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Teacher collaboration on the use of pupil learning outcome data: A rich environment for professional learning?

Roos Van Gasse*, Kristin Vanlommel, Jan Vanhoof, Peter Van Petegem

University of Antwerp, Belgium

HIGHLIGHTS

- Mainly storytelling and helping with regard to using pupil learning outcome data.
- Little interdependency between Flemish teachers.
- Limited professional learning among teachers regarding data use.

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ABSTRACT

Collaboration on data use is expected to provide valuable opportunities for teachers to learn. Therefore, the goals of this qualitative study are to provide insight both into teachers' learning activities (storytelling, helping, sharing, joint work) with regard to collaborative use of pupil learning outcome data, as well as into teachers' professional learning (new or confirmed ideas, changed ideas of the self, consciousness, intention to change behavioural practice, turn new or confirmed ideas into practice) from these activities. We find that teachers mainly undertake storytelling and helping activities in terms of data use and that professional learning resulting from these activities is limited.

1. Introduction

Data are becoming more and more important for teachers' day-to-day decisions (Kerr, Marsh, Ikemoto, Darilek, & Barney, 2006; Verhaeghe, Vanhoof, Valcke, & Van Petegem, 2010). In particular, pupils' cognitive and non-cognitive learning outcomes are seen as data with great potential for teachers to develop and improve their practice (Jimerson, 2014).

Data use has been described as a cyclical process, in which phases of discussing, interpreting and diagnosing data and taking actions follow each other (Verhaeghe et al., 2010). During this process, interactions among team members are considered to be essential for fruitful data use (Copland, 2003; Hubbard, Datnow, & Pruyn, 2014; Wayman, Midgley, & Stringfield, 2006). Problems that are – at times – attributed to the individual capacity of data users might be overcome by interacting with colleagues (Hubbard et al., 2014; Wayman et al., 2006). Researchers expect that teachers' interactions with colleagues on data use provide valuable opportunities for teachers to learn, so that data use has the potential to serve as a rich environment for teachers' professional learning (Katz & Dack, 2014; Vanhoof & Schildkamp, 2014). This study aims to contribute to existing literature by providing insight into teachers' professional learning in the context of data use.

Up to now, research into data use has fallen short in two areas. First, there is insufficient evidence on the nature of teachers' interactions on the subject of pupil learning outcomes. Although researchers into data use have attempted to study various forms of collaboration, such as team work or communities (Bertrand & Marsh, 2015; Hubbard et al., 2014; Wayman et al., 2006), little is known about the learning activities undertaken by teachers during these interactions. Given the potential contribution of data use for teacher learning, more insight into teachers' learning activities with regard to discussing data, interpreting data, diagnosing data and taking actions upon data is needed. Therefore, the first goal of this study is to describe teachers' learning activities with regard to

* Corresponding author. University of Antwerp, Department of Training and Education sciences, Faculty of Social Sciences, Gratiekapelstraat 10, 2000 Antwerpen, Belgium.
E-mail address: Roos.VanGasse@uantwerpen.be (R. Van Gasse).

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teachers' use of pupil learning outcomes.

Data use is a cyclical process in which interaction can vary depending on each phase (e.g. more interaction in discussing than in taking action). To address this complexity, we use the Little (1990) framework, which incorporates an individual as well as a social perspective on teachers' learning activities. We investigate four types of teacher learning activities that have the potential to enhance teachers' professional learning: daily conversations on pupil learning outcomes (storytelling), asking for help or giving advice with regard to the use of pupil learning outcomes (helping), sharing materials or strategies to use pupil learning outcomes (sharing) and making arrangements or creating work groups with regard to pupil learning outcomes (joint work) (Kwakman, 2003; Little, 1990).

Second, knowledge on teachers' professional learning by means of data use interactions is scarce. A major pitfall for teachers' professional learning from data use activities is that teachers fit data into their current thinking (Katz & Dack, 2014). Although storytelling, helping, sharing and joint work are all activities that have been found to contribute to teachers' professional learning (Bakkenes, Vermunt, & Wubbels, 2010; Meirink, Meijer, Verloop, & Bergen, 2009a; Pareja Roblin & Margalef, 2013; Zwart, Wubbels, Bergen, & Bolhuis, 2007), the extent and type of professional learning results depend on the learning activities that are undertaken. The second goal of this study is to examine whether the learning activities that teachers undertake result in (some types of) professional learning.

Teachers' professional learning is studied using the Zwart, Wubbels, Bolhuis, and Bergen (2008) framework because this framework captures professional learning at the level of cognition, attitude and behaviour. We examine seven different types of professional learning: new ideas, conceptions or beliefs; confirmed ideas, conceptions or beliefs; consciousness; turning new ideas into practice; changed ideas of the self; intention to change behavioural practice; and turning confirmed ideas into practice.

In order to expand the current knowledge base on teachers' learning activities regarding the use of pupil learning outcomes and teachers' professional learning, the following research questions are central to this study:

1. Which learning activities do teachers undertake with regard to the use of pupil learning outcomes: storytelling, helping, sharing and/or joint work?
2. Which types of professional learning do teachers report as a result of storytelling, helping, sharing and joint work activities with regard to pupil learning outcomes?

2. Context of the study

This study took place in Flanders, which has a specific context to study data use in. Compared to other recurring countries in literature, the Flemish government takes a rather school improvement oriented perspective with regard to data use. Whilst standards are defined at the end of the second and sixth grade of secondary education, schools are autonomous in how these standards are reached (the curriculum) (De Volder, 2012; Penninckx, Vanhoof, & Van Petegem, 2011). In addition, central exams are absent and no public databases or rankings of schools are available (De Volder, 2012; OECD., 2013). Schools themselves are responsible for getting insight into whether or not they reach the Flemish standards at the end of secondary education (De Volder, 2012). Thus, governmental expectations towards data use are rather implicit and the responsibility for using data and support for data use lies with individual schools and teachers.

The absence of standardized testing in Flanders has implications for the conceptualization of data in this study. Schools and teachers primarily rely on their own data sources in order to get insight into pupil learning outcomes. Given the wide range of potential data sources (e.g. tests, assignments, observations or portfolios) and potential differences between teachers and schools in the data sources that are used, a broad conceptualization of data is needed within the Flemish context. Therefore, learning outcome data in this study comprise both cognitive (i.e. linguistic and arithmetic skills) and non-cognitive outcomes (i.e. attitudes, art and physical education), which can be both qualitative (i.e. observations) and quantitative (i.e. class tests).

3. Conceptual framework

To situate teachers' learning activities and their professional learning in their broader context, we first frame teachers' use of pupil learning outcomes within the context of workplace learning. Subsequently, we describe potential learning activities of teachers in regard to the use of pupil learning outcomes and our conceptualization of teachers' professional learning outcomes.

3.1. Teachers' workplace learning

Teachers' workplace learning is a comprehensive concept, which has been described from various points of view (Bakkenes et al., 2010; Hoekstra, Brekelmans, Beijaard, & Korthagen, 2009; Levine & Marcus, 2010; Meirink et al., 2009a). Recurrent elements are that teachers' workplace learning is situated within daily practice (Kwakman, 2003; Pareja Roblin & Margalef, 2013) and that teachers act as constructors of new knowledge, beliefs or behaviour (Meirink et al., 2009a).

Research incorporates two major foci in investigating teachers' workplace learning. First, the concept can be approached as a process variable. In these studies, teacher learning is examined as (a sequence of) learning activities that teachers undertake in the workplace (Kwakman, 2003; Little, 1990; Zwart et al., 2008). Although this approach provides insights into 'what teachers do' in order to learn, learning results ('what teachers actually learn') are not necessarily brought to the surface. Therefore, the second approach to teachers' workplace learning is to conceptualize it as an outcome variable. Several studies have investigated cognitive and/or behavioural learning results of teachers in workplace settings (Bakkenes et al., 2010; Hoekstra et al., 2009; Levine & Marcus, 2010; Meirink et al., 2009a; Zwart et al., 2008).

Our study will distinguish between process characteristics (learning activities that take place) and the results of learning processes (teachers' professional learning), in order to cover the concept of workplace learning profoundly.

3.2. Learning activities

Given that workplace learning is situated in daily practice, one cannot expect that learning activities will be merely individual or social (Kwakman, 2003). We use the Little (1990) framework because it incorporates both the individual and the social perspective on learning activities. Little (1990) categorizes learning activities depending on the (increasing) level of interdependence between teachers: storytelling, helping, sharing and joint work.

The integration of an individual and a social perspective on learning activities in the Little (1990) framework is particularly useful for this study since social interaction can vary depending on the data use phase (discussing, interpreting, diagnosing, taking action). Whereas discussing data can comprise a wide array of different social interactions, taking (instructional) action upon data

can be a merely individual process.

The first learning activity in Little's (1990) framework is *storytelling*. Storytelling is a learning activity in which teachers are nearly completely independent of each other. Due to daily conversations with colleagues, a quick exchange of information takes place. Subsequently, teachers are completely independent in their use of this information in practice (Little, 1990).

Storytelling provides a good illustration of daily life in schools (Bakkenes et al., 2010; Katz & Earl, 2010; Meirink et al., 2009a). Also in the context of data use, daily conversations are reported (Bolhuis, Schildkamp, & Voogt, 2016; Datnow, Park, & Kennedy-Lewis, 2013) These storytelling activities can range from general conversations about data use to conversations about a specific data use topic within the school.

In this study, storytelling is conceptualized as daily conversations between teachers about the use of pupil learning outcomes in a broad sense. This means that not only specific information concerning using learning outcomes of pupils is the subject of storytelling, but also topics related to learning outcomes (for example, evaluation criteria that are used or actions that are undertaken to improve pupils' learning outcomes).

Helping is a learning activity that refers to giving or asking for help or advice and incorporates a high level of independence (Kwakman, 2003; Little, 1990). Helping activities derive from a question that is asked by an individual teacher, who – subsequently – decides independently to follow or ignore the help or advice that is offered (Little, 1990). Thus, helping is not about interfering in colleagues' work in unwarranted ways; the initiative lies with the teacher in search of help or advice (Katz & Earl, 2010). Due to the underlying purpose of help-seeking, this type of activity is less open-ended for the help-seeker than storytelling activities.

Helping activities are one of the main reasons why emphasis has been laid on collaborative data use (Datnow et al., 2013; Hubbard et al., 2014). The presence of helping activities in data use settings can be crucial in order to tackle personal barriers with regard to data use, such as difficulties with analysing and interpreting data or setting improvement actions (Datnow et al., 2013; Hubbard et al., 2014; Jimerson, 2014).

Mixed results have been found on the prevalence of helping activities in schools. In some studies, a high frequency of helping activities is reported (Katz & Earl, 2010; Katz et al., 2008; Meirink et al., 2009a), whereas helping activities remain limited in other studies (Kwakman, 2003).

In this study, we focus on teachers' helping activities related to the use of pupil learning outcomes and which meet a high level of independence of teachers. This means that the only helping activities are that studied are those which originate from a teacher's question related to using pupil learning outcomes in a broad sense (ranging from, for example, asking advice on evaluating a pupil's writing assignment to, for example, how to interpret a pupil's test scores).

A third learning activity is *sharing*, which implies the distribution of data, materials and methods, or the open exchange of ideas and opinions (Little, 1990). The underlying goal of teachers is to make aspects of their work accessible and expose their ideas and intentions (Katz & Earl, 2010). Thus, teachers create a kind of 'open access environment' of materials and choices and rationales that have been made. Therefore, sharing is seen as a learning activity that incorporates a higher level of interdependence, compared with storytelling and helping (Little, 1990). Sharing activities do not imply that teachers are bound to what is shared with regard to how they shape their daily practice (Little, 1990).

Empirical evidence has validated sharing activities, also in the context of data use. However, there is little insight into their frequency of use, since the extent to which sharing activities are reported differs across studies (Bolhuis et al., 2016; Hubers, Poortman, Schildkamp, Pieters, & Handelzalts, 2016; Katz & Earl, 2010; Kwakman, 2003; Meirink, Meijer, Verloop, & Bergen, 2009b).

We approach sharing activities with regard to the use of pupil learning outcomes in a broad sense. This means that, for example, ideas about how to deal with pupil learning outcomes or materials to improve learning outcomes can all be part of sharing activities.

The last learning activity in Little's (1990) framework is *joint work*, or "*encounters among teachers that rest on shared responsibility for the work of teaching*". This implies a high level of interdependency - collective purposes that result in truly collective action, such as work groups and agreements (Little, 1990). Felt interdependencies among teachers are few, which is why joint work is rarely found among teachers (Kwakman, 2003; Katz & Earl, 2010; Katz et al., 2008). Within the context of data use, indications for joint work are found, but mainly by means of intervention studies (Cosner, 2011; Hubers et al., 2016; Schildkamp, Poortman, & Handelzalts, 2015).

In this study, joint work is again conceptualized in a broad sense, and can, for example, include joint work activities on the interpretation of test scores or with regard to strategies to improve learning outcomes. In line with Little's (1990) definition, we approach joint work as activities with a high level of interdependency. This means that joint work among teachers derives from shared goals and that results of joint work activities are reflected in teachers' individual practice (for example, arrangements on evaluation criteria that are made among teachers).

For reasons of conceptual clarity, we have strictly distinguished between storytelling, helping, sharing and joint work in this conceptual framework. However, we assume that in real-life situations more than one learning activity can appear at a time (for example, situations in which storytelling as well as sharing materials appear).

3.3. Teachers' professional learning outcomes

Professional learning outcomes of teachers' workplace learning have generally been conceptualized as 'change' in teachers' cognition or beliefs, in teachers' practice or behaviour and in teachers' attitudes (Bakkenes et al., 2010; Hoekstra et al., 2009; Katz et al., 2008; Levine & Marcus, 2010; Meirink et al., 2009b; Zwart et al., 2007). However, teachers can also learn about current practices that are going well. Thus, professional learning is not only about changing, but also about finding confirmation about aspects of teachers' cognition or beliefs, practice or behaviour and attitudes (Bakkenes et al., 2010; Zwart et al., 2008).

We draw on the work of Zwart et al. (2008) to map teachers' professional learning to establish both changing and finding confirmation about aspects of teaching into our conceptualization of professional learning. Zwart et al. (2008) distinguish seven types of professional learning, which can be categorized into the three components of professional learning mentioned earlier (see Table 1): new ideas, conceptions or beliefs; confirmed ideas, conceptions or beliefs; changed idea of the self; intentions to change behavioural practice; turn new ideas, conceptions or beliefs into practice; turn confirmed ideas, conceptions or beliefs into practice; and consciousness.

With regard to teachers' cognition, Zwart et al. (2008) find that workplace learning can result in new ideas, conceptions or beliefs. This are changes in teachers' understanding, thinking or mental models with regard to a certain topic or insights into problems or situations related to this topic (Bakkenes et al., 2010; Zwart et al., 2008). Next to new ideas, conceptions or beliefs, workplace learning can lead to the confirmation of existing ideas, conceptions or beliefs (Bakkenes et al., 2010; Zwart et al., 2008). This means that

Table 1
Types of professional learning (Zwart et al., 2008).

Component of professional learning	Type of professional learning (Zwart et al., 2008)
Cognition	- New ideas, conceptions or beliefs - Confirmed ideas, conceptions or beliefs - Changed ideas of the self
Practice	- Turn new ideas, conceptions or beliefs into practice - Turn confirmed ideas, conceptions or beliefs into changed behavioural practice
Attitudes	- Intention to change behavioural practice - Consciousness

teachers find support for specific ideas, conceptions or beliefs they already had beforehand (Zwart et al., 2008). A last type of professional learning related to teachers' cognition or beliefs is a changed idea of the self. Zwart et al. (2008) state that teachers have a certain image of themselves and of their profession, which can be changed through workplace learning.

Next, Zwart et al. (2008) distinguish types of professional learning that are related to teachers' practice. Teachers can become convinced of a new idea, conception or belief to such an extent that they have already changed or plan to change their practice accordingly (Bakkenes et al., 2010; Zwart et al., 2008). Also the confirmation of existing ideas, conceptions or beliefs can push teachers to change or continue their current practices or the intention to do so (Bakkenes et al., 2010; Zwart et al., 2008).

Finally, related to teachers' attitudes, Zwart et al. (2008) name intentions to change behavioural practices or teachers' willingness to change as professional learning. Some learning activities lead to teachers explicitly rejecting their current practices. Although these teachers do not necessarily have ideas about or carry out changes in their practice, they (start to) demonstrate willingness to change (Zwart et al., 2008). Teachers' workplace learning can also result in teachers adopting a more conscious attitude towards certain topics or an increased awareness of things because they now hear, see or feel more clearly what is happening around them (Bakkenes et al., 2010; Zwart et al., 2008).

The aforementioned types of professional learning will be used to describe 'what teachers learn' from teachers' learning activities. We will not relate each type of professional learning in the Zwart et al. (2008) framework exclusively to the different learning activities (e.g., the impact of storytelling on the generation of new ideas), because we aim to examine the overall contribution of learning activities to teachers' professional learning.

4. Method

4.1. Participants

This qualitative study took place in the context of a project concerning the assessment of pupils' writing competences. Out of 10 participating secondary schools in the project, six were randomly asked to participate in this study.

In each school, we focused on a particular grade-level teacher team to map teachers' learning activities and their professional learning. The teams are temporary and interdisciplinary (Vangrieken, Dochy, Raes, & Kyndt, 2013), and are collectively responsible for the learning of pupils within the fifth grade of an academic track in economics and languages (16- to 17-year-olds). Two to three times a year, the teams are obliged to discuss the pupils' learning outcomes in a formal team meeting. During the school year, these meetings serve to discuss pupils' learning progress. In the last team meeting of the year, team members deliberate whether or not pupils will successfully complete their year.

We interviewed 14 teachers out of six teacher teams to examine learning activities on the basis of the use of learning outcome data. A minimum of two teachers was interviewed within each teacher team.

The 14 teachers varied in gender (six were male; eight were female), teaching experience (five to 30 years) and teaching course (Dutch, English, French, German, history and chemistry). Participation of all teachers was voluntary. An overview of the main characteristics of all participating teachers is provided in Table 2.

4.2. Interviews

We used semi-structured interviews to answer the research questions. Participants' answers to questions regarding which team members they consult when discussing, interpreting, diagnosing or taking action upon pupil learning outcomes, deriving from a prior survey, formed the starting point of our interviews.

First, we provided the teachers with an overview of the colleagues they consulted. Then, we asked them what exactly happened in these interactions, using an open question so that participants' answers were not necessarily restricted to the concepts we had set forward (e.g., 'What actually happens when you consult these colleagues on pupil learning outcomes? Can you recall real-life situations?). Subsequently, we posed additional questions on the Little (1990) framework (e.g., 'To whom amongst your colleagues do you ask advice on pupil learning outcomes? Can you sketch out such a situation?').

For teachers' professional learning results we also started with an open question (e.g., 'What have you learned from interacting with these colleagues on using pupil learning outcomes?'). Subsequently, the Zwart et al. (2008) framework guided our questions (e.g., 'Which new ideas, conceptions or beliefs have been the result of your interactions with colleagues on the use of pupil learning outcomes?').

The interviews had an average duration of 45 min and were transcribed ad verbatim.

Table 2
Overview of the participants.

Team	Participant	Gender	Teaching experience	Course(s)
A	AA	Male	10–15	Dutch
A	AB	Male	10–15	German
B	BA	Female	0–5	History
B	BB	Male	10–15	Dutch
B	BC	Female	15–20	French
C	CA	Male	15–20	History
C	CB	Male	5–10	English
D	DA	Female	+25	Dutch
D	DB	Female	+25	Economics
E	EA	Female	5–10	Dutch, English
E	EB	Male	15–20	Chemistry
F	FA	Female	10–15	English
F	FB	Female	15–20	Dutch
F	FC	Female	15–20	German

4.3. Coding process

After transcribing the interviews, a six-step coding process took place using Nvivo 10 software.

First, half of the interviews were coded inductively. A researcher (researcher A) provided interview fragments with an open code, staying as close as possible to the original text (Pandit, 1996).

In step 2, the open codes were discussed with a second researcher (further: researcher B). Both researchers evaluated the validity of the open codes. This resulted in the need to concretize or rephrase certain codes. Subsequently, researcher A finished the open coding.

Step 3 concerned agreements between researchers A and B on the conceptual characteristics of axial codes related to both frameworks (see Table 3).

Subsequently, the coding process took a deductive approach. Researchers A and B independently put open codes of seven randomly chosen interviews under the axial codes (step 4).

In step 5 the inter-rater reliability between researcher A and researcher B on the axial coding (headcodes) was calculated. For the learning activities framework, a substantial Cohen's kappa of 0.74 was found. For the professional learning results framework, the Cohen's kappa value of 0.86 was almost perfect (Sim & Wright, 2005).

Finally, disagreements between the coding of both researchers were discussed to assure validity in the rest of the axial coding, which was finished by researcher A (step 6).

4.4. Analysing process

After finalizing the coding, analysing started by exploring general themes within the headcodes (framework analysis) across participants (cross-case analysis). For example, 'helping' comprised open codes concerning 'improving teaching and evaluation' and 'specific problems in daily practice'.

Second, we binarized the qualitative data on the level of headcodes for each participant. Score 1 was given to a participant if a headcode was present in the interview, score 0 if this was not the case. Binarization is a robust technique to get insight into the appearance of phenomena across or within participants (Onwuegbuzie, 2003). Since all conceptual topics were questioned in all semi-structured interviews, this technique was suitable for the present dataset. The advantage of binarizing relative to counting citations is that it purges personal differences of participants (e.g., talkative versus introverted participants).

Cross-case analyses were conducted, using the headcodes and sub-themes mentioned earlier. The binarized data were used to provide insight into the occurrence of headcodes across participants via the calculation of the relative frequencies (Onwuegbuzie, 2003). For example, 'storytelling' occurred in all 14 interviews. This means that the relative frequency of 'storytelling' is 0.41 (14 of a total of 34 spread over the four learning activities). In theory, this relative frequency is a value between 0 and 1, going from not occurring (0) to being the only occurring code (1). Counting the relative frequencies of all learning activities together ends with a total of 1. Thus, the extent of occurrence of all learning activities compared with each other is reflected by the values (Onwuegbuzie, 2003).

Furthermore, we analysed similarities and differences between participants on the basis of the binary coding. In this process, we started from the binary coding to explore which of the participants behave similarly of differently in their collaborative data use.

5. Results

We start with describing teachers' learning activities with regard to using pupil learning outcomes. Afterwards, we examine teachers' professional learning outcomes.

5.1. Learning activities

Table 4 provides an overview of the relative frequency of teachers' storytelling, helping, sharing and joint work with regard to the use of pupil learning outcomes, as explained in the method section. The first letter in participants' ID identifies the school (teacher team) and the second letter identifies the teacher within

Table 3
Conceptual characteristics of axial codes.

	Axial code	Conceptual characteristics
Learning activities (Little, 1990)	Storytelling	- Asking/talking about learning outcomes - Individually driven: gathering information for own practice - Quasi no interdependency
	Helping	- Advice related to learning outcomes - Individually driven: derives from a need/question - Little interdependency: need of the advice-seeker
	Sharing	- Distribution of materials, strategies, information - Driven from a collective perspective: serving the teacher team - Little interdependency: individual responsibility of teachers
	Joint work	- Actively working together (making arrangements, etc.) - Driven from a collective perspective: make the teacher team work more efficiently/better - High interdependency: joint work is reflected in individual practice
Professional learning results (Zwart et al., 2008)	New ideas, conceptions or beliefs	- Changed understanding - Changed thinking - Changed picture in the mind
	Confirmed ideas, conceptions or beliefs	- Greater proof of something - Support for an idea, conception or belief
	Consciousness	- Awareness grown from new knowledge - Being/acting more conscious on the basis of new knowledge
	Intention to change behavioural practice	- Reject current practice(s)
	Turn new ideas, conceptions or beliefs into practice	- (Plan to) change behavioural practice because of new ideas, conceptions or beliefs
	Turn confirmed ideas, conceptions or beliefs into practice	- (Plan to) change behavioural practice because ideas, conceptions or beliefs have been confirmed

Table 4
Binarized results for teachers' learning activities and relative frequency.

	Participant ID														Total	Relative frequency
	AA	AB	BA	BB	BC	CA	CB	DA	DB	EA	EB	FA	FB	FC		
Storytelling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	0.41
Helping	1	1	1	1	0	1	0	0	1	1	1	1	1	1	11	0.32
Sharing	0	1	0	0	0	0	0	0	0	0	0	1	0	0	2	0.06
Joint work	1	1	0	0	0	0	0	1	0	1	1	1	0	1	7	0.21
															34	**1**

the team. For example, participant CA is teacher A out of school (teacher team) C.

5.1.1. Storytelling

All teachers (N = 14) report storytelling with regard to using pupil learning outcomes, which indicates that this is a common learning activity in teacher teams. This finding is also underpinned by the binarized interview data (Table 4), with a relative frequency of 0.41. Thus, of all the activities in the Little (1990) framework, storytelling is most apparent in terms of using pupil learning outcomes.

We found that two of the participating teachers (BC and CB) limit their learning activities in the context of data use to storytelling activities. When asked what triggers their learning activities, both teachers indicated the need to feel comfortable with people when undertaking storytelling activities. This was confirmed by five other teachers. Only with colleagues with whom teachers have a trusting relationship do they feel confident to tell stories related to classroom practice.

Both teachers that reported only storytelling activities indicated that their learning activities are strongly influenced by the course that is taught by colleagues. For example, teacher BC reports that she does not feel the need to invest in deeper forms of collaboration around pupils learning outcomes since she is the only French teacher in the team. According to her, colleagues are not familiar with her course, whereby helping, sharing or joint work activities would not be meaningful.

We find that storytelling with regard to using pupil learning outcomes is triggered by individual teachers. Most of the time, storytelling is initiated due to poor performances on class tests. For example, several teachers indicate that it is frustrating when pupils do not achieve as expected on tests, especially when these teachers have the feeling that they put a lot of effort into teaching the subject. Storytelling can be initiated by these situations because teachers feel the need to talk about them.

Storytelling regarding the use of pupil learning outcomes mostly occurs ad hoc. When teachers notice a pupils' poor performance on several class tests, they will consult colleagues in order to talk about these performances. Subsequently, a conversation originates based on the learning outcomes of the specific pupil. Teachers exchange information on how the pupil performs in their course: they tell stories about how the pupil's class tests are going. In most cases, storytelling is not only about test scores as such but also about how pupils behave in the classroom.

"The moment I notice that a pupil has difficulties, I will go chat with my colleagues in foreign languages to find out whether or not his/her reading or listening is weak in my colleagues' courses as well." [Participant A, School C].

Teachers suggest that storytelling activities offer them opportunities to frame problems they run into. For example, a teacher tells a colleague about a pupil who does not achieve as expected in his/her course. His/her colleague might have the same experience or a different one. Teachers indicate that, in both cases, knowing the experiences of colleagues is useful in maintaining or reshaping expectations towards the specific pupil. By knowing whether or not the experiences of colleagues are similar, teachers can assess whether a problem is only related to the discipline they are teaching or their teaching style, or whether it might derive from the pupil's general cognitive ability or his/her general attitude at school.

5.1.2. Helping

The majority of the interviewed teachers (11 out of 14) report helping activities with regard to using pupil learning outcomes. Helping is the second most frequently reported activity out of the Little (1990) framework with regard to pupil learning outcomes (see Table 4). The number of 11 interviewees reporting helping with regard to the use of pupil learning outcomes results in a relative frequency of 0.32.

We find that for the majority of the teachers (11 out of 14), collaborative learning activities around pupil learning outcomes are limited to storytelling and helping. As in storytelling, teachers indicate that a trusting relationship is needed to share stories about classroom practice and to seek help. Teacher DA is the only teacher that does not report helping activities despite the fact that she undertakes joint work activities. According to this teacher, she does not feel confident to discuss problems she runs into regarding pupil learning outcomes.

As with storytelling, the trigger for helping with regard to using pupil learning outcomes lies with individual teachers. Similarly to storytelling, helping is initiated when teachers experience a problem. For example, a language teacher tells how he imposed a book review, but that the quality of pupils' assignments did not meet the teacher's expectations. This situation triggered the teacher to search for help among colleagues, by asking critical friends to take a look at his assignment in order to know how to improve it. The example illustrates helping situations we find in the interview data. Helping with regard to the use of pupil learning outcomes occurs when teachers run into problems (often disappointing learning results) with the goal of finding a (quick) solution.

In the citations on teachers' helping activities, we find several data sources that can trigger helping activities. Helping activities can occur around (results of) class tests or exercises:

"You are correcting tests or assignments in the staffroom and you think, 'How should I mark this?' And then you ask the advice of a colleague: 'How would you mark this?'" [Participant A, School F].

Helping with regard to using pupil learning outcomes is often initiated with the aim of improving teachers' assessment practice. For example, a teacher states that she often consults a colleague who teaches the same course to the same grade. When she has doubts about her pupils' marks in assignments, she asks this colleague for advice. A lot of examples of helping with regard to using pupil learning outcomes are similar. Teachers have doubts about the scoring of certain exercises or (types of) errors. Subsequently, they consult colleagues in order to solve these problems.

Teachers talk less often about helping activities on the basis of class tests or exercises with the aim of improving their teaching practice.

In conjunction with class tests and exercises, teachers' classroom observations can be a source of data around which helping activities occur. These cases are often about pupils' (problematic) behaviour in the classroom. Pupils' behaviour that is or becomes problematic in teachers' classroom practice can be a trigger for teachers to consult colleagues for help. By telling colleagues about these situations, teachers hope that their colleagues serve them with (quick) solutions for this behaviour.

5.1.3. Sharing

Only two teachers report sharing with regard to using pupil learning outcomes. Compared with the other activities in the Little (1990) framework, evidence on sharing with regard to using pupil learning outcomes is scarce. Sharing in relation to using pupil learning outcomes remains practically absent, which is indicated by a relative frequency of 0.06. The small amount of evidence on sharing activities compared with the extent to which teachers report storytelling and helping activities is remarkable.

The few citations available lead us to presume that sharing can happen ad hoc in daily conversations as well as in structured settings (team meetings). In the team meetings that are reported by teachers, pupils' scores on class tests are the subject of discussion. One teacher for example states that during these discussions, expectations regarding the ability outcomes of pupils at the end of the year can be made explicit. One teacher reports she also shares strategies in the staff room. In conversations with (certain) colleagues, she talked about low test scores and strategies she used to overcome specific problems with these low achievers.

Although it was the expectation that interview data would provide insight into why sharing activities are limited, we do find indications of the absence of sharing activities among some teachers. Two teachers (FB and FC) indicated that they do not feel the need to undertake sharing activities around pupil learning outcomes. According to them, they have become experienced teachers which implies that they have a lot of insight into materials and strategies to improve pupils' learning outcomes.

Our limited evidence on sharing activities compared with storytelling and helping activities indicates that the higher degree of interdependency in sharing activities might be a hindrance teachers to engaging in these activities. Sharing implies that teachers provide each other with information or materials as a result of common goals. However, common goal setting and a systematic approach to sharing activities remain absent.

5.1.4. Joint work

Half of the teachers (7 out of 14) report joint work with regard to using pupil learning outcomes. Thus, compared with storytelling and helping, the number of interviewees who report joint work with regard to using pupil learning outcomes is small (relative frequency of 0.21; Table 4). Notable is that both learning activities with a higher degree of interdependency (sharing and joint work) appear less frequently among teachers.

In contrast to storytelling and helping, joint work with regard to using pupil learning outcomes primarily takes place in structured settings, such as the team meetings that are organized to monitor and evaluate whether pupils will achieve their desired grade. Teachers explain that, at those team meetings, particularly problematic test scores of pupils are discussed. During these discussions, potential causes of low achievement are defined and arrangements for remedial plans are made.

"For some pupils, we discuss how their scores can be improved. And then we discuss whether they should receive remedial exercises during holidays or if we should provide a remedial hour during class." [Participant C, School B].

At team meetings, the process of discussing test scores, diagnosing problems and making arrangements for actions is carried out quite superficially and only in case of problematic test scores. For example, when a teacher indicates that a pupil's test scores remain problematic, teachers can agree that the pupil will receive a remedial plan. However, how the remedial plan will look remains the responsibility of the individual teacher, sometimes in dialogue with the pupil counsellor.

The aforementioned team meetings are mandatory, which implies that joint work activities with regard to using pupil learning outcomes are not undertaken out of teachers' personal interest or motivation.

Little evidence is available on joint work that takes place outside team meetings. These few examples available mainly include making arrangements for marking tests or assignments. Thus, as with sharing activities, it is remarkable that teachers do not tend to undertake joint work activities with regard to using pupil learning outcomes outside the mandatory team meetings.

The interview data provide some insight into why joint work activities around pupil learning outcomes are limited among teachers. Three of the interviewed teachers (AA, AB, EA) that report joint work indicate that they value collaboration around pupil learning outcomes and that more joint work activities are required. However, according to four out of seven teachers that do not undertake joint work activities (BA, BB, BC, FB), the tendency at school is for teachers to solve their own problems. This is confirmed by three other teachers that do report joint work activities (AA, DA, EB).

In sum, we find that storytelling and helping with regard to using pupil learning outcomes are common activities among teachers. However, a limited number of teachers undertake learning activities with a higher degree of interdependency (sharing and joint work) on a voluntary basis.

5.2. Teachers' professional learning outcomes

Despite the general assumption that data use contributes to teachers' professional learning, we find little evidence of professional learning on the basis of storytelling, helping, sharing and joint work with regard to using pupil learning outcomes. Of the seven types of professional learning results in the Zwart et al. (2008) framework, we only found citations that can be grouped into four types: new ideas, conceptions or beliefs; confirmed ideas, conceptions or beliefs; consciousness; and turning new ideas, conceptions or beliefs into practice. In each case, the reported learning outcomes are the result of teachers' storytelling, helping, sharing or joint work activities in the context of data use.

Given the assumption that data use provides a rich environment for professional learning, it is remarkable that the other types of professional learning results in the framework (changed ideas of the self; intention to change behavioural practice; and turning confirmed ideas, conceptions or beliefs into practice) were not reported by teachers. Table 5 provides information on the binarized results of teachers' professional learning upon teachers' storytelling, helping, sharing and joint work.

5.2.1. New ideas, conceptions or beliefs

Almost half of the participants (6 out of 14) indicate that their learning activities with regard to using pupil learning outcomes result in the growth of new ideas, conceptions or beliefs. The relative frequency calculated is 0.22 (see Table 5), which indicates that new ideas, conceptions or beliefs have a reasonable share in teachers' professional learning.

Table 5
Binarized results for teachers' professional learning and relative frequency.

	Participant ID														Total	Relative frequency
	AA	AB	BA	BB	BC	CA	CB	DA	DB	EA	EB	FA	FB	FC		
New ideas, conceptions or beliefs	1	1	1	0	1	1	1	0	0	0	0	0	0	0	6	0.22
Confirmed ideas, conceptions or beliefs	1	1	1	0	0	0	1	0	0	0	0	0	0	0	4	0.15
Consciousness	1	1	1	1	1	1	1	0	0	1	1	1	1	0	11	0.41
Turn new ideas, conceptions or beliefs into practice	1	1	1	1	0	0	0	0	0	1	0	0	0	1	6	0.22
Changed ideas of the self	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Intention to change behavioural practice	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Turn confirmed ideas, conceptions or beliefs into practice	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
															27	**1**

New ideas, conceptions or beliefs can be general or specific within a situation. For example, a teacher suggests that interacting with a certain colleague for him resulted in a change in expectations towards particular pupils (specific situations).

"Sometimes there is a pupil who behaves differently during your course compared with your colleagues' courses. And knowing that can adjust your image of this pupil in a positive way. I see my pupils only 1 h a week and sometimes I think that a pupil is weakly motivated. But in a different course with a different teacher, that can be completely different." [Participant B, School C].

With regard to general ideas, conceptions or beliefs, a teacher gave the example of test scores that remain low in a pupil group in which he had limited teaching experience. Telling this to a colleague, she told him his tests and assignments were too difficult bearing in mind that those pupils had limited prior knowledge relating to his course. All this led to the teacher having different expectations of pupils in this branch of studies in general.

Altogether, professional learning results in the form of new ideas, conceptions or beliefs reported in the interviews are quite superficial, as illustrated in the examples above. We did not find citations in which teachers suggested that their learning activities with regard to using pupil learning outcomes initiated fundamental new ideas or conceptions in their daily practice.

5.2.2. *Confirmed ideas, conceptions or beliefs*

Of the 14 interviewees, four participants report that confirmed ideas, conceptions or beliefs resulted from their learning activities with regard to using pupil learning outcomes. This type of professional learning has a small share in this study (relative frequency of 0.15; Table 5). Few teachers find confirmation of existing ideas, conceptions or beliefs in storytelling, helping, sharing and joint work.

Confirmed ideas, conceptions or beliefs can be related to teaching in general. Teachers indicated that their learning activities sometimes confirm them in their teaching practice. For example, a language teacher is convinced that teaching a language should incorporate a stronger focus on language skills than pure knowledge. He says that interactions with colleagues strengthen this conviction because his colleagues share the same opinion. Other, more specific, confirmations of ideas, conceptions or beliefs that teachers mention contain insights into 'the teacher they want to be'. Several teachers suggest that interactions with colleagues on using pupil learning outcomes give them a frame of reference for 'the teacher they try to be'.

"These are colleagues who are similar to me. And that has taught me about the teacher I want to be. Like I already said, being committed to your pupils, accompanying them in their learning process." [Participant A, School B].

Despite the assumption built on data use research, it is remarkable to notice that teachers' learning activities do not genuinely seem to initiate new ideas, conceptions or beliefs, nor to confirm existing ideas, conceptions or beliefs. Thus, at cognitive level, the learning activities found in teachers' use of pupil learning outcomes do not make a strong contribution to teachers' professional learning.

5.2.3. *Consciousness*

Consciousness is the most reported type of professional learning outcome among teachers. Over three-quarters of the participating teachers (11 out of 14) indicated that consciousness has resulted from their learning activities with regard to using pupil learning outcomes. This resulted in a relative frequency of 0.41 (Table 5).

Teachers suggest that storytelling, helping, sharing and joint work leads to an increased awareness of things that are happening in their classroom practice. For example, a teacher told the anecdote of a colleague who asked him whether or not a pupil had dyslexia. Apparently, this pupil was making a lot of writing errors in the colleague's course but not in this teachers' course. This made him aware that pupils achieve differently depending on the course of the teacher.

Teachers also indicated that their learning activities help them to situate themselves within the teaching team. According to one teacher, interactions made him realize that he has some colleagues with a totally different view of teaching and learning. He gives the example of teachers who are more severe and who assume that pupils, rather than teachers, are responsible for low achievement.

"I learned that, beside my teaching method, other ways of teaching are possible. And that those ways are not necessarily worse. So if colleagues come to you to ask advice, this means that they have a problem with which they cannot cope. And those interactions around ways of teaching are enriching." [Participant C, School F].

It is curious that teachers almost exclusively reported situations in which they became aware of aspects of their teaching compared with aspects of their colleagues' teaching. We found only a very small amount of evidence of profound reflection upon teachers' personal practice. It is notable that teachers' learning activities with regard to using pupil learning outcomes do not seem to result in deeper awareness or consciousness of teaching, since data use implies processes of thorough analysis and reflection. Thus,

teachers' learning activities make a contribution to attitude level, although the extent of this contribution can be questioned.

5.2.4. Turn new ideas, conceptions or beliefs into practice

Six participants reported new ideas and intentions to change behavioural practice as a result of their learning activities with regard to using pupil learning outcomes. The relative frequency of 0.22 indicates that learning activities may introduce new ideas and intentions to change behavioural practice to some extent (see Table 5).

We find that learning activities might serve teachers with new, general ideas and intentions to change their behavioural practice. A teacher explains that, through talking about pupil learning outcomes, he heard from a colleague who gave his pupils a rubric and let them evaluate their peers' assignments. The colleague told the teacher that the grades pupils gave each other were similar to the grades given by the teacher and that peer assessment was a useful learning strategy for pupils. Through this story, the teacher became convinced by the idea and tried it himself.

Another finding is that teachers' consciousness of their colleagues' teaching styles leads to teachers trying to change their own teaching practice. For example, a teacher indicates that he is strongly knowledge-oriented, while some of his colleagues are not. Interacting with these colleagues made him realize that he should also explicitly value (social) skills of pupils.

"A colleague of mine had low achieving pupils in second grade and she improved her pupils' learning results through study contracts. I remembered it and introduced them in fourth grade when I experienced the same problem." [Participant A, School C].

In general, the changes in practice reported by teachers take the form of quick changes or solutions to problems. On the basis of the interviews, we cannot presume that teachers' learning activities, with regard to using pupil learning outcomes, result in questioning fundamental aspects of teachers' practice and – subsequently – in (planning) to change these aspects. This is noteworthy because data use is generally assumed to guide these processes. Therefore, it is curious that learning activities with regard to using pupil learning outcomes have a small contribution at practice level.

6. Discussion and conclusion

Over recent years, the emphasis on collaboration in data use settings has grown. Researchers believe that teachers' interactions with colleagues regarding data provide valuable opportunities for teachers to learn. Up to now, little evidence has been available on teachers' interactive learning activities during their use of pupil learning outcomes and on the types of professional learning resulting from these activities. Therefore, a qualitative study using semi-structured interviews was carried out in Flanders. We examined (1) teachers' storytelling, helping, sharing and joint work with regard to teachers' use of pupil learning outcomes and (2) what teachers say they learn from these learning activities.

We learned that teachers in this study mainly undertake storytelling and helping activities with regard to their collaborative use of pupil learning outcomes. Within the six teams, teachers primarily engage in learning activities that incorporate no or little interdependency. Sharing and joint work with regard to teachers' use of pupil learning outcomes, learning activities that imply a higher degree of interdependency, are rare.

A possible explanation for this finding might be that the participating teachers experience a great sense of individual responsibility for their pupils' learning outcomes. Thus, although teachers consult (some of their) colleagues in order to discuss, interpret, diagnose or take action upon pupil learning outcomes, they do not tend to feel strong interdependencies with colleagues regarding the use of pupil learning outcomes. Therefore, sharing and joint work might not be common learning activities with regard to the use of pupil learning outcomes among the teacher teams studied.

The limited learning activities with a higher degree of interdependency in our teacher teams is not uncommon in educational research (Katz & Earl, 2010; Kwakman, 2003; Little, 1990). Moreover, with regard to Flanders, the research result confirms our assumption, since Flemish teachers do not generally engage in activities that demand higher degrees of interdependency with their colleagues (OECD, 2013). A limited amount of sharing and joint work among teachers might be the result of teachers not feeling interdependent in terms of teaching and learning (Little, 1990).

Second, we find that the participating teachers' professional learning resulting from the studied learning activities is limited. At cognitive level, we find evidence for new ideas, conceptions or beliefs and confirmed ideas, conceptions or beliefs to some extent. We also find indications that teachers (plan to) change their practice upon new ideas, conceptions or beliefs. Teachers' learning activities contribute the most at attitudinal level. By working together, the interviewed teachers become more conscious of pupils' achievement and of their colleagues' teaching styles. However, overall, the professional learning of teachers resulting from their learning activities regarding the use of pupil learning outcomes in the teacher teams remains limited.

There are two possible ways to explain this research finding. First, the limited impact of teachers' learning activities on their professional learning can be assigned to the learning activities that are found in this study. It might be that storytelling and helping activities are not the activities that lead teachers to professional learning, which has been raised in previous research (Katz & Earl, 2010; Meirink et al., 2009a). Second, teachers' limited professional learning can be explained by the stimuli for learning activities with regard to their collaborative use of learning outcomes. Teachers might primarily aim at support seeking in using pupil learning outcomes collaboratively. Although support seeking can initiate storytelling and helping, learning or practical improvement are not the underlying stimuli. Therefore, these learning activities do not automatically initiate professional learning.

Even though data use is generally supposed to have the potential to initiate profound professional learning, finding limited learning at teacher level is consistent with previous research. One of the major pitfalls in data use is that data users have the tendency to search for quick solutions in data and pass over thorough investigation of (personal) hypotheses (Schildkamp et al., 2015). This thorough investigation of (personal) hypotheses not only increases the quality of the data use process, but also creates time and space for teachers' professional learning (Hubers et al., 2016). Generally speaking, teachers do not aim to question current practices by themselves (Katz & Dack, 2014). Teachers will rather try to fit data into their current thinking (Katz & Dack, 2014), whereby existing assumptions are not challenged and professional learning might not be reached.

This study contributes to current data use literature in several ways. First, this study addresses the need to approach data use as a means for teachers' professional development (Vanhoof & Schildkamp, 2014) and shows that the Little (1990) and the Zwart et al. (2008) frameworks can be useful to do so. Second, contrary to the high amount of intervention studies, data use is examined as a part of teachers' daily life, which is crucial in order to understand the potential of data use in general and the success and sustainability of data use interventions in various contexts. Last, the Flemish context of the study contributes to the school improvement versus accountability debate in the data use field since the results indicate that learning in collaborative data use is not

necessarily self-evident in a school improvement oriented context.

The methodology in this study provided a rich description of teachers' learning activities and professional learning results in a data use context. However, the approach used also has its limitations. The results remained descriptive at participant level, without the data having the potential to reveal micro-processes. To provide more insight into the relation between learning activities and teachers' professional learning, more micro-level research is needed (e.g. through an intervention study). Additionally, the current methodology does not account for which colleagues are consulted in the learning activities studied. However, one cannot look at these activities profoundly without taking into account features of the colleague who is consulted. The characteristics of colleagues might have implications for learning activities that are undertaken and professional learning that is reached. Embedding social network theory would provide opportunities to study whether or not teachers (only) consult colleagues with a similar mindset with regard to pupil learning outcomes and the way this influences their professional learning.

Altogether, this study draws a rather pessimistic image of learning activities in the six teacher teams with regard to discussing, interpreting, diagnosing and taking action upon pupil learning outcomes. Despite the interest dedicated to collaboration with regard to data use (Hubbard et al., 2014; Wayman et al., 2006), the quality and impact of learning activities leading from this collaboration remain unclear. Moreover, since research has shown the value of a greater interdependency among teachers (Katz & Earl, 2010; Meirink et al., 2009b, 2009a) for teachers' professional learning, questions can be raised at the assumption that teachers' collaboration on data use in any case results in profound professional learning (Katz & Dack, 2014; Vanhoof & Schildkamp, 2014). Therefore, the need arises to generate insights into aspects of collaboration that are needed for teachers to learn. More in-depth research on discussing, interpreting, diagnosing and taking action upon data is needed to reveal how collaboration within these processes does or does not contribute to teachers' professional learning.

Additionally, the preconditions for fruitful collaboration on data use have not yet been brought to the surface. This study indicates that interdependencies might be a part of the puzzle. Therefore, future research should take preconditions to initiate and support interdependencies in teacher teams into account, such as structural conditions (for example, structured time for collaboration on using pupil learning outcomes), de-privatizing of the classroom and team-wide goals with regard to pupil learning outcomes (Levin & Datnow, 2012; Verbiest, 2011).

The results of this study imply that teachers' professional learning upon collaborative data use cannot be taken for granted. As interdependencies between teachers are few, one cannot expect that teachers automatically learn from collaborative data use. If data use is set up in schools with the aim of professional learning, a first step could be to support teachers to go beyond storytelling and helping activities, since sharing and joint work are thought of as activities that are more promising for professional learning. Since teachers do not tend to feel these interdependencies, they should be stimulated to create them. A common goal setting related to data use might be the key to success in schools (Levin & Datnow, 2012; Schildkamp, Rekers-Mombarg, & Harms, 2012). This is not self-evident from a teacher's perspective. Therefore, it is important for practitioners to explicate and formulate problems from which a data use collaboration starts (Schildkamp et al., 2015). Working together on solving these problems by using data might result in growing interdependencies, which might lead to an enriching environment for teachers to learn.

There is a growing tendency in data use literature to believe that, next to pupils, teachers themselves also benefit from attempts to use pupil learning outcomes to improve teaching. Despite the fact that the results are not as promising as the research field would expect, this study has provided an important first step in exposing teachers' professional learning related to their use of pupil learning outcomes.

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References

Bakkenes, I., Vermunt, J. D., & Wubbels, T. (2010). Teacher learning in the context of educational innovation: Learning activities and learning outcomes of experienced teachers. *Learning and Instruction, 20*(6), 533–548.

Bertrand, M., & Marsh, J. A. (2015). Teachers' sensemaking of data and implications for equity. *American Educational Research Journal, 52*(5), 861–893.

Bolhuis, E. D., Schildkamp, K., & Voogt, J. M. (2016). Improving teacher education in the Netherlands: Data team as learning team? *European Journal of Teacher Education, 1–20*.

Copland, M. A. (2003). Leadership of inquiry: Building and sustaining capacity for school improvement. *Educational Evaluation and Policy Analysis, 25*(4), 375–395.

Cosner, S. (2011). Supporting the initiation and early development of evidence-based grade-level collaboration in urban elementary schools: Key roles and strategies of principals and literacy coordinators. *Urban Education, 46*(4), 786–827.

Datnow, A., Park, V., & Kennedy-Lewis, B. (2013). Affordances and constraints in the context of teacher collaboration for the purpose of data use. *Journal of Educational Administration, 51*(3), 341–362.

De Volder, I. (2012). *Externe schoolevaluaties in Europa.* Antwerpen - Apeldoorn: Garant.

Hoekstra, A., Brekelmans, M., Beijaard, D., & Korthagen, F. (2009). Experienced teachers' informal learning: Learning activities and changes in behavior and cognition. *Teaching and Teacher Education, 25*(5), 663–673.

Hubbard, L., Datnow, A., & Pruyn, L. (2014). Multiple initiatives, multiple challenges: The promise and pitfalls of implementing data. *Studies in Educational Evaluation, 42*, 54–62.

Hubers, M. D., Poortman, C. L., Schildkamp, K., Pieters, J. M., & Handelzalts, A. (2016). Opening the black box: Knowledge creation in data teams. *Journal of Professional Capital and Community, 1*(1), 41–68.

Jimerson, J. B. (2014). Thinking about data: Exploring the development of mental models for "data use" among teachers and school leaders. *Studies in Educational Evaluation, 42*, 5–14.

Katz, S., & Dack, L. A. (2014). Towards a culture of inquiry for data use in schools: Breaking down professional learning barriers through intentional interruption. *Studies in Educational Evaluation, 42*, 35–40.

Katz, S., & Earl, L. (2010). Learning about networked learning communities. *School Effectiveness and School Improvement, 21*(1), 27–51.

Katz, S., Earl, L., Ben Jaafar, S., Elgie, S., Foster, L., Halbert, J., et al. (2008). Learning Networks of Schools: The key enablers of successful knowledge communities. *McGill Journal of Education, 43*(2), 111.

Kerr, K. A., Marsh, J. A., Ikemoto, G. S., Darilek, H., & Barney, H. (2006). Strategies to promote data use for instructional improvement: Actions, outcomes and lessons from three urban districts. *Americal Journal of Education, 112*, 496–520.

Kwakman, K. (2003). Factors affecting teachers' participation in professional learning activities. *Teaching and Teacher Education, 19*(2), 149–170.

Levin, J. A., & Datnow, A. (2012). The principal role in data-driven decision making: Using case-study data to develop multi-mediator models of educational reform. *School Effectiveness and School Improvement, 23*(2), 179–201.

Levine, T. H., & Marcus, A. S. (2010). How the structure and focus of teachers' collaborative activities facilitate and constrain teacher learning. *Teaching and Teacher Education, 26*(3), 389–398.

Little, J. W. (1990). The persistence of privacy: Autonomy and initiative in teachers' professional relations. *Teachers College Record, 91*(4), 509–536.

Meirink, J. A., Meijer, P. C., Verloop, N., & Bergen, T. C. M. (2009a). How do teachers learn in the workplace? an examination of teacher learning activities. *European Journal of Teacher Education, 32*(3), 209–224.

Meirink, J. A., Meijer, P. C., Verloop, N., & Bergen, T. C. M. (2009b). Understanding teacher learning in secondary education: The relations of teacher activities to changed beliefs about teaching and learning. *Teaching and Teacher Education, 25*(1), 89–100.

OECD.. (2013). *Synergies for better learning. An international perspective on evaluation and assessment*. Paris: OECD Publishing.

Onwuegbuzie, A. J. (2003). Effect sizes in qualitative research: A prolegomenon. *Quality & Quantity, 37*, 393–403.

Pandit, N. R. (1996). The creation of theory: A recent application of the grounded

theory method. *The Qualitative Report, 2*.
Pareja Roblin, N., & Margalef, L. (2013). Learning from dilemmas: Teacher professional development through collaborative action and reflection. *Teachers and Teaching, 19*(1), 18–32.
Penninckx, M., Vanhoof, J., & Van Petegem, P. (2011). *Evaluatie in het Vlaamse onderwijs. Beleid en praktijk van leerling tot overheid*. Antwerpen-Apeldoorn: Garant.
Schildkamp, K., Poortman, C. L., & Handelzalts, A. (2015). Data teams for school improvement. *School Effectiveness and School Improvement*, 1–27.
Schildkamp, K., Rekers-Mombarg, L. T. M., & Harms, T. J. (2012). Student group differences in examination results and utilization for policy and school development. *School Effectiveness and School Improvement, 23*(2), 229–255.
Sim, J., & Wright., C. C. (2005). The kappa statistic in reliability studies: Use, interpretation, and sample size requirements. *Physical Therapy, 85*(3), 257–268.
Vangrieken, K., Dochy, F., Raes, E., & Kyndt, E. (2013). Beyond individualism and isolation in schools: What types of teacher teams are there in schools? or can we merely speak about groups? *Frontline Learning Research, 1*(2), 86–98.
Vanhoof, J., & Schildkamp, K. (2014). From 'professional development for data use' to 'data use for professional development'. *Studies in Educational Evaluation, 42*, 1–4.
Verbiest, E. (2011). Developing professional learning communities. In *Paper presented at the AERA conference, New Orleans*.
Verhaeghe, G., Vanhoof, J., Valcke, M., & Van Petegem, P. (2010). Using school performance feedback: Perceptions of primary school principals. *School Effectiveness and School Improvement, 21*(2), 167–188.
Wayman, J. C., Midgley, S., & Stringfield, S. (2006). Leadership for data-based decision-making: Collaborative educator teams. In *Paper presented at the annual meeting of the American educational research association, San Francisco*.
Zwart, R. C., Wubbels, T., Bergen, T. C. M., & Bolhuis, S. (2007). Experienced teacher learning within the context of reciprocal peer coaching. *Teachers and Teaching, 13*(2), 165–187.
Zwart, R. C., Wubbels, T., Bolhuis, S., & Bergen, T. C. M. (2008). Teacher learning through reciprocal peer coaching: An analysis of activity sequences. *Teaching and Teacher Education, 24*(4), 982–1002.