they teach the children in their early years and do not need any subject considerations. They focus on development of the whole child more than knowledge in different school subjects.

**Listening to the pupil, understanding their thoughts and difficulties**
In the seminars and interviews the teachers expressed many profound thoughts about teaching and learning. The teachers’ main knowledge was, according to them, the ability to listen to a pupil, to understand their thoughts and difficulties.

> My role as a teacher has changed. You have to sit next to a child and listen to them in order to understand how they think. There are too many things in school that we must be good at. I think we need to decide what we should focus on (Teacher F-3).

As seen in the above quotes, the experienced teachers tell us a story about something we understand as the invisible side of learning. This means you need to use many senses in order to understand what pupils say and what they are trying to explain. But, at the same time, you are in the middle of everything else. Some aspects of classroom life are, as the teachers say, invisible or difficult to grasp.

**The curriculum – a support or a burden?**
The teachers felt the curriculum contained far too much and demands too much from pupils and teachers. According to the teachers, there was no room for any in-depth learning unless teachers gave priority and deliberately left parts of the course syllabus out.

> I have lost confidence in the curriculum; it is too broad. It is a threat rather than a support. We have to work much more to help pupils use their skills. Now we just have to go on further and further (Teacher 4–6).
These quotes show an important dimension of subject didactics in action that the teachers are aware of. Yet, at the same time, they say something that calls for reflection – the teachers are forced to create their own curriculum. They emphasise the wide gap between the classroom level and the policy level. At the same time, they are faced with quality systems, evaluations, inspections and so on in order to implement the official curriculum. You hear of many threats causing tension in the classroom.

**The ability to seize the moment, to deviate from the plan**
The teachers demonstrated the ability to take advantage of the situation, use opportunities, but also the ability to manage difficulties. One teacher showed she was flexible in the way she discussed fractions with the kids. She noticed she could go further than she initially thought in her conversations with the children.

I discovered that there were some pupils who could not understand the third and fourth part and needed to do an exercise. But then it went off in another direction, but it was mainly due to the fact that I happened to put three apples in a row. But I noticed that they were following, they understood and it was lucky that I had thirty apples. It was actually a coincidence. I thought it would, in any case, be more than 25 when I threw some apples in the bag (Teacher F-3).

Teaching is sometimes characterised by accident, surprise and coincidence. In these moments, you can discover potential for learning and didactic dimensions. And the teachers also talk about the functions of plans. They do make plans but it is not always possible to implement them – they have to improvise and follow some other path. Hence one might say that subject didactics has to be captured in the moment (she had 30 apples).

**The pupils acquire fragments of knowledge**
The pupils acquire knowledge gradually. It may be pieces that eventually add up to larger units.

But the six-year-old pupils are watching and seem to follow. I say that if you do not understand it now, you will understand it next year. So they must not worry that they do not understand everything; they will do so later. I stress this now and then. This is how we learn in life when you learn a language and we, as adults, learn geography and everything else in that way (Teacher F-3).

This teacher formulates an everyday version of sociocultural theory or situated learning. It is about taking part in something without being able to understand everything. This may be a solution to the discussion about pupils misunderstanding concepts. Pupils will possibly understand them later on. Learning is a long-term process and hard to predict and that is the experience of the teachers.

This experience may contradict what they learned at their teacher training institution. Those formal theories are presented at university as part of teacher training, but
displayed in another form and in another language in the classroom. And this everyday formulation of a theory goes unnoticed. But it explains a lot about the conditions for teaching and didactics in schools.

**Teachers’ learning**

**Through their own experiences and contact with their colleagues**

The teachers had learned about methods, ways of working and lesson plans by trying them out by themselves and through contact with their colleagues.

> We are two teachers who share a group of pupils; we have always something in the pipeline. We have had in-service training as long as we have been working together. When you start thinking, you improve yourself; then we carry on by way of conversations and give tips about something we have heard or seen. But there is a risk if two people are working together. You just work and do not get any outside inspiration; you stagnate (Teacher F-3).

These teachers and quotes give us a feeling for the learning processes for adults in schools. They talk about improvising, adaptation, being forced to learn, receiving tips, being inspired, and revising. They also mention the risk of getting stuck in a rut. To some extent, learning seems to be generated through the process and the situation you enter. One might say that they are forced to learn and they enjoy it too.

**Learning from student teachers and literature**

Seeking out ideas and suggestions from educational literature was unusual for the teachers in the study. But there was still a desire among the teachers to have more time to do this.

> Yes, I like to read about educational research, Vygotsky and his ideas. There is so much that I didn’t learn at teacher training college (Teacher F-3).

Some of the teachers mentioned a view we have heard before (Hultman, 2001), namely that some books and journals are too hard to read, even though they are specially designed for teachers. But, on the other hand, some teachers seem to have a desire to read and learn but find there is not enough time for reading.

**Theories important for school practice**

Theories of learning were, for these teachers, not teaching aids but were used to explain and better understand what has happened in the classroom. The interview below with a teacher (F-3) gives an illustration. (I = Interviewer, T= Teacher)

> I: Do you need theories then?
> T: Yeah, I think so.
> I: But you are telling me that you build your world on your own experience.
> T: Yes, but there must be connections to something; otherwise, it could work with anything. I do not think I do this by coincidence. I don’t think so.
> I: No, I don’t think it is by mere chance. Maybe you do it from your own experience.
> T: Yes, but not only experience. Because then, I think I would have continued with the things that worked well. You have to develop.
This teacher offers an interesting reflection on the relationship between theory and experience. It seems to be the other way around. She understands theoretical matters when she has something to connect them to. Theory on its own means nothing. When she sees the meaning of theories, she develops a positive attitude to them. She needs them to help with her reflection and in the process of her own development.

**Discussion**

The participating teachers reveal a great ability to create contexts for students’ learning. It was evident when they introduced new tasks and areas of work. Other important skills are, according to the teachers, dealing with students in groups and individually, organising, being leaders, and understanding students. The results also show there were only a few occasions when the teachers touched upon subject didactics and learning theories in their discussions. But, on the other hand, some teachers talked about how to structure the subject in order to get through to their pupils. This is one of the issues that Sjøberg (2000) emphasises. The role of the teacher is complex and many factors influence what happens in the classroom. Some teachers felt that the literature in this area was difficult and they did not have time to read texts about subject didactics. They want more down-to-earth tips on how to act in the classroom. Accordingly, one can wonder whether the gap is too wide between subject didactic research and school practice. We agree with Eraut (2002) and Freund (2009) when they say that teachers learn on the job and get ideas from other teachers. The complexities in the classroom create knowledge. This is also something we see in our transcripts and it seems to apply to our teachers. According to Seddon and Palmieri (2009), teachers’ learning about students’ learning appears to be intuitive, but they argue in favour of a more sophisticated view.

The teacher’s skill in supporting learners’ learning often appears as pure intuition but this appearance underestimates the sophistication with which this skill may be developed (p. 469).

Researchers should try to transform the research results from this area so that it feels easy and important for teachers to acquire. Often the theories are far away from the everyday reality of the classroom. More practice-based theories might be one solution, theories which evolve from the classroom. The teachers in our study had the same perspective as the teachers in England, according to Broadfoot et al. (2000). Most teachers in our study felt that subject knowledge is not as important as social competence. Creating safe environments for pupils meant for these teachers, among other things, producing well-functioning groups of pupils. It was a prerequisite for the pupils’ learning.

The knowledge of the pupil was considered more important than knowledge of and about the subject. Our findings correspond well with those described by Hultman
(2001) who stresses, among other things, that an important precondition for learning is the creation of a network of informal contracts and mutual relationships between the people in the classroom. Teaching cannot be put into practice until these relationships have been established (Hultman, 2001). An interesting finding in the present study was that the teachers felt they acquired their skills for work in the classroom mainly through their own experience and in conversations with their colleagues.

In this context, the teachers can be located in the two models developed by Imsen (1999) and Uljens (2009). According to Imsen’s three levels, it seems that the teachers in our study are on the second level. This means they have an explicit theory that is often home-made and based on their own experiences. On the other hand, in terms of Uljens’ descriptions, our teachers are on level two. According to his model, this is the level at which subjective theories encounter colleagues’ beliefs and scientific theories. But, as we have seen, even practical theories exist which are similar to academic theories.

Some teachers in our study regard pedagogical theories, such as Vygotsky’s approach to learning, as a means of better understanding their own practice. The theories give confirmation and serve as analytical tools.

These results can be compared with those of Grimmett and MacKinnon (1992) who play down the idea that teaching should be regarded as an academic subject. It is, according to these researchers, instead, some sort of craftsmanship. The teachers in the present study view the relationship between research and practice in the same way as Grimmett and MacKinnon. But, even if craft dominates, the use of theories will have a function. Teachers learn themselves to make subject didactic considerations by maintaining these practices. Another factor that may influence teachers’ views on subject didactics can be seen in the following statement by one of the teachers:

The teacher should be available as a sounding board, as a lifeline. Pupils should acquire knowledge by themselves and be responsible for their own learning (Teacher F-3).

This statement points to another reason why subject didactics is not considered important. It has, for a long time, been a trend in Swedish schools to play down the role of the teacher. The pupils acquire knowledge by themselves and the teacher will just be a supervisor. The teacher has in some way transformed into a person who only provides the pupil with material and new tasks. In these circumstances, subject didactics is not needed. Some conclusions can be drawn from the present study. In this situation, subject didactics is therefore what happens in practice in the classroom; it is not an ideal method or theory that teachers should follow. Further, we can say that subject didactics, across different school subjects, is an enormous field of knowledge for teachers. One might consider whether teacher training should give teachers several more subject didactic tools. There must be a meeting place between educational research and the school. Subject didactic research should be more connected to practice or else there is a risk that these two fields will become isolated.
from each another. Subject didactics is often embedded in the teaching process. It becomes part of the whole dynamic. The classroom is dominated by an interaction between people and the content is important, but it is not the number one priority.

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