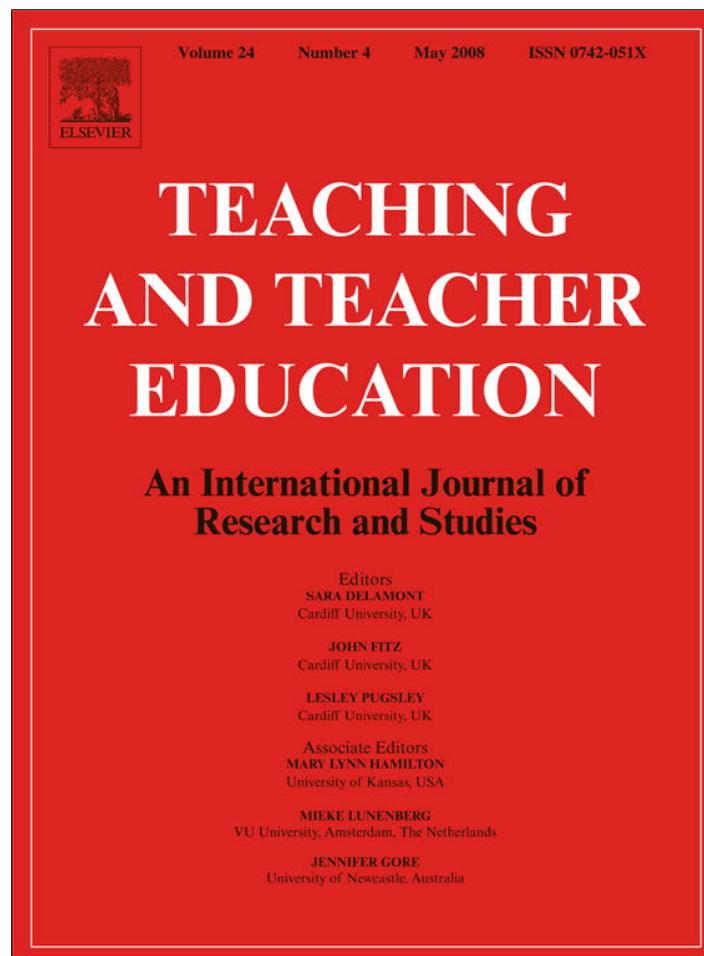


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# Teacher learning through reciprocal peer coaching: An analysis of activity sequences

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## Abstract

Just what and how eight experienced teachers in four coaching dyads learned during a 1-year reciprocal peer coaching trajectory was examined in the present study. The learning processes were mapped by providing a detailed description of reported learning activities, reported learning outcomes, and the relations between these two. The sequences of learning activities associated with a particular type of learning outcome were next selected, coded, and analyzed using a variety of quantitative methods. The different activity sequences undertaken by the teachers during a reciprocal peer coaching trajectory were found to trigger different aspects of their professional development.

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*Keywords:* Learning process; Learning activity; Activity sequence; Reciprocal peer coaching; Professional development

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## 1. Introduction

The research literature on peer coaching suggests that the professional development of teachers can be improved through “experimentation, observation, reflection, the exchange of professional ideas, and shared problem solving” (Ackland, 1991; Gottesman, 2000; Joyce & Showers, 2002; Robbins, 1991). Peer coaching provides just such an opportunity and the empirical evidence indeed shows peer coaching to be effective and teachers to be satisfied with this form of coaching (Bergen et al., 2006; Joyce & Showers, 2002). Nevertheless, the actual individual learning processes that occur as a result

of peer coaching have yet to be described in detail (Desforges, 1995; Hashweh, 2003; Wilson & Berne, 1999).

Many researchers and professional development experts have proposed models of cyclical processes to characterize peer coaching but these models largely encompass desired activities as opposed to actual activities. In the present study, the focus will therefore be upon actual teacher activities.

The purpose of the present study was to explore just what and how eight experienced teachers learn during a 1-year reciprocal peer coaching trajectory by examining their learning activities, their learning outcomes, and the relations between these. Reciprocal peer coaching is defined as a configuration of activities that a dyad of teachers can undertake in the workplace with the intention of supporting each

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other. The configuration of activities can differ from dyad to dyad and from situation to situation but must contain some basic activities in order to constitute reciprocal peer coaching. The basic activities should include at least the following:

- the teachers regularly discuss their efforts to support student learning;
- the teachers experiment with instructional methods; and
- the teachers observe each other in their classrooms.

Insight into which specific activities concur with which specific learning outcomes is obviously valuable for the development and implementation of professional development activities for teachers in schools.

The context of the present study was provided by a large educational reform that was implemented in the upper grades of Dutch secondary education (i.e., grades 10–12) in 1998. As part of this reform, teachers are expected to place a greater emphasis on active and self-regulated student learning. Reciprocal peer coaching was thus embedded in a larger project as a tool to help teachers stimulate and support more active and self-regulated student learning.

## 2. Teacher learning

Teacher learning is considered any ongoing work-related process that leads to a change of cognition and/or behavior.<sup>1</sup> “Cognition” is understood to be the integrated whole of theoretical and practical insights, beliefs, and orientations on the part of individual and can also thus include personal goals, emotions, expectations, and attitudes (Fenstermacher, 1994; Korthagen & Lagerwerf, 2001; Meijer, 1999; Putnam & Borko, 1997). The integrated cognitive whole was operationalized within the context of the present study as the teacher’s thinking, desires, and emotions with respect to the stimulation and support of more active and self-regulated student learning. “Behavior” is understood within the context of the present study as those actions that the teacher reports undertaking to

stimulate and support more active and self-regulated student learning. From a constructivist perspective, we understand the process of learning to entail the undertaking of activities that concur with changes in cognition and/or behavior. Such activities are referred to as *learning activities* and the relevant changes are referred to as *learning outcomes*.

In the following sections, we will elaborate on the knowledge and practice aspects of teacher learning, different types of learning activities, and the affective aspects of teacher learning. The latter is of critical importance in light of the fact that “personal transformation leading to changed pedagogy often entails emotional struggle, it does not simply happen from a desire or a request to change” (Weissglass, 1994, p. 69).

### 2.1. Knowledge and practice aspects of teacher learning

In the literature on peer coaching and the professional development of teachers, different perspectives on teacher learning can be detected (see Ackland, 1991; Mena Marcos & Tillema, 2006; Swafford, 1998). There is usually a focus on the relations between knowledge and practice but just how these relations are envisioned can differ markedly. Cochran-Smith and Lytle (1999) describe teacher learning in terms of a number of relations between knowledge and practice and distinguish knowledge *for* practice, knowledge *in* practice, and knowledge *of* practice for this purpose.

In contrast to most peer coaching programs, the coaching trajectory in our program was not developed as a mechanism to specifically increase the classroom implementation of a particular training component or, in other words, *knowledge for practice*. Quite the opposite, the coaching trajectory in our program was a work-based learning environment in which pairs of teachers could work together to support each other’s professional growth with respect to some—often troublesome—issues already present in their day-to-day teaching practice. The focus of our attention was thus on *knowledge in practice* or—in other words—practical knowledge, personal practical knowledge, practical experiential knowledge, or craft knowledge. Our work-based learning environment also stimulated professional collaboration between the teachers in the school; provided opportunities to take a critical perspective on not only one’s own assumptions but also the

<sup>1</sup>In much of the research literature, teacher change is only regarded as learning when the teachers reach a learning goal that has been set by them or by the training program. We regard any change, irrespective of direction, as learning.

assumptions of others, theory, and research; and also stimulated learning beyond the immediate classroom environment and thus involved *knowledge of practice* as well.

## 2.2. Types of learning activities

“Compared to studies of *students’* learning processes, considerably fewer studies have focused on *teachers’* learning processes” (Meirink, Meijer, & Verloop, 2007). The study of student learning processes is also mainly undertaken from a cognitive-psychological perspective with those learning activities that produce changes in student knowledge, understanding, and skill standing central (e.g., Vermunt & Verloop, 1999). Given our interest in the work-related learning of teachers and therefore cognitive and behavioral change, we do not assume *teacher learning activities* to be similar to *student learning activities* (also see Glazer & Hannafin, 2006; Putnam & Borko, 1997). As recently pointed out by van Eekelen, Boshuizen, and Vermunt (2005), teachers learn during all kinds of day-to-day activities and often without any planning of the learning. For example, “they spontaneously learn by taking note of remarks made by students or colleagues. They may also learn in non-linear ways by solving problems” (see Bolhuis, 2006; Wubbels, 1992).

Meirink et al. (2007) recently reviewed those studies in which the workplace learning activities of teachers were examined and systematically categorized. As can be seen from Table 1, reading, learning from supervision, reflection, practice, experimentation, and the exchange of information with colleagues were all found to be part of teachers’ workplace learning. We extended this overview to include studies of peer and other forms of coaching in relation to the workplace learning of teachers and found reflection, experimentation, the exchange of information, and collaboration with colleagues to characterize teacher learning activities (see Table 1).

Further inspection of Table 1 shows the studies of teacher workplace learning to provide only rough categories of learning activities. The studies of coaching provide somewhat greater detail but focus on only certain aspects of teacher learning—namely, the interaction aspects. Learning from one’s regular job or individual experimentation and reflection are clearly undervalued. And in our definition of reciprocal peer coaching (see above), we have

therefore included individual activities that can take place in the workplace as well.

## 2.3. Affective aspects of teacher learning and learning outcomes

The studies of the workplace learning of teachers and the coaching studies presented in Table 1 also show a major emphasis on thinking and acting. Given that “good teaching is charged with positive emotions [...], and teachers do not just act and think but also feel” (Hargreaves, 1998, p. 835), it is obvious that the emotional aspects of teacher learning should be considered as well. There is nevertheless a strong focus in most of the literature on teacher change on the rational aspects of such change while many authors observing teachers during daily practice have found teaching to be driven by not only rational motives but also emotions and human needs (Day & Leitch, 2001; Deci & Ryan, 2000; Hargreaves, 1998; Ryan & Deci, 2001). The emotional and volitional aspects of learning are thus undervalued in research on teaching and the professional development of teachers (Korthagen & Lagerwerf, 2001; Sutton & Wheatley, 2003).

A sufficiently comprehensive framework for a thorough analysis of the workplace learning of teachers involved in a peer coaching trajectory is thus not available today. In order to map both the rational and affective aspects of teacher learning activities and learning outcomes, we therefore turned to grounded theory (Strauss & Corbin, 1998) for the development of an inductive model of the different types of learning activities and learning outcomes reported as part of the involvement of teachers in a reciprocal peer coaching trajectory. Drawing upon the categories of learning activities presented in Table 1, we adopted acting individually (e.g., daily activities, experimentation), thinking (e.g., reflection, analysis), and interaction (e.g., exchange of information, collaboration) as sensitizing concepts and added the volitional and emotional aspects of learning (e.g., wanting and feeling) to our analyses.

## 3. Design of the study

### 3.1. Research questions

The following research questions were posed. What learning activities (i.e., acting, thinking,

Table 1  
Overview of categories of learning activities mentioned in different studies of the workplace learning of teachers and teacher coaching

Studies of the workplace learning of teachers	Categories of learning activities			
Kwakman (1999)	Reading	Reflection	Doing/ experimenting <sup>a</sup> Doing	Collaboration
Van Eekelen et al. (2005)	Reading	Thinking		Learning in interaction
Lohman and Woolf (2001)	Environmental scanning			Knowledge exchange
Berings (2006)	Learning from theory or supervision	Learning from reflection	Learning from one's regular job	Learning from social interactions with colleagues
<i>Studies of teacher peer coaching</i>				
Engelen (2002)		Reflection		Exchange of professional ideas
Bergen, Engelen, and Derksen (2006)		Analysis of situation Thinking together about the impact of one's behavior		Problem solving
Showers and Joyce (1996)		Thinking together about the impact of one's behavior on student learning		Receipt and provision of constructive feedback Planning of instruction
Garmston et al. (1993)		Exploration of the thinking underlying practice via reflection		Development of support materials
Kohler and Ezell (1999)		Exchange of feedback		Collaborative planning
			Watching each other work with students Experimentation Observation	Collaboration on the development of materials
			Implementation and refinement of practices Observation	

<sup>a</sup>Not described as separate activities.

wanting, feeling, and interacting) do teachers report during participation in a reciprocal peer coaching trajectory? What types of rational and affective learning outcomes do teachers report during participation in a reciprocal peer coaching trajectory? What patterns of learning activities are reported in relation to the reported learning outcomes?

### 3.2. The reciprocal peer coaching trajectory

The 1-year reciprocal peer coaching trajectory started with a two-day workshop in which the participants received training on coaching and on

being coached. The participants attended three follow-up meetings during the year in which both peer coaching skills and different aspects of how to stimulate and support more active and self-regulated student learning were discussed. In this paper we focus on activities and learning in the domain of fostering active and self regulated student learning.

### 3.3. Participants

Data were gathered from eight high school teachers from four schools in an urban area in the eastern part of the Netherlands. The project

coordinators appointed by the principals for each school were asked to invite teachers to participate on a voluntary basis in a peer coaching project. The coordinators provided suggestions for the composition of coaching dyads, the teachers accepted these. The coaching dyads were formed on the basis of a variation in subject taught, years of teaching experience, and age of the teachers.

### 3.4. Data collection

In order to obtain a rich description of those learning activities that concur with the learning outcomes reported by the teachers, multiple data collection methods were employed (Merriam, 1998). Repeated measurements involving three different sources of data were conducted across a period of a year. The three data sources were: audiotapes of peer coaching conferences, audiotapes of semi-structured post-coaching interviews held by telephone, and teacher reports of learning experiences in digital diaries.

The teachers audiotaped four peer coaching conferences during the course of the year. These tapes provided insight into the activities undertaken during classroom teaching, observations, and reflection upon practice. During the peer coaching conferences, the teachers discussed each other's classroom practices, why they did certain things, evaluations of their performances, what the students did, and how student outcomes were evaluated.

Directly following the audiotaped peer coaching conference, a semi-structured interview was conducted separately for each of the teachers in the dyad via the telephone. The interviewer addressed primarily the teacher's perceptions of his or her learning from the coaching process and asked the teacher to describe the coaching process. The interviewer might ask, for example, "What did you do in your role as coach/coachee?" Given that the teachers were asked to talk about their learning experiences in general, the interviews also provided insight into those learning processes that were not directly related to participation in the coaching trajectory as well.

Finally, the teachers were asked to submit a digital diary every 6 weeks via the e-mail with a description of at least one learning experience during that period. The digital diary allowed the teachers to mention learning experiences that they perceived as important for their own development. The teachers were asked to report all possible types

of learning experiences, which thus included those learning experiences not perceived as directly related to participation in the reciprocal peer coaching trajectory by the teacher. Given that we wanted the teachers to report as much information on their learning experiences as possible, we provided a form to guide the diary writing. This included specification of how, when, why, and with whom the learning experience occurred and what the teacher thought, felt, and did at that moment.<sup>2</sup> If the teachers did not experience any learning during a given six week period, they were also asked to report this as well. In Table 2, an overview of the characteristics of the participants and the different data sources is presented.

### 3.5. Data analysis

The coaching conferences and the interviews were transcribed verbatim from the audiotapes. Pseudonyms were assigned to the teachers and the schools to ensure confidentiality. And for practical reasons, we grouped the data into four groups to reflect the period in which the information was collected.

The data for each period were examined and coded for indicators of learning (Merriam, 1998). Recall that teacher learning was defined as a shift in cognition and/or behavior. In the present study, an indication of change with respect to the stimulation and support of more active and self-regulated learning on the part of students was thus taken to be an indicator of teacher learning. The identification of the change indicators was grounded in the transcripts and diaries of the participants (Cohen, Manion, & Morrison, 2000). For each of the teachers, the three sources of data were thus coded for indicators of change. And based on these indicators the learning outcomes were defined. A list of the different types of change indicators discerned in the teacher transcripts and diaries (hereafter: reports) is presented in Table 3.

For each of the learning outcomes, the activities mentioned by the teachers in connection with these outcomes were next identified and labeled as 'learning activities'. To determine which specific *learning activities* were reported in relation to which specific *learning outcomes*, the activities and outcomes were next selected and connected to each

<sup>2</sup>The authors would like to thank Inge Bakkenes, Annemarieke Hoekstra, and Jacobiene Meirink for their help with the construction of this form.

Table 2  
Overview of participants and data sources

Participants						Data sources		
Name (fictitious)	Dyad	Gender	Age (in years)	Years of teaching experience	Subject taught	Peer-coaching conference	Post-coaching interview	Digital diary
Martin	1	Male	42	5	Dutch	4	4	6
Fiona	1	Female	30	7	English	4	4	6
Mark	2	Male	49	20	Chemistry; General Science	4	4	6
Mary	2	Female	57	30	Biology	4	4	5 <sup>a</sup>
Jane	3	Female	44	15	Economics	3 <sup>b</sup>	4	6
Peter	3	Male	44	18	Economic; Management & Organization	3 <sup>b</sup>	4	5 <sup>a</sup>
John	4	Male	27	5	Geography	4	4	5 <sup>a</sup>
Kathryn	4	Female	48	11	Social Science	4	4	5 <sup>a</sup>

<sup>a</sup>These teachers did not submit the fifth diary, which had to be written just before the summer break; a total of six diaries was requested.

<sup>b</sup>The audiotape of the fourth coaching conference got lost in the mail.

Table 3  
Indicators of change discerned in teacher reports

*Types of indicators*

1. Statements made by teachers themselves about own learning outcomes:

*I have learned that...*

2. Teacher report of desire or intention to perform behavior more often in the future:

*I'm sure I'm going to do this the same way next time.*

3. Use of comparatives or superlatives in teacher reports of events:

*I think about these things much more now than I used to.*

4. Use of verbs that explicitly reflect change in teacher reports of events (change/move/gain/go back to):

*I think I gain a lot by using this method.*

5. Use of change signaling adverbs in teacher reports of events (before/differently/suddenly/never before):

*I tend to do things differently now.*

6. Teacher utterances reflecting spontaneous insights on the part of the teacher:

*Now I see!*

7. Utterances indicating surprise or uncertainty on the part of the teacher:

*I was very surprised that the students liked it.*

other on the basis of identical content. Our aim in this study was not to describe (statistical) causal relations between, for example, the engagement in learning activities and changes in cognition and/or behavior, but to look for recurring patterns of sequential processes based on what the teachers write or say. Working with various data sources collected at various moments in time and wanting to extract sequences of activities in relation to learning outcomes from these data sources, to some extent asked for interpretation from the researcher. Most simple, the sequences of activities were reconstructed based on chronological order, that is, the teacher experimented first and a day later talked about this experience with his dyad-partner in a coaching conference. Thus, experimenting preceded

taking part in a coaching conference. In many situations, however, reconstructing the order of activities was not that simple. To reconstruct the sequences of learning in those cases the idea of the Gricean *cooperative principle* (Grice, 1975) was used to support us in the reconstruction process. This principle is similar to the concept of 'lawlike generalisations' used in non-conversational contexts. "The observer of physical events cannot but see them as, on the whole, instances of how things generally tend to go" (Westra, 2006). Suppose, for example, that a participant tells us that "a teacher got real angry at one student and all of the other students shivered." We infer, in this case, that the shivering of the students has something to do with the anger of the teacher although the

Table 4  
Sample learning sequence

Change indicators	Reported learning outcome	Concurrent learning activities
<p>I: I chose to work with <i>another</i> method and I cannot imagine myself <i>going back</i> to the <i>old way</i> of teaching anymore. I saw the students work very seriously and I think that this is a <i>great benefit</i>.</p> <p>DD: <i>I have learned that</i> even my chatterboxes will now work very seriously on the assignment.</p>	<p>This teacher changed his way of teaching. He uses more methods that support the self-regulated learning of students. He also feels that he has gained something with this method (“the chatterboxes also now work seriously”). This reinforces his idea that students are indeed able to work independently.</p>	<p>I: <i>I tried out this new teaching strategy and saw that</i> the students worked very seriously on the assignment. <i>I saw this when I visited Jane’s classroom and also noticed it in my own classroom:</i> Students are very motivated to work on the assignment.</p> <p>CC: <i>I indeed saw</i> the students work very hard in your classroom and just <i>noticed this in my own classroom</i> as well.</p>

I = post-coaching interview; DD = digital diary; CC = peer coaching conference.

narrator does not explicitly say this and the students could possibly shiver because they were cold. According to H.P Grice (1975) there is a rough conversational principle which guides participants in understanding their exchanges: *the cooperative principle*.

In addition, preliminary inspection of the data showed a *series* of learning activities to often be associated with a single learning outcome. In Table 4, an example of such a learning sequence is presented.

To strengthen the internal validity of the analyses, the identification of the learning sequences was conducted separately by two researchers (Cohen et al., 2000). The obtained results were then compared and found to differ in only two cases, which were then discussed until agreement was reached and resulted in a total of 91 learning sequences.

Interviews were next held with the teachers to confirm our interpretations of the learning sequences (i.e., assess the credibility of our descriptions of their realities) (Cresswell & Miller, 2000). One teacher did not recognize one of the learning sequences as his own, and this sequence was therefore eliminated from any further analyses. This resulted in a total of 90 learning sequences containing 90 learning outcomes and 551 learning activities. An average of 6 activities constituted a learning sequence with a range of 3–15 activities per sequence.

The reported learning sequences were next coded for the type of learning activity (i.e., the types of activities reported by the teacher), the type of learning situation (e.g., teaching, observation, preparation, coaching conference, etc.), and the type of

learning outcome (i.e., the type of change reported by the teacher).

The 551 learning activities were first coded at a more detailed level, which resulted in 37 subcategories of activities. On the basis of the sensitizing concepts of acting, thinking, interacting, wanting, and feeling (see Section 2.3. above), the subcategories of learning activities were next grouped into five more general categories.<sup>3</sup> The Cohen’s kappa (Cohen, 1968) for the coding of the 37 subcategories of activities was 0.87.

Given the *lack* of detail that characterizes descriptions of such learning activities as thinking or collaborating and the fact that we assumed thinking in a coaching conference to be different than thinking in preparation for practice or—for that matter—the interaction with school colleagues in the cafeteria to be different than the interaction with colleagues during a coaching conference (also see Swafford, 1998), we analyzed the different types of learning situations. The following two learning situations exist *inside* the classroom: (1) learning while teaching and (2) while observing a lesson. The following five exist *outside* the classroom: (3) learning while participating in a coaching conference, (4) while preparing for practice,

<sup>3</sup>All activities are reported. When teachers wrote a sentence like “the students were not at all paying attention to what I was telling them but at that time I thought that this was due to the time of the day”, we coded this activity as attributing student behaviour to some cause within the category thinking. If the teachers did not say anything about or referring to what they thought, they probably did think while they were acting but at least at that point they were not aware of that, hence could not report on it.

(5) while assessing students, (6) while performing extra-curricular tasks, (7) while participating in a (one day) professional development course, and (8) other. Given that only a small number of activities were reported for the one-day professional development course and this situation is different from the other situations outside the classroom, learning within the professional development course was omitted from any further analyses. Furthermore, the analyses showed a relatively large number of activities to be reported for the “other” situation, which thus encompassed a wide variety of rather idiosyncratic situations such as the home, the car, the bike, in other places not related to the school, or difficult to determine because the teacher did not specify the situation of the reported activities. The “other” category was therefore omitted from any subsequent analyses as well. The inter-judge coding results revealed a Cohen’s kappa of 0.91 for the *situation* variable.

The learning outcomes were initially categorized into seven types: (1) new idea, conception, or belief; (2) confirmed idea, conception, or belief, (3) increased awareness; (4) intention to change behavioral repertoire; (5) changed idea of self; (6) new idea and intention to change behavior; and (7) confirmed idea and intention to change behavior. As can be seen, the analyses of the data showed the teachers not only to report new or confirmed ideas but also combinations of these with other types of learning outcomes (i.e., categories 6 and 7). For five of the original 90 learning outcomes, the teachers mentioned more than two different types of learning outcomes (e.g., idea, changed idea of self, and intention to change behavior). These were coded as “other” and omitted from any subsequent analyses. The inter-judge coding results revealed a Cohen’s kappa of 0.68 for *learning outcome*, which was considered sufficient. This kappa is lower due to the small number of learning outcomes (85).

The coded fragments were next analyzed using multiple episode protocol analysis<sup>4</sup> (MEPA), which is a program developed for the flexible annotation, coding, and protocol transcription of dynamic verbal or nonverbal observational data (Erkens, 2005). A variety of quantitative methods were used: frequency analyses, cross-tabs analyses, pattern analyses, and lag-sequential analyses. The pattern and lag-sequential analyses enabled exploration of

the patterns of activities for particular learning sequences. For a lag-sequential analysis, the sequences of events (i.e., teacher learning activities) are summarized within a transition matrix that thus shows how often one reported activity precedes another. Whether or not the actual transitional frequencies differ from those for the equiprobable (zero-order) model in which the probabilities of one reported activity following another are equally divided across all the activities is then tested.<sup>5</sup>

## 4. Results

In the sections below, we will first provide an overview of the reported learning activities, learning situations, and the sequential relations between the different types of learning activities with particular attention to those transitions that are more frequent or less frequent on average. Thereafter, the different types of learning outcomes reported by the teachers will be presented and considered in connection with those particular sequences of activities that concur with them.

### 4.1. Reported learning activities

In the following, the learning activities reported by the teachers during their participation in a reciprocal peer coaching trajectory are described. The particular learning situation is also described and then the most significant sequences of activities in order to provide the most accurate picture possible of the teachers’ learning.

#### 4.1.1. Types of learning activities

In Table 5, the frequencies and percentage distribution for the five general categories of learning activities are presented. While the teachers differed somewhat with regard to the activities that they reported, all of the general categories of activities were reported by all of the teachers.

<sup>5</sup>The conditional probability of occurrence for a target event (activity A) relative to another event (activity B) is estimated by dividing the transitional frequency for cell (A, B) by the frequency for the row that these are in. The conditional probability of activity A preceding activity B is then compared to the unconditional probability of such a transition (i.e., the total for the row/the total for all activities), and the difference is tested using *z*-scores. Significant transitions (*z*-scores with a value higher than  $-1.96$  or lower than  $1.96$ ,  $p < 0.05$ ) are then those transitions occurring more frequently or less frequently than expected on the basis of the distribution of the codings as a whole (Wampold & Margolin, 1982; Wampold, 1984; Wampold, 1992).

<sup>4</sup>The authors would like to thank Gijsbert Erkens and Jeroen Janssen for their help with this analytical procedure.

Table 5  
Overview of the general categories and specific subcategories of reported learning activities

Acting (individually)	Thinking (individually)	Wanting (individually)	Feeling (individually)	Interacting
1. Doing something for the first time.	9. Becoming aware of something.	20. Having a plan, goal, or idea in mind with regard to student behavior/ motivation/ learning.	23. Experience a positive/negative feeling as a result of an event or goal.	26. Telling, putting into words, thinking out loud.
2. Experimenting (planned or spur of the moment); modeling something new.	10. Noticing student behavior while teaching.	21. Having a plan, goal, or idea in mind with regard to own learning.	24. Experience a positive/negative feeling experienced by one person in relation to another.	27. Requesting and receiving feedback.
3. Suppressing tendency to act in a certain manner.	11. Appraisal of student, own or the dyad partner's performance.	22. Having a plan or intention to teach in a specific manner.	25. Experience a positive/negative feeling in relation to oneself.	28. Asking questions.
4. Teaching a normal lesson.	12. Attribution of student own or the dyad partner's performance.			29. Listening and/or responding to questions.
5. Sitting in the back of the classroom/ walking around the classroom to observe.	13. Comparison.			30. Receiving and/or responding to a request for feedback.
6. Observation of own behavior: videotaped lesson.	14. Recall.			31. Listening and/or responding to experiences of the dyad-partner.
7. Construction or modification of teaching materials.	15. Pondering experiences, coming experiments.			32. Listening and/or responding to the dyad-partner's perspective on what happened in the classroom.
8. Gathering of information: textbook/map, searching the internet.	16. Anticipation of the behavior students will show in the classroom.			33. Hearing success stories of others.
	17. Interpretation of feedback.			34. Noticing enthusiasm of others with regard to own practices.
	18. Experience of conflict/doubt.			35. Construction or modification of materials together with others.
	19. Keeping something in mind.			36. Gathering of information.
				37. Agreement on something.
<i>Total of activities (551)</i>				
Frequency: 104	272	33	58	84
19%	49%	6%	11%	15%

The majority of the learning activities reported by the teachers fell into the categories of thinking or acting. That is, the teachers frequently reported pondering something, attributing student results to a certain cause, appraisal of student behavior, experimentation, sitting in the back of the classroom to observe, and the teaching of a normal lesson. Activities categorized as wanting were mentioned least frequently (e.g., setting student learning goals, setting teaching goals).

#### 4.1.2. Learning situation

In Table 6, the frequencies of the general learning activities per learning situation are presented along with the relative percentages of the activities per situation (see Appendix A for specific examples).

Of particular interest to us here are those situations in which the activity frequencies deviate considerably from the general distribution of activity frequencies (i.e., those activities that are twice as high or twice as low as the column totals

Table 6  
Frequencies of different types of learning activities reported for different types of learning situations

Type of learning situation	Type of learning activity <sup>a</sup>					Total row
	Acting (i)	Thinking (i)	Wanting (i)	Feeling (i)	Interacting	Freq.
Teaching	60 31%	102 54%	3 2%	19 10%	6 <b>3%</b>	190 50%
Observation	11 29%	24 63%	0 <b>0%</b>	3 8%	0 <b>0%</b>	38 10%
Coaching conference	0 0%	12 <b>18%</b>	0 <b>0%</b>	3 5%	51 <b>77%</b>	66 18%
Preparation	17 33%	22 43%	3 <b>6%</b>	4 8%	5 10%	51 14%
Student assessment	4 26%	9 60%	0 <b>0%</b>	1 7%	1 <b>7%</b>	15 4%
Extra-curricular tasks	2 13%	9 61%	0 <b>0%</b>	2 13%	2 13%	15 4%
<i>Total column</i>						
Frequency:	94 25%	178 47%	6 2%	32 9%	65 17%	375 100%

(i) = individual activity

<sup>a</sup>Frequencies of activities that deviate from the general distribution of activities (twice as high or twice as low as the column totals) are indicated in bold.

in Table 6). The results in Table 6 show a higher frequency of learning activities in the teaching situation than in the other situations. Learning activities involving interaction were mostly reported for the coaching conference and remarkably little for the teaching situation. While teachers obviously interact with students on a day-to-day basis, they do not report interaction with students in connection with their own learning. The teachers further mentioned such learning activities as setting a learning goal for their students or themselves mostly in the preparation situation. Conversely, they never mentioned keeping a learning goal for themselves in mind when participating in a coaching conference or during the observation of a dyad-partner's class. Most of the learning activities occurring outside the classroom were reported to occur during participation in a coaching conference which could be both a pre-practice coaching conference and a post-practice coaching conference. Thinking activities were mentioned relatively less often within the situation of a coaching conference, however.

#### 4.1.3. Sequential analysis of learning activities

In order to study the sequences of learning activities in greater depth, pattern analyses and lag-sequential analysis were performed. First, those

sequences involving more than two successive activities were explored at both the levels of the detailed subcategories and the more general categories. Those patterns detected at the general level did not provide much information on what, exactly, the teachers did, thought, or felt in connection with a particular learning outcome. When studied at the subcategory level, however, most of the patterns proved unique to a particular learning situation, which suggests that the reciprocal peer learning of teachers may be much more intricate than we originally suspected.

The results of the same lag-sequential analyses conducted for those sequences involving only two successive activities are presented in Table 7. For each cell in the analyses at a general level, the observed frequency of a particular succession ( $F$ ), the expected frequency ( $E$ ) of that succession based on a zero-level model, and the  $z$ -scores ( $Z$ ) are presented. The rows refer to events (i.e., activities) occurring earlier in time ( $t1$ ) and the columns refer to events (i.e., activities) occurring later in time ( $t2$ ).

The  $z$ -scores in Table 7 show 7 of the 25 patterns of succession to occur significantly more frequently or less frequently than might be expected on the basis of the zero level model. The 25 possible patterns of succession are also depicted in Fig. 1

Table 7  
Successions of one type of activity (t1) by the same or another type of activity (t2)

t1	t2						Total
	Acting	Thinking	Wanting	Feeling	Interacting		
Acting	F:	14	69	2	8	11	153
	E:	20	52	6	11	16	
	Z:	–	<b>3.78</b>	–	–	–	
Thinking	F:	51	140	19	39	24	224
	E:	51	136	16	28	41	
	Z:	–	–	–	<b>2.83</b>	<b>–4.09</b>	
Wanting	F:	14	12	4	1	2	33
	E:	6	16	2	3	5	
	Z:	<b>3.75</b>	–	–	–	–	
Feeling	F:	13	23	5	2	15	58
	E:	11	29	3	6	9	
	Z:	–	–	–	–	<b>2.44</b>	
Interacting	F:	12	30	3	7	31	83
	E:	16	41	5	8	12	
	Z:	<b>–2.66</b>	–	–	–	<b>6.16</b>	
Total							551

F = succession frequency; E = expected succession frequency, Z = z-score ( $- = -1.96 < Z < 1.96, p > 0.05$ ).

where those patterns occurring more frequently than expected are denoted in bold and those patterns occurring less frequently than expected are denoted with dotted lines. The thicker the arrow, the greater the frequency with which the actual succession differs from the expected.

Inspection of Fig. 1 shows significant positive transitions for the following sequences of two activities: (1) wanting before acting; (2) acting before thinking; (3) thinking before feeling; (4) feeling before interacting; and (5) interacting before itself. When the subcategories of activities are examined more carefully, the most frequent sequence of activities for transition 5 is found to be listening and responding to questions or listening and responding to the dyad-partner's perspective on what happened in the classroom. The activity sequences underlying transition 2 involve mostly teaching or experimentation in the classroom followed by attention to or appraisal of student behavior. Further, the teachers report thinking before feeling (transition 3) with the most common sequence of activities involving student appraisal or own behavior followed by a specific (positive or negative) feeling with regard to the appraisal or behavior. Transition 1 shows the teachers to formulate a teaching or learning goal prior to acting. The most common sequences of activities underlying transition 4 were experiencing a positive

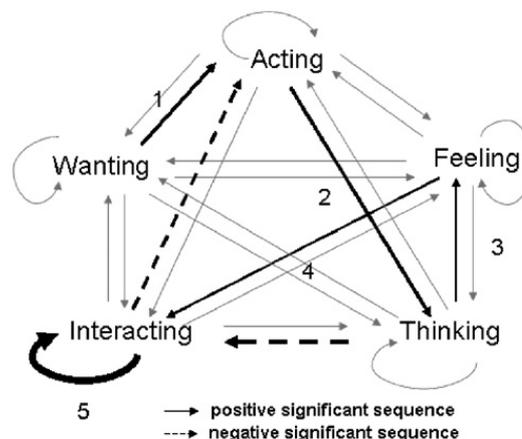


Fig. 1. Activity succession diagram.

or negative feeling prior to interaction with the students in the classroom. In general, interaction preceded acting significantly less frequently than expected, which may be explained by the necessity of thinking about what needs to be done and/or wanting to act after interaction with a colleague. Thinking preceded interaction less often than expected, which might be explained by the fact that interaction was mostly reported for the coaching conference situation where most of the successive sequences of activities simply involved different types of interaction (transition 5).

Table 8  
Frequencies of different learning outcomes

Learning outcome Frequency	Percent	
New idea, conception, or belief	19	22
Confirmed idea, conception, or belief	15	18
Increased awareness	5	6
Intention to change behavioral practice	8	9
Changed idea of self	7	8
New idea and intention to change behavioral practice	17	20
Confirmed idea and intention to change behavioral practice	14	16
Total	85	100

#### 4.2. Reported learning outcomes

The frequencies of the different types of learning outcomes are presented in Table 8 (see Appendix B for specific examples).

As can be seen, a new or confirmed idea, conception, or belief—either with or without an accompanying intention to change behavioral practice—were the most frequently reported learning outcomes.

#### 4.3. Relations between learning activities and learning outcomes

##### 4.3.1. Types of learning activities per learning outcome

In Table 9, the cross-tab relations between the reported learning outcomes and learning activities are presented. A significant association between the learning outcomes and learning activities appears to exist ( $\chi^2 = 40$ ,  $df = 24$ ,  $p = 0.019$ ), but the strength of the association (Contingency coefficient  $C = 0.27$ ) is relatively small (Cohen, 1988).

Inspection of Table 9 shows that activities in the category of wanting were generally less well represented but even less so in relation to the learning outcomes of a confirmed idea and intention to change behavior or a changed idea of self. However, activities such as setting a teaching or learning goal were relatively more often mentioned in relation to a new idea and an accompanying intention to change one's behavior. Further, individual acting activities were found to be mentioned relatively less frequently in relation to a changed idea of oneself. Interaction, however, was

found in connection with a changed idea of one's self much more frequently than expected on the basis of the total distribution of activities. As confirmed by the results in Table 6, interaction was found to mainly happen within the peer coaching conference. Taken together, these results suggest that interacting with a dyad-partner or other colleagues (e.g., asking and receiving feedback, help, or advice but also talking together in a coaching conference) made the teachers feel more self-confident, more capable of using specific curricular materials and possibly increased their sense of belonging thereby.

##### 4.3.2. Sequential analysis of the learning activities per learning outcome

Similar to the lag-sequential analyses for all of the teacher learning activities reported above, lag-sequential analyses of those sequences of activities occurring for the four most frequently mentioned learning outcomes were analyzed: a new idea, a confirmed idea, and a new or confirmed idea with an accompanying intention to change behavioral practice. For each of these learning outcomes, the associated sequences of activities were analyzed for occurrence that was more frequent or less frequent than expected. In Fig. 2, the significant successions between learning activities are again presented, as in Fig. 1 with arrows 1 through 5, but now in connection with the relevant learning outcome denoted by a specific color.

Of particular interest to us here are the five successions that occurred more frequently than expected between the general types of activities. These successions are discussed below and illustrated with insights derived from a more detailed level of analysis.

*4.3.2.1. Transition 1. Wanting before acting in relation to a new idea.* Inspection of Fig. 2 shows wanting to precede acting for a new idea either with or without an accompanying intention to change behavioral practice. The formulation of a particular teaching or learning goal prior to action thus appears to be related to the adoption of new ideas with regard to, for example, how students learn and also a concrete intention to change one's teaching behavior.

Closer inspection of the particular subcategories of activities and learning situations associated with this succession of general activities shows the teachers to mainly report such a sequence of

Table 9  
Cross-tab relations between reported learning activities and learning outcomes

Learning outcome	Learning activity <sup>a</sup>					Total row
	Acting (i)	Thinking (i)	Feeling (i)	Wanting (i)	Interacting	
Intention to change behavior	6 15%	18 45%	5 13%	2 5%	9 22%	40 8%
Increased awareness	7 26%	11 41%	4 15%	2 7%	3 11%	27 5%
Confirmed idea	17 16%	63 61%	8 8%	6 6%	9 9%	103 20%
Confirmed idea and intention to change behavior	21 22%	52 56%	9 10%	2 2%	9 10%	93 18%
Changed idea of self	4 10%	14 36%	5 13%	1 3%	15 38%	39 8%
New idea	24 21%	55 48%	14 12%	8 7%	14 12%	115 22%
New idea and intention to change behavior	20 20%	43 43%	9 9%	10 10%	18 18%	100 19%
Total column	99 28%	256 41%	54 54%	31 31%	77 77%	517 517%
						100%

(i) = individual activity

<sup>a</sup>Frequencies of activities that deviate from the general distribution of activities (twice as high or twice as low as the column totals) are indicated in bold.

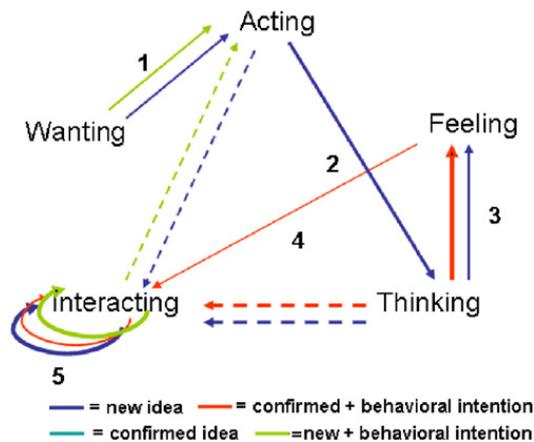


Fig. 2. Activity succession diagram per learning outcome.

activities in the preparation situation. That is, a specific teaching goal—such as “*Today I am going to experiment with the use of ICT in my lesson on tax systems*”—is formulated prior to the use of a new instructional method (i.e., the new idea plus behavioral intention learning outcome).

For the learning outcome of new idea alone, however, the teacher mentioned the formulation of a specific teaching goal (i.e., wanting) prior to individual experimentation in the classroom (i.e., acting) in a situation involving observation of one’s teaching by the dyad-partner. It is possible that

knowing that one is being observed prompts teachers to think about the specific goals of their teaching. That is, observation may prompt consideration of the alternatives for teaching particular subject matter (i.e., wanting) and trigger experimentation (i.e., acting). And, indeed, a frequently heard statement was: “*I intended to teach a normal lesson but then I realized that my dyad-partner was coming to observe and decided to experiment with something new.*”

Taken together, the above findings suggest that the learning situation of “teaching” should be split into “teaching” and “teaching while being observed.”

4.3.2.2. *Transition 2. Acting before thinking in relation to a new idea.* In Fig. 2, acting can be seen to precede thinking in relation to a new idea. Literally, this means that the teachers acted before thinking. Closer examination of the specific activities and learning situations further shows the sequence of acting before thinking to occur in the teaching situation. For this sequence of activities, that is, the teachers reported experimentation and noticing a particular effect on students, which is then connected to the experimentation and can lead to the formulation or adoption of new ideas. In other words, both awareness of student behavior

while teaching and one's interpretations of student behavior appear to be critical for the attainment of new ideas.

*4.3.2.3. Transition 3. Thinking before feeling in relation to a new or confirmed idea and an intention to change behavioral practice.* Thinking before feeling can be seen to be of particular importance in Fig. 2 where the succession of activities is shown to be characteristic of a new idea and particularly a confirmed idea with an accompanying intention to change behavioral practice. The activities occur in mostly the teaching situation. An examination of the specific activities shows reflection upon appraisals of student behavior (either positive or negative) to precede positive or negative feelings with regard to either the students or oneself. Thinking about student performance can thus make one happy or sad about what the students have done and proud or frustrated with respect to one's own capacities and performance.

A slight difference between the learning outcomes of a new versus a confirmed idea was also detected. The teachers reported relatively fewer negative feelings in connection with the confirmation of an idea and an accompanying intention to change behavioral practice than in connection with a new idea. In other words, teachers may seek proof for new ideas and thus interpret student behavior more negatively in connection with new ideas than in connection with ideas that have already been proven and associated with an intention to change. This does not necessarily mean that teachers do not want to change, thus; they simply seek proof of effectiveness before putting new ideas into practice. We also take the strong patterns of thinking and feeling found here to suggest that teachers formulate hypotheses about the effects of new teaching strategies—frequently based upon the ideas of others—but remain skeptical until they are shown otherwise. Once their hypotheses have been confirmed and the teachers notice desired student behavior or positive performance, they may be pleasantly surprised, happy to accept the initial idea, and make plans to modify their own teaching repertoires.

*4.3.2.4. Transition 4. Feeling before interaction in relation to a confirmed idea and an intention to change behavioral practice.* When teachers have a confirmed idea, conception, or belief and plans to change their behavior in accordance with this,

feeling is found to occur before interaction. A closer look at the subcategories of activities constituting this sequence shows positive feelings to precede interaction with the students in the form of fielding unexpected questions with regard to the teaching method used.

*4.3.2.5. Transition 5. Interaction before interaction.* The sequence of interaction followed by interaction occurs for all of the selected learning outcomes with the exception of confirmation of an idea. This means that when teachers have a confirmed idea, their interactions with students or other teachers were not followed by additional interactions more frequently than expected on the basis of the other sequences of activities on average. It is certainly possible in the case of confirmed ideas that *thinking* about the results of one's interactions (e.g., reflection on feedback from one's dyad-partner) can intervene or mediate subsequent interactions (e.g., summary of experiences within a coaching conference). It is also possible that, as shown in Table 9, interaction simply occurs more often in relation to new ideas than in relation to already confirmed ideas. And finally, it is possible that teachers think and act more individually when it comes to already confirmed ideas or conceptions without an actual intention to change one's behavioral repertoire and thus interact less with regard to the idea that is—in this case—more self-regulated learning on the part of students. Additional research is clearly needed to unravel these alternative explanations.

## 5. Conclusions and discussion

In the present study, just what and how eight experienced teachers learned from participation in a 1-year reciprocal peer coaching trajectory was explored by studying the associations between their reported learning activities and learning outcomes. We did not focus on isolated activities or learning outcomes but explicitly explored the relations between the two. In order to do this, the different types of learning activities and learning outcomes were first examined. Analyses of the periodic coaching conferences, the post-coaching interviews, and the digital diaries submitted by the teachers produced a total of 90 sequences of learning activities associated with a particular learning outcome and 551 distinct learning activities. The 551 learning activities could be categorized into 37

subcategories and 5 general categories of acting, thinking, wanting, feeling, and interacting with acting and thinking mentioned most often by the teachers.

The specific character of the reported learning activities was found to differ depending on the learning situation: teaching, observation, participation in a coaching conference, preparation outside the classroom, appraisal (outside the classroom) of student performance, and extra-curricular tasks. Relatively more learning activities were reported within the teaching situation, which means that the teachers clearly learned on the job (see also Bolhuis, 2006; Kwakman, 2003; Wubbels, 1992). The teachers reported acting considerably less frequently than thinking in all of the learning situations, which may be due to a tendency to treat teaching as less of a learning activity than reflection. In addition, this could indicate that many different patterns of thinking activities are connected to the teacher's acting. With respect to the professional development of the teachers it might seem fruitful to make these thinking activities explicit and open for discussion by discussing them together with colleagues, for example in a coaching conference.

Activities within the category of interaction were reported remarkably infrequently in the actual teaching situation. Although the teachers obviously interacted with their students, they hardly ever mentioned interaction with their students in connection with their own learning. The same pattern of results was found for interaction within an observation situation. The teachers reported learning from the interactions with their dyad-partners during a coaching conference but not from the observation of the dyad-partner's class. While this finding may seem trivial at first, it is clearly not upon closer inspection. It is not that the teachers interacted more in a coaching conference than in their classroom. The teachers clearly reported about their dyad partners creating possibilities to interact with students by walking around the classroom and visiting with small groups of students during the observation of their own class, but nevertheless neither they themselves nor their dyad-partners did report these activities in connection with their own learning. One explanation for this discrepancy may lie in the fact that the teachers never mention a learning goal for themselves when observing a dyad-partner's lesson. That is, the teachers generally do not consider themselves learners when sitting in the back of the classroom to observe someone else. The

teachers thus have the learning goals and learning of the dyad-partner in mind but not their own learning, which may therefore occur as only more of a side-effect under such circumstances. This is an interesting finding since the idea that coaches could benefit from coaching a dyad partner was stressed rather often during the training of the teachers. Especially because it is known from other studies (e.g. Joyce and Showers) that it takes some sort of 'mind-switch' to open up for learning in the role of the observer as well as in the role of the observed. Maybe 1 year is not enough time to actually get to that mind-switch.

A practical implication of this result is firstly that the potential power of learning from observing needs to be stressed even more during the coaching training, may be including more actual training in how to do that. Secondly, the power of coaching can be increased by having teachers interact more with students not only in their role of teacher but also in their role as observing coach.

Most of the learning activities occurring outside the classroom were reported to occur during participation in a coaching conference which could be both a pre-practice coaching conference and a post-practice coaching conference. Thinking activities were mentioned relatively less often within the situation of a coaching conference, however. An explanation for this result might be that when two teachers have to interact in a coaching conference, there is hardly any space for thinking. It might be perceived as rather awkward to be quiet for a long time in a dialogue between two people. Forming triads of teachers instead of dyads could therefore be an interesting approach for fruitful peer coaching. In such a context, at least one partner has time to listen and reflect on what is said.

Although the examination of the specific learning situations helped provide a more thorough and thus accurate picture of teacher learning during a reciprocal peer coaching trajectory, the large category of either idiosyncratic or otherwise unspecified "other" situations nevertheless complicated the analyses. This might have been prevented by asking the teachers to be much more specific about the situations in which particular learning activities were undertaken. However, it may generally be difficult to pinpoint just where and when a particular insight occurred. Reporting about one's own learning appears to be a complex endeavor.

Irrespective of the specific learning situation, the sequences of learning activities were studied in

relation to the reported learning outcomes via frequency analyses, cross-tabs analyses, pattern analyses, and lag-sequential analyses (Erkens, 2005). The frequency analyses and cross-tabs analyses showed interaction to be reported in concurrence with a changed idea of self more frequently than expected on the basis of the distribution of all the activities. This shows interaction with the dyad-partner or colleagues in the form of asking and receiving help, advice, or feedback but also consultation in a coaching conference to provide teachers with greater self-confidence, increased capabilities with respect to the use of specific curricular materials, and an increased sense of belonging. And this finding elucidates the widespread evidence of teacher satisfaction with regard to the affective learning outcomes of peer coaching (see Bergen et al., 2006; Joyce & Showers, 2002). This result also points to a possible discussion with respect to the power of interacting with colleagues. If changed classroom behavior is the focus of a professional development activity in schools, then interacting with colleagues alone might not be sufficient. Although it is absolutely important for teachers to feel confident, proud and happy in their work—especially in a context of innovation—when actual changes in practice are concerned, it seems necessary to also focus strongly on the actual experimentation with new strategies in practice.

For the lag-sequential analysis, the four most frequently mentioned learning outcomes (i.e., a new idea, a confirmed idea, and a new or confirmed idea with an accompanying intention to change behavioral practice) were selected and the accompanying sequences of activities were analyzed for significantly more frequent or significantly less frequent successions of activities than expected on the basis of the overall distribution of the activities. The five more frequent successions show clear differences in the sequences of activities associated with the different types of learning outcomes reported by the teachers. That is, the different activities undertaken by the teachers as part of their participation in a reciprocal peer coaching trajectory clearly triggered different aspects of their professional development. In addition, when we look at the general activity patterns in relation to learning outcomes, it seems that teachers undertake more structured and intentional patterns of activities in relation to new ideas and that the activity patterns related to confirmed ideas seem more *haphazard*.

*Wanting before acting in relation to a new idea:* Activities within the category of wanting occurred before acting in relation to a new idea—either with or without an accompanying intention to change behavior. Knowing that one is going to be observed appears to make teachers consider their teaching goals or alternatives for teaching the lesson to be observed, which can lead them to experiment. When a teacher knows that he or she is going to be observed, he or she might want to look more cutting edge so he or she changes her old teaching plan. Or the teacher might think, this is an opportunity for me to get feedback on something I'm not sure about. Rather than do what I know 'works', let's try something different so I can take advantage of the feedback. This aspect of peer coaching therefore appears to be very powerful when teacher learning is concerned.

*Acting before thinking in relation to a new idea:* Acting preceded thinking in relation to new ideas. In other words, experience with the effects of a specific teaching strategy on student behavior is needed to evaluate new ideas and thus an awareness of student behavior and one's interpretations of student behavior.

*Thinking before feeling in relation to a new or confirmed idea and an intention to change behavioral practice:* Thinking preceded feeling in relation to a new or confirmed idea and an accompanying intention to change behavioral practice more often than could be expected based on change alone. These results suggest that teachers look for proof of new ideas and the effectiveness of new practices and, when they find evidence, they can be very happy or disappointed—depending on the nature of the evidence. Teachers do not necessarily not want to change but, rather, simply remain skeptical until sufficient evidence has been noticed to the contrary. And this may explain the tendency of the teachers we studied to interpret student behavior less negatively in connection with confirmed ideas than in connection with new ideas.

*Feeling before interaction in relation to a confirmed idea and an intention to change behavioral practice:* Feeling preceded interaction in relation to a confirmed idea and an accompanying intention to change behavioral practice. That is, a positive feeling with respect to an already confirmed idea preceded interaction with students in the form of listening to unexpected questions from the students with regard to the methods used.

*Interaction before interaction:* Sequences involving interaction followed by interaction occurred in relation to almost all of the learning outcomes with the exception of a confirmed idea alone. This suggests that teachers think and act more individually with respect to ideas, conceptions, or beliefs that have already been proved valid or effective but have yet to be put into regular practice.

In the introduction to the present research, it was observed that the studies of teachers' workplace learning to date provide only rough categorizations of the learning activities of teachers. Studies of teacher coaching, in contrast, utilize more detailed categorizations but focus on only selected aspects of teacher learning. It was therefore suggested that a combination of the two aforementioned perspectives in the form of a more detailed description of the workplace learning activities of teachers in connection with the learning outcomes that they report during participation in a 1-year reciprocal peer coaching trajectory might be

promising. We think the present results confirm this idea and that the present approach can also be adopted in future research on teaching learning within the context of reciprocal peer coaching. Furthermore, this study provided us with valuable insights for the development and implementation of professional development activities for teachers in schools.

**Acknowledgements**

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**Appendix A. Examples of learning activities associated with different learning situations**

See Table A1.

Table A1

Individually occurring activities				Collaborative activities
Acting	Thinking	Wanting	Feeling	Interacting
<i>Teaching situation (inside the classroom)</i>				
Teacher does something for the first time (e.g., takes over ill colleague's classes).	Teacher becomes aware of student behavior.	Teacher has a specific goal in mind with respect to student learning.	Teacher feels relieved or excited about what students do.	Teacher shares his/her concerns with students.
Teacher experiments (observed by someone) with a new teaching strategy because he thinks students might like it better or because other colleagues use the strategy.	Teacher appraises student behavior.	Teacher wants more active student involvement in the lesson.	Teacher feels fed up with specific student behavior.	Teacher asks for feedback from students.
Teacher teaches a normal lesson.	Teacher experiences a conflict between wanting to interfere but at the same time wanting students to show some responsibility for their own learning.	Teacher does not want to provide the students with the right answers.	Teacher feels lost, foolish, or insecure when practicing a new strategy.	Teacher listens and responds to questions from students.
<i>Observation situation (inside the classroom)</i>				
Teacher sits in the back of the classroom or walks around in the classroom and observes student behavior, the dyad-partner's behavior, or student teacher behavior.	Teacher compares own teaching strategy with that of dyad-partner.		Teacher feels worried about the modeled teacher behavior and the effect it has on students.	

Table A1 (continued)

Individually occurring activities				Collaborative activities
Acting	Thinking	Wanting	Feeling	Interacting
	Teacher evaluates the teaching strategy of the dyad-partner in relation to observed student behavior.		Teacher is positively surprised about the effects of the teaching strategy of the dyad-partner on students.	
<i>Participation in a coaching conference situation (outside the classroom)</i>				
	Teacher anticipates questions the dyad-partner will ask him/her.		Teacher feels stimulated and supported by the dyad-partner to continue experimenting.	The dyad-partners talk about their ideas of good teaching or the fostering of active and self-regulated student learning. Teacher listens to the dyad-partner's perspective on what happened in the classroom.
	Teacher becomes aware of the effects of own behavior on students.			
	Teacher interprets feedback received from dyad-partner.			
<i>Preparation situation (outside the classroom)</i>				
Teacher constructs new material.	Teacher thinks that students learn better when they themselves identify problems and new elements in the subject material.	Teacher has a goal in mind with regard to student learning or own learning.	Teacher feels happy about constructing new materials.	Teacher agrees to work in a specific manner.
Teacher gathers information from textbooks, the internet, a newspaper, or journals.	Teacher experiences a conflict between wanting to increase the level of involvement of the students and wanting to cover all of the subject matter required for a test.	Teacher wants to use ICT in his/her lessons.	Teacher feels insecure about own capacities to develop new materials.	Teacher constructs new materials together with (a) colleague(s)
		Teacher wants to learn how to work with a specific instructional format.		Teacher asks for feedback/help from a colleague or colleagues.
<i>Student assessment situation (outside the classroom)</i>				
Teacher reads though materials in need of grading?	Teacher attributes the grades of the students to the capabilities of the students.		Teacher is positively surprised about student's results.	Teachers asks students questions and listens to their responses for assessment purposes.
Teacher reads/ assesses student work.	Teacher appraises/ compares student results with the main aim of the assignment.		Teacher is angered or disappointed by student's results.	
<i>Extra-curricular task situation (outside the classroom)</i>				
Teacher notices changed student or colleague behavior.	Teacher compares the behavior of this years' students with the behavior of previous generations.		Teacher feels motivated by colleagues to experiment with a new instructional method.	Teacher agrees with colleagues or the school management to use a specific instructional method.

Table A1 (continued)

Individually occurring activities				Collaborative activities
Acting	Thinking	Wanting	Feeling	Interacting
Teacher monitors students taking an exam.	Teacher becomes aware of practices of his/her colleagues.		Feels sympathy for a student under his/her guidance.	Teacher talks about ideas, beliefs, concepts, or experiences in the school cafeteria. Teacher notices enthusiasm of colleagues about specific instructional methods.

## Appendix B. Examples of reported learning outcomes

See Table B1.

Table B1

Reported learning outcomes	Examples
New idea, conception, or belief	Teacher has changed understanding, thinking, or picture in his/her mind with regard to the promotion of active and self-regulated student learning. Teacher has more positive feelings of certainty that something exists or is true with regard to the promotion of active and self-regulated student learning. Teacher has changed understanding of a situation or a principle related to the promotion of active and self-regulated student learning. Teacher has more or less sudden insight into a problem or situation related to the promotion of active and self-regulated student learning.
Confirmed idea, conception, or belief	Teacher has greater proof or support for an idea, conception, or belief related to the promotion of active and self-regulated student learning.
Increased awareness	Teacher is continually aware of what is happening or present because he/she now hears, sees, or feels it.
Intention to change behavioral practices	Teacher plans or intends to act in a different manner for the promotion of active and self-regulated student learning. a. Try something new Teacher wants or is convinced to start working for the first time with new curricular materials or teaching strategies that foster more active and self-regulated student learning. b. Continue experimenting Teacher wants or is convinced to keep on experimenting with curricular materials or teaching strategies that foster more active and self-regulated student learning in order to discover what it is like, learn from experiences, or attain evidence of effectiveness. c. Reject current practice Teacher wants or is convinced to discontinue use of present curricular materials or work with a specific teaching method.
Changed idea of self	Teacher feels a certain way about his or her personality, achievements, and value for the profession.
Confirmed idea and intention to change behavioral practice	Teacher is convinced of an idea, conception, or belief for the promotion of more active and self-regulated student learning and he/she plans to change his/her practices accordingly.
New idea and intention to change behavioral practice	Teacher has a changed idea, conception, or belief with regard to the promotion of active and self-regulated student learning and plans to change his/her practices accordingly.

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