Chapter 12
Regulation Activities of Teachers in Secondary Schools: Development of a Theoretical Framework and Exploratory Analyses in Four Secondary Schools Based on Time Sampling Data

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12.1 Introduction

Previous research revealed that teachers' and school leaders' regulation activities in schools are most relevant for sustainable school improvement (Camburn, 2010; Camburn & Won Han, 2017; Hopkins, Stringfield, Harris, Stoll, & Mackay, 2014; Kyndt, Gijbels, Grosemans, & Donche, 2016; Messmann & Mulder, 2018; Muijs, Harris, Chapman, Stoll, & Russ, 2004; Stringfield, Reynolds, & Schaffer, 2008; Widmann, Mulder, & Köning, 2018). Regulation activities are (self-)reflective activities of teachers, subgroups of teachers, or school leaders that are aimed at improving current practices and processes in classes and in the school in order to achieve higher teaching quality and more effective student learning. Schools that are highly effective in improving teaching and student learning are those that are able to implement tools and processes on an individual, interpersonal, and school level that enable the school actors to think about and adapt current strategies and objectives, to anticipate new possible demands and develop strategies for meeting the demands successfully in the future, and to reflect upon their own adaptation and learning processes. Regulation activities are interwoven in everyday school practices.

However, there are severe shortcomings of previous research, on both a theoretical and a methodological level. For one, there is a lack of a comprehensive theoretical framework to understand regulation in schools, since current models only focus

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on limited aspects of the regulation activities of teachers and school leaders, and the complex hierarchical and nested structure of everyday school practices has not been considered sufficiently. For another, apart from a few exceptions (e.g. Spillane & Hunt, 2010), research on school improvement and on teachers' formal and informal learning has mostly used self-report on standardized questionnaires, such as teacher surveys on cooperation or teaching practices. The validity of these self-report ratings is limited, however, if the aim is to gain insights into everyday school practices, which is crucial for studying teachers' regulation in the context of school improvement in terms of its significance for student learning (Ohly, Sonnentag, Niessen, & Zapf, 2010; Reis & Gable, 2000).

Hence, in this paper, we develop a framework for understanding regulation in the context of school improvement. Furthermore, we present the results of a mixed-method case study in four lower secondary schools, in which we analysed teachers' regulation activities by using time sampling data of teachers' performance-related and situation-specific day-to-day activities over 3 weeks.

This new methodological approach extends previous research significantly in four different ways: First, whereas in former research teachers' activities were recorded retrospectively, often after a longer period of time, we investigated activities on each day over 3 weeks. This reduces the danger of errors or biases in teachers' remembering of past activities and allows more valid identification of teachers' regulation activities (Ohly et al., 2010; Reis & Gable, 2000). Second, in contrast to investigating activities on a more general level by using self-reports, e.g. at the end of the year, this approach allows us to capture topic-specific activities each day, including informal and formal settings, since a detailed catalogue of activities was provided that helped the teachers to differentiate between the single activities during the day. Furthermore, the approach allows identification of day-specific variation in regulation activities. Third, since the teachers had to specify whether they conducted the activities alone or together with others, the approach allows analysis of the social structure of the regulation activities in a more detailed manner. And finally, since the regulation activities were analysed every day, the relation between day-to-day variation in regulation activities and day-to-day variation in the benefits of these activities for school improvement can be analysed.

In the paper, we first discuss the theoretical background and provide a definition of regulation in the context of school improvement. Second, we present the research questions and hypotheses, followed by a description of the study and the research design. Finally, initial results are presented. The paper closes with a discussion of the strengths and limitations of this newly implemented approach and suggestions for further research.

12.2   Theoretical Framework on Regulation in the Context of School Improvement

12.2.1   Regulation in the Context of School Improvement: Theoretical Anchors

From a theoretical perspective, different approaches exist for describing regulation pertaining to school development. First, of particular interest are approaches that consider the hierarchical as well as the nested and loosely coupled structure of school organisations (Fend, 2006; Weick, 1976) and, in doing so, differentiate between individual and collective regulation processes and activities. Second, due to the dynamic perspective of school improvement (Creemers & Kyriakides, 2012), theoretical approaches have to be able to focus on the processes of regulation.

Accordingly, the present study refers to Argyris and Schön's (1996) theory of organisational learning as a basic theory for understanding individual and collective learning in organizations. As this theory is unspecific in terms of type of organisation, Mitchell and Sackney's (2009, 2011) theory of the learning community is also important for an understanding of individual and collective learning processes particularly in schools. However, neither of the two theories are really able to describe the respective learning processes and learning activities very well. Therefore, self-regulation theories (Hadwin, Järvelä, & Miller, 2011; Panadero, 2017) and particularly the theory of self-regulated learning by Winne and Hadwin (2010) are relevant for this study. The following table (see Table 12.1) provides a brief overview of the core assumptions and theoretical approaches that will be presented subsequently in more detail.

With reference to the first criterion, the theory of organisational learning by Argyris and Schön (1996) and the theory of the learning community by Mitchell and Sackney (2009, 2011) have been crucial for the present study. These theories

Table 12.1 Theoretical anchors for the analysis of regulation in the context of school improvement

Theoretical approach	
Theory of organisational learning (Argyris & Schön, 1996)	Individual and collective learning, including • Single-loop learning: change of actions and strategies • Double-loop learning: change of school-related objectives, strategies, and assumptions • Deutero-learning, meta-learning: change of the learning system
Socio-constructivist learning theories, theory of the learning community (Mitchell & Sackney, 2009, 2011)	Individual, interpersonal, and organisational strategies of reconstruction, deconstruction, and construction of knowledge
Self-regulation theories (Hadwin et al., 2011; Panadero, 2017; Winne & Hadwin, 1998)	Regulation strategies of • Conditions (tasks and cognition) • Operations • Standards

assume that changes in organizations cannot be explained through individual learning processes of particular actors alone: To a significant extent, changes also involve collective or organisational learning. In contrast to Argyris and Schön's (1996) theory, which can be understood as a basic theory of organisational learning, Mitchell and Sackney's (2009, 2011) theory of learning communities is based on schools explicitly. It, therefore, puts a stronger focus on pedagogical processes and people's growth and development than theories of learning organisations do (Mitchell & Sackney, 2011, p. 8). This is of particular relevance for the study at hand, which we conducted at secondary schools. Mitchell and Sackney (2011) differentiate collective learning processes even further and distinguish between interpersonal and organizational learning processes. This differentiation is crucial for the understanding of schools, since schools are distinguished by their complex structure, ranging from individual teachers to different formal and informal social subgroups and sub-processes that are only loosely coupled (Weick, 1976) to the school's organization as a whole. To understand teachers' regulation in secondary schools, it is necessary to combine these subsystems explicitly so as to increase the ecological validity of the theory.

Accordingly, in this study, we will differentiate between individual regulation (for example, analysis and adaptation of individual lessons by a teacher), interpersonal regulation (for example, analysis of teamwork by a subgroup of teachers and adaptation of the modus of working), and organisational regulation (for example, adaptation of teaching processes based on the results of external evaluation by the school as a whole).

However, the analysis of regulation, regardless of whether the regulation is done by individuals, subgroups of teachers, or the whole school, requires a dynamic perspective on the research topic. This means referencing theoretical concepts that are able to identify and describe the corresponding processes.

As with the first criterion, for understanding regulation as a process, a first important theory is Argyris and Schön's theory of organisational learning (1977, 1996). At the centre are the theories-in-use of the various actors and of the organization. The theory-in-use is the actors' implicit knowledge about the organization, which affects the actors' subsequent actions and their individual and organizational learning. Individual and organizational learning processes are based on a cybernetic model. In the model, actions, objectives, and the learning system as a whole are analysed in a regulatory circle, distinguishing between three different learning modes: (a) single-loop learning, or "instrumental learning that changes strategies of action or assumptions underlaying strategies in ways that leave the values of a theory of action unchanged" (Argyris & Schön, 1996, p. 20), (b) double-loop learning, or learning that "results in a change in the values of theory-in-use, as well as in its strategies and assumptions" (p. 21), and (c) deutero-learning (also called second-order learning, or learning how to learn) that enables the members of an organization to "discover and modify the learning system that conditions prevailing patterns of organizational inquiry" (p. 29). The driving force behind these learning processes are challenges or unsatisfactory results, based on which alternative actions and objectives are extrapolated, and the organizational theory-in-use is modified.

For the present study, this means that regulation in schools could be understood as strategies of analysing and adapting current actions in the classroom by individuals, by subgroups of teachers, or by the whole school by reacting to internal or external challenges, conditions, and requirements (single-loop learning). In addition, regulation in schools can be understood as individual and collective strategies of analysing and adapting objectives and values in the school as well as the school's tactics and assumptions (double-loop learning). And finally, regulation is related to analyses of the organization's learning system and the effectiveness of the implemented single-loop and double-loop learning strategies, respectively (deutero-learning).

Although Argyris and Schön's theory is relatively old and learning processes are described in little detail, there are some congruences with current self-regulation theories (e.g. Panadero, 2017; Winne & Hadwin, 2010; Zimmerman & Schunk, 2001, 2007). As do Argyris and Schön, they refer to theories on information processing as well as socio-constructivist learning approaches (Panadero, 2017; Zimmerman, 2001). However, self-regulation theories describe regulation explicitly and in a more differentiated manner (Panadero, 2017; Zimmerman, 2001). These theories assume that learning is a result of an active and (self-)reflective manner concerning information processing; cognitive, metacognitive, motivational-emotional, and resource-oriented learning strategies are applied when dealing with the individual characteristics of the students and the characteristics of the task to be carried out. Further, there is a strong focus on the aspect that knowledge is constructed and thus constitutes a mental representation, which is analysed and advanced through active involvement of the student or teacher depending on the sociocultural and situative context (Järvenoja, Järvelä, & Malmberg, 2015).

The recursive model of self-regulated learning by Winne and Hadwin (1998), which strongly emphasizes (meta)cognitive processes, is of particular relevance for the present study. At its core are five dimensions, abbreviated as COPES: conditions, operations, products, evaluations, and standards. Regulation refers to the three dimensions conditions, operations, and standards. That means that based on an evaluation of the achieved products, either the conditions, the operations, or the standards will be regulated if the achieved products do not fulfil the requirements.

- First, regulation can refer to the conditions of the learning process; these are characteristics of the tasks to be processed (e.g. task resources, time, social context) as well as individual requirements (e.g. beliefs, dispositions, motivational factors, domain knowledge, knowledge of tasks and of study tactics and strategies). In the school context, these comprise, for example, analysis and adjustment of the time available (e.g. provide extra time) to conduct school improvement projects (task conditions) or regulation of teachers' and school leaders' knowledge of school development processes and school improvement strategies by collecting more information on how to proceed effectively (cognitive conditions).
- Second, regulation can refer to the operations that are used for analyzing and processing the available information. Here, cognitive, metacognitive,

motivational-emotional, and resource-oriented regulation strategies can be differentiated. Cognitive strategies in the school context may be, for example, strategies of teachers, a subgroup of teachers, or a steering committee, for summarizing and structuring different school-related pieces of information gained from internal and external evaluations. Metacognitive strategies are, for example, strategies of a subgroup of teachers for analyzing strengths and weaknesses of a new teaching model and for mapping out its further development (Pintrich, 2002). Motivational-emotional regulation strategies are used to increase the teachers' interest in implementing school-related reforms (Järvelä & Järvenoja, 2011; Wolters, 2003). Therefore, school-specific regulation referring to operations can be seen if teachers or groups of teachers analyze and adjust their cognitive, metacognitive, or motivational-emotional and resource-oriented regulation strategies in order to achieve a better understanding of the problem or to increase teachers' motivation to deal with daily challenges.

- Third, regulation refers to the standards that should be achieved. In the school context, corresponding regulation processes are visible if individual teachers, subgroups of teachers, or the entire school modify the standards of a school reform due to difficulties, by, for example, lowering the standards or setting different priorities.

Apart from the approaches by Argyris and Schön (1996) and by Winne and Hadwin (1998), Mitchell and Sackney's (2009, 2011) theory of the learning community is especially interesting for the relevant issues in this study because it provides a pedagogical and multilevel perspective on learning and regulation processes in schools. The theory is again based strongly on a socio-constructivist theory on individual and collective learning. However, it does not emphasize information processing approaches of learning. Mitchell and Sackney (2011) interpret knowledge and knowledge construction as "a natural, organic, evolving process that develops over time as people receive and reflect on ideas in relation to their work in the organization" (p. 40). Based on this approach, school-related regulation can be described as an individual but also collective strategy of active and reflective constructing of knowledge, whereas professional narratives of individuals and groups are reconstructed and deconstructed in a complex process. In doing so, teachers not only deal with their own ideas and experiences and identify their existing practices, reflect on strengths and weaknesses in their work, and "search for one's theory of practice" (p. 21), but also look for new ideas and new knowledge: They discuss new approaches or strategies with others or experiment with new methods and actively seek out new ideas within and outside their school, in order to utilize them for further developing lessons and learning. In the course of this, the objective is the "transition from familiar terrain to new territory" (p. 47).

Mitchell and Sackney's theory (2009, 2011), which also explicitly includes collective regulation strategies, is of particular relevance for this study, since sensemaking processes of the actors in organisations have a pivotal effect on their actions (Coburn, 2001; Weick, 1995, 2001). But the theory also highlights social contexts and social interactions in particular as being a key area of influence regarding

learning processes. As a consequence, learning takes place in social interactions, and knowledge – such as knowledge on effective teaching or school development – is reconstructed and deconstructed and thus extended on the basis of previous experiences and knowledge through sensemaking and (meta)cognitive adaptation processes.

12.2.2 Definition of Regulation in the Context of School Improvement

Considering the theoretical references outlined in the previous section, regulation in the context of school improvement can be defined as the (self-)reflective individual, interpersonal, and organizational identification, analysis, and adaptation of tasks, dispositions, operations, and standards and goals by applying cognitive, metacognitive, motivational-emotional, and resource-related strategies. Regulation means to reconstruct and deconstruct the current practices and, subsequently, to further develop the practices by searching for and constructing new knowledge in order to increase the support and learning success of the students. Regulation is a complex, iterative, non-linear, exploratory, and socio-constructive process of dealing with tasks, of which the actions, motivations, emotions and cognitions are recursively related to each other. Regulation can be realised in formal and informal settings (Kyndt et al., 2016; Meredith et al., 2017; Vangrieken, Meredith, Packer, & Kyndt, 2017) and individually or in smaller or larger groups (Hadwin et al., 2011) together with people and institutions from within the school or from outside. Therefore, regulation can be understood as a socially constructed and shared but also socially situated process, since regulation always takes place in social learning situations (Järvelä, Volet, & Järvenoja, 2010; Järvenoja et al., 2015) and is embedded in daily routines (Camburn, 2010; Camburn & Won Han, 2017; Day, 1999; Day & Sachs, 2004; Gutierez, 2015).

Four different regulation areas can be distinguished: (a) tasks, (b) goals and standards of tasks, (c) dispositions of actors or group of actors, and (d) operations (see Fig. 12.1):

(a) Tasks are understood in their broad sense. They encompass requirements and challenges for teachers, subgroups of teachers, school leaders, and other actors that arise in the development of the school and teaching and in the support of students. There are, for example, organizational and administrative tasks, tasks in curriculum development, tasks in the development of teamwork, or school-related quality management and development tasks. Consequently, tasks may vary regarding their complexity, instructional cues (e.g. well- vs. poorly-defined tasks), time needed, resources available or regarding who is in charge of carrying out the task (individuals, subgroup of teachers, school leader, or the whole school). Regulation of tasks means to analyse the task that has to be carried out, to make sense of the task or to identify challenging or easier aspects of

Context: (social) structures (individual, cooperative), situations, guidelines	
Tasks of individuals, subgroups, and the school as organisation Content Resources (e.g. time, material) Instructional cues Complexity Social context	**Goals and standards of individuals, sub-groups, and the school as organisation** Complexity Relevance for student learning Differentiation Leeway Alignment
Focus of Regulation	
Dispositions of individuals, sub-groups, and the school as organisation *Motivational-emotional*: motivational orientations, emotions, mindset, values *Cognitive*: tactics and strategies, declarative and procedural knowledge of school improvement, of task, of strategies, of actor(s)	**Operations of individuals, subgroups, and the school as organisation** Explicitness vs. implicitness Fit Grain size Depth of the analysis
Individual and collective characteristics: gender, professional experiences, etc.	

Fig. 12.1 Focus of regulation in the context of school improvement

realization of the task, to search for new knowledge to understand the task, and to extend or reduce the complexity of the task, for instance, if the task is too hard to be resolved.

(b) Goals and standards of tasks in the context of school improvement are closely related to the task that has to be performed. The goals can differ in their complexity (e.g. rather low [organize a meeting] vs. rather high [the introduction of sitting in on classes or new teaching methods]) and in the relevance for supporting students' learning. Further, they can differ in the level of differentiation (e.g. how precisely the goals are described), in their alignment with guidelines, in the leeway to modify the goals, and in the standards that have to be achieved. Regulation of standards and goals means to analyse the appropriateness of the goals of a specific task and the standards that are related to the realization of the task. If necessary, goals have to be modified, extended or diminished, and standards can be lowered or raised to increase the chance of successfully achieving the goals.

(c) Dispositions of actors or group of actors are relevant conditions for task realization. Motivational-emotional and (meta)cognitive dispositions can be distinguished. The regulation of these dispositions means, for instance, that strategies are applied to increase motivation to deal with the task (e.g. individual and

collective self-efficacy, mindset), to reduce fear or pressure to perform, or to increase knowledge of the task or of the required tactics and instruments to resolve the task.

(d) Operations are implicit and explicit tactics, methods, and strategies that refer to two different areas: (i) strategies to carry out tasks in schools (e.g. teaching methods, strategies to support students, strategies to cooperate), and (ii) strategies to regulate current practices in schools (e.g. cognitive or metacognitive strategies). In the former, operations may be regulated by making the applied methods and strategies more explicit or by analysing how well the strategies fit for accomplishing the goals of the operations. In the latter, understanding operations as strategies to regulate practices in school, the regulation of these operations means to regulate the analyses, and adaption process itself, or, in the sense of Argyris and Schön (1996), the individual or collective learning system (deutero-learning). Therefore, actors may modify and adjust the 'grain size' of the applied regulation strategy, realizing, for instance, that they have been applying overly narrow strategies to deal with teaching problems and that they need to take a wider look at the problem, for instance, by seeking to gain knowledge from experienced teachers outside the school. Further, they might modify the applied regulation strategies by increasing the depth of their analyses to better understand the task.

This understanding of regulation is compatible with the concept of reflective practice or reflection as it is used in many previous studies (Nguyen, Fernandez, Karsenti, & Charlin, 2014; Schön, 1984). As analysed in the systematic review by Nguyen et al. (2014) on theoretical concepts on reflection, regulation is an explicit process of becoming aware and making sense of one's thoughts and actions with the view to changing and improving them. It is also compatible with the concept of reflective dialogue, which has been identified as a central feature in professional learning communities (Lomos, Hofman, & Bosker, 2011; Louis, Kruse, & Marks, 1996). We also see some congruence between our concept of regulation and the concept of informal learning or workplace learning (Kyndt et al., 2016). These theoretical approaches are interesting for the present model, since they put a focus on everyday learning that occurs not only in formal settings like vocational training but also in not planned and formally structured occasions that are embedded in daily work. However, the concept of regulation developed here represents a significant extension: It is more differentiated than the concepts mentioned, since it explicitly emphasizes the particular regulation practices that help people to understand and to improve current practices. Further, it introduces a multilevel perspective that takes into account the complex, hierarchical, and nested structures of schools as organizations. With this, it will become possible to develop a deeper understanding of regulation in the context of school improvement, to identify possible difficulties in dealing with complex school-related requirements, and to develop approaches for promoting regulation in schools more effectively.

In this paper, an emphasis is put on the analysis of the regulation tasks that are performed over 3 weeks. Of special interest are what daily regulation activities of

the teachers occur, and to what extent possible variabilities are associated with teachers' daily experienced benefit, teachers' daily satisfaction, and teachers' individual characteristics.

12.3 Previous Research on Daily Regulation in Schools and Research Deficits

Research on teachers' regulation in schools has focused above all on the analysis of teachers' reflective practices and on informal learning in the workplace. Studies on teachers' reflective and informal practices have been conducted primarily in three areas: (a) frequency level, or content of the reflection and informal learning on the basis of standardized surveys, qualitative data, or a mixed-method design; (b) efficiency of targeted interventions or professional learning programmes on teacher's reflection and informal learning and identification of significant prerequisites for reflective and informal learning; and (c) efficiency of teachers' reflective practices and informal learning regarding the professionalisation of the teachers, teaching development, or student performance. The studies frequently pursue multiple objectives, although there is a stronger focus on the first two aspects, and research is very much limited in terms of the analyses of effects of reflective and informal practices (Kyndt et al., 2016).

Camburn and Won Han (2017) reanalysed three large US studies comparatively. Taken together, approximately 400 schools with 7500 teachers were analysed using standardized surveys on reflective practices. The results, which were based on teachers' retrospective assessment of their practices, showed that the majority of teachers reported active reflective practices in various forms. However, if the specific contents of reflection are focused on teaching or school-related aspects, for example, the results showed that only some teachers, generally less than half, engaged more frequently in reflective practices. In particular, reflective practices were reported regarding content or performance standards, reading/language arts or English teaching, teaching methods, curriculum materials or frameworks, and school improvement planning. In contrast, reflective practices that would require a considerable amount of introspection and initiative were rather rare (p. 538) (see also Kwakman, 2003).

There were major differences to be found in teachers' reflective practices (Camburn & Won Han, 2017). The differences could be explained particularly by the teachers' experience in reflection or by provision of instructions for professional development. Individual characteristics such as gender or ethnic background seemed to have no effect on teachers' reflective practices. However, the role that the teachers take in schools (e.g. senior managers, teachers, support staff) and the subject that the teachers teach were revealed to be significantly related to teachers' profile of learning (Pedder, 2007).

Besides teachers' individual factors, particularly interest and motivation for reflexive learning, school factors are most relevant for explaining differences between teachers in their reflexive practices, particularly teachers' autonomy, embedded learning opportunities, school culture, support, or leadership (Camburn, 2010; Kyndt et al., 2016; Oude Groote Beverborg, Sleegers, Endedijk, & van Veen, 2017).

As to school differences, Camburn and Won Han (2017, p. 542) found hardly any differences in the frequency of reflective practices. The largest difference between the schools was whether or not reflective practices were implemented with the help of experts from outside the schools. However, Pedder (2007) suggested that there are differences between schools if the mix of learning profiles of teachers (e.g. high levels of in-class and out-of-class learning vs. low levels of in-class and out-of-class learning) are identified, analysed by using cluster analyses considering four types of learning (enquiry, building social capital, critical and responsive learning, and valuing learning).

Gutierez (2015) analysed the reflective practices of teachers as well but, in contrast to Camburn and Won Han (2017), over an entire school year on the basis of a qualitative design. Further, the study aimed to record not only the frequency of reflection over the school year but also the level of reflection. The focus was on the reflective practices of three groups of public school elementary science teachers taking part in a professional development programme. The researcher used a variety of methods, including daily reflective logs, field notes, survey forms, and audio- and video-taped recordings of all the teachers' interactions, which at the same time recorded teachers' reflections on their practice. Through the analysis of reflective interactions, Gutierez was able to identify three levels of reflective practice: descriptive, analytical, and critical reflection. The levels differed in their complexity (consideration of possible arguments for understanding of situations). Critical reflection was identified as the highest level. Reflective interactions were observed in practically all conversations, but the level of reflection varied in frequency. Descriptive reflective interactions were the most frequent (43%), followed by analytical (30.8%) and critical reflective interactions (26.2%). Further, reflective practice was less visible in normal conversations but was especially visible where it was initiated by "knowledgeable others" (Gutierez, 2015).

A look at Gutierez (2015) and Camburn and Won Han (2017) yields the insight that less complex reflective practices take place more often than more complex reflective practices. This is also evident in the German-speaking context (Fussangel, Rürup, & Gräsel, 2010; Gräsel, Fussangel, & Parchmann, 2006; Gräsel, Fußangel, & Pröbstel, 2006), which is also the context in which the study presented here was conducted. However, the two studies also found that reflective practices can be facilitated by selected external persons, "knowledgeable others" (Gutierez, 2015) or "instructional experts" (Camburn & Won Han, 2017), which is in line with various other studies on the professionalisation of teachers and school development (Butler, Novak Lauscher, Jarvis-Selinger, & Beckingham, 2004; Creemers & Kyriakides, 2012; Day, 1999; Desimone, 2009; Kreis & Staub, 2009, 2011; West & Staub, 2003).

Even though these studies provide some insights on teachers' reflective practices and informal learning, various questions remain open concerning both methodology and content. Whereas the methodological approach chosen by Gutierez (2015) or others (see e.g. Raes, Boon, Kyndt, & Dochy, 2017) allows for a simultaneous recording of reflective activities without the bias of individual distortion through retrospective recording, the approach can only be used in small samples because of the time requirements for data collection. In contrast, it is possible to gain insights into the reflective activities of a large number of teachers using the standardized approach chosen by Camburn and Won Han (2017); however, these insights are restricted in their validity because of self-reports, since they constitute reflective actions that are evaluated retrospectively and interpreted subjectively. This presents similar methodological difficulties to those that have been discussed in self-regulation studies for years (e.g. Spörer & Brunstein, 2006; Winne, 2010; Wirth & Leutner, 2008).

Since research on teachers' reflection and informal learning is basically dominated by qualitative approaches that allow exploratory gathering of in-depth knowledge on professional learning but are limited in terms of generalisation of the results (Kyndt et al., 2016), new approaches with a more quantitative perspective have to be developed. These approaches should be effective in assessing how teachers regulate their work in a daily situation concretely, taking into account a more dynamic perspective and how effective the regulation strategies are for teachers' and students' learning (see also Oude Groote Beverborg et al., 2017, and the paper in this book). Therefore, analysis of teachers' day-to-day practices and learning requires methods that are able to record individual activities as promptly and accurately as possible. This would not only increase the ecological validity of the measurements but would also aid progress in the development of a theoretical understanding of regulation in the context of school improvement.

In classroom research, strategies with daily logs for teachers have been developed in recent years that make it possible to record concrete day-to-day classroom practices (Elliott, Roach, & Kurz, 2014; Glennie, Charles, & Rice, 2017). Corresponding analyses have revealed that in this way, interesting insights into concrete classroom practices can be gained – insights that systematically increase the level of knowledge and are associated systematically with external criteria, such as with student performance – and that these methods can be deemed valid based on comparison with other methods, such as observations (Adams et al., 2017; Kurz, Elliott, Kettler, & Yel, 2014).

In school development research as well, there are initial studies available that assessed performance-related activities and practices using various methods. Accordingly, studies by Spillane and colleagues analysed the daily activities of school leadership based on experience sampling data (Spillane & Hunt, 2010) and end-of-day log data (Camburn, Spillane, & Sebastian, 2010; Sebastian, Comburn, & Spillane, 2017). In addition, interviews, observation data, or standardized surveys were used. The studies found a high variability in the activities of the school leaders (e.g. administration, instruction) and also substantial differences between the respective school leaders as well as in the course of the week. According to Spillane

and Hunt (2010), three types of school leaders' practices can be differentiated: administration-oriented, solo practitioners, and people-centred.

Sebastian et al. (2017) found that the variation in school leadership practices is domain-dependent, whereas differences were particularly significant for the domains "student affairs" or "instructional leadership" and particularly small for the domains "finances" or "professional growth." In the course of a week, there were only a few differences. One of these differences concerned individual development ("professional growth"): These activities seemed to be performed at the end of the week rather more often, whereas other tasks (e.g. community/parent relations and instructional leadership) were less likely to be performed at the end of the week. The differences between school leaders could be attributed to a (weak) influence of the school's performance level as well as size and type of school.

Further, the analyses showed that valid information on school improvement processes can be gained regarding the daily activities of school leaders with the help of the chosen methods (Camburn et al., 2010; Spillane & Zuberi, 2009). Moreover, a comparison between experience sampling methods and daily log methods showed that both methods delivered similar results; however, the daily log method has proven to be easier in its application and less intrusive on a daily basis (Camburn et al., 2010).

Johnson (2013) investigated school development activities as well. The study analysed 18,919 log entries of instructional coaches at 26 schools, who supported the schools in meeting the needs of at-risk and low-income students (the sample included 23 Title I and three School Improvement Grant schools in the Cincinnati Public Schools). Their specific activities were subsumed under three different categories, and the study analysed to what extent the patterns of categories of work were connected to different state performance indicators. In addition, the results showed that differences in the activities of the school leaders can be identified based on the chosen methods, which, furthermore, correlated with performance indicators.

In summary, research has found that more differentiated information on the activities of teachers, school leaders, and coaches can be gathered using the daily log method rather than with retrospective methods. In contrast to the studies referred to above, what is still missing in the literature are studies that assess the teachers' daily regulation activities outside the classroom with the help of daily logs. Therefore, it remains unclear to what extent teachers deal with their concrete work reflectively and to what extent they regulate it.

Hence, the goal of the case study presented here is to describe the regulation activities of teachers at four secondary schools over 3 weeks. With reference to the theoretical framework presented in Sect. 12.2.2, the main focus is on the regulation of tasks, e.g. organisational-administrative tasks, teaching and learning tasks, or team and school development tasks. However, we will not be able to analyse what regulation strategies the teachers applied, or on what quality level they regulated these aspects. Therefore, we will not corroborate the validity of the theoretical framework. Instead, our first aim is to obtain insights into the day-to-day regulation activities of teachers at secondary schools and to extend the respective literature particularly by analysing teachers' day-to-day activities. To achieve this, we

developed a new task- and day-sensitive instrument for teachers that is based on the time sampling method (Ohly et al., 2010; Reis & Gable, 2000). Our second aim is to investigate the validity of the instrument. However, one has to keep in mind that only a small school sample is examined. Therefore, the analyses can be interpreted only as exploratory.

12.4   Research Questions and Hypotheses

To achieve the aims of this study, we analyse two different sets of research questions: The first set of questions examines teachers' daily regulation activities and analyses differences between tasks, parts of the week, persons, and schools. To investigate the validity of the newly developed instrument, we test hypotheses related to previous research. The second set of questions examines the relation between teachers' daily regulation activities and teachers' perceptions of the benefit of these activities for student learning, teaching, teacher competencies, and team and school development. Further, we investigate the associations with teachers' daily satisfaction. Again, to verify the validity of the instrument, we test hypotheses based on previous research.

Set of Questions No. 1: Daily Regulation Activities

Question 1a: What daily regulation activities occur in the participating schools, and what is their frequency?

Hypothesis 1 (H1): In particular, the greater part of regulation activities is expected to relate to teaching classes and to administrative-organisational tasks. Regulation activities that require a higher level of introspection and initiative are conducted considerably less frequently, however (Camburn & Won Han, 2017).

Question 1b: To what extent do the daily regulation activities during the week (from Monday to Friday) differ from daily regulation activities on the weekend?

Hypothesis 2 (H2): Systematic differences are expected (Sebastian et al., 2017): Activities that require on-site interactions (e.g. teaching, meetings) will take place during the week more often than on weekends. Moreover, regulation activities that are closely related to demanding situations at school and that require activities in a timely and – if necessary – collaborative manner with other teachers are expected to occur more often on weekdays than on the weekend. Class preparation or follow-up activities are expected to take place on a similar relative level on weekdays and on weekends, since teachers often do teaching preparation or grade student work also on the weekend. In contrast, teachers' study of specialist literature is expected to occur relatively more often on weekend days than during the week as teachers have more free time on weekend days.

Question 1c: To what extent are there differences among the schools in selected regulation activities specifically relevant for school development?

Hypothesis 3 (H3): We expect to find differences among schools (Camburn & Won Han, 2017; Pedder, 2007; Sebastian et al., 2017). However, since only four schools participated in this case study, we expect to find only small differences.

Question 1d: To what extent are there differences among teachers?

Hypothesis 4 (H4): Systematic differences among teachers have to be assumed (Camburn et al., 2010; Camburn & Won Han, 2017; Pedder, 2007; Sebastian et al., 2017; Spillane & Hunt, 2010).

Hypothesis 5 (H5): Teachers with specific leadership roles in schools (e.g. school leader, member of a steering committee) differ from teachers with no leadership roles in particular areas (Pedder, 2007; Sebastian et al., 2017). For example, it can be expected that teachers with leadership roles are involved in activities concerning school quality and school development more often than teachers with no specific leadership roles, and that they are more likely to carry out tasks on behalf of the school. Regarding class teachers with a special responsibility for their classes, a special focus concerning reflection upon their own teaching practices is expected.

Set of Questions No. 2: Interrelation Between Daily Regulation Activities, Perceived Benefit, and Level of Satisfaction

Question 2a: How do teachers perceive the benefits of the daily regulation activities, and how satisfied are teachers at the end of the day? To what extent are there differences among the schools?

Hypothesis 6 (H6): In Switzerland, the main focus of teacher training and continuing education is on improving competencies in the area of teaching and learning. In contrast, competencies in the area of team and school development are promoted less purposefully (Schweizerische Konferenz der kantonalen Erziehungsdirektoren, 1999). Therefore, it is expected that teachers are able to realize their daily activities in a particularly beneficial manner regarding student learning but to a lesser degree when it comes to team and school development. With this in mind, it can also be assumed that teachers' perceived benefit of the activities will be higher for supporting student learning than for team and school development.

Hypothesis 7 (H7): Systematic differences are expected between the schools, since schools differ significantly in their school improvement capacity (e.g. Hallinger, Heck, & Murphy, 2014). As with hypothesis 3 (H3), however, we assume only small differences between schools.

Question 2b: To what extent are teachers' daily regulation activities related to teachers' daily perceptions of benefit and teachers' daily satisfaction level?

Hypothesis 8 (H8): Teachers' regulation activities realized during the day are related systematically to the perceived benefit (H8a) and the level of satisfaction at the end of the day (H8b). However, the strength of the associations between regulation activities and perceived benefit can vary depending on the strength of the overlap between the content of the regulation activities (e.g. individual teachers' reflection upon and further development of their teaching) and the area of bene-

fits (e.g. regarding the improvement of individual teaching practices). As to the relation with the level of satisfaction, previous research is missing. However, we argue in analogy to school improvement and self-regulated research: For instance, school improvement research shows that it is not school leaders themselves but a specific type of leadership that is most beneficial to school improvement (e.g. Hallinger & Heck, 2010). Additionally, the literature on self-regulated learning demonstrates that it is not the quantity itself but the quality of the implemented strategy that is beneficial for learning (e.g. Wirth & Leutner, 2008). Similarly, a rather weak connection between teachers' regulation activities (quantity) and their level of satisfaction at the end of the day is expected.

Question 2c: To what extent is teachers' perceived daily benefit related to their daily level of satisfaction? To what extent do the relations between daily benefit and satisfaction differ among the schools?

Hypothesis 9 (H9): Following the argumentation in hypothesis 8 (H8) above, it is expected that teachers' perceived daily benefit relates systematically to their daily level of satisfaction. This correlation becomes apparent especially when teachers have experienced their daily activities as beneficial for the "core business" of teachers – student learning – and their individual development of teaching practices and competencies (Landert, 2014).

Hypothesis 10 (H10): Correlation strengths between perceived benefit and the level of satisfaction in schools provides information on how important the benefits in a specific area are for satisfaction in a school. Since schools seem to put a focus on teaching and learning processes to different degrees, and since they realize school development processes in different manners (e.g. Hallinger et al., 2014; Muijs et al., 2004), we expect to find differences among the schools in terms of the correlation between teachers' perceived daily benefit and teachers' daily level of satisfaction.

Question 2d: To what extent do individual factors influence the relation between teachers' perceived daily benefit and teachers' daily satisfaction level?

Hypothesis 11 (H11): The expectancy-value theory (Eccles & Wigfield, 2002) assumes that the perceived value of a specific goal as well as the expectation of being able to achieve the goal have an influence on a person's motivation to engage in specific activities. Accordingly, it is assumed that teachers, who are especially interested in analysing and developing teaching and learning processes, are able to benefit more from daily activities that are perceived as beneficial when it comes to their individual levels of satisfaction. They will be especially dissatisfied if their perceived daily activities are deemed less beneficial. Accordingly, we expect to find a closer relation between teachers' perceived daily benefit and teachers' daily level of satisfaction for teachers with a higher level of interest than for teachers with a lower level of interest (moderation effect).

Hypothesis 12 (H12): In contrast, given that there are neither theoretical arguments nor any empirical evidence, it is expected that individual characteristics, such as teachers' sex and length of service, do not have any systematic moderating influ-

ence on the relation between teachers' perceived daily benefit of daily regulation activities and teachers' daily satisfaction levels.

12.5   Methods

12.5.1   Context of the Study and Sample

The study depicted was a mixed-method case study in four lower secondary schools (ISCED 2) in four cantons in the German-speaking part of Switzerland. In these cantons, the compulsory school system is structured into two different levels (primary and lower secondary level), and the total period of compulsory education amounts to 11 years (http://www.edk.ch/dyn/16342.php; [June 12, 2018]). Generally, compulsory education starts at age 4. The primary level – including 2 years of kindergarten – comprises 8 years and the lower secondary level 3 years. In lower secondary schools in the cantons, where we conducted the study, several teachers educate the same students. Therefore, they need to exchange materials and information about the students. In addition, special education teachers and social work teachers extend the regular teaching staff at the schools. Due to the assignment of a greater autonomy to the schools, the schools are required to regularly assess the strengths and weaknesses of teaching and the school. Therefore, school improvement and the regulation of school processes are mandatory and are supervised by external school inspections. However, in contrast to other countries, this is only a low-stake, supportive monitoring without a lot of social pressure (Altrichter & Kemethofer, 2015); the schools, school leaders, and teachers do not have to fear severe consequences if they fail to meet the expectations.

All schools participated voluntarily in this study. For the selection of the schools, it was important to be able to consider different school contexts, considering both rural and urban schools as well as schools in communities with a high or low socio-economic level.

In total, 96 of the total population of 105 teachers and school leaders participated (response rate: 91.4%). The sample in the time sampling sub-study was a bit smaller, however. Here, we were able to analyse the data of 81 participants. Correspondingly, the response rate of 77.1% was a bit lower but still very high (School1 = 87.5%, School2 = 65.2%, School3 = 76.7%, School4 = 78.6%). Table 12.2 shows the composition of the sample in terms of sex, workload (in grades), role (combination in four main groups), and schools.

Since all but one school leader also had to teach classes, we use the term 'teacher' for all participants. The average length of service of the 81 teachers was 14.6 years (SD = 9.2). Moreover, many of the teachers had been working at the school examined for many years (M = 10.2, SD = 8.2). There was no significant difference among the four schools in teachers' length of service ($F(3,70) = 0.013$, $p = 1.00$) or in length of service at the current school ($F(3,70) = 0.247$, $p = .86$) (no table).

Table 12.2 Sample for the time sampling sub-study

		n	%
Sex	Female	40	54.1
	Male	34	45.9
	No response	7	
Workload (% FTE)	$0\% \leq x < 20\%$	0	0.0
	$20\% \leq x < 40\%$	3	3.7
	$40\% \leq x < 60\%$	13	16.0
	$60\% \leq x < 80\%$	10	12.3
	$80\% \leq x \leq 100\%$	48	59.3
	No response	7	
Role	Special needs teacher[a], teacher of German as a second language[a], therapist[a]	2	2.5
	Subject teacher[a]	29	35.8
	Class teacher[a]	28	34.6
	Leadership role (school leader, steering committee)	22	27.2
School	School 1	21	25.9
	School 2	15	18.5
	School 3	23	28.4
	School 4	22	27.2
	Total	81	100.0

Note. There are no data on sex and work load available for 7 of the 81 participating persons. The percentages refer to valid values; *FTE* full time equivalent
[a]With no leadership role

    In total, the very high response rate indicates a very solid empirical data base. Most of the persons who did not take part in the study were on maternity leave or were on a sabbatical from teaching and schoolwork. Therefore, only very few teachers missed filling in the daily practice log. Besides the time sampling sub-study and before the time sampling started, the teachers had to fill in a teacher questionnaire that assessed important dimensions of regulation processes, including interest in and motivation for regulation processes, cognitive and metacognitive regulation strategies, and the school's social and cognitive climate. Further, a network analysis was conducted at each school. However, in this paper, we focus basically on the time sampling data.

12.5.2 Data Collection and Data Base

12.5.2.1 Recording of Regulation Activities

The time sampling method was applied to identify topic-specific day-to-day practices in schools. This method allows more valid identification of teachers' activities than the method of only asking teachers at the end of the year to retrospectively

Table 12.3 Time structure of the on-line journal entries

Week 1	Week 2	Week 3	Week 4	Week 5
Survey	No survey	Survey	No survey	Survey
(7 days)	(7 days)	(7 days)	(7 days)	(7 days)

report the intensity of their activities (Ohly et al., 2010; Reis & Gable, 2000). In addition, capturing activities and associated ratings has an advantage over a more closely meshed recording of a day's activities (e.g. using experience sampling) in that it is less work for the teachers; they only have to record the activities once a day and not all throughout the day, and there is no substantial loss of validity (Anusic, Lucas, & Donnellan, 2016; Camburn et al., 2010).

During three 7-day weeks between fall and Christmas 2017 (a total of 21 days), teachers' activities were assessed using a newly developed tool. Teachers filled in a daily on-line practices log at the end of each workday (including weekend days if work had been done). There was a week's break between each daily log week in order to reduce teachers' burden and workload (see Table 12.3).

One week prior to the first daily log day, all teachers received a personalized e-mail with information on the procedure and how to log in their activities. They had two options for filling in the daily log: (1) via an internet-based programme on their computer, or (2) via an app on their smartphone. Every day, at 5 p.m., they received a text message or an e-mail with the invitation to log in the activities of the day. They had time until 2 p.m. the next day to do so. Based on numerous reports from teachers that the time window was too small, we extended it by an additional day in the second week of the survey. There were no problems regarding the activities' assignment to a specific day.

Right at the end of the data recording period, we conducted interviews with selected teachers and the school leaders at each school. The interviews revealed that the teachers found it easy to fill in their daily activities log. At the beginning, the daily logging was somewhat unfamiliar, but, after a short time, as the teachers became acquainted with the categories and single steps, they carried out the procedure without any major problems. Further, the teachers confirmed the validity of the newly developed measurement instrument, particularly also the categories provided.

The daily practice log had two parts. In the first part, the teachers had to answer three questions[1]:

1. "You are involved in different activities in your school life. Please state for each activity what category you ascribe it to (e.g. teaching)." The teachers had to identify each activity based on a catalogue of four main categories and 15 sub-categories (see Table 12.4). These categories are in line with the official guidelines for school work in Switzerland. To gain an overview on the daily range of activities, any activities that could not be interpreted as primarily regulation activities were also included – especially teaching lessons, class prepara-

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[1] Only the first question will be analysed in this paper.

Table 12.4 Main categories and sub-categories to identify daily activities (regulation activities shown in bold)

Teaching, support of students and parents
Teaching lessons, incl. break supervision and excursions, special events with class or learning group
Class preparation and follow-up activities, grading, assessing the competencies of the students
Reflecting upon and further developing individual lessons
Talking with students and legal guardians outside of class
Cooperation at team level
Exchange on organisational and administrative questions
Exchange on subject-specific questions
Design and further development of teams/work groups
Collaboration at school level
Participating in quality management and development (e.g. evaluation, school projects, organisation development)
Taking part in school conference meetings
Realisation of tasks for the school (e.g. organising school events, taking over duties)
Professional development
Attending school-internal and -external professional development training
Studying specialist literature
Individual feedback (e.g. sitting in on classes)
Taking part in supervision/intervision

tion and follow-up activities, or talking with students and legal guardians. Regulation activities are highlighted in Table 12.4 in bold type.

2. They (the teachers) had to specify whether they conducted the activities alone or together with others: "Please state for each activity if you performed it alone or together with others." Possible answers included: alone, with the school leader, with my own team that meets regularly, with special needs teachers.
3. They (the teachers) had to indicate how long the activities lasted: "Please state the approximate duration of each activity." The response scale was: hours (1 to 8) and minutes (in 10-minute sections: 10 to 50).

In the second part of the daily practice log, the teachers had to rate the benefit of their day in terms of six aspects on a 10-point Likert scale (1 = not at all beneficial, …, 10 = highly beneficial): "If you think back to the past day as a teacher/expert, how beneficial do you rate this day for the following aspects:

- for reaching the students' learning goals
- for the best support and promotion of the students
- for the development of my competencies
- for the development of my teaching
- for the development of our work in the team
- for the development of our school."

Further, they had to rate their day in terms of overall satisfaction and stress,[2] again based on a 10-point Likert scale (1 = not at all, …, 10 = extremely): "If you think back on this day as a teacher/expert, how satisfied are you with the day all in all?", and "If you think back on this day as a teacher/expert, how stressful was this day for you all in all?"

For each teacher, data on up to 21 days were available, resulting in a total of 947 daily records of 81 teachers.

12.5.2.2   Assessment of Interest

For the analysis of possible moderator effects (see research question 2d), two scales were used that were administered through the standardized teacher survey: internal search interest and external search interest.

The scales internal search interest (6 items, Cronbach's alpha = .78; one-dimensional) and external search interest (6 items, Cronbach's alpha = .67; two-dimensional) were developed following Mitchell and Sackney's (2011) concept of internal and external search for knowledge. Internal search interest included to what extent teachers have a substantial interest in learning why certain practices do not work well in their classes, how effective their teaching really is, how good their students really are, and what can be improved in class. An example item for internal search interest was: "Teachers (…) differ according to their interests. To what extent are you (…) interested in different topics? Please state what you (…) would absolutely like to know for your professional daily routine: Absolutely knowing why certain teaching practices do not work well in your own class."

In contrast, the external search interest scale included substantial interest on the part of teachers in ascertaining methods or strategies with which other teachers are able to promote the students particularly well or what methods are available for giving fair grades. This scale was two-dimensional: The first dimension referred to interest in expert knowledge, and the second dimension referred to interest in the experiences of other teachers. An example item for external search interest was: "Teachers (…) differ according to their interests. To what extent are you (…) interested in different topics? Please state what you (…) would absolutely like to know for your professional daily routine: Absolutely knowing how other teachers teach." Teachers responded to these statements on a 6-point Likert scale from 1 (strongly disagree) to 6 (strongly agree).

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[2] Only the question about overall satisfaction is analysed in this paper.

12.5.3   Data Analysis

To answer the research questions on the frequency of the participating school members' daily activities in the first set of questions, their daily activity data were recorded dichotomously (1 = activity performed this day; 0 = activity not performed this day). Not considered was the extent to which certain activities had taken place more than once a day or the duration of the reported activities. Hence, these transformed activity data bring into light the absolute number of daily occurrences of specific activities as well as their proportion relative to the number of days with any entry of an activity. The data were analysed using multilevel analysis. Day-to-day changes in the activities over the assessed 21 days, respectively the use of time series analysis, were not the focus here.

Differences between activities that took place during the week and activities that took place on weekends (question 1b) were tested statistically using chi-square tests.

Differences among the schools (question 1c) were calculated using binary logistic multilevel analyses based on dummy variables for the schools.

For the analyses on a personal level (question 1d), the information on the daily activities was aggregated person-related across all days. Question 1d was analysed descriptively and, for the analysis of differences between persons with different roles, by means of binary logistic multilevel analyses. Therefore, three groups were compared: (1) class teachers, and (2) subject-specific teachers, both with no leadership roles, and (3) teachers with leadership roles.

The answers to the research questions in the second set on the relation between teachers' regulation activities, perceived daily benefits, and levels of satisfaction were given descriptively on a daily basis (question 2a). Differences among the schools were then examined using linear multilevel analyses (level 1: daily entries, level 2: persons).

The answers regarding research question 2b were given on the level of daily activities using Pearson correlation coefficients between teachers' daily activities and teachers' perceived daily benefits.

To answer question 2c on the relation between teachers' perceived daily benefits for three target areas (students, teachers, team/school) and daily level of satisfaction, correlations were calculated for each school separately, and differences in coefficients were tested statistically using multilevel analyses.

To answer the last question, 2d, on possible influencing factors on a personal level on the relation between teachers' perceived daily benefit and daily satisfaction level, random slope multilevel analyses were used with the slope of each person being explained through their characteristics (here: teachers' interest, their sex, and length of service).

To reduce type I errors, for all but one of the above multiple hypotheses tests, we applied an adjustment of the significance criterion using the Holm-Bonferroni method. The analysis of the last question, 2d, was the exception, since the number of hypotheses was limited, and they should be decided separately upon and not family-wise.

12.6   Results

12.6.1   Set of Questions No. 1

12.6.1.1   What Daily Regulation Activities Occur in the Participating Schools, and What Is Their Frequency? (Question 1a)

The results are compiled in Table 12.5. They show the number of daily entries of different activities and the proportion relative to all days on which any entry was made. The underlying data were structured dichotomously (activity was performed vs. was not performed on a given day).

As expected, activities in teachers' 'core business' areas exhibited the highest relative frequencies. They were: *Class preparation and follow-up activities* (84.1% of entries), *teaching* (71.6%), and somehow less often, *talking with students and legal guardians outside of school*, respectively (27.5%); 40.5% of entries indicated *exchange on organisational and administrative questions*, followed *by reflection on and further development of individual teaching practices* (30.1%), *exchange on subject-specific questions* (23.1%), and *design and further development of teams/work groups* (13.1%). Regulation activities in the area of *school quality management and development* were much rarer (5.4%). Completing tasks for the school was recorded approximately once every seventh day. Finally, one series of activities

Table 12.5 Absolute and relative frequency of different activities (regulation activities shown in bold)

	n	Percentage (%)
Class preparation and follow-up activities	796	84.1
Teaching	678	71.6
Exchange on organisational and administrative questions	384	40.5
Reflection on and further development of individual teaching practices	285	30.1
Talking with students and legal guardians outside of school	260	27.5
Exchange on subject-specific questions	219	23.1
Realisation of tasks for the school	136	14.4
Design and further development of teams/work groups	124	13.1
Study of specialist literature	60	6.3
Further training, both within the school and externally	52	5.5
Participating in quality management and development	51	5.4
Taking part in school conference meetings	43	4.5
Individual feedback (e.g. sitting in on classes)	42	4.4
Taking part in supervision/intervision	9	1.0

Note. Data basis: daily entries (N = 947)
All activity data refer to summed-up occurrences (no: 0/yes: 1) on a day. The percentages represent proportions relative to the total number of days on which at least one school-related activity was reported (N = 947). Multiple responses were possible (column sum of percentages >100%)

exhibited a clearly marginalized status – namely, the hardly occurring *taking part in supervision or intervision* (1.0%), *individual feedback* (4.4%), *taking part in school conference meetings* (4.5%), and *further training both within the school and externally* (5.5%). *Studying specialist literature* was reported approximately every 16th day only.

12.6.1.2 To What Extent Do the Daily Regulation Activities During the Week (from Monday to Friday) Differ from Daily Regulation Activities on the Weekend? (Question 1b)

Out of 947 entries of activities, 813 (85.9%) occurred on a weekday, and 134 activities (14.1%) occurred on the weekend (no table). Hypothetically assuming an equal distribution of activities over all 7 days, five out of seven activities (71.4%) would have been performed during the week and two out of seven activities (28.6%) on the weekend. However, the results revealed that school-related activities on weekends were less frequent than during the week (14% of all activities instead of 28% when assuming equal distribution). Yet, the weekend days were also used for school--related activities, albeit a bit less intensively (Table 12.6).

Table 12.6 Average distribution of different activities on weekdays and on weekends (regulation activities shown in bold)

	During the week (%)[a]	On weekends (%)[b]	p[c]
Class preparation and follow-up activities	85.2	76.9	ns
Teaching	82.8	3.7	p < .001
Exchange on organisational and administrative questions	45.5	10.4	p < .001
Reflection on and further development of individual teaching practices	32.5	15.7	p < .001
Talking with students and legal guardians	31.2	4.5	p < .001
Exchange on subject-specific questions	26.1	5.2	p < .001
Realisation of tasks for the school	15.6	6.7	ns
Design and further development of teams/work groups	14.9	2.2	p < .001
Participating in quality management and development	6.0	1.5	ns
Study of specialist literature	5.8	9.7	ns
Further training, both within the school and externally	5.4	6.0	ns
Taking part in school conference meetings	5.2	0.7	ns
Individual feedback (e.g. sitting in on classes)	4.3	5.2	ns
Taking part in supervision/intervision	1.1	0.0	ns

Note. Sequence organized according to percentage during the week
Multiple responses were possible (column percentage total > 100%)
[a]Data basis: daily entries for weekdays (*n* = 813)
[b]Data basis: daily entries for Saturdays or Sundays (*n* = 134)
[c]Statistically tested using chi-square tests; significances adjusted using the Holm-Bonferroni method

Table 12.6 documents the *relative* percentages of the 14 activities analysed within all activities on weekdays vs. weekends. It should be noted that an equally high percentage does not signify equally frequent activities on weekdays and on weekends, when viewed absolutely, but rather an *equal percentage* relative to all reported activities on weekdays and relative to all reported activities on weekends.

Teachers used the weekends especially for *class preparation and follow-up activities* (76.9%), followed by *reflection on and further development of individual teaching practices* (15.7%), and by *exchange on organisational and administrative questions* (10.4%), which can be engaged in easily nowadays through electronic means of communication.

Comparing weekdays and weekends, the results revealed logically coherently that the largest differences appeared in activities that were often place- or time-bound, most of all *teaching* (3.7% on weekends vs. 82.8% on weekdays), but also *exchange on organisational and administrative questions* (10.4% on weekends vs. 45.5% on weekdays), *exchange on subject-specific questions* (5.2% on weekends vs. 26.1% on weekdays), or *design and further developments of teams and work groups* (2.2% on weekends vs. 14.9% on weekdays). *Reflection on and further development of individual teaching practices* was also relatively more common on workdays than on weekend days (32.5% on weekdays vs. 15.7% on weekends).

Whereas *further training activities* and *individual feedback* were reported to a similar relative extent on weekends as on weekdays, the *study of specialist literature* had a nominally slightly higher rating on weekends (9.7% vs. 5.8%), which might be attributed to more time being available. However, this difference was not significant (even without Holm-Bonferroni adjustment).

12.6.1.3   To What Extent Are There Differences Among the Schools in Selected Regulation Activities Specifically Relevant for School Development? (Question 1c)

Two forms of activity were chosen for answering the research question on differences between schools in regulation activities. The two activities are of special interest from a school development perspective, and they occur in sufficient frequency: *Reflection on and further development of individual teaching practices* and *exchange on subject-specific questions*. Table 12.7 shows the average activity percentages by school. The binary logistic multilevel analyses with dummy variables for the schools exhibited no significant contrasts, even without Holm-Bonferroni adjustment. The schools did not differ in the relative percentages of the two activities.

12.6.1.4   To What Extent Are There Differences Among Teachers? (Question 1d)

So far, the daily entries for school-related activities constituted the evaluation units ($N = 947$). In the following, we examine how the activities were depicted on a personal level ($N = 81$) and what differences between the teachers could be identified.

Table 12.7 Activities relevant to school development by school

	School 1 n teachers = 21 n entries = 254	School 2 n teachers = 15 n entries = 122	School 3 n teachers = 23 n entries = 229	School 4 n teachers = 22 n entries = 295	p[a]
Reflection on and further development of individual teaching practices	26.0%	27.5%	29.7%	35.0%	ns
Exchange on subject-specific questions	21.8%	29.0%	22.5%	22.2%	ns

Note. [a]Statistically tested using binary logistic multilevel analyses (dummy coding of schools); significance of multiple contrasts adjusted using the Holm-Bonferroni method

Table 12.8 Average distribution of different activities on a personal level (regulation activities shown in bold)

	Average proportion (%)	Standard deviation (%)
Class preparation and follow-up activities	80.1	26.5
Teaching	73.0	21.3
Exchange on organisational and administrative questions	43.7	26.4
Reflection on and further development of individual teaching practices	33.3	30.4
Talking with students and legal guardians outside of school	27.3	25.0
Exchange on subject-specific questions	27.2	24.3
Realisation of tasks for the school	14.0	19.3
Design and further development of teams/work groups	15.6	21.3
Study of specialist literature	5.6	9.1
Further training, both within the school and externally	6.3	14.1
Participating in quality management and development	6.3	13.4
Taking part in school conference meetings	7.7	19.4
Individual feedback (e.g. sitting in on classes)	4.9	16.2
Taking part in supervision/intervision	0.9	5.2

Note. Data basis: percentages of days with specific activity (occurs vs. does not occur) aggregated on a personal level

For this purpose, the daily dichotomous entries for the activities on a personal level were aggregated into average values (see Table 12.8). Person-related, these averages are to be interpreted as frequency percentages of activities on the days documented by each person. For example, if an activity had the value of 33.3%, as was the case with *reflection on and further development of individual teacher practices*, it follows that the 81 teachers on average reported this activity on every third documented day.

The results differed just marginally from the percentages documented in Table 12.5 on the level of daily activities. However, aggregation on a personal level allowed analysis of the differences between persons. Figure 12.2 depicts a series of diagrams that show, with a resolution of 5%, how the activity percentages of the 81 persons were constituted.

The distributions of the average relative frequencies of different activities on a personal level scattered strongly for specific forms of activity. Regarding regulation activities, especially high variances appeared with *exchange on organisational and administrative questions*, *exchange on subject-specific questions*, and *reflection on and further development of individual teaching practices*. Other forms of activity – of course, most of all, activities with a very low absolute response frequency – but also the very widespread *class preparation and follow-up activities*, exhibited far fewer differences or less distribution.

To analyse the relation between daily activities and teachers' school-related roles, we classified teachers into three groups: (1) class teachers, (2) subject-specific teachers, and (3) teachers with leadership roles. Table 12.9 documents the average percentages of the frequency of the 14 different activities by role. As to the regulation activities that are of interest in this context, the results showed that class teachers were involved especially often in the regulation activities *reflection on and further development of individual teaching practices* (together with subject teachers) and *exchange on organisational and administrative questions* (apart from exhibiting a higher percentage of classes taught or *talking with students and legal guardians*). Teachers with leadership roles, however, engaged in *school-related tasks* and *participation in quality management and development* slightly more often.

However, the differences identified resulted from a systematic analysis of all contrasts between the three groups regarding 14 features, i.e. from a total of 42 pairwise comparisons. Because of the multitude of hypothesis tests, the alpha inflation problem arose. When a Holm-Bonferroni adjustment was carried out in order to neutralize this problem, the significance criterion intensified severely. For the contrast with the lowest *p*-value, the significance threshold would be at $p < .0011$ instead of, uncorrected, .05. With these Holm-Bonferroni adjustments, no contrast exhibited an alpha error below the corrected threshold value. Accordingly, the differences were no longer significant.

12.6.2   Set of Questions No. 2

12.6.2.1   How Do Teachers Perceive the Benefits of the Daily Regulation Activities, and How Satisfied Are Teachers at the End of the Day? To What Extent Are There Differences Among the Schools? (Question 2a)

The results showed that the day's activities were particularly perceived as beneficial for student learning and support of students, followed by beneficial for teachers but at almost a half standard deviation lower (see Table 12.10). The lowest were the
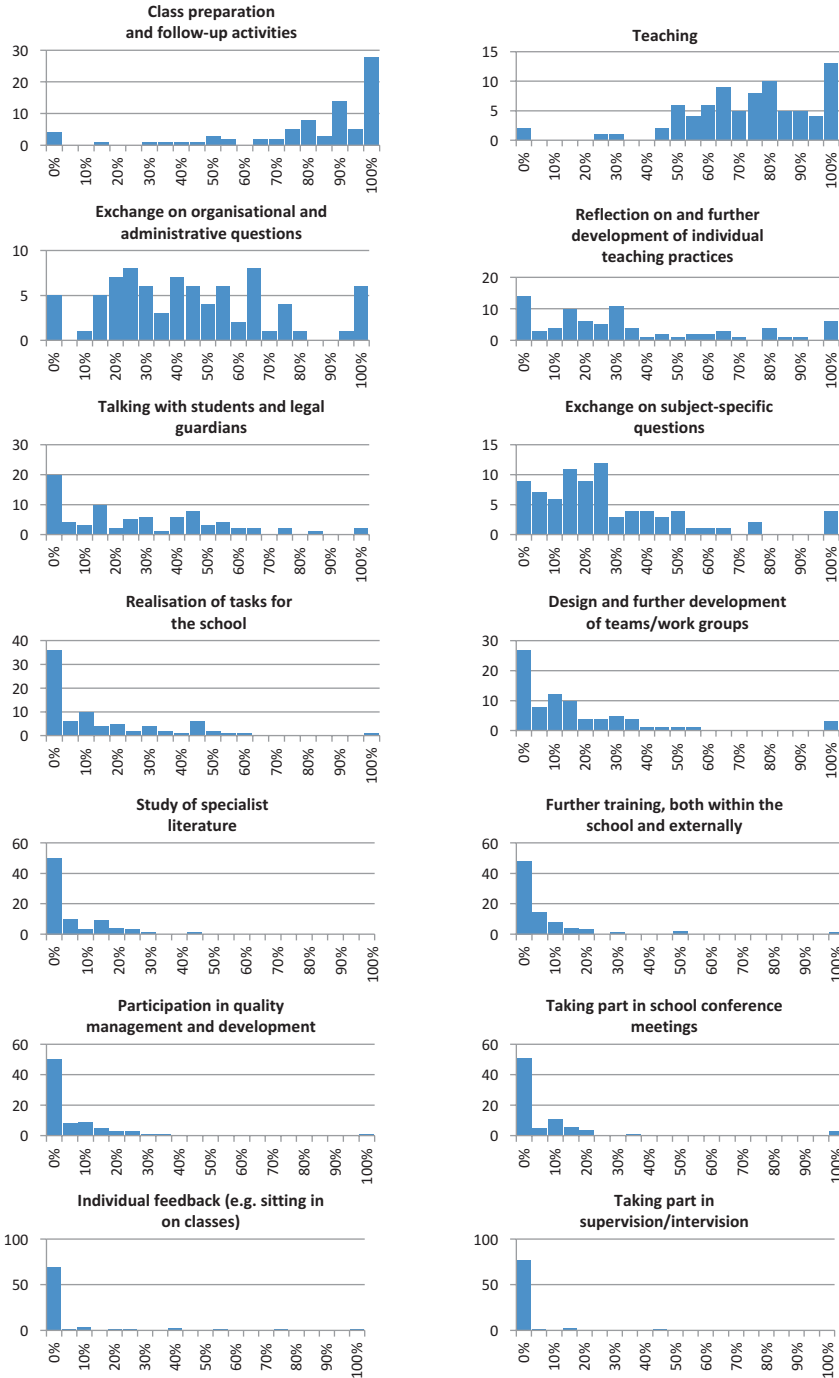
Fig. 12.2 Relative frequencies of different activities on a personal level

Number of persons by average frequency of activities (summarized in levels of 5% each); 100% signifies that this activity was reported on each day an activity had been recorded; 0% signifies that it was not recorded on any of the documented days

Table 12.9 Average occurrence of different activities on a personal level by role (regulation activities shown in bold)

	Class teachers[a] n = 25	Subject teachers[a] n = 23	Teachers with leadership roles n = 30	Significant contrasts[b]
Group number	1	2	3	
Class preparation and follow-up activities	91.5%	78.1%	75.5%	1 > 3
Teaching	83.1%	68.6%	66.0%	1 > 2, 1 > 3
Exchange on organisational and administrative questions	54.3%	33.8%	42.0%	1 > 2
Reflection on and further development of individual teaching practices	40.6%	38.0%	20.6%	1 > 3, 2 > 3
Talking with students and legal guardians	37.0%	22.6%	24.3%	1 > 2, 1 > 3
Exchange on subject-specific questions	28.8%	25.3%	25.7%	Ns
Design and further development of teams/work groups	16.2%	16.1%	15.4%	Ns
Realisation of tasks for the school	10.8%	11.1%	18.7%	3 > 1
Taking part in school conference meetings	7.4%	10.2%	6.1%	Ns
Participating in quality management and development	1.9%	7.5%	9.2%	3 > 1
Further training, both within the school and externally	3.6%	9.3%	6.8%	Ns
Study of specialist literature	2.1%	7.3%	7.7%	2 > 1, 3 > 1
Individual feedback (e.g. sitting in on classes)	3.0%	6.5%	5.8%	Ns
Taking part in supervision/ intervision	1.7%	0.5%	0.2%	Ns

Note. [a]Groups 'class teacher' and 'subject teacher' only comprise teachers with no school-related leadership roles
[b]Statistically tested using binary logistic multilevel analyses on the level of daily activity entries. Contrasts with $p < .05$ were accounted for without an adjustment using the Holm-Bonferroni method

Table 12.10 Average perception of different forms of benefit and levels of satisfaction regarding the activities on a single day

Perceived benefit for…[a]	n	M	SD
Reaching educational objectives of students	899	6.8	2.0
Encouragement and support of students	897	6.9	1.9
Improvement/development of individual competencies	895	6.0	2.1
Improvement/development of individual teaching practices	897	6.0	2.1
Improvement/development of work done in teams	899	5.2	2.5
Improvement/development of the school as a whole	897	5.2	2.5
Level of satisfaction[b]	904	7.4	1.7

Data basis: daily entries regarding productivity perceptions and level of satisfaction (N = 947)
Note. [a]Scale: 1 (not at all beneficial) to 10 (highly beneficial)
[b]Scale: 1 (not at all satisfied) to 10 (highly satisfied)

Table 12.11 Teachers' ratings of different forms of benefit and levels of satisfaction with the activities, by school

Perceived benefit for…	School 1 n = 254 M (SD)	School 2 n = 122 M (SD)	School 3 n = 229 M (SD)	School 4 n = 295 M (SD)	Significant contrasts[c]
Reaching educational objectives of students[a]	6.5 (2.2)	8.0 (1.6)	6.6 (2.1)	6.9 (1.7)	B > A, C, D
Encouragement and support of students	6.6 (2.1)	8.1 (1.5)	6.7 (2.0)	6.8 (1.7)	B > A, C, D
Improvement/development of individual competencies	6.1 (2.0)	6.7 (2.2)	5.7 (2.1)	5.9 (2.0)	–
Improvement/development of individual teaching practices	6.1 (1.9)	6.8 (2.1)	5.6 (2.2)	5.9 (1.9)	–
Improvement/development of work done in teams	4.9 (2.6)	6.0 (2.4)	5.1 (2.6)	5.2 (2.2)	–
Improvement/development of the school as a whole	5.1 (2.6)	6.1 (2.5)	5.1 (2.6)	4.9 (2.2)	–
Level of satisfaction regarding a single day[b]	7.4 (1.5)	8.0 (1.4)	7.4 (1.9)	7.1 (1.6)	–

Data basis: daily entries regarding the perceived benefit and level of satisfaction ($N = 947$)
Note. [a]Scale: 1 (not at all beneficial) to 10 (highly beneficial)
[b]Scale: 1 (not at all satisfied) to 10 (highly satisfied)
[c]Statistically tested using linear multilevel analyses (level 1: daily benefit/satisfaction; level 2: persons). Listed are contrasts with $p < .05$ with adjustment using the Holm-Bonferroni method

perceptions of benefit for developments on the team and school levels. The average level of teachers' daily satisfaction was rather high, with a mean of 7.4. Interestingly, the standard deviation was low.

If the average benefit ratings were calculated separately by schools, one school (school 2) would exhibit clear upward deviations (see Table 12.11). For the two benefit perceptions concerning students, the difference in relation to the other schools proved to be statistically significant, even with a correction of the multiple comparisons problem. Moreover, school 2 exhibited the highest levels of satisfaction for the survey period. However, after adjustment using the Holm-Bonferroni method, this difference was no longer significant. In contrast to the occurrence of activities (see Sect. 12.6.1.3 above), certain benefit ratings seemed to vary significantly between the schools, although it was only one school out of four that differed. Therefore, this result needs to be corroborated in a larger sample.

12.6.2.2 To What Extent Are Teachers' Daily Regulation Activities Related to Teachers' Daily Perceptions of Benefit and Teachers' Daily Satisfaction Levels? (Question 2b)

To answer this research question, the six statements concerning perceived benefit, based on factor analyses and high correlations within each factor, were combined into three learning and development-related benefit aspects, based on the object of

benefit: For the students, for the teachers, and for the team and the school. As Table 12.12 shows, the daily benefit rating for the students' learning process was positively associated with *teaching*, *class preparation and follow-up activities*, and *talking with students and legal guardians*, most of all. If the focus was on regulation activities, however, only less distinct connections appeared. *Reflection on and development of individual teaching practices* seemed to be positively related to teachers' daily benefit rating for student learning.

Overall, taking part in *further training, both within the school and externally* correlated in a slightly negative manner with teachers' perceived benefit for the students. As a consequence, further training was regarded as something from which the main target group was not able to benefit directly and as something that might even diminish the benefit, respectively.

Apart from that, *further training, both within the school and externally* was associated with the perceived benefit for the teachers themselves in a positive manner, together with *reflection on and further development of individual teaching practices* and *teaching*. The other statistically significant correlations with the development of the teachers were very low ($|r| < .10$, i.e. less than 1% explained variation).

Subsequently, perceived benefit for team and school development was related systematically but not very closely to numerous forms of activities in a positive manner, most of all *exchange on organisational and administrative questions* and discussion on the *design and further development of teams and work groups*. *Exchange on subject-specific questions*, *taking part in school conference meetings*, *participation in quality management and development*, *realisation of tasks for the school*, and *reflection on and further development of individual teaching practices* also correlated positively (in decreasing order). *Individual feedback (e.g. sitting in on classes)* was associated in a positive manner significantly as well, yet correlation strength was so low ($|r| < .10$, i.e. less than 1% explained variation) that this relation bears no meaning.

Further, there was no clear correlation between the recorded activities and the daily recorded *level of satisfaction*. Although two of the coefficients were significant ($p < .05$) – namely, *teaching* and *reflection on and further development of individual teaching practices* – correlation strength was below $|r| = .10$ or $r^2 = 1\%$ and, therefore, irrelevant. For this reason, the somewhat surprising negative significance of the correlation with *reflection on and further development of individual teaching practices* bears no meaning.

12.6.2.3   To What Extent Is Teachers' Perceived Daily Benefit Related to Their Daily Level of Satisfaction? To What Extent Do the Relations Between Daily Benefit and Satisfaction Differ Among the Schools? (Question 2c)

To answer this question, bivariate correlations between teachers' daily perceived benefit and daily level of satisfaction were calculated. Table 12.13 documents the Pearson correlation coefficients in general as well as separately for each school.

Table 12.12 Correlations between daily activities and different benefit ratings and level of satisfaction regarding the respective day (regulation activities shown in bold)

	Benefit for students n = 899	Benefit for teachers n = 898	Benefit for team/school n = 899	Satisfaction n = 904
Teaching	0.46***	0.18***	0.14***	0.09
Class preparation and follow-up activities	0.22***	0.06	−0.09*	0.00
Reflection on and further development of individual teaching practices	0.11**	0.25***	0.13***	−0.07
Exchange on organisational and administrative questions	0.07	0.02	0.31***	−0.04
Talking with students and legal guardians	0.20***	0.08	0.15***	0.05
Exchange on subject-specific questions	0.03	0.07	0.23***	−0.01
Design and further development of teams/work groups	−0.01	0.01	0.31***	−0.01
Participating in quality management and development	0.03	0.00	0.17***	0.03
Taking part in school conference meetings	0.00	0.04	0.19***	−0.01
Realisation of tasks for the school	−0.01	−0.06	0.17***	−0.02
Further training, both within the school and externally	−0.17***	0.16***	0.06	−0.01
Study of specialist literature	0.01	0.09	0.04	0.03
Individual feedback (e.g. sitting in on classes)	−0.04	−0.02	0.08	0.00
Taking part in supervision/ intervision	0.03	0.05	0.05	0.03

Note. Data basis: daily entries (N = 947)

Pearson correlation coefficients. * $p < .05$,** $p < .01$, *** $p < .001$ (with adjustment using the Holm-Bonferroni method for 14 relations at a time)

Again, the six statements concerning perceived benefit were combined into the three learning and development-related benefit aspects: Students, teachers, and team/school.

The results showed that teachers' daily level of satisfaction was related more closely to teachers' daily perceived benefits for student learning ($r = 0.38$, $p < .001$) and for the development of the teachers ($r = 0.34$, $p < .001$) than for team or school ($r = 0.15$, $p < .05$). Accordingly, the results revealed a higher importance of the perceived benefit for students and teachers than of the perceived benefit for the team and the school for teacher's individual daily satisfaction.

The four columns on the right side of Table 12.13 reflect the correlation strengths, separated by school and the multivariate calculations of R^2 for all three predicators (students, teachers, and team/school). None of the schools differed significantly.

Table 12.13 Correlations between teachers' daily perceived benefit and teachers' daily level of satisfaction

Correlation[a] between perceived benefit for different groups and level of satisfaction	Generally n = 897	School 1 n = 252	School 2 n = 121	School 3 n = 229	School 4 n = 295	p[c]
Students[b]	0.38***	0.35***	0.50***	0.41**	0.27*	ns
Teachers[b]	0.34***	0.33***	0.41**	0.35***	0.26*	ns
Team and school[b]	0.15*	0.17**	0.19 ns	0.13 ns	0.08 ns	ns
R squared (multivariate)	17.4%	17.0%*	28.5%*	19.0%*	10.6% ns	ns

Note. Data basis: daily entries (N = 947)
* p < .05,** p < .01, *** p < .001
[a]Calculation of bivariate correlation coefficients and multivariate variance explanation of the complete model in Mplus with standard errors corrected for the design effect (type = complex)
[b]Combination of the two ratings of benefit for students, the teachers, and the team and the school by means of averaging at a time (based on a highly plausible three-dimensional factorial structure and reliability coefficients of alpha ≥ 0.85)
[c]Statistical testing by hierarchical linear regression with effects of school dummy variables (level 2) on the random slope of the effect of teachers' perceived daily benefit on daily satisfaction (level 1) (adjusted using the Holm-Bonferroni method)

Noteworthy, however, is that a deviation from the general tendency was found at two schools. Whereas teachers' daily level of satisfaction at school 2 appeared to be influenced by teachers' perceived benefit in an above-average manner with a total of approximately 28.5%, the explained variance at school 4 was lower and below average with 10.6%. It seems that at school 4, teachers' satisfaction was less dependent on the perceived benefit of their daily work. Instead, for teachers' perceived daily satisfaction at school 4, other factors may have been more influential (e.g. relationship with students, or with colleagues).

12.6.2.4   To What Extent Do Individual Factors Influence the Relation Between Teachers' Perceived Daily Benefit and Teachers' Daily Satisfaction Level? (Question 2d)

The analyses in Table 12.14 show if and to what extent individual factors were able to explain the variation in the correlation between daily perceived benefit and daily level of satisfaction. The analyses were conducted as a series of multilevel models, in which the correlation between teachers' perceived daily benefit and teachers' daily level of satisfaction was assessed on a personal level as a random slope. To explain the variation in the slopes, teachers' personal traits (sex, length of service, internal search interest, external search interest) were used as predictors.

There were no significant moderating effects for either teachers' *sex* or *length of service*. In contrast, there were rather distinct moderating effects for the teachers' internal search interest (having interest in knowledge concerning teaching quality and student learning) and external search interest (being open and ready to learn

Table 12.14 Influences of different individual factors on relation (random slope) between teachers' perceived daily benefit for different areas and teachers' daily level of satisfaction

Moderators for the linear effect of perceived daily benefit on daily level of satisfaction	Mean random slope (standard.)	b (on random slope)	se b	p	r^2 (of random slope)
Daily level of satisfaction regressed on perceived daily benefit for students					
Sex (f = 1, m = 2)	.26***	−0.059	0.084	ns	0.7%
Length of service (in years)	.26***	0.005	0.005	ns	1.1%
Internal search interest	.26***	0.194	0.097	$p < .05$	4.4%
External search interest	.26***	0.248	0.092	$p < .01$	7.7%
Daily level of satisfaction regressed on perceived daily benefit for teachers					
Sex (f = 1, m = 2)	.23***	−0.016	0.088	ns	0.6%
Length of service (in years)	.23***	0.000	0.005	ns	0.6%
Internal search interest	.23***	0.084	0.091	ns	1.2%
External search interest	.23***	0.094	0.088	ns	1.5%
Daily level of satisfaction regressed on perceived daily benefit for team and school					
Sex (f = 1, m = 2)	.11***	−0.026	0.064	ns	1.1%
Length of service (in years)	.11***	−0.003	0.004	ns	2.2%
Internal search interest	.11***	0.184	0.062	$p < .001$	17.4%
External search interest	.11***	0.173	0.063	$p < .01$	13.9%

Note. Data basis: daily entries (N = 947) for benefit perceptions and for levels of satisfaction as well as for personal traits documented in the initial survey (N = 81)

Each line represents a separate multilevel model for a single moderator. The effects shown in column 3 are unstandardized regression coefficients of the level-2 moderator in column 1 on the random slope of the daily level of satisfaction regressed on the perceived daily benefit for different areas, both on level 1. *** p < .001

from others). For teachers that were interested in optimizing their practices, their daily work-related level of satisfaction depended more strongly on their perceived daily benefit than it did for teachers with less interest. However, this applied only regarding the benefit for student learning as well as for the teams and the school but not regarding benefit for the teachers.

12.7   Discussion

In this contribution, a newly developed time sampling-based method of assessing teachers' daily regulation activities at secondary schools was explored empirically. For this purpose, in a first step, we developed a theoretical framework model, in which regulation in the context of school improvement is conceptualized by combining (self-)regulatory approaches from organization and school development research and pedagogical psychology. Accordingly, regulation of school-related activities is understood as the (self-)reflective individual, interpersonal, and organizational identification, analysis, and adaptation of tasks, dispositions, operations, and standards and goals by applying cognitive, metacognitive,

motivational-emotional, and resource-related strategies. Regulation means to reconstruct and deconstruct current practices and to further develop current practices by seeking new knowledge.

In a second step, a mixed-method case study was conducted at four secondary schools (in Switzerland) to identify teachers' regulation activities. We aimed to detect teachers' perceptions of the benefit of regulation activities for student learning and support of students, for the development of teaching competencies, and for the development of teams and schools. We focused on two sets of investigations: (1) analysis of the frequency of teachers' daily regulation activities at secondary schools and identifying differences between parts of the week, teachers, and schools, and (2) assessment of teachers' perceived benefit of the daily regulation activities and teachers' satisfaction and the relations between teachers' daily regulation activities, perceived daily benefit for different potential benefits, and daily levels of satisfaction. The results of both sets of questions were factored in for the assessment of the validity of the newly developed approach for daily measurement of teachers' regulation activities. Data analyses were based on 947 daily log entries of 81 teachers in total. Because of the high response rate in general and for each school, no severe systematic biases were expected. However, the sample size on the personal level has to be considered as rather small.

In summary, we found the following results for the *first of set of questions*: In accordance with the first hypothesis, (H1), teachers' most frequent regulation activities were found to be in the area of administration and organisation and in reflection on individual teaching practices. On average, the teachers reported these activities 1–2 times a week. Their average frequency is therefore relatively limited. Exchange with others on subject-related questions took place on only about 2 out of 10 days. Activities pertaining to team and school development appeared even less frequently, as did also regulation activities that require more introspection and initiative (e.g. intervision).

Teachers used the weekends basically for class preparation and follow-up activities. To a minor degree, the teachers used the weekend for reflection on and further development of their teaching practices and for exchange on organisational and administrative questions. We found plausible differences between teachers' activities during the week and activities on the weekend (e.g. teaching classes, exchange, reflection on individual teaching practices) as well as similarities (e.g. class preparation and follow-up activities) that are in line with previous research (H2). However, contrary to our expectations, teachers did not read specialist literature significantly more often on weekend days than on weekdays, although there was a slightly higher frequency on the weekend, as expected. This not significant result might be due to the very low level of regulation activity identified during the 3 weeks (study of specialist literature made up only 6% [n = 60] of the activities reported). Therefore, an extension of the data collection over a longer time (not only for 3 weeks) would perhaps help to elaborate this point more clearly. This could be useful as well for the analyses of other activities with a low occurrence during the 3 weeks (e.g. individual feedback).

In line with previous research, only random differences in the frequency of regulation activities appeared between schools (H3), in contrast to significant differences between teachers (H4) (Camburn & Won Han, 2017; Sebastian et al., 2017). These individual differences can be partly explained by the specific roles that the teachers have at the school (Pedder, 2007). As expected, teachers with leadership roles engaged more often in activities regarding school quality management and school development as well as in tasks for the school than teachers with no leadership roles did. Teachers with leadership roles reflected on their individual teaching practices less often and did not develop these further as often as class or subject teachers did, which was expected according to H5. That these differences were no longer significant when correcting for the alpha inflation problem, could be explained by the fact that teachers with leadership roles also teach classes. In Switzerland, therefore, the two groups are not distinct and may share more activities than is the case in countries where school leaders do not have to teach. Nevertheless, further studies should examine this aspect in more depth and in a larger sample.

The *second set of questions* assessed teachers' perceived benefit of the daily activities as well as teachers' daily satisfaction. As expected according to H6, the results revealed that teachers rated the regulation activities as especially beneficial for teaching, student learning, and teachers' learning but as less beneficial for team and school development. This is not surprising, since teacher education and professional development courses focus, above all, on teacher competencies in their core work area – that is, teaching. Additionally, 80% of the teachers' working hours were dedicated to teaching and fostering student learning. The lower level of perceived benefit for team and school development could be an indication that there is still need for support of activities in that area (Camburn & Won Han, 2017; Creemers & Kyriakides, 2012; Gutierez, 2015).

As expected according to H7, teachers' perceived benefit of these activities varied school-specifically, although it was only one school (school 2) that outperformed the other three schools. Besides the need to corroborate this result in a larger sample, it will be crucial to work out to what extent school 2, at which the teachers rated the benefit for student learning and support of students as higher, differs from the other schools in other features (on the individual and school level). It could be that there was a stronger standard implemented at this school for teaching and the achievement of learning goals or professional competencies, and teachers' interest in reflection on school practices could differ from other schools in a positive manner. Taking into account the quantitative questionnaire survey data will make it possible to test these assumptions.

The results regarding correlation between daily regulation activities, daily perceived benefits, and daily levels of satisfaction partially confirm the hypotheses. In line with our assumption H8a, there was a positive, albeit weak, correlation between the activities that include reflection on and further development of individual teaching practices and teachers' ratings of the benefit for student learning. Further training, however, related negatively to teachers' perceived benefit for student learning. In light of the high demands placed on further training programmes in order to be effective for student learning, this result may be understandable (Day, 1999;

Desimone, 2009). However, further training as well as reflection on and further development of individual teaching practices were positively correlated with perceived benefits for the teachers themselves. As previous studies have shown, further training has an impact first of all on teachers' practices and beliefs, and only in second place, and under specific conditions, on student learning (Kreis & Staub, 2009).

Other regulation activities, however, seem to be connected only to the perceived benefit for team and school development but not for students and teachers, most of all exchange on organisational and administrative questions and further development of teams. The fact that more frequent exchange on subject-specific questions was, unexpectedly, not associated with higher levels of perceived benefit for the teachers themselves indicates that these activities are seen more as a service for the team and school than as a source of individual professional development. This means either that the quality of exchange has to be increased (see Spillane, Min Kim, & Frank, 2012, for the preconditions of effective exchange) or that the value and necessity of this important type of shared activity for professional development have to be made more visible.

Overall, the level of the correlations between the daily regulation activities and the thematically corresponding perceived benefits is somewhat lower than we would have expected. There are two possible explanations for this: First, the occurrence of an activity, e.g. exchange on subject-specific questions, may vary considerably in estimated quality and productivity. Activities perceived as unproductive will lower the correlation between the occurrence of activities and the perceived benefit. Second, the activities were unspecified not only regarding their perceived quality but also regarding the duration. By looking only at daily occurrences of activities (yes/no), very short sequences are treated in the same way as long ones, which also leads to lower correlations between activities and perceived benefits.

Our hypothesis H8b on the relation between teachers' daily regulation activities and teachers' daily level of satisfaction could be confirmed only partially. We expected that daily regulation activities are related systematically but on a weak level to teachers' daily level of satisfaction. However, the identified correlations were insignificant. Therefore, the occurrence of the regulation activities in itself had no effects on teachers' daily level of satisfaction. Instead, as argued in H8 and H9, the perceived benefits of the regulation activities are significantly related to the daily satisfaction level. Accordingly, and in line with school improvement and school effectiveness research (Creemers & Kyriakides, 2008; Hallinger & Heck, 2010) and self-regulated learning research (Wirth & Leutner, 2008), high-quality activities are more important for teachers' daily satisfaction than the quantity of the respective activities is. In line with H9, the strongest contribution to a high daily satisfaction level comes from teachers' perception that the daily activities are beneficial for student learning and for teachers' professionalisation and development of teaching practice (Landert, 2014). The more positive the perceived benefit, the more satisfied the teachers are at the end of the day.

For the question as to what extent the relation between daily benefit and daily satisfaction differ among the schools (H10), the results were similar to those for the

analysis for H7. The daily satisfaction levels at school 2 seemed to be influenced by the perceived benefit to a greater degree than at other schools; however, the effect was not significant. It may be that a larger sample providing more power would yield a different result.

The concluding moderator analyses showed, as expected according to H11, that it is plausible in general to assume that interest in searching for new knowledge (Mitchell & Sackney, 2011) has an effect on the relation between perceived benefit and satisfaction level. Teachers, who strive to do a better, more professional job by seeking to acquire more knowledge, appear to be more influenced in their perceptions of satisfaction by their perceived daily benefits than teachers with lower interest are. The results revealed this interaction to be especially relevant for achieving team and school development goals and, in a weakened form, for student learning.

Interestingly and against expectations, there was no significant moderation effect of interest in seeking new knowledge concerning further development of one's own teaching practices and competencies. The question arises as to how this result can be interpreted. As the mean level of perceived benefit for the teachers themselves and its standard deviation (Table 12.10) as well as the general association between this benefit (for teachers) and perceived daily satisfaction (Tables 12.13 and 12.14) are inconspicuous (since the correlation was between the coefficients for the benefit for students and for team and school), there are no technical reasons, such as restricted variance, for this lower level of moderation effect. Therefore, we exclude an artefact and, instead, try to find a content-specific interpretation.

A first possible explanation relates to the meaning of the moderators at issue – that is, internal interest and external interest in seeking new knowledge. Based on the operationalization applied, the two scales measure teachers' interest in monitoring the effectiveness of their own teaching for student learning and interest in seeking new knowledge for optimizing teaching and student learning. Our assumption is that not all of the assessed benefits are equally sensitive to these interests, and that these indicators of interest may not be equally interpreted as reflecting the actual value (Eccles & Wigfield, 2002) of the respective benefits. For instance, teachers may see the goals of this search for knowledge more in optimization of student learning and of team and school and not so much in further development of their own competencies. Daily activities that are perceived as productive for one's own person and one's own teaching may possibly for this reason per se contribute to teachers' daily satisfaction – namely, largely independently of teachers' interest in monitoring effectiveness and searching for new knowledge. However, for student learning and development of the team and school, interest in seeking new knowledge increases the importance of the daily activities for teachers' satisfaction, as is supposed by expectancy-value theory (Eccles & Wigfield, 2002). If this explanation were correct, it would be helpful in the future to assess the benefit of such activities not only indirectly via teachers' interest but also directly.

The particularly strong moderation effect in connection with benefit for team and school could be related to the fact that precisely the mean association between perceived benefit for team and school development and satisfaction, in contrast to the other two areas of benefit, is definitely lower, at $r = .15$ (vs. $r = .34$ and $r = .38$). The

perceived benefit of team and school activities thus appears to contribute on average only little to teachers' satisfaction. According to Landert (2014), teachers' work satisfaction in Switzerland is based mainly on what are viewed as teachers' core activities – namely, teaching and supporting students. In contrast, team and school development activities are seen by teachers often as additional to their core mission and, moreover, as difficult and connected with stressful situations, such as the introduction of reforms. Unless they have specific interest in these activities, it appears that teachers benefit little from them for their own satisfaction.

A second possible explanation for the lack of a moderator effect could be that teachers view their own competencies as a relatively static given and not as plastic, malleable, and capable of development, as is the case for students or team. Following Dweck and Leggett (1988), then, teachers' implicit theories must differ depending on the learning object being focused on: Regarding their own competencies, teachers would have a more fixed mindset (as opposed to a growth mindset) and, thus, a belief that their own competencies are not or are only little modifiable, whereas their mindset regarding student learning or further development of the team or school would be more of a growth mindset. Fixed mindsets tend to lead to lower interest in further development of one's own competencies and also have a negative effect on the achievement of objectives. This supplementary hypothesis cannot be tested further based on the existing data, as in the present study, no information is available on those views and beliefs. Further studies will be needed to clarify the issue.

12.8 Strengths and Weaknesses of the Applied Methodological Approach, and the Need for Further Research

Considering the results, presented above, and the confirmation of most of the hypotheses, it can be concluded that the newly developed methodological approach makes an instrument available that appears to be suitable for recording teachers' daily regulation activities in a (relatively) valid manner and for use as a complement tool to existing instruments, such as standardized surveys for retrospective recording of regulation activities. Daily micro-level measurements, such as those employed in this study, are unique in uncovering differences between parts of the week, teachers, and (to some extent) schools, and this allows for the recording of individual as well as collective regulation activities profiles. Further, it is crucial in this context that the activities are recorded not only on a daily level but also for different areas. That means that information can be obtained on regulation activities for teaching or administrative/organisational matters as well as for team and school development. In addition, in the case study, school leaders and selected teachers confirmed in interviews, conducted after data collection, that the methods chosen, indeed, capture the main activity areas of the teachers with an appropriate degree of differentiation.

It became clear that the combination of recording the frequency of regulation activities and collecting information on the perceived daily benefit increased the substance of the results. Particularly the finding that it is not the realization of regulation activities but rather the perceived benefit of daily regulation activities that is systematically associated with perceived daily satisfaction confirms that it is necessary to capture not only the quantities but rather the qualities of activities (Creemers & Kyriakides, 2008).

However, precisely in that regard, there is a deficit in the design of the case study, insofar as perceived benefit was not rated for each individual activity but only at the end of the day as a kind of balance sheet. When planning the case study, we had intended to implement ratings for each activity. However, after intensive discussions with teachers, we had to drop that as we feared that for the teachers, benefit ratings of every single activity would have been a burden in terms of time (and also in part in terms of content). This would have been the case, especially for short activities, the benefit of which for different aspects would be difficult to determine. Based on the analyses, however, this must be reconsidered, particularly as from this a clearer and closer relation between regulation activities and perceived benefit is expected.

Further studies will also be necessary in order to include in the analyses not only daily frequencies but also the time spent on the individual activities within the day. Not yet considered in the findings presented here is also the social structure of the regulation activities – that is, whether teachers carried them out alone or together with others. We plan to include that aspect in further analyses.

A major limitation of the case study, presented here, is that we examined only four schools so that analysis of differences among schools was possible only to a limited extent. It, therefore, remains open whether or not schools differ in the frequency of regulation activities (Camburn & Won Han, 2017; Sebastian et al., 2017), also under consideration of more in-depth analysis, as is possible with time-sampling data. Regarding the quality of the regulation activities, we expected to find differences (H7), which the case study confirmed in part. However, the differences were only very small, so that it will also be necessary to check the results in a larger sample of schools.

A further limitation is that it was not possible to set teachers' regulation activities in overall relation to the concrete development of student learning, to teaching, or to school development. It remains to be seen whether or not these activities are not only subjectively but in fact verifiably beneficial to further development of a teacher's own competencies, of teaching, and of team and school. From a methodological perspective, it also remains an open question whether the data collected represent a better basis for explaining differences in student performance and student performance development. This is a relevant question, ultimately, also from an economic perspective because compared to filling in a standardized questionnaire, the effort that the data collection required of the teachers, even though it was not very great (5–10 minutes per day), should not be underestimated.

Beyond that, an important question concerning the validity of the methodological approach is the time point of data collection. The data were collected in 3 weeks during the second quarter of the school year, with each week being followed by a

week with no data collection. In contrast to the number of days on which data had to be collected in order to obtain a stable data base (Bolger, Stadler, & Laurenceau, 2012), there were practical considerations for the choice of these 3 data collection weeks and the on-off rhythm. For example, the data collection period could not be expanded to an entire school year, as it would then not be possible to provide each school with individual feedback within the same year. Ultimately, the procedure chosen could also limit the validity of the design and explain why certain regulation activities, such as further training or intervision, were seldom recorded. Whether this, in fact, corresponds to reality or whether a different frequency would be observed if we examined an entire school year, would have to be checked. In one interview with a school leader after data collection, we learned that the school conducted most of its internal further training programmes in the second half of the school year. With this, it can be assumed that precisely those regulation activities that are not normally carried out throughout the entire school year cannot be adequately represented using the methodological approach applied here. And, even though we found no indications for it based on the interviews that we conducted, the opposite is also conceivable – that in the study, certain regulation activities were identified more frequently than they appear in reality because in the data collection period, there was by chance a particular focus on, for instance, exchange and cooperation, and intensive exchange did not take place all throughout the year.

All in all, then, it will be important to conduct further analyses and to test the chosen methodological approach in further studies.

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