# Individual teacher learning in a context of collaboration in teams

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# Chapter 4

*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 corrects 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 not only to control homework 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.

*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 4
# The relations of teacher learning activities to changes in preferences for learning activities[4]

In this study teacher learning is explored via an examination of changes in teachers' preferences for particular learning activities and the connection of changes in these preferences to actual learning activities undertaken. Thirty-four teachers were asked to complete a questionnaire to assess their preferences for learning activities on two occasions. During the intermediate period of one year, the teachers collaborated with colleagues in teams and were asked to report their learning activities in digital logs. Comparison of the questionnaire scores showed some of the teachers' preferences for learning activities to change and particularly their preference for the activity 'trying different things.' Those teachers with a higher preference for this learning activity often reported learning experiences in which they, based upon their interactions with colleagues, experimented with different teaching methods. The digital logs also showed the learning activity of 'trying different things' to always be a part of a more general sequence of learning activities and never occurs as a separate activity. Preferences for the learning activity 'asking colleagues for advice' did not change, despite collaboration in small teams and the report of frequent learning experiences involving colleagues. Comparison of the formulations of the learning activities for the questionnaire and in the digital logs showed the learning experiences reported in the digital logs to be characterized by 'listening to the experiences of colleagues,' which is clearly different from the questionnaire item 'asking colleagues for advice.'

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[4] This chapter has been submitted in adapted form as:
Meirink, J.A., Meijer, P.C., Verloop, N., & Bergen, T.C.M. *How do experienced teachers learn in the workplace? Changes in teacher preferences for learning activities related to teacher learning experiences.*

**4.1 Introduction**

In recent years, numerous educational reforms have been implemented on several different levels of the educational system. In Dutch secondary education, a reform aimed at — among other things — the fostering of active and self-regulated student learning has recently been implemented. The stimulation of students to take responsibility for their learning has nevertheless proved difficult for many teachers. In addition to the task of imparting subject matter, teachers must also now stimulate students to manage their own learning processes. As Sykes (1996) has observed, teachers are now continuously confronted with the "low-lying swamp of messy problems and persistent dilemmas of practice for which no evident technical knowledge exists" (p. 465). However, dilemmas at one's work can prompt critical reflection, experimentation, and subsequent professional development (Smylie, 1995). In order to help teachers with these dilemmas and changes in education, several professional development programs have been introduced into secondary education during the past few years.

Most of the teacher professional development programs are situated in the actual workplace as this is assumed to provide teachers with numerous and instant opportunities to experiment with newly acquired knowledge and skills. Stated differently, teachers need to gain insight into the underlying ideas and objectives of educational reforms, how to change their behavior, and what approaches may work best to adjust their teaching practices accordingly. But descriptions of just *how* teachers learn in the workplace are still largely lacking (Hashweh, 2003).

*4.1.1 Preferences for learning activities*

Previous research on the professional development of teachers has shown teachers to learn from — among other things — experience (Jarvis, 1987), deliberate practice (Dunn & Shriner, 1999), and collaboration with colleagues (Little, 2002; Schwarz McCotter, 2001). The descriptions of teacher learning are still rather general, however.

In studies of student learning, considerable attention has been paid to precise descriptions of how they learn and how they may differ from each other in terms of learning activities, learning strategies, and learning styles (cf. Entwistle, 1991; Schmeck, 1988; Vermetten, Lodewijks, & Vermunt, 1999). Vermetten, et al. examined student learning in terms of *learning activities* (i.e., such thinking activities as memorization and analysis) and defined *learning* as the "application of learning activities in such a way that an individual's knowledge base or his/her repertory of skills changes" (p. 1). Students were found to consistently adopt the same learning activities across different situations. Along these lines, the concepts of *learning strategies* and *learning styles* suggest that learners may *prefer* a

particular manner of learning (Entwistle, 1991). In studies by Vermunt (1998) and Vermunt and Vermetten (2004), the stability of student learning styles was found to be high but not sufficiently high to treat learning style as an unchangeable trait. This finding is important in light of the recently implemented educational reforms that require students to learn in a more active and self-regulated manner.

The question that now arises is what learning preferences do teachers show and how their preferences for particular learning activities can change as a result of involvement in recent educational reforms. To understand how *teachers* learn in the workplace, that is, their preferences for learning activities and changes in these preferences should be explored across time.

### 4.1.2 Teacher learning activities

The results of recent research show teachers to learn from self-initiated activities in the workplace which allows teachers to construct meaning (Lohman, 2005). In contrast to the many studies of student learning in terms of thinking activities, teacher learning is often conceptualized in terms of their workplace activities. In section 2.2.2, we described five general categories of learning activities: 1) doing, 2) experimentation, 3) reflection on experiences, 4) learning from others without interaction, and 5) learning from others with interaction. *Doing* refers to the activities of teachers undertaken without an explicit intention to learn. For example, a teacher may use an old assignment, notice that the assignment is not working, and adjust the assignment on-the-spot. *Experimentation* includes activities explicitly undertaken to evaluate alternative methods and possibly change one's own methods as a result. *Reflection on experiences* refers to the activities that teachers explicitly undertake following experiences with a particular teaching method such as consideration of alternatives for use in future lessons. *Learning from others without interaction* includes such activities as reading books or listening to lectures, which can give teachers new ideas without two-sided interaction. *Learning from others with interaction*, in contrast, involves engagement in such activities as brainstorming, discussions with colleagues, and discussions with students.

Most current professional development programs for teachers are situated in the school and thus provide ample opportunities for different types of learning activities. One such professional development program involves teacher collaboration in teams, which is generally assumed to constitute a very powerful learning environment for teachers (Schwarz McCotter, 2001; Little, 2002). In collaborative learning teams, teachers can exchange their own experiences and ideas, develop and discuss new materials, and receive feedback from colleagues (Putnam & Borko, 2000; Butler, et al., 2004).

*4.1.3 The present study*

The aim of the present study is to gain a more comprehensive understanding of the workplace learning of experienced teachers in the context of an educational reform. A more comprehensive understanding of workplace learning is needed for the design and optimization of future professional development programs. Drawing upon findings from the study of student learning, we will first explore the *preferences* of teachers for particular types of learning activities and any *changes* in these preferences across a period of a year. Second, we will examine how the observed changes in the preferences of the teachers relate to actual engagement in learning activities related to a specific aim of the secondary education reform, namely the promotion of more active and self-regulated learning on the part of students. The following research question will thus be addressed:

- How are learning activities that teachers undertake in a context of collaboration in interdisciplinary teams related to changes in their preferences for learning activities during a period of one year?

## 4.2 Method

*4.2.1 Participants*

Thirty-four experienced teachers were examined across a period of one year. Their teaching experience ranged from three to thirty-four years, and they collaborated in five teams involving four to nine teachers from different subject departments, as the topic of active and self-regulated learning is assumed to be not subject-specific. The five teams were located at five different secondary schools in the western part of the Netherlands, and the aim of the collaboration in teams was to collectively think of ways to foster more active and self-regulated student learning. The teams were free to develop their own manner of working to achieve this. For example, one team chose to discuss the topic of student motivation and experimented with different teaching methods to increase student motivation in their own classes. Another team opted to exchange ideas and experiences regarding alternative methods to discuss the results of tests and thereby stimulate self-regulated learning on the part of students. All five teams began their collaboration at the start of this study. More detailed information on the composition of the teams is presented in Table 4.1.

*Table 4.1 Composition of the five teams*

|  | Team A | Team B | Team C | Team D | Team E |
|---|---|---|---|---|---|
| Number of teachers | 7 (4 females, 3 males) | 8 (5 females, 3 males) | 4 (3 females, 1 male) | 8 (3 females, 5 males) | 7 (3 females, 4 males) |
| Subjects | Economics History Geography Science Physics Mathematics Chemistry | Geography Science Dutch language English (3x) Economics Physical education | Mathematics Economics Latin Culture and arts education | Biology English Culture and arts education Mathematics Economics (2x) Dutch language (2x) | Science Economics Physics English German Culture and arts education History |
| Years of experience | Mean 15.4 SD 9.98 | Mean 20.8 SD 9.96 | Mean 10.5 SD 8.5 | Mean 15.0 SD 4.6 | Mean 19.6 SD 9.83 |

### 4.2.2 Data collection

To examine the preferences of the teachers for different types of learning activities, we developed a questionnaire consisting of eight descriptions of particularly challenging or problematic tasks and situations that are likely to occur in the workplace and could result in teacher learning (see Appendix 4.1). The situations were formulated in collaboration with four educational researchers and in such a manner that the following situations were covered: everyday learning situations, situations specific to actual teaching practice and beyond, and situations involving a variety of individuals (e.g., students, colleagues, parents).

For all eight situations, the participating teachers had to indicate what they would do in that particular situation using a set of response options derived from the five general categories of learning activities as described earlier in section 2.2.2. For each of five categories of learning activities, the teachers had to rate the likelihood of choosing that option in connection with the described situation along a five-point scale ranging from *I would never do that* to *I would always do that*. Table 4.2 shows both the categories of learning activities used in the present questionnaire and the categories of learning activities identified in previous research.

*Table 4.2 Categories of learning activities identified in the literature and used in the questionnaire*

| Categories in questionnaire | Categories in literature (cf. section 2.2.2) |
|---|---|
| Asking colleagues for advice. | Learn from others with interaction. |
| Critical individual reflection in order to think up an appropriate approach. | Reflect upon experiences. |
| Trusting own intuitions and feelings. | Doing. |
| Gathering information from the internet, books, et cetera. | Learn from others without interaction. |
| Trying different things and see where they go. | Experiment. |

The validity of the questionnaire was established via discussion of the eight situations and five response options with both teacher educators and teachers to check that the situations and response options were recognizable for secondary school teachers and formulated accurately. In Table 4.3, a sample situation from the questionnaire is presented.

*Table 4.3 Example situation of the questionnaire 'Preferences for learning activities'*

| When I am having trouble with a class and want to do something about this, then I will …. | I never do that | I rarely do that | I sometimes do that | I often do that | I always do that |
|---|---|---|---|---|---|
| a  ask a colleague for advice. | O | O | O | O | O |
| b  critically reflect individually in order to think up an appropriate approach. | O | O | O | O | O |
| c  trust my intuitions and feelings. | O | O | O | O | O |
| d  gather information from the internet, books, etc. | O | O | O | O | O |
| e  try out different things and see where they go. | O | O | O | O | O |

In order to attain information on the *changes* in the teachers' preferences for learning activities, the teachers completed the 'Preferences for learning activities' questionnaire at both the beginning and the end of the study with an intermediate period of one year.

To examine the actual learning activities of the teachers in the context of the educational reform, the teachers were asked to record their learning experiences in digital logs and e-mail at least one learning experience to the researchers every six weeks. This occurred across a period of one school year, which meant that a total of six digital logs could be submitted. The teachers were asked to describe their learning experiences in a story-like manner: what and how they had learned and the manner in which the learning experience related to the specific topic of active and self-regulated student learning. The teachers were asked to do this in order to gain greater insight into those learning activities that they, themselves, considered relevant and important for their learning. Examples of various learning experiences were provided as part of the instructions on how to write a digital log. Also, it was stressed that all types of learning experiences could be reported and not just learning experiences directly related to the teams in which they participated.

## 4.3 Analysis

For the 'Preferences for learning activities' questionnaire, we initially computed the mean scores and standard deviations for the five types of learning activities across the eight situations for the two measurement occasions separately. Whether or not the mean preference scores for the different learning activities *changed* significantly ($p$ <.05) from the first to the second measurement occasion was then determined. As we were interested in individual changes of preference, the Reliable Change Index (RCI) was used to identify significant differences between the scores for each teacher separately (Jacobson & Truax, 1991).

The digital logs were next analyzed in several steps. First, the digital logs from ten teachers were scanned for the specific types of learning activities reported. The teachers were found to frequently report more than one learning activity in connection with a particular learning outcome. The learning experiences reported by the teachers were therefore next described in terms of *a sequence of specific learning activities* (for further details, see section 2.4 and Appendix 2.2). The sequences of learning activities identified for the 60 digital logs from the ten teachers were next searched for more general patterns, which resulted in a list of 12 general sequences of learning activities that were subsequently used to analyze the digital logs from the remaining twenty-four teachers. Eighteen logs could not be classified using this initial list of sequences and new general patterns of learning

activities were therefore sought, which resulted in 3 new sequences in addition to the original 12 or a total of 15 general sequences of learning activities. Seven of the reported learning experiences in digital logs appeared to be specific to a single teacher and were and were therefore not included in the remainder of the analysis. A research assistant coded 50 randomly selected digital logs using the list of 15 sequences of learning activities to assess the reliability of the coding process, and an interrater reliability of .77 (Cohen's kappa) was found.

Following the analyses of the 'Preferences for learning activities' questionnaire and the sequences of learning activities reported in the digital logs, the *changes* in the teachers' preferences for the five learning activities were next compared to the specific learning activities sequences reported in their digital logs.

## 4.4 Results

### 4.4.1 Preferences for learning activities

In Table 4.4, the means and standard deviations for the 'Preferences for learning activities' questionnaire are presented for the two measurement occasions separately.

*Table 4.4 Means and standard deviations for the questionnaire*

| | Occasion 1 | | Occasion 2 | |
|---|---|---|---|---|
| | Mean | Std. deviation | Mean | Std. deviation |
| Asking colleagues for advice | 3.75 | .79 | 3.63 | .68 |
| Critical individual reflection | 4.42 | .43 | 4.37 | .48 |
| Trusting intuitions and feelings | 3.96 | .56 | 3.85 | .58 |
| Gathering information from the internet, books, etc. | 2.78 | .97 | 2.75 | .70 |
| Trying different things | 2.30 | .93 | 2.30 | .91 |

As can be seen from Table 4.4, the teachers generally prefer to critically reflect individually when confronted with challenging or problematic tasks and situations. They also indicate that in challenging or problematic situations they often trust their own intuitions and feelings or ask colleagues for advice. On both measurement occasions teachers indicate to use the other two types of learning

activities — namely, gather information from the internet, books, et cetera and try out different things — only sometimes.

### 4.4.2 Changes in preferences for learning activities

The mean preference scores for the teachers on the different types of learning activities were next compared for significant ($p<.05$) differences between the first and second measurement occasion. Inspection of the results in Table 4.5 shows only one teacher to have an increased preference for 'asking colleagues for advice'; eleven teachers showed changed preferences for 'critical individual reflection'; eight teachers showed significantly different preference scores for 'trusting own intuitions and feelings'; seven teachers showed significant changes in preference scores for 'gathering information from internet, books et cetera.'; and sixteen teachers scored significantly different for 'trying out different things.' In general, however, the results in Table 4.5 show the preferences of the majority of the teachers to not have changed.

*Table 4.5 Number of teachers with significant changes in their preferences for learning activities after one year (N=34)*

|  | Number of teachers with *significantly lower scores* | Number of teachers with *unchanged scores* | Number of teachers with *significantly higher scores* |
|---|---|---|---|
| Asking colleagues for advice | 0 | 33 | 1 |
| Critical individual reflection | 7 | 23 | 4 |
| Trusting own intuitions and feelings | 5 | 26 | 3 |
| Gathering information from the internet, books, etc. | 3 | 27 | 4 |
| Trying different things | 6 | 18 | 10 |

### 4.4.3 Reported sequences of learning activities in digital logs

The thirty-four teachers in this study reported a total of 204 learning experiences in their digital logs, which comes down to an average of six learning experiences per teacher (with a range of three to nine logs submitted per teacher). As already mentioned, the analysis of the learning experiences reported in the digital logs produced a list of 15 general sequences of learning activities. Seven reported learning experiences appeared to be specific for only one teacher, and were

therefore not included in the list of general sequences of learning activities (cf. Table 3.3).

As can be seen from Table 3.3, sequences 1, 2, 3, 5 and 6 involve colleagues in the learning experiences of the teachers in different ways. Sequences 7 through 14 represent individual learning experiences that occurred during actual teaching practice. Finally, sequences 4 and 15 differ somewhat from the other sequences in that it can be characterized as learning from becoming aware of one's own learning process.

Comparison of the fifteen general sequences of learning activities to the five types of general learning activities (cf. section 2.2.2) shows the five types of learning activities to be clearly reflected in the fifteen sequences but in different ways. The category of 'doing' resembles sequence 9 in which teachers learn from the observation of students during a standard assignment. The category 'experimentation' is reflected in many of the sequences. In sequences 1 and 2, for example, the teachers experiment with alternative methods as a result of exposure to the methods of colleagues. The category 'reflect upon experiences' is also present in many of the general sequences. In sequence 7, for example, the teachers reflect upon their experimentation with alternative methods. The category 'learning from others without interaction' was not reported very often (cf. sequence 5). The category 'learning from others with interaction,' however, was clearly reflected in sequence 6, for example, where teachers report a collective dissatisfaction with the level of knowledge, skills, or attitudes of students and therefore collectively think up alternative methods to increase the student level of knowledge, skills, or attitudes.

Finally, inspection of Table 3.3 shows each of the general sequences of learning activities to involve more than one type of learning activity. In sequence 2, for example, the teachers experiment with alternative methods as a result of exposure to the methods of colleagues and subsequently reflect upon this experimentation; the following types of learning activities are thus included: 'learning from others with interaction,' 'experimentation,' and 'reflect upon experiences.'

*4.4.4 Associations between changed preferences for learning activities and specific learning activities reported in the digital logs*
When the changes in the teachers' preferences for learning activities were examined in connection with the general sequences of learning activities actually reported in their digital logs, three rather surprising findings were encountered.

*Finding 1*
While a high frequency of sequences of learning activities involving colleagues occurred in the digital logs (cf. sequences 1, 2, 3, 5, and 6, N=63), only one teacher showed an increased preference for the 'asking colleagues for advice' type of learning activity.

*Finding 2*
a) The teachers preferred the activity 'trying different things' *least* on both measurement occasions, but 'experimentation' was part of many of the general sequences of learning activities, as can be seen from Table 3.3.
b) Also, sixteen of the thirty-four teachers nevertheless showed significant changes in their preferences for the learning activity 'trying different things'. Ten of the teachers scored significantly higher and six of the teachers scored significantly lower, which could be explained by different antecedent activities.

*Finding 3*
Eleven teachers showed significant changes in their preferences for 'critical individual reflection' but in different directions. The preferences of the teachers for this type of learning activity related inversely to the reporting of learning experiences involving colleagues.

In the following, we will further elaborate upon these findings and illustrate them with fragments from the digital logs.

*Finding 1: Only one increase in preference for 'ask colleagues for advice' despite reports of many such learning experiences in digital logs*
Inspection of Table 3.3 shows the teachers to often report learning experiences that involved their colleagues. Particularly learning experiences in which the teachers report learning from experimentation with colleagues' methods after observation or discussion of the methods with colleagues (sequence 1) was often reported. Colleagues were also involved in sequences 2, 3, 5, and 6. The reporting of the teachers with regard to their learning experiences involving colleagues was generally positive (with the exception of sequence 5). Given these positive experiences and the fact that the teachers collaborated with colleagues in teams for a year, one would expect an increased preference for learning activities involving colleagues. However, only one teacher scored significantly higher on the learning activity 'asking colleagues for advice' when the 'Preferences for learning activities' questionnaire was again administered on the second measurement occasion.

In our search for an explanation for this result, we closely examined the exact reporting of the teachers with regard to the involvement of colleagues in their learning experiences and found this to differ markedly from the formulation of the relevant information in the questionnaire. For the questionnaire, the teachers were confronted with eight challenging or problematic situations and asked to indicate just how often they would ask colleagues for advice. In their digital logs, in contrast, the teachers report learning from *listening* to colleagues' experiences with (new) teaching methods or *observation* of colleagues using these methods. They were subsequently inspired by these experiences and experimented with the methods, but they initially listened and observed as evident in the following segment from Jeff, an economics teacher.

> **Jeff[5], digital log number 6[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.

In the above example, Jeff was inspired by the description of a new teaching method by a colleague and subsequently experimented with the new method. Other teachers similarly report experimentation with new teaching methods, more or less immediately following an interaction with colleagues as evident in the following segment from Iris, an English language teacher.

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[5] For privacy reasons, we have adopted fictional names.
[6] Cf. sequence number 1.

**Iris, digital log number 3**[7]

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.

In the examples above, the teachers expanded their teaching repertoires by listening to a colleague or observing a colleague. In fact, this was the essence of most of the reported learning experiences involving colleagues. In sequence number 3, in contrast, the teachers encountered a problem and explicitly asked their colleagues for feedback in order to deal with the problem and improve their teaching practice.

In sum, a discrepancy between the activity descriptions presented in the 'Preferences for learning activities' questionnaire and the teacher descriptions of their learning experiences in the digital logs was found. This may explain the absence of an increased preference for 'asking colleagues for advice' despite the frequent report of learning activities involving colleagues.

*Finding 2a: Low preference for 'trying different things' despite high frequency of reported learning experiences involving 'experimentation'*
From Table 3.3, it can be seen that eight of the fifteen general learning sequences involved 'experimentation with alternative or new teaching methods' (sequences 1, 2, 3, 6, 7, 8, 10, and 14). Although this specific learning activity resembles the learning activity 'trying different things' from the questionnaire, the results in Table 4.4 nevertheless show the learning activity 'trying different things' to be *least* preferred on both measurement occasions. Once again, a discrepancy between the reported preferences of the teachers and their reported learning activities appears to exist and the question is just how this discrepancy should be explained.

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[7] Cf. sequence number 2.

The digital logs submitted by the teachers were carefully reviewed to determine if the questionnaire item 'trying different things' differed from the teacher descriptions of learning activities involving 'experimentation.' The segments below from the digital logs of Mark, Isabel, and Mary are illustrative.

**Mark, digital log number 3[8]**

Whole-class discussion of test results is often difficult. Students with high scores find it boring, and students with low scores often have so many questions that it is impossible to answer them all in 45 minutes. In order to develop a better method for this, we decided to think up a new method of test analysis and experiment with this in our classes.

Last week, I analyzed the results of a test in such a manner. I assigned two boys and two girls to a group with two good students and two less good students in each group. I opted for this particular composition because I assumed that such a varied composition would allow the groups to solve most of the problems.

The students were told that they had to discuss the 25 test questions and that they could only go to the next question when each student in the group understood the current question. They were also told that they could only ask for my help when all of the students in the group were stuck and could not find the answer. [...]

I quickly noticed that the students were all very busy discussing the questions. It also quickly became apparent that I had time to walk around and help students as needed.

I am very enthusiastic about the attained results. Of course there are some students who do not attach much value to this manner of test analysis, but the majority by far was very satisfied. They repeatedly mention that they learn a lot from hearing how other students interpret the questions and can clarify the material. For some of the students, just where they make the same mistakes and those skills that need considerably more practice also became abundantly clear. [...] I am very satisfied with the results and had not expected such positive results. I am certainly going to keep using this method even though it may cost somewhat more preparation time. In the end, it saves a lot of work!

**Isabel, digital log number 2[9]**

[...] I have learned that it is really important to teach in a varied manner using different instructional techniques. One of my classes indicated right at the beginning of the school year that they wanted to do fun things in Arts and Culture. They did not want to have just lectures as that was boring. I agreed as

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[8] Cf. sequence number 6.
[9] Cf. sequence number 10.

I like to do fun things as well. They conducted a project in the second period of the year [...]. And for the period that just ended, I had them prepare a lesson, which boiled down to a type of presentation. Some of the students did a really nice job while others made a complete mess of things. The question that I am now asking myself is whether the fun things were very educational. If you want things to go really well, then you have to invest a lot of time in the guidance of things. I should probably have a kind of manual for students with points to pay attention to during a presentation. [...]

What did I learn? I suggested that regular lessons would be taught in the upcoming periods of the year with different instructional techniques in them, of course. The students also now felt like this as well. Too many fun things without structure doesn't, thus. You simply have to alternate between all kinds of lessons and instructional techniques.

**Mary, digital log number 4[10]**

My learning experience concerns examination training. As a result of the meeting on March 17th, I applied the same approach as my colleague Hans during the final lesson for one of my classes. [...] My colleague came up with the idea of having the students take part of correcting a test, distributing the answer sheet, and having them then grade their own work. I thought this was a good idea. The students can immediately see and be made aware of (as a result of grading) what they should pay attention to.

While we were talking about this, I thought to myself that it might be even more interesting to have the students grade the work of a fellow student instead. I hoped to achieve a stronger learning effect in such a manner. The student is now in the same position that I am in when it comes to grading. And sees how important it is to provide clear answers. [...] I was really enthusiastic about this arrangement and tried it out. [...] What happened thereafter (and I naturally could have foreseen)? The one student finished much quicker than the other. The one who finished earlier had no one to exchange exams with. It's too bad, this part of my plan could not be done. And I thus decided that everyone would check his or her own work. [...]

What I learned is that you should not, with your enthusiasm, try to achieve too many things at once because the one objective can sometimes exclude another. I felt that I had thought of everything [...]. But this appeared to not be the case. I have learned that it is better to survey where the pitfalls in my approach may lie ahead of time: wanting too much at the same time (qua *objectives* but also the *amount of work*). [...] This will certainly increase the effectiveness.

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[10] Cf. sequence number 1.

The above three examples show 'experimentation' to indeed occupy a central position in the learning experiences reported by the teachers, but the teachers can also be seen to always *start* their reports of learning experiences with learning activities other than experimentation. Mark starts the description of his learning experience with the collective dissatisfaction that is apparent for whole-class discussion of test results with students. This results in an agreement to individually think up a solution to this problem and experiment with new methods in order to then exchange experiences with colleagues. Isabel first hears students say that they want to do something fun in art class and thus experiments with a new approach. Mary first hears a colleague describe a technique for helping students prepare for exams and, after this meeting, decides to experiment with the new method and even elaborate upon it. In other words, teachers may have shown a low preference for 'trying different things' on the questionnaire as they never really *start* with such experimentation. Other activities, such as brainstorming about solutions to a problem, often precede experimentation with new methods in one's own practice.

*Finding 2b: High number of changed preferences for 'trying different things' explained by different antecedent activities.*
Given that numerous learning experiences with experimentation activities were reported by the teachers in their digital logs, one might expect to see a shift of preference in the direction of this learning activity at some point. The results in Table 4.5 show ten of the thirty-four teachers to indeed show such a significant shift, but six other teachers showed a significant shift *away* from such a preference when they again completed the questionnaire ($p < .05$). Stated differently, almost 50% of the teachers who participated in this study showed a change of preference with regard to the learning activity of 'trying different things' but not all in the same direction.

To gain greater insight into the different shifts of preference, the frequencies of reported learning experiences involving 'experimentation' were next examined for the different groups of teachers. Given the unequal numbers of teachers with preference scores that had decreased significantly (n=6) versus increased significantly (n=10), relative frequencies for the learning experiences involving 'experimentation' were calculated and compared for these two groups of teachers. These relative frequencies were derived from dividing the number of experiences involving 'experimentation' in a group of teachers by the total number of reported learning experiences of that group and put into percentages (Table 4.6).

*Table 4.6 Relative frequencies of learning experiences involving 'experimentation'[11] for teachers with changed preference scores for 'trying different things'[12]*

| | Sequence code | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 6 | 7 | 8 | 10 |
| Teachers with *lower* preference scores (N=6) | 3.0% | 3.0% | 9.1% | 3.0% | 36.4% | 0% | 12.1% |
| Teachers with *higher* preference scores (N=10) | 11.3% | 1.9% | 5.7% | 11.3% | 26.4% | 3.8% | 3.8% |

Inspection of the results in Table 4.6 shows those teachers with significantly *lower* preferences for the activity 'trying different things' upon second measurement to often report learning experiences involving sequence 7. In 36.4% of the total number of digital logs for these six teachers, *individual dissatisfaction* with the level of knowledge, skills, or attitudes of students and the effects of current teaching methods was reported to prompt their experimentation with alternative teaching methods. For those teachers with significantly *higher* preferences for learning activity 'trying different things,' his percentage was 26.4%. This latter group reported relatively more learning experiences involving interaction with *colleagues* across a variety of settings and subsequent experimentation with alternative teaching methods (e.g., sequences 1, 2, 3 and 6). In contrast to the group of teachers with significantly lower preference scores upon second measurement, moreover, this group reported a variety of causes for experimentation with alternative teaching methods. It appears, thus, that experimentation with alternative teaching methods as a result of *multiple causes* can produce a higher preference for the learning activity of 'trying different things' in the long run.

*Finding 3: Changes in preference for 'critical individual reflection' with different associations to the involvement of colleagues in learning experiences*
'Critical individual reflection' was found to be the most preferred learning activity for almost all of the teachers on both measurement occasions. Nevertheless, seven

[11] Cf. Table 3.3
[12] Sequence 14 did not occur in any of the digital logs for these two groups of teachers.

teachers scored significantly lower and four teachers scored significantly higher upon second measurement. Closer inspection of the reported learning experiences for these two groups of teachers showed more than 50% of the learning experiences for the teachers with significantly *lower* scores to involve colleagues while about 33% of the learning experiences for the teachers with significantly *higher* scores involved colleagues. More specifically, teachers with significantly lower scores for 'critical individual reflection' upon second measurement reported six learning experiences in which they were, together with colleagues, dissatisfied with the students' level of knowledge, skills, and attitudes or the effects of a previous method on student learning and therefore collectively brainstormed about possible solutions. Teachers with significantly higher scores for 'critical individual reflection' upon second measurement did not report this type of learning experience at all. Also teachers with significantly lower scores more often than teachers with significantly higher scores, reported learning experiences in which they based on acquaintance with colleagues' ideas and methods, experimented with alternative methods in their practices. Apparently, teachers who have had positive experiences with working with colleagues in different ways may develop lower preferences for critical consulting themselves as a means to change their practices.

**4.5 Conclusions and discussion**

The aim of this study was to contribute to a better understanding of the workplace learning of experienced teachers. We formulated the following research question: How are learning activities that teachers undertake in a context of collaboration in interdisciplinary teams related to changes in their preferences for learning activities during a period of one year? First, we examined the general preferences of the thirty-four teachers for five types of learning activities. Second, we examined if and how the learning preferences of the teachers changed across a period of one year. Finally, we examined just how the sequences of learning activities reported by the teachers in digital logs related to the changes in their preferences for different types of learning activities.

Examination of the mean scores on the 'Preferences for learning activities' questionnaire showed a general preference for 'critical individual reflection', when confronted with particularly challenging or problematic situations. The teachers also showed a preference for two other learning activities; namely, 'asking colleagues for advice' and 'trusting own intuitions and feelings.' The remaining two learning activities of 'gathering information from the internet, books etc.' and 'trying different things' were least preferred. The majority of the teachers did not show a change of preferences, although some of the teachers did show a change of preference for one or more of the five learning activities. Taken together, these

results are in line with the results of studies of student learning in which the learning styles of students appear to be relatively stable across time but not absolutely unchangeable (Vermunt, 1998). The learning activities probed in the present study can be assumed to be a part of learning styles, and this has important implications for the professional development of teachers. Teacher preferences for particular types of learning can change, which suggests that in professional development programs it would be worthwhile to pay attention to such changes in addition to increasing or adjusting teachers' subject matter or pedagogical knowledge and skills.

In order to gain greater insight into why certain teachers scored differently on the second measurement, we examined the specific learning activities reported by the teachers in the period between first and second measurement in their digital logs. The analysis of the learning experiences reported by the teachers in their digital logs produced a list of fifteen general sequences of learning activities. The frequencies of changed preferences for the five types of learning activities addressed in the questionnaire were next compared to the frequencies of similar learning activities reported by the teachers in their digital logs. To start with, colleagues often played a part in the learning experiences reported by the teachers but this finding did not relate to a general preference for 'asking colleagues for advice.' Instead, the teachers reported mostly learning from the observation of colleagues or listening to colleagues and their experiences with alternative teaching methods. This finding is in line with the results of a recent study by Shank (2006) in which it is argued that 'storytelling' with colleagues is an effective means for teacher professional development. Teachers also indicate in other studies that they can learn a lot from watching others or the exchange of ideas with others (e.g., Briscoe & Peters, 1997; Butler, et al., 2004). However, in most of these studies, the 'sharing of ideas' refers to situations in which the teacher learns by telling his or her problem or experiences to colleagues and by collectively reflecting upon the experience and by directly receiving feedback from colleagues. In the present study, the teachers frequently reported learning from just *listening* to the ideas and experiences of colleagues and subsequent experimentation with alternative ideas or methods in their own teaching practice. Future studies of teacher learning preferences, types of learning activities, and the questionnaire used here should therefore take the listening and observation forms of learning from colleagues more explicitly into account. In other words, it appears that teachers in this study do not learn so much from solving individual problems with colleagues but more often from just listening to the experiences and ideas of other teachers.

A second finding is that the learning activity of 'experimentation' played a role in eight of the fifteen general sequences of learning activities identified for the

digital logs provided by the teachers. Once again, however, the 'Preferences for learning activities' questionnaire did not show a similar preference for the comparable learning activity of 'trying different things.' In fact, this activity was preferred *least* by the majority of the teachers. At first sight, these results appear to contradict each other. However, closer examination of the descriptions of the learning experiences provided by the teachers in their digital logs showed other activities, such as individually or collectively thinking up alternatives or solutions, to *precede* 'experimentation.' In future research on teacher learning, the learning activity 'trying different things' should therefore be explicitly referred to as possibly part of a *sequence* of activities. Despite the fact that the teachers displayed the least preference for 'trying different things' on both measurement occasions, six teachers scored significantly lower and ten teachers scored significantly higher on the second measurement occasion. Teachers who showed a significantly *lower* preference for 'trying different things' reported learning experiences in which experimentation was the result of an individual dissatisfaction with the level of knowledge, skills, and attitudes of students or the effects of current teaching methods relatively more often. Teachers who showed a significantly higher preference for 'trying different things' reported a variety of causes or antecedent activities to precede their experimentation with alternative or new teaching methods, and this may explain their increased preference for 'trying different things' in the long run. It is also possible that the teachers interpreted the questionnaire formulation of this particular learning activity differently. Some teachers may interpret 'trying different things' as 'non-purposeful' or as 'trial and error' (Lohman, 2005). Other teachers may interpret 'trying different things' as more purposeful and thus as a conscious and explicit means of evaluation. In their digital logs, the teachers we examined mainly reported on their experiments with alternative or new teaching methods in terms of 'deliberate practice.' Dunn and Shriner (1999, p. 633 & 635) observed that "teachers' development of expertise is supported by engagement in specific activities that provide optimal opportunity for learning and skill acquisition." "Deliberate practice is distinct from actual job performance." Deliberate experimentation with alternative teaching methods implies that teachers consciously choose a specific alternative because they have an idea of why and how the approach may work (cf. Mark's digital log number 3). In future research on teacher learning it should also be made sufficiently clear that the activity of 'trying different things' concerns experimentation with the deliberate selection of one or more specific alternatives or new methods for consideration.

The third finding concerned the changed preferences of some teachers for the learning activity of 'critical individual reflection'. We found those teachers with a significantly lower preference for 'critical individual reflection' upon second

measurement to report relatively more learning experiences in which colleagues played part in changing their teaching practices. Conversely, those teachers with a significantly higher preference for 'critical individual reflection' upon second measurement reported relatively fewer learning experiences involving colleagues. We suspect that positive experiences with involvement of colleagues in teachers' professional development can thus produce a lower preference for reliance on one's own knowledge and skills. Initiatives aimed at teacher professional development may stimulate such experiences as for teachers it is important to realize that their needs, experiences and problems when changing their teaching practices are not unique, which makes it easier to collaborate with colleagues in future. Teacher collaboration is supposed to stimulate professional learning and consequently the implementation of educational innovations.

In future research on teacher preferences for learning activities and possible changes in these preferences, sequences of learning activities and not just single learning activities should probably be considered. In the questionnaire used in the present study, the teachers had to indicate the likelihood of choosing a single specific activity when confronted with a challenging or particularly problematic situation. However, the analysis of the actual learning experiences reported in the teachers' digital logs showed teachers to often learn from *sequences* of activities. Similarly, in the literature on student learning, it has been shown that students often undertake more than one learning activity (Snowman, 1986; Vermetten, et al., 1999). A focus on separate learning activities may not do sufficient justice to the complexity of teacher learning in the workplace.

In future studies of how teachers learn but also in professional development programs, attention should be paid to not only learning as a result of dealing with challenging situations but also 'spontaneous' learning. The learning experiences reported by the teachers in the present research showed them to often — and freely — acquaint themselves with other teaching methods without actually experiencing problems with their own methods. This was done via the observation of students during standard assignments, via listening to colleagues' experiences with particular methods, or perhaps during unexpected situations.

To conclude, the results of this study can be applied to help optimize professional development programs for teachers. Teachers should be stimulated to not only increase and possibly adjust their subject matter or instructional knowledge and skills but also consider their preferences for a particular form of learning. For example, in interdisciplinary teams teachers can be stimulated to learn from not only solving individual problematic situations with colleagues but also from listening to colleagues' ideas and experiences or from the observation of students during regular assignments. Stimulating teachers to become more aware

of their own ways of learning and how to regulate their learning may also help them in think up novel ways to foster more active and self-regulated student learning.

Appendix 4.1 Situations in the questionnaire 'Preferences for learning activities'

|  | **Description of situation** |
|---|---|
| **Situation 1** | "When I notice didactical problems during the preparation of my lessons and want to do something about this, then I will…" |
| **Situation 2** | "When I have problems in a certain class and want to do something about this, then I will…" |
| **Situation 3** | "When I see that assignments are not working very well for my students and I want to do something about this, then I will…" |
| **Situation 4** | "When I have problems with a colleague and want to change this, then I will…" |
| **Situation 5** | "When I have problems in the contact with the parents of a student and want to solve these, then I will…" |
| **Situation 6** | "When I have to start working with new, just purchased teaching materials, then I will…" |
| **Situation 7** | "When I notice that a particular teaching method is not working very well and I want to elaborate on it, then I will…" |
| **Situation 8** | "When I have to develop a test for use by all of the teachers in my department, then I will…" |