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Individual teacher learning in a context of collaboration in teams

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Ann, digital log number 1

My first learning experience started off during our first team meeting. Just before the meeting I had marked a test of one of my classes who had got really low grades. [...] Something had to change in that class. My first thought was: the students don't learn, they underestimate the subject matter. [...] My goal was to control students' homework very strictly in future and to confront them with the fact that they did not study well since I could point out in their textbooks and assignments exactly where they could have found the correct answers to the test questions. [...] During the meeting I realized that it would be worthwhile to examine first why students caught on to the subject matter so badly, because it is a rather quick conclusion to say that they just do not work hard enough. [...] In this meeting, colleagues often mentioned motivation and positive feedback as the key to activate students' learning. I realized that this was the problem in my own teaching practice. I formed the intention to control the work but mainly to compliment students in order to improve the atmosphere and work climate. So far, I do not have new grades to prove that this approach is working, but the atmosphere has improved and I notice that students are indeed more motivated when they receive a compliment. Actually, I knew this for years, but the consultation with colleagues has opened my eyes and stimulated me to use this knowledge in my teaching practice.

Chapter 2

Iris, digital log number 3

I went to Eric in his class as I had a question. It was so much fun that I decided to stay (just by coincidence, I had a free hour). [...] The students had to individually show Eric what they had done for the drawing teacher. When a student had not done the work, it was immediately agreed that it had to be done by the next class. This was done with a joke, but thereafter order and clarity and he wants immediate explanation from the students. The students who did do the work were asked to explain what the assignment entailed and how they interpreted it. The rest of the class watches and discusses as well. [...] Good atmosphere, involvement, and clarity. I left the classroom with the idea that I should have attention for every student, good or bad but in a positive manner, because then you can do almost anything. My learning experience is that you can confront students with their failures and also compliment them with their product as long as you do that with humor and clarity. And the students learn from each other: how things should be done and what is expected of them.

Jeff, digital log number 6

Three weeks ago, we were in an Education Group meeting to prepare the first study afternoon. [...] One of my colleagues introduced the concept 'visible learning' that requires a high level of action for both the teacher and the students during a lesson. [...] In a short enumeration of possible teaching methods for 'visible learning,' my colleague mentioned the 'half-time conversation'. The teacher asks small groups of students to briefly talk with him or her about what has been done during the past few lessons. The students can learn from each other in such a manner and are, of course, forced to put aspects of the subject matter into words. [...] In the two weeks following this preparatory meeting, I used the half-time conversations in four lessons and they really worked! Of course, you have to ask the right questions. [...] A pleasant side effect is that you can pay more personal attention to the students in a serious environment.

Susan, digital log number 1

This year I wasn't very pleased with my own method of controlling students' homework. I want students to do their homework as asked, but I don't want to use punishment exercises. I would rather motivate them to do their homework in a different manner. In the second term of this school year, I started off with a different method. I got the idea by visiting schools in France and observing a teacher at one school. This teacher pulled out a number out of a bag at the start of each lesson and asked the student whose number on the student list corresponded to this number, to write his or her homework on the blackboard. [...] I don't control students' homework anymore, but I let chance decide which student has to write down his or her answer to a homework assignment on the blackboard. [...] Students think it is important to have their homework in order when it

Chapter 2

Collaboration in teams: Teacher learning activities and self-reported outcomes¹

A considerable amount of current research on teaching and teacher education focuses on teacher collaboration. Teacher collaboration is presumed to be a powerful learning environment for teachers' professional development. However, empirical research about how teachers actually learn in collaboration is lacking. In this study, learning activities were explored in relation to reported changes in cognition or behavior, or both, of six teachers that collaborated with colleagues in teams. These six teachers were interviewed after team meetings and also asked to report learning experiences in a digital logbook six times during a period of one year. Qualitative analyses of both data sources resulted in seven configurations of (successions of) learning activities and reported changes in cognition or behavior. A closer look at these configurations showed that (successions of) learning activities in collaboration resulted mostly in reported changes in cognition. These reported changes in cognition often concerned confirmation of own ideas or teaching methods. The high number of confirmations of own ideas or teaching methods may be explained by the reform context in which these teachers work. Teachers who are experimenting with new teaching methods can feel insecure about these newly acquired methods and, therefore, seek confirmation from their colleagues.

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2.1 Introduction

Present knowledge-based society requires continuous development of professionals. Professionals are expected, for example, to anticipate emerging new technologies, to be informed about latest developments, and to be able to work in teams. In response to these demands, several educational reforms have been implemented during the last two decades in order to prepare students for this knowledge-based society. As these reforms require educational professionals who can give shape to these ideas in practice and are also able to pay constant attention to self-improvement, teacher professional development has become a central topic in the research literature about teaching and teacher education (Orland-Barak & Tillema, 2006). Teachers are expected to stimulate active and self-regulated learning of students during their teaching practice instead of focussing solely on teaching their students subject matter. As a result of these reforms, teachers are expected to concentrate more on their role as coach/activator or stimulator in the learning process of students (e.g., Bolhuis & Voeten, 2004). For most teachers, this reform requires a change in beliefs and attitudes towards the learning process of students and also a change in their own classroom behavior. In order to advocate such changes, programs organized in the working context of teachers, often collaborative settings such as learning communities (Shulman & Gamoran Sherin, 2004), are nowadays preferred (Grossman, et al., 2001; Richardson & Placier, 2001). Teachers perceive discussions with colleagues in collaborative settings as relevant and valuable for the improvement of their own teaching practice (e.g., Dunn & Shriner, 1999; Kwakman, 1999). In collaboration they can exchange ideas or experiences, develop and discuss new materials, and receive feedback from colleagues (Butler, Novak Lauscher, Jarvis-Selinger, & Beckingham, 2004; Putnam & Borko, 2000).

Though collaboration is considered a powerful professional development program for teachers, little empirical research has been done into how teachers learn in collaborative settings (Borko, 2004). Instead, there has been a strong focus in the literature on what teachers learn from collaboration and on the conditions under which collaboration is most effective for the professional development of teachers (e.g., Borko, et al., 1997; Little, 1999; Schwarz McCotter, 2001). Thus, it remains unclear what teachers actually do in collaboration that leads to learning, or in other words, which processes take place in such settings. This may be due to the difficulties researchers face when analyzing learning in interaction in collaborative settings. Little (2002), for example, showed that learning is difficult to locate in the interaction between teachers in collaborative settings. In her study, analysis of the interaction between teachers in episodes provided merely speculation about what might have been learned instead of what (apparently) had been learned.

We aimed to contribute to existing theories about teacher learning in a (formal) program at the workplace, and we present here the results of a one-year study into teachers' individual learning from collaboration in teams. In order to gain insight into how teachers learn in such teams, we took the view that learning is a result of being engaged in learning activities such as, reading books, attending conferences, or discussing with colleagues. Mapping these learning activities was a necessary first step in understanding how teachers learn in collaboration with colleagues. Because we regarded learning as undertaking activities that result in changes in cognition or behavior, or both, the second step consisted of combining learning activities with what teachers learn. Accordingly, the following research question was formulated:

- What learning activities do teachers undertake in collaboration in interdisciplinary teams and what do they report to learn from it during a period of one year?

As teacher learning in collaboration has not yet been examined from a point of view in which learning activities related to changes in cognition or behavior, or both, take a central position, we decided to conduct an in-depth study with six teachers. Including only six teachers in the study would make it possible to analyse learning activities and changes in cognition and behavior in more detail, which we hoped would result in a more comprehensive understanding of how teachers learn in collaboration. Owing to the small number of teachers, the results of this study are (for the most part) described in a qualitative manner.

2.2 Conceptual framework

2.2.1 Collaboration as a context for teacher learning

In research on teacher learning, learning is often conceptualized as a change in cognition (knowledge, beliefs, attitudes, emotions) that can lead to changes in teaching practice (e.g., Fishman, et al., 2003). Richardson and Placier (2001), in a literature review on teacher change, showed that during the last three decades research on teacher learning focussed more and more on the first part of the conceptualization of teacher learning, that is, changes in teacher cognition. In this cognitive perspective, teachers, like students, are seen as 'active constructors of knowledge who make sense of the world and learn by interpreting events through their existing knowledge and beliefs (Putnam & Borko, 1997, p.1227). Based on these insights, we defined teacher learning in this study as an active process in which teachers undertake learning activities that lead to a shift in their cognition or behavior, or both. Teachers who, for example, aim to extend their knowledge about ways to motivate students can read books about this topic, ask colleagues for

information, or experiment in their own classes with different teaching methods. In other words, they can undertake different sorts of learning activities in order to change their cognition or behavior, or both. Changes in cognition and behavior are considered separately in this conceptualisation of learning. A change in cognition does not necessarily have to result in a change in behavior to be labelled as 'learning'. Likewise, a change in behavior does not have to result in a change in cognition in order to be identified as 'learning'. Furthermore, we conceptualize teacher cognition as an integrated unit of theoretical and practical insights, beliefs, and orientations (personal goals, emotions, expectations, and attitudes) (e.g., Fenstermacher, 1994; Korthagen, 2001; Putnam & Borko, 1997). Changes in behavior are described in terms of changes in classroom behavior.

We examined learning activities that result in changes in cognition or behavior, or both, in a context of collaboration in teams, as research on teacher learning has shown positive effects of teacher learning communities on teacher professional development. Such learning communities appear to stimulate changes in teachers' cognition and improvements in teaching practice (Briscoe & Peters, 1997; Palinscar, Magnusson, Marano, Ford, & Brown, 1998; Perry, Walton, & Calder, 1999). It is commonly assumed that exchanging ideas, conceptions, opinions, knowledge, and experiences enhances learning. It is also assumed that, in collaboration, people can generate or create things which could not have been generated or created by one individual (e.g., Peters & Armstrong, 1998). In collaboration, teachers can become aware of or question their own (tacit) beliefs and understandings. Also, new knowledge can be created and existing knowledge extended. Learning in teams is particularly enhanced when people with different ideas, conceptions, and opinions interact (Putnam & Borko, 2000). Teachers can use the expertise of colleagues either to adjust or improve their own teaching practice or to adjust, extend, expand, substitute, or supplement their own beliefs (Borko, et al., 1997).

It is still largely unclear, however, how exactly teachers learn in and from this collaboration in teams. Descriptions of what teachers do in collaboration and how this might lead to changes in cognition or behavior remain general. Moreover, learning activities undertaken in collaboration and changes in cognition or behavior are seldom investigated in relation to each other.

2.2.2 Learning activities in teacher collaboration

Compared to studies of *students'* learning processes, considerably fewer studies have focussed on *teachers'* learning processes. Student learning processes are investigated mostly from a cognitive-psychological perspective in which *learning activities* that result in changes in cognition or behavior have a central position

(e.g., Ten Dam & Vermunt, 2003). As the contexts in which teachers learn are quite different from the contexts in which students learn, it cannot be assumed that *teacher learning activities* are similar to *student learning activities* (Putnam & Borko, 1997). Teachers' working contexts are often also their contexts for learning. In other words, teachers often learn by doing their job, for example, by preparing their lessons, looking up information on instructional formats on the World Wide Web, or conducting discussions with colleagues in meetings. Only in recent years have teacher learning activities at the workplace been investigated. We looked for comparable studies in which learning activities at the workplace were examined. We found three studies in which teachers were asked to report learning activities they undertook at the workplace that resulted in learning. All three studies resulted in well-organized categories of learning activities and were used as a starting point for describing teacher learning activities in this study (Table 2.1).

In the bottom row of Table 2.1 we combined learning activities categories derived from the three studies (see also Bakkenes, et al., 2004). Firstly, we separated 'doing' from 'experimenting', because 'doing', in contrast to 'experimenting', often does not imply an intention to learn. Secondly, we preferred the label 'reflecting' to the label 'thinking', because the first is more specific. Thirdly, we labelled category 4 with the more general term 'learning from others without interaction', because in addition to learning from reading texts written by others, teachers also learn from observing colleagues or listening to presentations at conferences. Category 5 includes teacher learning activities such as talking, discussing, and brainstorming with others and can be characterized by the presence of interaction between people.

Table 2.1 Learning activities categories found in three studies and starting learning activities categories for the present study

Studies				
Kwakman (1999)	Doing/ Experimenting ^a	Reflection	Reading	Collaboration
Van Eekelen, Boshuizen & Vermunt (2005)	Doing	Thinking	Reading	Learning in interaction
Lohman & Woolf (2001)	Experimenting		Environmental scanning	Knowledge exchanging
Present study	Doing Experimenting	Reflecting	Learning from others without interaction	Learning from others in interaction

a) Not described as separate activities

2.3 Method

2.3.1 Enlisting schools to participate

In February/March 2004, the principals or managers of forty-five schools for secondary education in the western part of the Netherlands received a letter in which, first, the aim and design of this study were briefly explained. Second, they were asked if they were interested in participating in the study, implicating that during the school year 2004/2005 a team of six or seven teachers of different subjects would collaborate in working on a topic related to 'stimulating active and self-regulated learning of students'. This topic was chosen to link up with the recent educational reform in Dutch upper secondary education. In order to connect as much as possible with the needs or concerns within each school, schools were given a large amount of freedom in further specifying the topic of discussion in the team of teachers. In total, nine schools responded to our letter, of which five schools were selected to participate in this study. In May/June 2004 introductory meetings were arranged with all five participating schools in order for the researcher (first author) to meet the participating teachers. These meetings also provided an opportunity for the teachers to ask more specific questions about the study and to explore whether the topic they wanted to work on fitted within the boundaries of this study. Agreements were made about the frequency of team meetings (a minimum of five meetings during the school year), and which meetings would be videotaped and attended by the first author. Team A planned seven meetings, and team B aimed to hold weekly meetings, in which in addition to the topic 'active and self-regulated student learning', problems with individual students would also be discussed. Teams C and E planned five meetings, and team D planned six team meetings.

2.3.2 Characterization of collaboration in teams

Team meetings were attended by an experienced coach, who paid attention to the process of collaboration in the teams. A study team approach was used as a guideline for monitoring the collaboration process (Tillema & Van der Westhuizen, 2006). Three stages are distinguished in this approach: (1) Reflection; raising problem awareness by explicating knowledge and beliefs, (2) Study; investigation, or enquiry using different perspectives, and (3) Change; generation of conceptual artifacts (2006, p. 54/55). The coach kept these three stages in mind when monitoring the collaboration in the teams.

2.3.3 Participants

Six teachers (one or two teachers from each team) were selected for an in-depth study. Table 2.2 shows the fictional names, teaching subjects, and years of

experience of these six teachers. It also shows the teams in which they participated, and the amount of data we gathered in our study.

Table 2.2 Teacher characteristics and quantity of data collection

Teacher	Teaching subject	Years of experience	Team	Number of interviews	Number of digital logs
Tom	Science	30	A	5	4
Susan	Mathematics	5	A	5	6
Iris	English language	16	B	6	6
Isabel	Culture & arts education	6	C	6	6
Jef	Economics	17	D	5	6
Nick	History	23	E	5	4

2.3.4 Data collection

Two instruments were used to obtain information about learning activities and learning outcomes: semi-structured interviews and digital logs.

Interviews

We aimed to conduct a semi-structured interview after each team meeting. Table 2.2 shows that the number of interviews conducted with each teacher does not correspond with the earlier-mentioned number of team meetings. This difference in number of meetings and number of interviews can be explained by teachers being absent (e.g., due to illness) at some of the meetings. Even though the team in which Iris participated had had a larger number of meetings than the other teams, we chose to interview her no more than six times, equally spread over the eleven meetings, in order to have a comparable amount of data for each teacher. We intended to conduct the interviews on the same day on which the team meeting took place. Owing to the full agendas of the participating teachers, however, this was not possible in about half of the cases. In these cases, the interviews were conducted within one or two days after the meeting.

In order to reactivate their memory of a particular meeting, the teachers were asked to tell what happened in the meeting and which topics were discussed. The teachers were then asked what they had learned from the meeting, for example, whether they had discussed things in the meeting that they wanted to consider more deeply, or whether methods were discussed which they intended to experiment with in their own teaching practice. Depending on whether the teachers reported something they had learned from the meeting, they were asked to indicate

the moment in the meeting at which the 'learning experience' had taken place and tell what happened at that moment: what did they do or what did others do? These questions made it possible to understand the connection between reported learning activities and learning outcomes (reported changes in cognition or behavior, or both).

Digital logs

The six participating teachers were asked to send six digital logs during the period of study. The right column of Table 2.2 shows the number of digital logs actually sent in by each teacher. The teachers were given instructions about writing a digital log at the beginning of the research project. Other teachers' logs, collected in a pilot study, were used as examples to show how to write a log and what kind of information a log should contain.

In line with our conceptualization of cognition as an integrated unit of theoretical and practical insights, beliefs, and orientations (personal goals, emotions, expectations, and attitudes), the teachers were first asked to describe what they had learned. They were then asked to describe thoughts, feelings, and aims that went together with their learning experience. Both questions should give information about changes in cognition and behavior. Furthermore, the teachers were asked to describe how their learning experiences were related to the topic of stimulating active and self-regulated learning of students. The purpose of this question was to connect the reported learning experiences with the implemented educational reform, on the one hand, and with the topic of the teacher teams, on the other hand. Finally, the teachers were asked what had caused the learning experiences, how they had learned, and whether other people had been involved in the learning experiences, in order to gain insight into learning activities. In order to get a rich description of their learning experiences, the teachers were asked to combine their answers to these questions and write the result in a story-like manner. As a reminder when writing their logs, the teachers used a card with a visualization of the information a log should contain (see Appendix 2.1).

2.4 Analysis

To better understand teacher learning in collaboration during a period of one year, we combined data from the interviews and the digital logs and analyzed it in a qualitative way. Combining and analyzing both data sources required a five-phase procedure. We describe these phases below, and where applicable illustrate the phases using examples from the data.

In the *first phase*, we selected fragments of each transcribed interview in which a learning outcome (=change in cognition or behavior, or both) was

reported. Often these fragments were answers to the first two interview questions (1. What happened in the meeting?, and 2. What did you learn from it?). The following is an example of such an answer:

Susan, interview 1 (December 2004)

For example, that as a teacher you always check, and that's my learning experience, students that did not do their homework, but we actually never check students who did do their homework. In other words, we punish but we don't reward. The thing I became very aware of at that moment was that I don't pay attention to students who do things well or maybe that I didn't pay enough attention, that I might do it but not enough and not consciously. Maybe I made compliments unconsciously but not consciously. And then I think to myself, that's something I neglected while I find it very important. It is a subject that I have taken home, I have given it some thought, and now I teach and think, oh yes, now I see what I am doing. I am more conscious of what I am doing and I don't want it that way, I want to do it differently.

In this fragment, in which Susan answered the question about what she learned from the meeting, she indicates that she has become more aware of her own teaching method (= reported change in cognition) and formulates an intention to change her teaching method (= reported intention to change behavior). Occasionally, teachers gave either additional information about the same learning outcome or reported a second change in cognition or behavior in a later part of the interview. In the next step, we identified the fragments from the interviews in which the teachers reported learning activities related to the earlier-reported changes in cognition or behavior. For example,

Susan, interview 1 (December 2004)

In my view we talked about teaching students how to self-regulate their learning. That was the discussion, self-regulated learning or self-regulated working without losing the depth of learning. Then we started making an inventory of what went wrong and what already went well... so we made two lists. We also talked about motivating and punishing students....I think Lisa said it, she mentioned 'giving positive attention to students'. And then I thought, yes, that's it. It hadn't been in the foreground for a while for me, I think. It was a sudden insight for me.

The fragments on reported learning activities were combined with the corresponding fragments on reported changes in cognition or behavior, or both. Next, for each teacher separately, selected fragments from all interviews were combined into a time-ordered matrix to get an overview of *what* (changes in

cognition or behavior, or both) and *how* (learning activities) these six teachers learned during the period of one year (Miles & Huberman, 1994).

The *second phase* consisted of the analysis of the digital logs. This analysis required similar steps to those followed for the interviews. First, we selected fragments concerning reported changes in cognition or behavior, or both. Second, fragments concerning related learning activities were identified. Both types of fragments were combined in another time-ordered matrix for each teacher separately.

The *third phase* in analysis consisted of integrating both matrices for each teacher. The resulting matrix provided an overview of all changes in a teacher's cognition or behavior, or both, and related learning activities reported in the interviews and in the digital logs.

For the *fourth phase* of analysis we conducted within-case analyses on the 'overview' matrix (phase three) for each teacher (Miles & Huberman, 1994). The first step in these within-case analyses consisted of combining *how* and *what* teachers learned. For that reason, we made *configurations* of all reported learning activities and changes in cognition or behavior. We use the label 'configuration' firstly to indicate that activities and changes are related to each other, and secondly to illustrate in what way these two elements in a configuration are related. Learning activities and changes in cognition or behavior appear in particular sequences and these sequences can vary under different circumstances. Appendix 2.2 presents an illustration of how we converted original fragments concerning reported learning activities and changes in cognition or behavior from the interviews and digital logs into configurations. We use dotted arrows in the configurations to indicate that learning activities which result in a change in cognition or behavior occur in succession and should not be interpreted as plain causal relations between two activities. The second step in the within-case analyses was to search, in each time-ordered matrix, for similar configurations of learning activities and changes in cognition or behavior, or both, and describe these comparable configurations on a more general level. Configurations that occurred only once in one case were also described on a general level.

In the *fifth phase* we conducted a cross-case analysis to explore which configurations of learning activities and related changes in cognition or behavior, or both, could be retrieved for all or most teachers, and which configurations were specific to only one of the participating teachers. We decided that a configuration should at least occur for two of the six teachers in order to include it in our analysis. Configurations that were specific to one teacher were not taken into account.

2.5 Results

Our research question consisted of two parts: (1) What learning activities do experienced teachers undertake in collaboration in teams? and (2) What do teachers report to learn from these activities? We start with the results for the first part of the research question.

2.5.1 Learning activities in teacher collaboration

The selection of fragments concerning learning activities from the interviews and digital logs, and the formation of time-ordered matrices (phases one, two, and three in the procedure of analysis) resulted in a broad variety of learning activities in teacher collaboration (Table 2.3).

Table 2.3 Specifications of teachers' learning activities categories

Categories	Specifications
Experimenting	- Experimenting with an adjusted teaching method of a colleague - Experimenting with a copied teaching method of a colleague - Experimenting with a self-invented teaching method - Experimenting with an teaching method developed in a team meeting
Reflecting	- Relating/comparing teaching methods or theories to own teaching method - Selecting discussed teaching method suitable for own teaching practice - Thinking about how to implement an teaching method - Reflecting on collaboration in study team or on own experiments in teaching practice - Valuing an experiment - Valuing elements in colleagues' teaching methods - Becoming aware of/Recognizing own conceptions or shortcomings/good practices in own teaching method - Becoming aware of earlier plans to use a similar teaching method in own teaching practice
Learning from others, without interaction	- Observing colleagues' teaching methods - Listening to presentations of experts - Reading articles - Reading colleagues' written reports
Learning from others in interaction	- Brainstorming - Discussing - Exchanging (experiences with) teaching methods - Asking questions about colleagues' experiences or experiments - Receiving feedback from colleagues on own experiences or experiments

All activities found in the data could be placed in the categories of experimenting, reflecting, learning from others without interaction, and learning from others in interaction. Activities fitting in *category 1*, doing (cf. Table 2.1), were not found in the data we used for this study. This category entails activities that take place in teachers' daily teaching practice, such as explaining subject matter to students, designing and checking students' tests, or coaching students. Activities in this category are often undertaken without the intention to learn. The teachers in this study all collaborated in teams in which activities are undertaken with an intention to learn. A second result is that we found a distinction in *category 2* between four sorts of experimenting. These four sorts of experimenting can be typified by the amount of a teacher's own contribution to a teaching method, with experimenting with a copied method at the one extreme and experimenting with a self-invented method at the other. Reflecting, *category 3*, was further specified as 1) reflecting on exchanged teaching methods (selecting discussed methods suitable for own teaching practice and valuing elements in colleagues' methods), 2) reflecting on own teaching practice (relating and comparing teaching methods or theories to own teaching method, thinking about how to implement a method, and valuing an experiment), 3) reflecting on processes in study team (reflecting on collaboration in study team), and 4) becoming aware of own teaching practice (becoming aware of and recognizing own conceptions or shortcomings or good practices in own teaching method, and becoming aware of earlier plans to use a similar method in own teaching practice). Learning activities fitting in with *category 4*, learning from others without interaction, were divided into three types of activities: 1) observing, 2) listening, and 3) reading, and were in line with the examples given by Lohman & Woolf (2001) for what they label as 'environmental scanning'. Finally, *category 5*, learning from others in interaction, was further specified as brainstorming, discussing, exchanging (experiences with) teaching methods, asking questions about colleagues' experiences or experiments, and receiving feedback from colleagues on own experiences or experiments.

2.5.2 Succession of learning activities

Combining learning activities reported by teachers in the interviews and digital logs over the period of one year made it possible to explore if and what learning activities succeeded each other that resulted in a reported change in cognition or behavior, or both. In the studies on teachers' learning activities listed in Table 2.1, learning activities were described separately. We found, however, that learning activities in the five categories are interrelated and need to be described in connection with each other as a first step in understanding more fully how teachers learn in teams. For example, exchanging teaching methods (category 5) was often

pursued by comparing a colleague's teaching method with own methods (category 3), or by valuing elements in colleagues' methods (category 3). A second step would be to connect these successions in learning activities with changes in cognition or behavior (i.e., making configurations of these two elements).

2.5.3 Configurations: types and frequencies

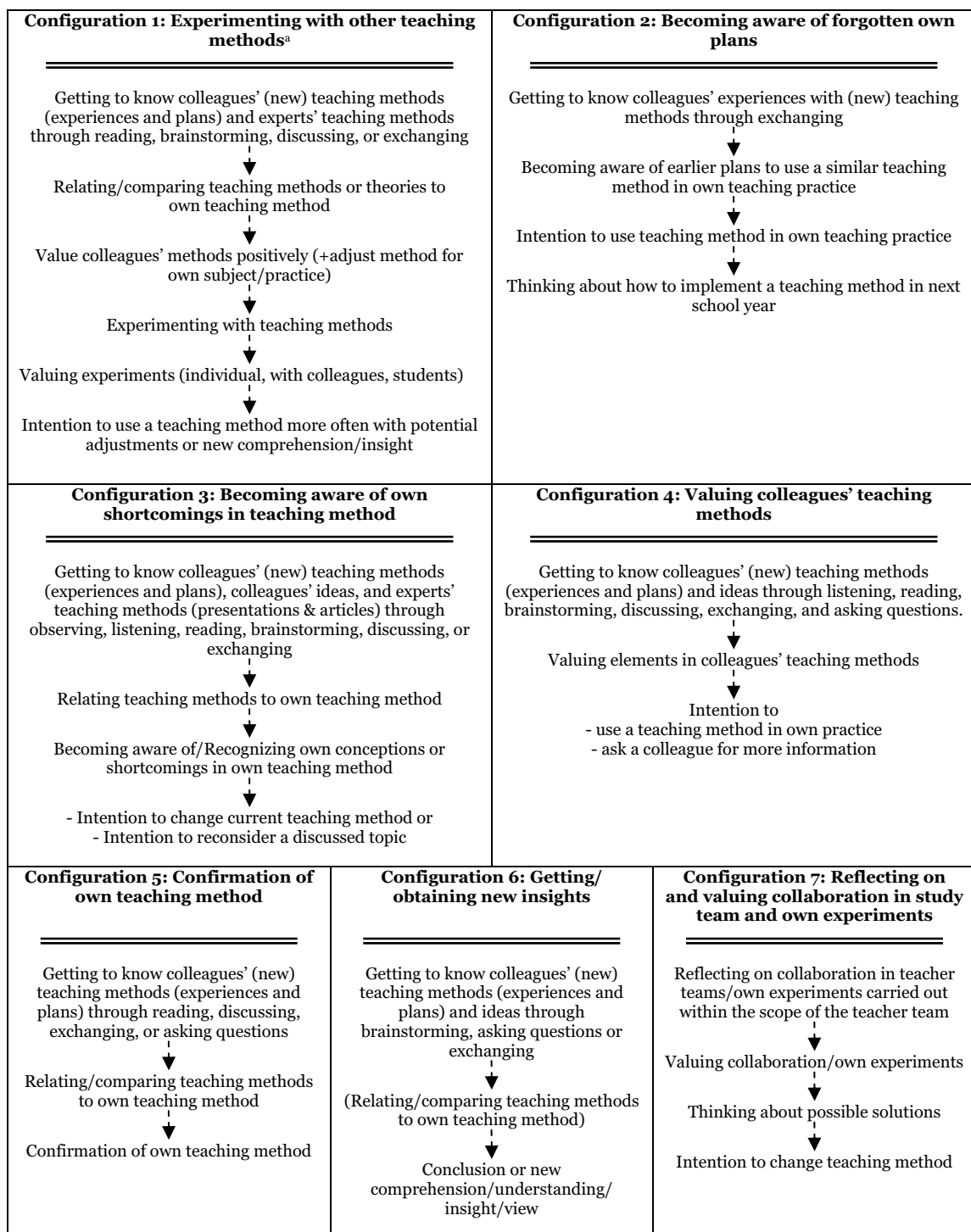
In phases four and five of the procedure of analysis, the within-case and cross-case analyses, we described similar and single configurations of reported learning activities and changes in cognition or behavior at a more general level, and subsequently examined which configurations could be found in two or more cases. These within-case and cross-case analyses resulted in seven configurations of reported learning activities and changes in cognition or behavior (Figure 2.1).

Table 2.4 shows how often the configurations could be found in the interviews and digital logs of the six teachers in our study.

Table 2.4 Frequencies of configurations

	Configuration							Total
	1	2	3	4	5	6	7	
Tom	1	-	1	2	2	-	1	7
Susan	2	-	2	1	-	-	1	6
Iris	1	-	-	2	1	-	-	4
Isabel	-	1	-	1	2	1	-	5
Jef	1	1	2	1	1	-	-	6
Nick	-	-	-	1	3	2	2	8
Total	5	2	5	8	9	3	4	36

From Table 2.4 it can be seen that configurations 4 and 5 occurred most frequently, and that only configuration 4 was found in all six cases. Configurations 2 and 6 occurred for just two of the six teachers.



^a Appendix 2.2 contains a detailed example of configuration 1

Figure 2.1 Configurations of reported learning activities and changes in cognition or behavior

2.5.4 Similarities and differences in configurations

Comparison of the seven configurations showed that in six configurations ‘getting to know other teaching methods’ was the starting activity. We look first at the similarities and differences between these first six configurations, and then explore the similarities and differences between the first six configurations and the seventh.

A closer look at the first six configurations, which all started with teachers ‘getting to know other teaching methods’, shows that only configuration 1 includes the learning activity ‘experimenting’ in teaching practice. Like the other five configurations, this configuration starts with teachers getting to know colleagues’ teaching methods and succeeds with teachers relating or comparing these to their own teaching practices. In contrast to the other five configurations, configuration 1 continues with teachers selecting a teaching method to experiment with in their own practice, which we interpreted as a reported change in classroom behavior. Valuing these experiments finally results in changes in cognition. Configurations 2 to 6 also result in reported changes in cognition, for example, intentions to use a format in their own teaching practice, or confirmation of their own teaching practice. However, the data did not provide information about whether these reported changes in cognition are preceded or followed by an experiment.

Exploration of the differences and similarities between configurations 2 to 6 showed that in the first three configurations (2, 3, & 4), getting to know colleagues’ teaching methods resulted in an intention to use a format in their own teaching practice, which we interpreted as a reported intention to change classroom behavior.² In configurations 5 and 6, on the other hand, getting to know colleagues’ formats resulted in teachers finding confirmation of their own formats, or new insights, without the intention to change classroom behavior.

Configuration 7 is described as valuing or reflecting on the collaboration in the study team or experiments within the scope of this collaboration. Teachers reported this configuration mainly at the end of the school year. Based on their valuing of positive and negative aspects of the collaboration or elements in experiments, teachers formulated intentions for changes in either collaboration in the study team or experiments in their own teaching practice. Although this configuration has similarities with, for example, configuration 3, we consider it a separate configuration, because reflecting on or valuing collaboration in a study team or one’s own experiments throughout a school year is a more comprehensive way of reflecting on or valuing, compared to, for example, reflecting on one specific experiment.

² We regard an intention to change classroom behavior as a change in cognition since the teacher has not (yet) actually changed his or her practice.

2.6 Conclusions and discussion

The first conclusion to be drawn from our findings in relation to the research question, ‘What learning activities do teachers undertake in collaboration in teams and what do they report to learn from it during a period of one year?’, is that teachers learnt from getting to know colleagues’ (experiences with) teaching methods (e.g., Butler, et al., 2004; Putnam & Borko, 2000), which can take place in different forms of interaction. Getting to know colleagues’ (experiences with) teaching methods was often the starting point for a succession of learning activities teachers undertook in teams. Differences between teachers became visible in (successions of) learning activities they engaged in after exchanging their ideas about teaching methods and experiences with them. These differences in (successions of) learning activities also resulted in different learning outcomes. Based on these differences in activities and outcomes, we described reported learning activities in relation to changes in cognition or behavior, or both, which resulted in seven configurations that give a closer look at how teachers learn in collaboration.

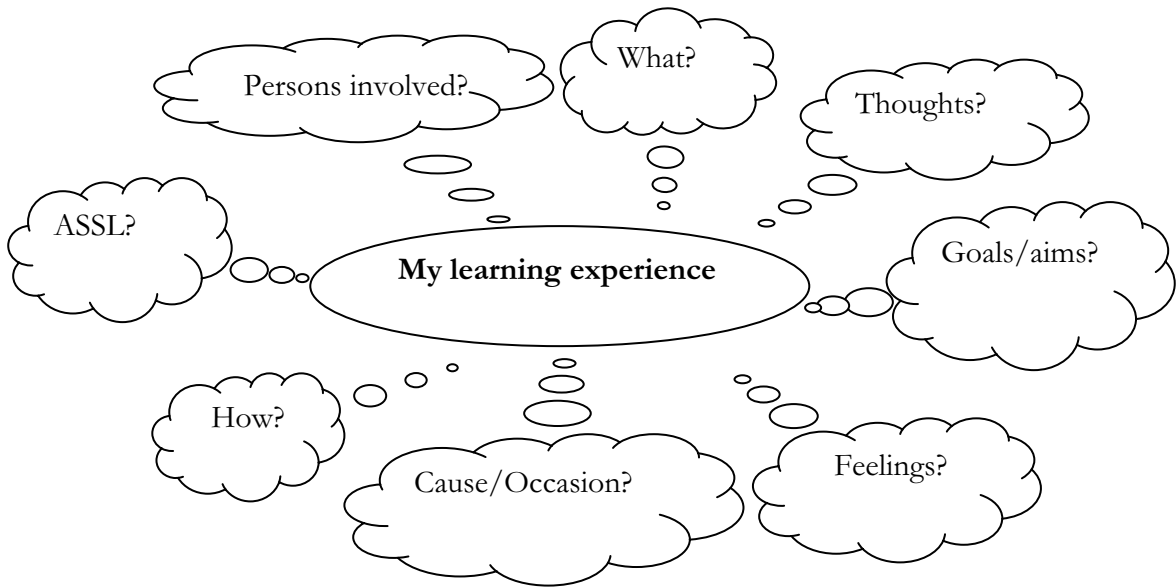
A second conclusion is that teachers reported more changes in cognition than changes in behavior. Reported changes in teaching method (behavior) can only be found in configuration 1, which was found only five times in the interviews and digital logs analyzed. In configuration 1, teachers get to know colleagues’ teaching methods and make practical applications of this knowledge for their own teaching practices. We reason that when teachers report experiments with new teaching methods they most likely have changed their classroom behavior. In all other learning experiences (configurations 2 to 7), teachers did not report experiments with teaching methods they got to know as a result of collaborating with colleagues. However, most professional development programs are aimed at achieving improvements in student learning which require changes in teachers’ classroom behavior (Guskey, 2002). Why, then, did the teachers report only a small number of practical applications of the methods they had got to know during their collaboration with colleagues? A possible explanation is that teachers do not experiment with colleagues’ methods because of the year plans they have to follow. Participating teachers occasionally reported a wish to postpone an experiment until the following school year, because they had just completed work on a subject for which a certain method would be most appropriate. Thus, teachers intended to experiment with other methods, but the experiments did not appear in the period in which we conducted our study. Another possible explanation can be found in the methodology we used for this study. Due to the use of interviews and digital logs, we only have access to *reported* changes in cognition and behavior. Use of a different method of data collection, for instance, observations in classrooms, might

have resulted in different findings. We might argue that teachers are not aware of the changes in their classroom behavior and, therefore, self-reports of teachers can result in incomplete information on their changes in behavior. On the other hand, it is also possible that no changes in classroom behavior occurred, as differences can exist between what teachers say they do and what they actually do. Finally, the period in which we examined these teachers might have been too short as changes in behavior require time and effort (Guskey, 2002). An important implication of this result for the practice of teacher professional development is that coaches of teacher teams might focus more on stimulating teachers to make practical applications of colleagues' methods for their own practice and actually experiment with these methods. Such coaches could also help teachers to remember the plans they made in preceding school years in order to convert intentions to change behavior into actual changes in behavior.

The final result we would like to address is the high frequency of configuration 5. In collaboration teachers can use colleagues' expertise to adjust, extend, expand, substitute, or supplement their own beliefs and practices (cf. Borko, et al., 1997). The learning outcome of configuration 5 is different. That is, teachers often reported to use colleagues' ideas and methods to confirm their own ideas and methods. The high frequency of this configuration (see Table 2.4) can possibly be explained by the reform context in which these teachers work. Perhaps teachers are still struggling with the educational reforms which have been implemented in recent years and feel insecure about their newly acquired teaching methods. In this light, it is not surprising that teachers are searching for confirmation of new beliefs and behavior. Although it is also possible that confirmation of own teaching methods is typical for teachers who don't want to change their beliefs and practices, in our view, this explanation does not do justice to the teachers who participated voluntarily in our study. A will to participate in a study on teacher learning can be interpreted as a will to change existing beliefs and practices.

To validate possible explanations for differences between configurations, additional empirically funded research is needed, preferably in a larger sample of teachers, and over a longer period of time. Focusing on only six teachers enabled us to conduct a qualitative in-depth analysis of reported learning activities and changes in cognition or behavior in collaboration and the relation between those two concepts.

Appendix 2.1 Visualization of the information asked for in the digital log



Explanation of figure

What?	What did you learn?
Thoughts?	What were you thinking? (before, during, or after the experience)
Goals/aims?	What was your goal/aim?
Feelings?	How did you feel? For example, did you feel angry, happy, hurt, disappointed?
Cause/Occasion?	What led to this learning? Did it happen spontaneously or did you deliberately create the situation in order to learn? Did you tell anyone else you were going to create the situation?
How?	What were you doing or what were other people doing that made you learn this?
ASSL?	What, in your perception, is the relation between what you learned and the support of Active and Self regulated Student Learning?
Persons involved?	Were there other persons involved? If so, who were they? For example, students, colleagues, parents?

Appendix 2.2 Example of how the original data from interviews and digital logs was converted into configurations

Fragments from interview 2 and digital log 3 of Susan, March 2005	Configuration	Categories of learning activities ^a
Next, we started discussing our ‘homework’; exchanging formats for discussing tests with students after they have taken them. I think Lisa started off with her experience in 6VWO^b. The other teachers then exchanged their experiences; everybody took about 5 minutes, and next we talked about reoccurring general features in all experiences. We discussed some other things afterwards (interview 2).	Listening to colleagues’ experiences with discussing tests with students afterwards. ↓	Learning from others in interaction
At the time I was talking about it, I also pointed it out later, I did not experiment with discussing tests afterwards in my own classes, but while I was listening to the others, I thought, well, I do have a test now that I would really like to discuss afterwards with my students (interview 2). While I was listening, I realized I had just marked the tests of 5VWO^c students, who had got really low grades. Besides, all this subject matter will show up again in the next test week, so discussing this test with the students is really important (digital log 3).	Realizing that it is important after all to discuss a test (with low student grades) afterwards in one of her own classes. ↓	Reflecting
Well, it is actually a result of what Lisa said (...) at the point in the meeting where she talked about how remarkable the students’ honesty and clarity was, I thought, “Yes, that’s it”, that’s the reason for doing it again in a similar way in my own class (interview 2).	Selecting one of the exchanged teaching methods that would fit best with this particular test ↓	Reflecting
Because I did not have much time, I wasn’t able to make a complete evaluation form with all students’ grades (like Lisa did) (digital log 3). In the past hour, I have been busy composing an evaluation form for my 5VWO students. I will see them tomorrow and use this form. They took a test, which resulted in dramatic grades (...) I’m going to use Lisa’s format in which she lists the points scored and the maximum points students could score alongside each other. She asks students to indicate why they did not score the maximum points, to say what went wrong, and to indicate what they can do to avoid making the same mistakes next time (interview 2).	Adjusting selected teaching method (=evaluation form) for her own students. ↓	(Preparing for) experimenting

Appendix 2.2 (continued)

Fragments from Interview 2 and Digital Log 3 of Susan, March 2005	Configuration	Categories of learning activities
I composed a form on which they could place the points they scored alongside the maximum points they could have scored. They could also indicate what errors they made. Next, they had to answer some general questions, in particular whether they liked this way of discussing a test afterwards. They also received a form with the correct answers (without the grading system) and the test itself (digital log 3).	Experimenting with adjusted teaching method (=evaluation form) in her own class ↓	Experimenting
The students had been working really actively, which gave me lots of time to answer questions and to discuss their mistakes. It felt really good to see students examine themselves and their ways of working in the past period in a really critical way. Most students thought it was a useful format for discussing their tests afterwards and also indicated that they thought it was a better way than merely checking their own tests. It did not take much time, but it did provide me with a good evaluation. Now I am curious to find out whether they will get much higher grades in the test week. Anyway, they evaluated their own work critically (digital log 3).	Valuing experiment with new teaching method (indicate good elements in teaching method) ↓	Reflecting
I have learned that discussing a test afterwards can result in a nice, quiet lesson. Discussing test questions with all students at the same time and keeping all students concentrated requires a great deal of energy from a teacher. For example, half of the students might have given the correct answer to a test question. These students are unlikely to pay attention when that particular test question is being discussed. This new format has many advantages; the students are occupied with their own mistakes, which leaves time for me to respond to questions and remarks. Moreover, reading their evaluation marks afterwards gives me the opportunity to understand them more fully and to coach them better in the future (digital log 3).	Comprehension of/Understanding positive effects when applying this teaching method	Reported change in cognition

a) cf. Table 2.1

b) final year in pre-university education

c) pre-final year in pre-university education