Teachers meeting the challenges of the Swedish school system

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Teachers Meeting the Challenges of the Swedish School System

Agents within Boundaries

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Abstract

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The overarching aim of this thesis is to provide the reader with a better comprehension of the notion of 'teacher quality' within the context of the work that teachers perform in the classroom, at school, and within the broader landscape of the Swedish national education system. Thus, the studies that are included in this dissertation investigate the relationships between a number of teacher characteristics and aspects of the school environment and their relative contribution to student- and teacher outcomes. Realist social theory serves as the underlying theoretical framework to this investigation, thereby facilitating the analysis of the relationships between teacher agency and the structures of the educational system. Data that was used in the studies that are included in this thesis is derived from TIMSS 2011 and TIMSS 2015 (Trends in International Math and Science Study) with special focus on mathematics teachers. The main analytical approaches that were employed are confirmatory factor analysis and structural equation modelling.

This dissertation includes three empirical studies, which address teacher quality from different, yet related, perspectives. Study I investigated the relationship between aspects of teacher professional competence and student mathematics achievement as well as student-assessed instructional quality, in the Swedish context. The main finding of the study was that the amount of teacher coursework in mathematics was positively associated with the classroom mathematics achievement. Moreover, teachers with higher self-efficacy beliefs tended to deliver instruction of a better quality, as assessed by their students. However, teacher self-efficacy beliefs were not related to student achievement levels. Finally, the relationship between teaching experience and

student achievement followed a non-linear pattern, with the effect of teaching experience increasing up to about twenty years of in-service experience and then declining with more years of experience. Study II focused on teacher well-being as a necessary precondition for teachers as they exercise their professional competence. The results of this study demonstrated a significant association between school working conditions and Swedish teachers' job satisfaction. More specifically, the feasible workload, degree of teacher cooperation, and teacher perceptions of student discipline at school were the most important factors for the teachers' job satisfaction. As to teacher characteristics, female teachers, teachers with more exposure to professional development, and more efficacious teachers tended to enjoy higher levels of job satisfaction. In addition, it was found that the relationship between the extent of teacher cooperation and job satisfaction was more pronounced for male teachers, while student discipline was more important for job satisfaction of teachers who held lower self-efficacy beliefs. Study III emphasized student well-being as a precursor for student learning and examined the role of the school climate in reducing student bullying. The study adopted a comparative approach as it revealed similarities and differences across the Nordic countries. The results of this study demonstrated both identical- and differing cross-country patterns. For example, the between-school variation with regards to student bullying was rather low, with Sweden having the highest between-school differences compared to the other Nordic countries. Further, in Sweden, schools with a higher proportion of immigrant students tended to have higher levels of bullying, while in Norway, higher levels of bullying were observed in higher SES schools. A similar feature that was detected across all national settings was that a positive school climate was linked to lower school levels of student bullying. With regard to the relationship between school-level bullying and achievement, these were only present in Sweden and Denmark, while no association was found in Norway and Finland. Improving the school climate may be a crucial factor in combating bullying in Swedish schools and enhancing student achievement.

Overall, the results of the studies that are included in this thesis all underline the relevance of the interplay between teacher agency and classroom/school structures, as either enabling- or restricting factors for the exercise of teacher professional competence. This interplay forms the basis for the integrated discussion section of this dissertation.

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To Dad

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Chapter 1: Introduction

In today's globalized world, many societies place ever-increasing demands on their education systems to equip students with complex knowledge and skills that will help them succeed in the future (Darling-Hammond et al., 2017). Moreover, schools, in particular those in the Nordic nations (Lundahl & Olson, 2013), are expected to provide equal opportunities for all students' learning and development. However, some schools are more successful than others in achieving these goals. A key factor for a school's success are the teachers who work there (Darling-Hammond, 2000; 2014; Nye, Konstantopoulos, & Hedges, 2004; Hattie, 2009; Hanushek & Rivkin, 2012; Kyriakides, Creemers, & Antoniou, 2009; Muijs et al., 2014). Teachers are tasked with the challenging goal of equipping students of different needs with the necessary knowledge and skills, as well as with contributing to their socio-emotional development (Darling-Hammond, 2012; Paine & Zeichner, 2012). Despite the common and widespread agreement that teacher quality is important for student success, the following questions remain: *What constitutes 'teacher quality'?* and *Which teacher characteristics are of the utmost importance in making an impact on student learning outcomes?* (Goe, 2007; Scheerens & Blömeke, 2016).

Knowledge about the aspects that contribute to teacher quality would be of relevance to the promotion and development of said aspects during teacher education programs, and would facilitate the recruitment process with respect to the identification of suitable teacher candidates. However, if the status of the teaching profession in a particular society is low, as is the case in many countries of the world, including Sweden (Bertilsson, 2014; The Swedish Higher Education Authority, 2017) it is difficult to attract the most qualified and highest performing graduates into teacher training programs (Darling-Hammond, 2017; Ingersoll, 2017). The low social regard for the teaching profession is one of the causes of teacher attrition (Darling-Hammond, 2017). This issue becomes particularly germane in times of acute teacher shortages. However, contrary to a common policy solution that is used to address teacher attrition, the recruitment of new teachers does not automatically resolve this issue, since it have been observed that many new recruits leave the job after just a few years of teaching (Ingersoll, 2017; Lindqvist, Nordänger, & Carlsson,

2014). Besides the low level of occupational prestige, teachers also leave schools due to their dissatisfaction with inadequate school working environments (Ingersoll, 2001; Ingersoll & Smith, 2003; Skaalvik & Skaalvik, 2009; Tema Nord, 2010).

A safe and stimulating environment where individuals can strive to do their best is of equal importance for students. Students are known to learn best when they feel safe, supported, and respected (Darling-Hammond & Cook-Harvey, 2018). However, many schools worldwide still struggle with the problem of student bullying, which seriously undermines their efforts to create such an environment (Smith, 2013; Menisini & Salmivalli, 2017). Schools in the Nordic nations, even though they might be characterized by a lower prevalence of bullying on the international scale, remain faced by this issue of student bullying (Bjereld, 2017). Therefore, the ability of teachers and school principals to foster a positive classroom and school climate, where everyone feels respected and included, may be indispensable for student socio-emotional and cognitive development (Allodi, 2010; Thapa et al., 2013; Wang & Degol, 2016).

Research aim and objectives

There are many factors that may contribute to explaining variation in teacher quality. Consequently, research on the relative contribution of various indicators and factors, including the impact of teacher characteristics, the school environment, and teacher well-being is warranted (Cochran-Smith & Zeichner, 2009). Most schools are concerned with selecting, recruiting and, most importantly, retaining qualified teachers by providing them with a satisfactory working environment. Teachers, however, are not the only group which benefits from a favourable school environment - it is of similar importance for student learning and development.

The overarching aim of this thesis is therefore to provide a better comprehension of the notion of 'teacher quality' within the context of the work that teachers perform in the classroom, at school, and within the broader landscape of the national education system. This dissertation presents an investigation into the interplay between several aspects of teacher professional competence, as well as the school teaching and learning context in terms of their relative contribution to student and teacher outcomes, in a Nordic setting with a special focus on Sweden. The empirical studies included in this dissertation address the following questions: (i) *Which teacher characteristics are*

important for student achievement? (ii) *Under which conditions can teacher professional competence flourish?* and (iii) *Can teachers and school leaders foster favourable learning environments for their students?*

Since teachers differ in terms of their educational background, the duration of their professional experience, their beliefs, and their effects on student outcomes, **Study I** investigates the relationships between the aspects of teacher professional competence, student mathematics achievement, and student-assessed instructional quality. In particular, the study examines the relationships between the amount of teacher coursework in mathematics, teaching experience, teacher self-efficacy beliefs, and student mathematics achievement. Further to this, the relationship between student-assessed instructional quality and student mathematics achievement is explored.

Study II is focused on teacher well-being as a necessary precondition for teachers as they exercise their professional qualities. If a school environment fails to provide proper and suitable working conditions, for example, by being stressful and unrewarding, then this may have serious consequences for an individual teacher's health, their students' well-being, and on overall school effectiveness. Yet another negative consequence of an unfavourable school environment is teacher turnover, and, in particular, teacher attrition, when teachers leave the profession for good. This is not only costly for the whole society, but also diminishes the prestige and respect that should be awarded to the teaching occupation. This study examines the relationship between the school working environment, teacher characteristics, and job satisfaction.

Study III underscores the importance of student well-being and presents school bullying as an acute problem that affects students in a number of negative ways. The study investigates the nature of school bullying from a Nordic perspective, by comparing the phenomenon in Sweden, Norway, Denmark, and Finland. Furthermore, differences and similarities in the role of school climate for reducing bullying in each country are examined. Finally, the differences and similarities in the relationship between school bullying and student achievement levels are investigated. This study contains important implications for school leaders and teachers who wish to improve their school climate.

The results of the above three studies underline the relevance of the interplay between teacher agency and classroom/school structures, as either enabling or restricting factors for the exercise of teacher professional competence. This interplay forms the basis for the integrated discussion section of this dissertation.

Chapter 2: Background

Swedish education system during the period: 1950-1990

The period between the 1950s and the 1980s was characterized in the Nordic countries (even though Iceland is considered to be a part of the region, it is Sweden, Norway, Denmark and Finland which are the focus of one of the studies of this thesis) by the development of the welfare model of education, often referred to as the 'Nordic model'. This development was part of a larger post-war effort to establish a comprehensive welfare state where education was envisioned to a driver of social equity and enhanced social mobility (Imsen, Blossing, & Moos, 2017; Lundahl, 2016). As such, the Nordic model, in terms of the provision of education, was characterized by shared principals of equity, social justice, and inclusion of every student in the education process, regardless their background (Lundahl, 2016). The State was entrusted with the task of providing education as a common good, equally for all students. Consequently, every school curriculum was endorsed at the state level, and teachers enjoyed a high level of trust (Imsen, Blossing, & Moos, 2017).

Sweden pioneered the introduction of compulsory education in 1962, followed by other countries in the region (Lundahl, 2016). The new Swedish compulsory school system consisted of nine years of schooling with tracking formally abolished (Gustafsson & Blömeke, 2018). In Finland, similar changes took place during the 1960s and 1970s, and both countries (Finland and Sweden) witnessed an enhanced teacher education program during this time. Whilst both Norway and Denmark introduced nine years of compulsory schooling in the aforementioned period, Norway eliminating tracking as early as the 1920s, while Denmark did so in 1993 (Gustafsson & Blömeke, 2018). Generally speaking, and some national differences notwithstanding, it was still possible to speak of the common 'Nordic model' with respect to compulsory education during this time, where Sweden stood out as "the trailblazer and model" (Antikainen, 2006 cited in Lundahl, 2016, p. 5).

The reforms of the 1990s

During the late 1980s, the Swedish education system was subject to a comprehensive school reform that was intended to increase school quality, equity, and efficiency (Erixon & Holm, 2011). Changes that took place during this reform were concerned marketization, decentralization, and deregulation, which manifested themselves in municipal control over the organization of education, the provision of 'school choice' through a voucher system, and an increase in the number of independent schools (Yang Hansen & Gustafsson, 2016). In addition, teacher education was reviewed several times during the 1990s and later years. The reform of 2001 de-emphasised the importance of specialized teacher education with respect to the subject and grade that was to be taught (Stenlås, 2009).

The aforementioned reforms gave rise to a number of consequences. With regards to their students, Swedish schools became highly segregated in terms of student demographics, including their socio-economic class and immigrant status. This resulted in an increase in between-school achievement differences (Böhlmark, Holmlund, & Lindahl, 2015; Yang Hansen & Gustafsson, 2016). School resources came to be unequally distributed across municipalities, and even within municipalities. This not only included financial resources, but also a school's most important asset – its teachers. A process of teacher selection gained momentum, where specialized, more experienced, and better-trained teachers choose to work in schools which had more resources than other schools and had a smaller proportion of students from disadvantaged backgrounds (EU Commission, 2016).

Given deteriorating student achievement and increased differences between schools, decentralization steps were made, with the authorities gradually implementing stricter regulation of education governance (Börjesson, Karlsson, & Lindgren, 2017). Thus, the new Education Act of 2011 established a requirement for teachers in terms of professional certification and subject specialization. All permanently-employed teachers with the right to assign grades were made subject to this requirement (Börjesson, Karlsson, & Lindgren, 2017). During the same period, teacher education programs reinstated the importance of subject and grade specialization in their curricula (Hansson & Gustafsson, 2016). While the effects of marketization in education can be said to be similar in the other Nordic countries, in Sweden, the

economic-, social-, academic-, and professional impact on schools and teachers, in particular, was the most intense (Lundahl, 2016).

The effects of educational marketization on teachers

The marketization trend and the accompanying New Pubic Management practices, including a focus on standards, quantified performance evaluations, and competition, has affected teachers and their work in several other important ways in many Western countries, including Sweden (Ball, 2003; Dovemark & Holm, 2017; Evetts, 2009). In fact, a number of researchers have noted that the effects of marketization in education on Swedish teachers were more similar to those of their Western colleagues in the UK, USA, and Australia, for example, than on their Nordic counterparts (Lundahl, 2016; Weiner, 2002).

Much of the research literature that has been written in recent decades on the topic pays particular attention to the many negative consequences the aforementioned reform has had on teachers. As Ball (2003) explains, the pressure of performativity has challenged teacher identities, because the very meaning of what it is to be a teacher has been changed. Teachers are now considered to be 'educational entrepreneurs', who are subject to regular performance reviews, with student achievement seen as a 'productivity goal'. In hand with the increasing evaluation of teachers' work according to external standards and benchmarks, their professional judgement and autonomy were threatened, a tendency towards a de-professionalization of the teaching profession could be observed (Ball, 2003; Zeichner, 2010). Evetts (2009) describes this phenomenon as the shift from 'occupational professionalism' to 'organizational professionalism', with the former emphasizing practitioner's control, collegial authority, and trust, while the latter targeting managerialism, standardized procedures, and competition. Meeting the demands of increased monitoring and accountability, in addition to traditional teaching tasks, resulted in an intensification of the affected teachers' work. At the same time, the teaching profession became subject to a high degree of uncertainty and instability, which was paired with a low degree of trust which was signalled by constant monitoring according to ever-changing criteria (Ball, 2003).

The above factors have transformed teacher relationships with students and parents, who were now in a stronger position of being classed as "customers" with respect to education. Increased levels of competition and ranking requirements impacted on schools as organizations, subsequently eroding relationships between school leadership teams and their teaching colleagues (Ball, 2003). As clarified by Evetts (2009), a closely-bound focus on individual teacher performance has magnified the impact of possible failure in terms of standardized outcomes, which is associated with undermining a sense of professional cohesion among the teaching staff. Perryman, Ball, Maguire, and Braun (2011) underscore how all of these changes affected the teachers' personal well-being, by causing stress, self-doubt, and anxiety. As a result of these changes in the teachers' situation, the status and attractiveness of the teaching occupation were undermined, which, in turn, aggravated the already-existing problem of teacher attrition (Ball, 2003; Borman & Dowling, 2008; Ingersoll, Merrill, & May, 2016).

Research in the Swedish context has raised similar issues to those described in the English-speaking countries, including, but not limited to, challenges to teacher identities and professional values, which are caused by demands imposed by performativity and accountability. These challenges have transformed teacher relationships and professional cohesion, and have intensified the work that is done by teachers (Dovemark & Holm, 2017; Lundahl et al., 2013; Lundström & Holm, 2011). The reasons that are given by Swedish teachers when they consider to leave the profession, for example, work overload and changed professional goals, may be in direct response to the conditions described above (Lindqvist, Nordänger, & Carlsson, 2014). Nonetheless, there has been less emphasis in the Swedish literature on the effects of the marketization of education on teacher status and turnover, despite the fact that a shortage of qualified teachers has been an issue in the Swedish education system for some time. Thus, the Swedish National Agency for Education (2018) has predicted alarming teacher shortages in the years to come. By the year 2031, around 80,000 more teachers will be needed in Sweden. Under such circumstances, recruiting and retaining a qualified teacher force becomes a high priority. However, recruiting new teachers may be a particularly challenging task, because only 11 % of teachers in Sweden think that society values the teaching profession (versus 35% of teachers in Norway, and 58% in Finland) (The Swedish National Agency for Education, 2019). One of the ways to raise the status of the teaching profession is to improve school working

environment. The results of a number of studies conducted by Ingersoll and colleagues in the US context (Ingersoll, 2001; Ingersoll, Merrill & May, 2016; Ingersoll, 2017) suggest that teacher dissatisfaction with school working conditions is one of the most influential factors in teacher attrition. Recent policy measures in Sweden have shown a similar direction towards enhancing working conditions for teachers (The Swedish National Agency for Education, 2018), which, in turn, can help with respect to the recruitment and retention of teachers in the future.

Chapter 3: An Overview of Teacher and School Effectiveness Research

In educational research, key teacher characteristics are usually presented under umbrella terms, such as *teacher professionalism*, *competence*, *effectiveness*, and *quality*. Often, these terms are used interchangeably and without a clear definition (Cochran-Smith & Zeichner, 2009; Goe, 2007; Goldstein & Woodhouse, 2000). The present section will clarify the different ways in which these terms have been conceptualized and operationalized in previous research, and will relate these terms to an understanding of what makes a 'good teacher'.

A teacher quality framework

Goe (2007) proposes an input-process-outcome framework which can be used to indentify 'teacher quality'. In this framework 'inputs' include teacher qualifications and teacher characteristics; 'processes' include teacher practices; and teacher effectiveness is the 'outcome' of these factors. *Teacher qualifications* include teacher education, degrees, certification, experience, and professional development, etc. *Teacher characteristics* refer to personal characteristics such as age and gender, as well as teacher attitudes, beliefs, and self-efficacy, etc. *Teacher processes* pertain to what teachers do in the classroom (also referred to as *teaching quality*) and include, for example, activities such as lesson planning, and classroom management. Finally, in this framework, *teacher effectiveness* is defined in terms of gains in student learning, which are often measured by student scores on standardized achievement tests (Goe, 2007). Thus, researchers have attempted to answer the question of: *What makes a good teacher?* by relating teacher qualifications, teacher characteristics, and teacher processes to student achievement. An account of this research is provided in the next section.

Teacher qualifications

From prior research, the following key qualifications are identified as being most frequently explored: educational level, experience, certification status, and a university degree in the subject being taught (Wayne & Youngs, 2003). In particular, research in this area reveals that possessing the relevant teacher education with respect to the subject and the grade that is taught is crucial for effective teaching (Darling-Hammond, 2000; Wayne & Youngs, 2003), and is the main source of teacher professional knowledge (Friedrichsen et al., 2009).

Teacher knowledge is classified into *content knowledge* (CK) and *pedagogical content knowledge* (PCK) in the seminal work of Shulman (1986). According to Shulman, *content knowledge* refers to deep knowledge of a certain subject, while *pedagogical content knowledge* pertains to the presentation of the subject-matter in a way that is comprehensible to students. In his subsequent work, Shulman (1987) extended his classification to include *general pedagogical knowledge*, referring to classroom management principles and strategies, in particular. In addition, teacher knowledge domains have been extended to comprise *curriculum knowledge*, *knowledge of learners' characteristics, educational contexts*, and *values* (Shulman, 1987). One of the most influential re-conceptualizations of Shulman's notions of CK and PCK has resuted in the term *mathematical knowledge for teaching*, or MKT (Hill, Ball, & Schilling, 2008). MKT is a global construct that comprises both content knowledge and pedagogical content knowledge. In contrast, other researchers have claimed that CK and PCK are distinct, yet related, constructs (Kleickmann et al., 2013). Additionally, CK has been found to be a prerequisite for PCK development, in that teachers need to possess profound levels of content knowledge if they are to make content comprehensible for their students (Friedrichsen et al., 2009; Kleickmann et al., 2013; Krauss et al., 2008). A number of researchers, both within the US and European context, have concluded that a high quality teacher education that offers lengthy periods of field experience may be equivalent to several years of in-service teaching, thereby equipping student teachers with both the CK and PCK that is needed for successful teaching (Darling-Hammond, 2000; 2014; Kleickmann et al., 2013).

In the US, Darling-Hammond found significant positive effects of deep subject knowledge on student achievement (2012). In the European context, and specifically in relation to student mathematics achievement, Baumert et al. (2010) for example, found a substantial positive effect of teacher's pedagogical

content knowledge on student achievement levels. As teacher general pedagogical knowledge and pedagogical content knowledge stem from teaching practice, both pre-service and in-serve, researchers have also investigated the effects of the number of years of teaching experience a teacher has on student achievement. These studies, however, have produced inconsistent results. For example, Wiswall (2013) claimed that the length of teaching experience had large effects on student mathematics achievement. Other studies, however, have indicated that no improvement in teacher quality can be associated with length of experience, besides the first few years of teaching (Rice, 2010; Hanushek, 2011). Darling-Hammond (2000) suggested that the relationship between teaching experience and student achievement is a non-linear one, since, this author states, teachers are most effective during their first five years of service. In a similar vein, Hanushek and Rivkin (2012), claim that teacher effectiveness decreases just after a few years in teaching, while other scholars have noted a decline in teacher effectiveness towards the end of their career (Chingos & Peterson, 2011). These varying results may be, at least partly, due to a lack of information on teacher education as a whole or its particular features, such as the duration and quality of field experiences.

Overall, despite the general agreement that teacher qualifications are important aspects of teacher competence, there is less consistency with respect to what their relative contribution is to teacher quality. As noted by Wayne and Youngs (2003), the effects of teacher qualifications may vary in importance, depending on subject domain and grade level. Their conclusions are further reiterated by Blömeke and Olsen (2019), who also stress the importance of considering cross-country cultural differences when assessing the various formal qualifications that teachers hold. Notwithstanding this, for certain domains and grade-levels, specifically secondary level mathematics, results from a number of studies within the US and European contexts alike reinforce the importance of teacher content knowledge and pedagogical content knowledge for student achievement (Baumert et al., 2010; Kleickmann et al., 2013; Wayne & Youngs, 2003).

Teacher personal characteristics

While some researchers have stated that 'teacher quality' is best measured in terms of formal qualifications and experience, others argue that some teacher personal characteristics, including the teacher's personality, beliefs, and verbal

skills, are equally important to teacher quality (see, for example, a meta-analysis by Klassen & Tze, 2014). Another teacher personal characteristic which has recently regained popularity in educational research is teacher self-efficacy beliefs (Klassen et al., 2011; Klassen & Tze, 2014).

Teacher self-efficacy is the belief that a teacher has about their ability to "successfully accomplish a specific teaching task in a particular context" (Tschannen-Moran, Woolfolk Hoy, and Hoy, 1998, p. 233). Teacher self-efficacy beliefs are context- and subject-matter specific, because teachers may feel efficacious teaching one subject to certain students, and less efficacious in other subjects with a different group of students (ibid., 1998). Teacher self-efficacy has been considered to be one of the most important motivational beliefs that influences a teacher's instructional behaviour and student learning. The origins of the concept of 'self-efficacy' stem from social cognitive theory developed by Bandura (1997), who defined 'self-efficacy' as a cognitive process in which beliefs of individuals about their capacity to perform a given task at a certain level of achievement are constructed. These beliefs in one's personal capabilities to produce desired levels of performance are important in explaining teacher effectiveness (Bandura, 1986; 1997).

Because self-efficacy beliefs shape individual perceptions of environmental factors (both constraining and favourable factors) and consequent behaviours, it follows that teachers with higher levels of self-efficacy beliefs may perceive certain school conditions as less stressful when compared to colleagues with lower levels of self-efficacy. Indeed, several studies in both European and North American contexts have shown that self-efficacy serves as a source of resilience in response to adverse environmental conditions, and teacher self-efficacy was negatively related, for example, to teachers' perceptions of discipline problems (Klassen & Chiu, 2010; Skaalvik & Skaalvik, 2010). Thus, teacher self-efficacy beliefs may moderate the effects of stressful working conditions on the level of commitment and teacher job satisfaction, as well as be relevant to the rate at which teachers suffer from burnout.

Teacher practices

This aspect of the teacher quality framework that is examined here takes into account what teachers actually do in the classroom, and links such practices to student outcomes (Goe, 2007). *Instructional quality*, or *teacher instructional behaviour*, are terms used in educational research to refer to teacher-student classroom interactions that foster student-learning and engagement (Hattie, 2009; Seidel

& Shavelson, 2007; Weinert, Shrader, & Helmke, 1989). The theoretical models of instructional quality that are elaborated on by Klieme, Pauli, and Reusser (2009) propose three key dimensions for the construct: 'classroom management', 'supportive climate', and 'cognitive activation'. For example, a supportive climate was found to be a significant predictor of student motivation (Klieme et al., 2009), while classroom management and an orderly classroom environment was linked to student achievement (Fauth et al., 2014). Instructional quality may be assessed by independent raters of quality, teachers, and students. Student assessments of teacher instructional quality have recently regained their popularity in educational research. However, while student assessments made by older students have been generally considered to be a valid measures of teacher instructional quality, in particular in classroom management domain (Wagner et al., 2013), between-country patterns for young children have proven to be highly inconsistent (Blömeke, Olsen, & Suhl, 2016; Johansson & Myrberg, 2019; Nortvedt, Gustafsson, & Lehre, 2016). The inconsistent results may be due to cross-national difference in response styles, as well as high correlations of student assessments of instructional quality with student attitudes to the subject and/or to the teacher (Blömeke & Olsen, 2019; Wagner et al., 2013)

Teacher effectiveness

When 'teacher quality' is defined in terms of teacher effectiveness, focus is placed on how much the students of a particular teacher have gained in their learning, usually measured by standardized achievement tests (Goe, 2007). Teacher effectiveness deals with the empirical evidence that is gathered with respect to both teacher quality and teaching quality, based on the teacher's contribution to student learning. Such evidence could be theoretically linked to the other three strands of teacher quality research (teacher qualifications, teacher personal characteristics, and teacher practices). However, this makes it difficult to determine the degree to which each one of the above factors (or their interactions) actually contributes to gains in student learning. This may, however, depend on the data and methods used in the studies. For example, while cross-sectional studies cannot establish temporal precedence (and thereby, causal relationships) between various factors, experimental- and fixed effect studies are able to successfully deal with such issues.

The model of instructional effectiveness proposed by Scheerens (2005) may be illustrative of a model that incorporates a combination of teacher characteristics, teacher practices, and teacher effectiveness measures. Scheerens' model is designed within a broader framework of educational effectiveness research, encompassing three levels: the system level, the school level, and the classroom level, or the level of instructional setting. The three levels are hierarchically nested within each other; i.e., classrooms function within schools, while schools function within local/regional/national educational systems (ibid., 2005). The model of instructional effectiveness is focused on the classroom/teacher level, and aims to open up the 'black box' that is instantiated by the classroom, so as to reveal which teacher factors contribute to enhancing student cognitive outcomes and student non-cognitive outcomes (Scheerens, 2016).

The main variables in Scheerens' model (2016) are teacher characteristics, which include aspects of teacher education, and comprise teacher professional knowledge, professional motivation, and beliefs about preferred teaching strategies. These characteristics are seen as malleable and can be changed by means of teacher training and professional development. The *classroom ecology*, which includes a number of compositional factors, is given, and the *classroom climate*, or the atmosphere in the classroom, is both given and amenable by teachers (Scheerens, 2016). We thus note that teaching processes are considered to be malleable. Teaching is conceptualized in this model of instructional effectiveness as a 'stimulating specific learning processes and creating a general context, in which learning would be enhanced' (ibid., 2016, p. 5).

How to assess a good teacher?

Each of the four ways of looking at teacher quality has its advantages and limitations. Thus, according to Goe (2007), the focus on teacher qualifications is relevant for certification and hiring processes, when there is a need to predict the probability for successful teaching. The disadvantage of the qualifications approach, however, is that paper qualifications do not always translate into good teaching, or instructional quality. The advantage of considering teacher personal characteristics is that it broadens the notion of 'teacher quality' and allows one to create a more comprehensive definition of 'teacher quality'. The major drawback of including teacher personal characteristics in the definition of 'teacher quality' is that many of characteristics, like personality, are not open

to direct observation and they are difficult to change by the teacher and/or the school (Goe, 2007).

The advantage of examining 'teacher quality' through teacher practices is that this approach targets the classroom where the teaching-learning process takes place (ibid., 2007). The main disadvantage of this approach is that the assessment of classroom teaching is a challenging process, requiring time and financial resources. Furthermore, a close monitoring of a teacher's work, especially against different and ever-changing benchmarks, has proven to cause teachers stress and anxiety (Perryman, Ball, Maguire, & Braun, 2011).

Educational effectiveness research, in general, has received its fair share of criticism; criticism which has primarily been directed at the oversimplification of what is the complex process of schooling, poor theoretical grounds, and methodological weaknesses (Goldstein & Woodhouse, 2000; Schereens, 2013). Consequently, school organizational complexity has often been overlooked, and the wider societal context (including the political-, cultural-, and economic circumstances) within which schools function is rarely considered. In terms of methodological approaches, the strongest critique targeted studies that draw causal conclusions from cross-sectional designs. It has been recognized, however, that complex statistical approaches, such as multilevel structural equation modelling can provide useful insights into the link between certain key school factors and student outcomes (Goldstein & Woodhouse, 2000; Schereens, 2013).

Finally, as contended by Reynolds et al. (2014), educational effectiveness research would benefit from a closer attention to (i) contextual variables that shape and inform school- and classroom processes, (ii) development of observational instruments in order to capture teacher instructional processes and its cultural variations, and (iii) more theory-driven research. Relevant theories, according to Reynolds et al. (2014), would be theories that explain how factors and process at the classroom and school levels are dependent upon limitations and allowances presented by the wider surrounding environment.

A teacher professional competence model

In order to unify various approaches to the investigation of different aspects of teacher quality into a single theoretical structure, Kunter and colleagues (Kunter et al., 2013a) have designed a model of teacher professional competence. The model brings together theories of professionalism and competence, and aims

to identify those characteristics which serve as necessary prerequisites to the achievement of the main teacher tasks; including (i) the creation of a favourable teaching and learning environment in the classroom and (ii) enabling students to achieve their learning objectives.

This model is based on the theoretical foundations of Shulman's work on 'professionalism' (1998), which suggests that teaching can be regarded as a profession—that is, as an occupational field characterized by, for example, the notion of a 'professional calling', the domains of theoretical understanding and skilled practice, the ability to exercise professional judgment under uncertain circumstances, learning from experience, and being part of a professional community. In addition, the model uses an extended conceptualization of 'competence' (Weinert, 2001) as it relates to teacher professionalism, thereby including metacognitive, motivational, and self-regulatory characteristics. The model views professional practice as an interaction between various aspects, which comprise both teacher formal qualifications and personal characteristics. These aspects of teacher competence are 'knowledge', 'beliefs', 'motivational orientations', and 'self-regulation' (see Figure 1).

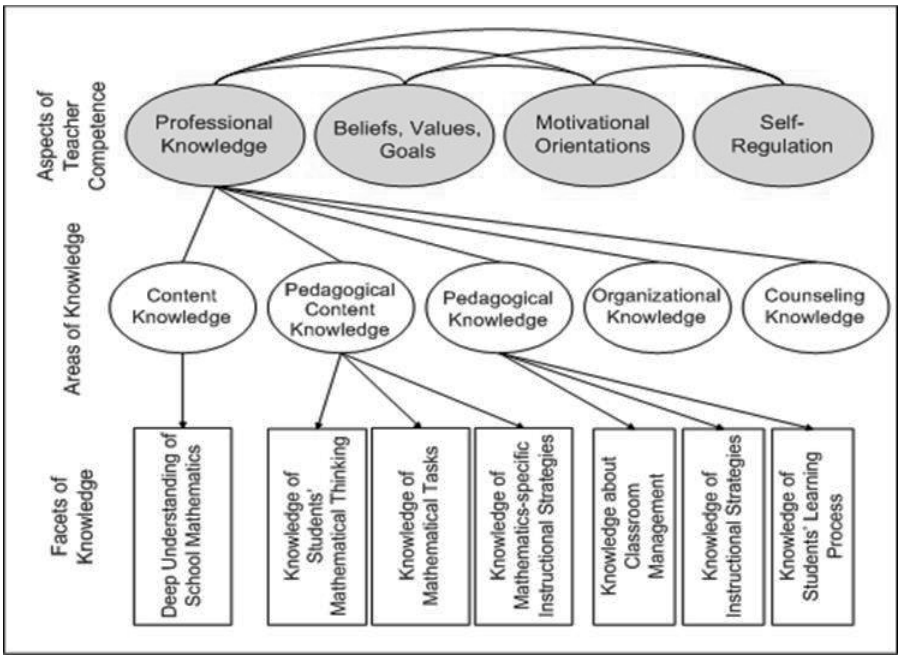

Figure 1 The COACTIV model of teacher professional competence *(Source: Kunter et al., 2013a)*.

Each of the aspects of teacher professional competence is comprised by specific knowledge areas which, in turn, are represented by distinct facets of knowledge. Within the COACTIV model, knowledge is recognized as the main aspect of teacher professional competence. Although it is based on previous expertise research that deals with knowledge and beliefs, the model also includes non-cognitive characteristics, such as 'motivational orientation' and 'self-regulation'.

- The professional knowledge aspect in the model is comprised of five knowledge areas. The three key areas, pedagogical knowledge, content knowledge, and pedagogical content knowledge are adopted from Shulman's classification (1986; 1987). Additionally, the domain includes organizational knowledge and counselling knowledge.
- The aspect of beliefs, values, and goals comprises value commitments, epistemological beliefs, subjective theories of teaching and learning, and goal systems
- The motivational orientations aspect includes locus of control, self-efficacy beliefs, and intrinsic motivation.
- The self-regulation aspect addresses sources of resilience to professional strain and stress, which is experienced by teachers (Kunter et al., 2013a).

The COACTIV model has a number of merits, since it takes issues related to multidimensionality and the interaction between both cognitive and motivational factors which are characteristic of the teaching profession into account. In addition, it recognizes that these qualities are teachable and learnable, through, for example, teacher education and further professional development. However, the model fails to incorporate the teaching-learning environment, which shapes and informs (and is shaped by) the proposed aspects of teacher professional competence.

The model of teacher professional competence was empirically tested in a study on a nationally representative sample of 10th grade German students and their mathematics teachers (Kunter et al., 2013b). The results of the study, on the basis of a 1-year repeated measurement design, demonstrated that teachers with higher levels of pedagogical content knowledge, constructivist beliefs, and teacher enthusiasm (representing teacher motivational orientation) contributed positively to student gains in mathematics achievement. Moreover, teacher enthusiasm was associated with student enjoyment of mathematics. It should

be noted that the above effects could also be explained by the quality of instruction provided by these teachers. Thus, teachers with higher levels of PCK offered their students more cognitive activation (positively effecting student achievement) and learning support (positively effecting student motivation). Teacher self-regulatory skills were found to impact on student outcomes indirectly through better learning support. One of the study's conclusions was that more research that integrates different aspects of teacher professional competence, in particular teacher motivational beliefs and self-regulation, is needed (Kunter et al., 2013b).

In summary, it is evident that it is a difficult task to identify one single aspect of teacher quality as being most important for student learning and development. Moreover, what constitutes a formally qualified teacher in terms of the content, length, and organization of teacher education varies greatly between countries, domains, and grade levels, and may also vary within individual countries over time (Blömeke & Olsen, 2019; Scheerens & Blömeke, 2016). Furthermore, the knowledge levels of teacher education candidates may vary between countries and within a single country over time. Notwithstanding this, while the existing research on the relationships between teacher quality aspects and student achievement present numerous (and sometimes, inconsistent) findings, some factors are of particular relevance, especially in relation to secondary school mathematics; in this domain, teacher content and pedagogical content knowledge demonstrate consistent links with student achievement.

It has been also recognized that it is by means of their formal teacher education that teachers acquire professional knowledge, something which is a key prerequisite for successful teaching. Even though pedagogical content knowledge, or the knowledge of making a subject matter comprehensible for the students, remains the most widely researched domain of teacher professional knowledge (Depaepe, Verschaffel, & Kelchtermans, 2013), other knowledge domains are also important to teacher success (König, et al., 2011). These domains include, but are not limited to, general pedagogical knowledge, knowledge of the learners, their characteristics, and educational contexts. An important finding of several research syntheses on teacher quality is that teacher success should be measured on the basis of multiple outcomes, and not only in terms of student achievement (Kunter et al., 2013a). For example, teachers may enhance student motivation to learn and create a positive classroom/school climate. Moreover, consideration of the teaching-learning context is crucial to

the evaluation of teacher success (Goe, 2007). Schools offer different conditions for teachers, many of which are already in place when the teachers start working there; for example, school location and type, the availability of resources, and the general characteristics of the student body. Other conditions, including the school climate, whilst exists at the time when the teachers enter the school, can, nevertheless, be changed by the teachers' efforts.

The importance of the school environment

For an extended period of time after the publication of the famous Coleman report (Coleman et al., 1966), it was believed that a student's family background was the single strongest predictor of a student's school success, with the school itself having little impact on this outcome. However, the studies of school effectiveness that followed (Mortimore, et al., 1988; Rutter et al., 1979) found that the school did matter for student success, and it was mainly teacher behaviour which made some schools more effective than others. In a 3-year longitudinal study of twelve secondary schools in a large urban area, Rutter and colleagues (1979) provided evidence that differences between schools, in terms of the role they play as social institutions, were of importance for student outcomes, over and the above the influence that student family background had. Among the school factors that made a difference for student success, regardless of their background, were school emphasis on academic success, instructional quality, and a favourable learning environment for students. Most of the above aspects are amenable by teachers.

A few years later, Mortimore et al. (1988) followed approximately 2000 primary school students from 50 randomly-selected schools, over the course of four years. This longitudinal study produced similar findings, in that most of the features of effective schools were related to teacher behaviour. Besides the overall school organization, factors that made a difference for student success included a safe and orderly school climate with high expectations for students, as well as various aspects of teacher and instructional quality, including subject-matter knowledge, effective teaching strategies, and classroom management. However, as underscored by Rutter and Maughan (2002), school effectiveness research has not paid enough attention to both generic- and knowledge-based teaching skills, as specified by Shulman.

Subsequent studies of school effectiveness have reinforced earlier findings recognizing that "school-level variables, although critical to understanding the

success or failure of schools, do not fully explain the performance of students and are, in fact, facilitators or inhibitors of teacher effects" (Schaffer, Devlin-Scherer, & Stringfield, 2007, p. 37). It is for his reason that, whenever feasible, school effects should be examined together with teacher effects (Reynolds et al., 2014).

The relationship between school environment and school composition

School compositional effects, or 'collective SES' (Gustafsson, Nilsen, & Yang Hansen, 2018), which include factors such as the social- and immigrant composition of the school, have also shown to be related to school processes (Opdenakker & Van Damme, 2001; Luyten et al., 2005).

The effects of school composition may be explained by various social mechanisms that shape and inform the school environment and school processes. These mechanisms include self-selection, peer effects, and educational choice, to name just a few (Gustafsson, Nilsen, & Yang Hansen, 2018). For example, students from higher SES backgrounds may enjoy more parental support, self-select themselves to schools with more favourable climates and better teachers, who, in turn, also choose to work in schools with a certain student intake.

Many studies have investigated school factors which influence the relationship between school SES and achievement. Generally, a safe school climate was shown to be related to both student achievement and school SES, which also makes it difficult to separate the effects of school climate and school composition (Gustafsson, Nilsen, & Yang Hansen, 2018). Fewer studies have explored the mechanisms by which school climate may impact on the collective SES. For example, Liu et al. (2015), using PISA data, found that school climate mediated the effects of school composition on student achievement. Further, school composition and school climate may interact with each other, creating a joint effect where students from higher SES backgrounds tend to enjoy more favourable school climates than students from lower SES backgrounds (Luyten et al., 2005).

All in all, a safe and stimulating school environment is important for both students and teachers, because it helps them to reach their fullest potential in learning and teaching, respectively. While schools depend on teachers to create a climate that is conducive for student learning and development, teachers, in

turn, depend on the school's efforts to support their mission of promoting a favourable working environment (Schaffer, Devlin-Scherer, & Stringfield, 2007).

The learning environment for students

Student well-being is a vital condition for student learning and socio-emotional development. Educational research has identified the particular role that a favourable school climate plays in its contribution to numerous student outcomes: including student social-, psychological-, behavioural-, and academic outcomes (Astor & Benbenishty, 2018; Wang & Degol, 2016). As McGiboney (2016) explains, if a student's fundamental needs for safety, care, and respect are not met, and if no basic opportunities to interact and connect with their peers and adults in a meaningful way are provided, then the student will not realise their intellectual-, emotional-, and social potential, something which is crucial to their general well-being. One way to ensure the student's well-being at school is to create and maintain a favourable school climate.

Admittedly, school climate is a very broad term, and is difficult to define; hence, there are many various definitions for this term (Anderson, 1982; Wang & Degol, 2016). School climate is often associated with concepts like 'school culture', 'spirit', 'ethos', 'openness', 'health', and 'the personality of the school', to name just a few (Thapa et al., 2013). The notions of 'school culture' and 'school climate' are often used interchangeably, as overlapping constructs. However, some researchers contend that 'culture' is a broader construct that encompasses 'climate' (MacNeil, Prater, & Busch, 2009). Furthermore, Hoy and Feldman (1999) suggest that 'climate' is a less abstract construct than 'culture', since it is, in their opinion, easier to measure empirically. They advise that this be used when measuring the organizational health of a school. Scheerens (2016) supports this suggestion by noting that, while the 'culture' metaphor is more applicable to organizations in general, the 'climate' metaphor is more commonly applied to the school environment.

Student well-being is closely associated with feeling safe in a bullying-free school environment (Kutsyuruba, Klinger & Hussain, 2015). Even though some progress has been made internationally in creating school environments where all students are treated fairly and with respect, challenges still remain Bullying is one of these challenges that schools are faced with, internationally (Gaffney, Ttofi, & Farrington, 2019; Olweus, 2013; Smith, 2013). Even though,

in the Nordic countries, the levels of bullying may be considered low compared to the international average, this does not mean that this phenomenon is completely absent in Swedish, Norwegian, Danish, and Finnish schools (Bjereld, 2017). Moreover, there may exist within- and between-country differences in the prevalence of bullying and differences in teacher responses to bullying. Research in Finland and Norway, for example, clearly demonstrates that teachers are able to foster healthy school environments, in which they can deal with bullying and prevent its occurrence (Menesini & Salmivalli, 2017; Olweus, Solberg, & Breivik, 2018).

Working conditions for teachers

Just as student success at school depends on their well-being, teachers can only exercise their professional potential to the fullest when they are provided with favourable working conditions. Thus, the issue of the school environment and its role in promoting teacher well-being comes to the fore.

Spilt, Koomen, and Thijs (2011) argue that a focus on teacher well-being is important for several reasons. First, knowing which factors make a teacher's working environment stimulating and enjoyable can help address issues related to job commitment, which in turn may prevent the serious problem of teacher attrition. Second, investigating what makes teachers feel rewarded in their job may help our understanding of how teachers perceive school reforms. Finally, ensuring teacher well-being directly translates into the well-being of their students.

Job satisfaction, in particular, was found to be closely related to both teachers' subjective well-being, as well as their mental and physical health (Bowling, Eschleman, & Wang, 2010; Skaalvik & Skaalvik; 2009). This observation calls for a closer investigation into the link between school working environment and teacher job satisfaction.

In sum, despite convincing evidence regarding the importance of teacher quality and instructional quality for student outcomes, teaching remains a complex and an inherently uncertain activity. There is much more to what we can observe and study empirically, because teachers balance between the uncertainties of knowledge, action, and influence on their students' learning and development daily (Floden & Clark, 1988). While many of these uncertainties can be diminished by suitable teacher education programs, pre-service and in-service experience, and professional development, a teacher's work remains

framed by the structures of the classroom and school, as well as the wider conditions imposed by local-, regional-, and national educational structures. One may also consider the influence that global trends in education may have in this context. These structures either allow or prevent teachers from bringing about their students' intellectual and socio-emotional development, while, at the same time, they strive to maintain their own well-being, professional commitment, and quality of instruction.

Chapter 4: Theoretical framework

The theoretical approach adopted in this thesis is inspired by critical realism (Archer, 1995; 2000; Bhaskar, 1975; 2016). Below, some of this theory's key propositions are addressed.

A stratified reality

One of the key propositions made by critical realism is that reality is autonomous and independent of our knowledge and understanding of it. Reality is a stratified system, comprising (i) the domain of the 'real' (a deeper level where social mechanisms, which cause events to happen, are realized); (ii) the domain of the 'actual' (where events take place, regardless whether we experience them or not); and (iii) the domain of the empirical (where we experience certain events) (Bhaskar, 1975; 2016). Therefore, while we might attempt to investigate the 'real' world, we should not reduce reality by equating it to our empirical observations, since to do so lead us to commit an 'epistemic fallacy' (Danermark, et al., 2002).

Critical realism places particular emphasis on investigating the domain of the real that is comprised of social objects. Such objects possess both necessary properties (those that are essential for the object's existence) and contingent properties and powers (which are more circumstantial) (Archer, 2000). A school as a 'social object' may thus comprise necessary properties, such as school type, location, school climate, teaching force, and student intake. Similarly, whether a school climate is favourable/unhealthy, whether the teachers are certified/non-certified, and whether the students are motivated/uninterested exemplify contingent school properties.

Social objects are also relational, in the sense that their essence lies in their relationships with other objects. For example, student cognitive and non-cognitive abilities can be causally related to teacher characteristics. A combination of internally-related objects forms a 'structure' (Danermark, et al., 2002). Social structures also exist on multiple levels and in different areas. For example, what happens in classroom is contingent upon, though not

determined by, the social structure of a school. What happens in a school, in turn, is contingent upon the features of a school system.

The study of a social phenomena

When we are interested in studying a certain social phenomenon, it is argued that our focus should be placed on the social relationships within structures which allow for or cause a phenomenon to happen (Danermark, et al., 2002). According to critical realism, things happen (or events take place) because of the action of structures and objects that possess causal powers, which trigger generative (causal) mechanisms. The concept of 'causality' is then immediately associated with an object's ability/inability to do things. To study causal mechanisms entails the investigation of an object's causal properties (Archer, 1995). The realization of generative mechanisms and their effects, in turn, depends on the existence of particular conditions, which can either be facilitating or hindering in their effect. According to Archer (1995), human agency constantly approves of or contests such conditions, which contributes to emergence of the properties of agency. For example, despite the existence of poor school working conditions, a teacher may nevertheless choose to stay in the profession, since he or she is driven by a commitment to bring about a positive change in their students' learning and development.

Adding to this complexity is the notion of the 'open system', which is the domain of social sciences (Bhaskar, 2016). In an 'open system', occurrences are not strictly sequential, because a preceding event does not necessarily cause a following one. This in contrast to 'closed systems', which are studied within the natural sciences, where, under experimental conditions, it is possible to single out the effects of a particular mechanism (Bhaskar, 2016). Further, phenomena that exist or occur on a higher level cannot be explained from a lower level only. This means that student behaviour or their achievement levels cannot be explained in terms of their personal resources only. In a stratified reality, national educational systems possess structural properties, just as specific schools and classrooms possess. With regards to educational systems, a multi-level analysis may facilitate our understanding of its stratified nature; with students being nested in classrooms, and classrooms being nested within schools, etc. In addition, the events in the 'real' domain are not always directly observable to us, since much of what happens happens 'behind the scenes' of our knowledge and perceptions. In this case, an inferential method of

'retroduction' (a method that is often adopted in critical realism) proves instrumental by "imagining a model of a mechanism that, if it were real, would account for a phenomenon in question" (Bhaskar, 2016, p.79). In other words, retroduction presupposes the provision of explanations of certain events, by hypothesizing about the underlying causal mechanisms behind them.

The relevance of time

Critical realism denotes three forms of conflation (Archer, 2000). A downward conflation implies that agents are devoid of their autonomous powers to act independently of structures, whereas an upward conflation presupposes that structures are solely the result of the agents' action. Further, the idea of the inseparability between agents and structures is regarded as a central conflation. Instead, critical realism puts forward the idea of 'analytical dualism', in which none of the levels possesses absolute autonomy since each level mutually influences the other (Archer, 2000). Analytical dualism also underscores the significance of time and space when one considers social phenomena. Thus, structures and agents have different powers and properties operating in different realms of social reality and are temporarily separable, with the former preceding the latter (Archer, 2000). As Archer (1995, p. 90) puts it, "structure necessarily predates action, which transforms it, and structural elaboration necessarily post-dates those actions."

The continuous interaction between structure and agency (as main constituents of social order) is explained in critical realism by the 'morphogenetic/morphostatic cycle' (Archer, 1995). It allows one to study generative mechanisms behind any change or resistance in a society. Within the cycle, structure exists before action, which transforms it, creating a new setting for human agency. The action may either reproduce a structure in a modified form, or transform it into a yet another structure. The agent herself also undergoes transformation during this process. Within this setting, human agency is not determined by the structures, but is either restricted or enabled by them. Therefore, it is important to study the attributes of social structures which agency possible (Archer, 1995).

Graphically, a morphogenetic cycle can be represented by using different time points where various relations take place between structural aspects, agency, and the resulting reproduction or change. Thus between time points 1 and 2, structures exert influence upon agents; between time points 2 and 3,

agency mediates (resists or accepts) the conditioning powers of corresponding structures; and time point 4 represents a resulting morphogenesis/transformation or morphostasis/reproduction (Figure 2). Time point 4 is what researchers are able to observe and label as 'a certain social phenomenon'.

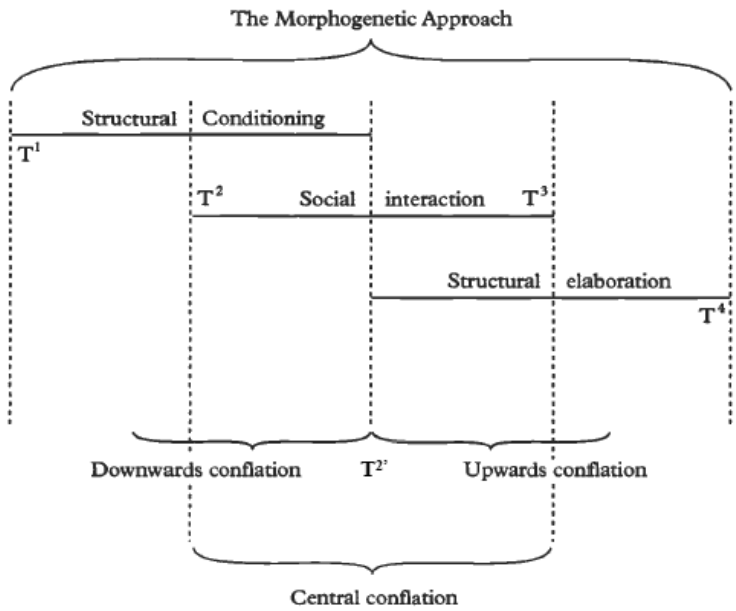

Figure 2 The limited time span of conflationary theories compared with the morphogenetic approach. *(Source: Archer, 1995, p. 82.)*

Three orders of reality

Human agency is also stratified, with its different properties and powers emerging at each strata of reality: 'the self' in the natural strata, 'the person' in the practical strata, and 'the social self' in the social strata. These orders, in turn, are 'the natural order', 'the social order', and 'the practical order' (Archer, 2000).

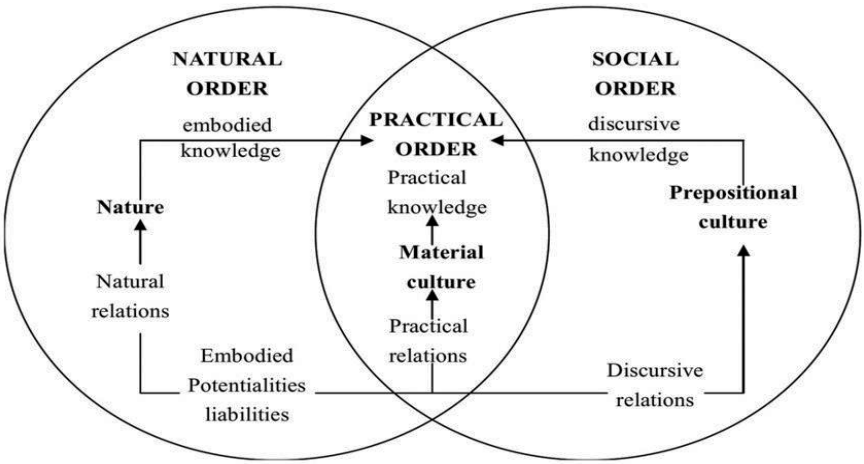

Figure 3 Three orders of reality and their respective forms of knowledge. *(Source: Archer, 2000, p. 162.)*

The natural order is characterized by embodied knowledge, self-discovery, and nature (Figure 3). A teacher's gender may be considered as a manifestation of self in the natural order. Social order is based on discursive knowledge, discursive relations, and prepositional culture. For example, the social status of teachers, or the way teachers' work is valued in the society, is a manifestation within the social order. In contrast to practical knowledge, discursive knowledge is obtained through scholarship. Natural and social order shape our actions within the practical order.

The practical order is characterized by practical knowledge, shaped by and acquired by practical interaction with material culture. Practical knowledge is thus defined by four distinctive features: (i) it is procedural, since it is mainly focused on 'doing'; (ii) it is implicitly embodied in the form of skills; (iii) it is also tacit, since it is realized through an activity involving artefacts. For example, artefacts in a teacher's domain of practical activity may be the school curriculum, textbooks, and various teaching materials and manuals. Finally, (iv) practical knowledge is extensive of the body by means of material culture. These qualities of practical knowledge shape and inform the mode through which it is inquired, i.e. by means of a apprenticeship, or by learning a skill. It may, therefore, be said that teacher candidates enter teacher education programs with embodied knowledge of what it means to be a teacher, gained, for example, from their own experience as school students. During their teacher training,

they are exposed to discursive knowledge which is based on the previously accumulated scholarship on teaching and learning, which they later exercise during their field and in-service experiences.

The three orders described above condition our emotional concerns towards our physical well-being (within the natural order), our performative achievement (the practical order), and our self-worth (the social order). Throughout the course of their lives, during continuous internal conversations, human beings try to find a balance between the three orders in their attempts to be successful within them all. However, there is an inherent conflict in trying to attend to all of the orders simultaneously, and at certain times one order is prioritized over the other(s). The way we prioritize our concerns for the three orders of reality, (or our 'modus vivendi'), is what shapes our personal identity (Archer, 2000). For instance, teachers may try to find a balance between the demands from students, parents, and school principals in the practical order, their physical and psychological well-being in the natural order, and the feeling of commitment to the teaching profession in the social order. Thus, humans do not have a full say in the formation of their personal identity, because it is embedded in nature, practice, and society. On the other hand, it is up to each active human being how concerns within the framework of these orders of reality will be balanced.

In conclusion, it may be noted that critical realism is characterized by epistemological relativism; a non-reduction of reality to our knowledge of reality, and ontological realism; the existence of the real world with its causal powers, which may not be readily observable, but have visible effects. Besides this, critical realism advocates for methodological pluralism – rather than the prescription of one 'best' method – since the choice to employ this theory is guided by the properties of the object under inquiry (Danermark, et al., 2002). This thesis does not aim to investigate student achievement or other outcomes for *individual* students and teachers. Instead, the purpose of this study is to shed light on *group* differences, and factors which may be associated with these differences. It follows that a quantitative approach is the most relevant one given these conditions, so that we can paint a broad picture of the patterns that exist between the aspects of teacher professional competence, school working conditions and the learning environment, on the one hand, and student outcomes and teacher outcomes, at the classroom level and the school level, on the other.

Chapter 5: Methodology

This chapter provides an overall perspective on the advantages and limitations of using data from international large-scale educational assessments, together with concrete examples of how data from TIMSS was dealt with in the studies that are included in this dissertation.

Data

This thesis is based on an analysis of the data collected from the Swedish participation in TIMSS 2011 and TIMSS 2015 (Trends in International Mathematics and Science Study). In addition to this data, the comparative study included in this thesis also uses data from TIMSS 2015 that was conducted in Sweden, Norway, Denmark, and Finland. TIMSS is the IEA's (International Association for the Evaluation of Educational Achievement) study of mathematics and science achievement for 4th grade and 8th grade students. The IEA has been conducting large-scale comparative studies of educational achievement for the past 50 years. Besides TIMSS, the IEA conducts a number of large-scale assessments such as PIRLS (Progress in International Reading Literacy Study) and ICCS (International Civic and Citizenship Education Study), to name but a few. TIMSS collects educational achievement data and information about the educational contexts for learning mathematics and science in 4th grades and 8th grades so as to provide countries with information on how they might improve their school systems, as well as providing information about longitudinal trends in student performance (Mullis & Martin, 2013). The study is performed on a four-year cycle, with the first assessment conducted in 1995, and the latest one in 2019.

There are a number of advantages with studies like TIMSS. Firstly, it collects a representative sample of around 5000 students in each respective grade in each participating country. This would be quite a daunting task for an individual researcher to do. Importantly, as participation in TIMSS is confidential, and results are not reported for individual students or teachers, the major ethical concerns present in experimental studies, such as consent claims, have been addressed (Gustafsson, 2013). Further, the study allows to connect student

achievement and background information with that of their teacher, which enables studying important questions related to teacher and instructional quality. In addition, rich contextual information on the participating students, teachers, and school principals is provided in the respective background questionnaires. For example, the TIMSS teacher contextual questionnaires provide data on teacher factors, including their educational level, years of teaching experience, number of university semesters they studied mathematics, and certification status, in addition to the teachers' background characteristics, such as their age and gender. Moreover, in TIMSS 2011, teacher self-efficacy beliefs were assessed in the teacher background questionnaire for the first time. Finally, the teacher background questionnaire offers the researcher the opportunity to assess a number of aspects relevant to the school working and learning environment; including school climate, a number of school working conditions, and teacher job satisfaction, to name just a few.

The present thesis takes advantage of TIMSS data from two cycles; 2011 and 2015. Study I employs data from 2011 for 8th grade students and their mathematics teachers in Sweden. Studies II and III use more recent data, from 2015, which is focused on 8th grade mathematics teachers in Sweden (Study II), and 4th grade students and their mathematics teachers in Sweden, Norway, Denmark, and Finland (Study III). The rationale why 8th grade students were chosen as the target population in Study I was because teachers at this level are more specialized in the subject-matter that they teach (compared to 4th grade teachers of mathematics). This allowed to analyse certain aspects of their professional competence in relation to student mathematics achievement. Study II focused on teacher job satisfaction, which is important for teacher well-being, student well-being, student achievement, overall school cohesion, and teacher retention and recruitment. Because the shortage of teachers is more pronounced for secondary school mathematics and science teachers, than other groups of teacher (Statistics Sweden, 2018), the investigation of job satisfaction of 8th grade mathematics teachers was deemed particularly relevant. Finally, the focus of Study III on 4th grade students and their teachers was justified by the fact that bullying is most widespread in this age group (World Health Organization, 2016). Therefore, an investigation into a school climate which promotes student well-being and allows them to achieve to their fullest potential would be quite pertinent.

Variables

The variables used in this dissertation are derived from TIMSS 2011 and TIMSS 2015 international database. They are summarized in Table 1 below.

Table 1 A summary of the variables used in the thesis.

Student level	**Source**
Number of books in the student's home	Student questionnaire
Language spoken in the student's home	Student questionnaire
Bullying victimization	Student questionnaire
Student achievement in mathematics	International TIMSS Database
Teacher level	
Teacher gender	Teacher questionnaire
Duration of teaching experience	Teacher questionnaire
Education as main study area	Teacher questionnaire
Mathematics education as main study area	Teacher questionnaire
The number of semesters spent studying mathematics	Teacher questionnaire
Teacher certification	Teacher questionnaire
Teacher professional development	Teacher questionnaire
Teacher self-efficacy beliefs	Teacher questionnaire
Teacher instructional quality	Student questionnaire
Teacher job satisfaction	Teacher questionnaire
School level	
Student discipline	Teacher questionnaire
Leadership support	Teacher questionnaire
School resources	Teacher questionnaire
Teacher cooperation	Teacher questionnaire
Teacher workload	Teacher questionnaire
School climate	Teacher questionnaire

Source: Boston College, TIMSS & PIRLS International Study Center

In Study I, the number of semesters spent studying mathematics, the years of teaching experience, and teacher self-efficacy beliefs were used as independent variables, whilst student-assessed instructional quality and student mathematics achievement were assigned as dependent variables.

Study II employed teacher perceptions of student discipline, leadership support, school resources, teacher cooperation, and teacher workload as independent variables. In addition to this, the other independent variables that are examined included teacher gender, teacher certification, education and mathematics education as main study areas, duration of teaching experience, the exposure to professional development, and teacher self-efficacy beliefs. Teacher job satisfaction was the dependent variable in Study II.

The independent variables in Study III were teacher perceptions of school climate, while the dependent variables were student perceptions of the prevalence of school bullying and student mathematics achievement.

The number of books in the student's home as well as the language spoken in the student's home were used as control variables at the student individual, classroom and school level, as applicable.

To account for various national educational settings, the TIMSS contextual questionnaires present an opportunity for participating countries to modify some questions or response options, so as to make them better suited to the specific country's context and/or to provide additional information about important features of the national education system (Foy, Arora, & Stanco, 2017). For Sweden, there were several specific adaptations made to the contextual student and teacher questionnaire, which were particularly germane to the study of teacher quality. Study I took advantage of the Swedish adaptation of the TIMSS 2011 international questionnaire dealing with an important teacher variable: 'The number of semesters the teacher has studied mathematics'. Other Swedish national adaptations to the international questionnaires that were used in the studies that are included in this dissertation pertained to additional teacher self-efficacy beliefs items (in the teacher background questionnaire), and student-assessed instructional quality (in the student background questionnaire) (see Study I). Study II examined the Swedish adaptations pertaining to teacher education variables, such as 'Teacher certification' and 'Main study area'.

International large-scale assessments of the IEA: Strengths and weaknesses

In this section, the major strengths and weaknesses of data collected by international studies are identified and discussed. TIMSS is based on the curriculum model, and comprises three facets: the intended curriculum, the implemented curriculum, and the achieved curriculum (Mullis & Martin, 2013). The intended curriculum is what is prescribed by the national educational system for students to learn. The implemented curriculum includes what is taught and how it is taught, whilst the achieved curriculum pertains to what the students have learned. As the nature and extent of curricula vary across educational systems, TIMSS tries to include facets of the different countries' curricula models in its tests to the largest extent possible. It is only natural that, in an attempt to find a common international denominator among the many countries' rich curricula, the full breadth of a national curriculum may not be captured.

Notably, the large-scale assessments that are conducted by the IEA, such as TIMSS, use rigorous quality assurance procedures during all stages of the study, from instrument development to their reporting on each study's results. Test items and scoring guides are developed by expert groups on the basis of assessment frameworks, and these text items and scoring guides are subsequently tried out during field tests. In addition, the scoring personnel undergo specific training, so as to enable the reliable scoring of open-ended assessment items (Mullis et al., 2016). The international version of the test is translated from English into the language of instruction in the participating countries. Specially-appointed National Research Coordinators (NRCs) play an important role in ensuring the accuracy of the translations. A similar process of development, trial, and review is used for the student questionnaires, the teacher questionnaires, and the school context questionnaires. These questionnaires are developed in close cooperation with a number of expert groups, including TIMSS and PIRLS International Study Centre staff, Questionnaire Item Review Committee experts (QIRCs), and the NRC (Martin, Mullis, & Hooper, 2016).

The TIMSS study also uses rigorous school and classroom sampling techniques so as to ensure that the data that is collected is representative for the student population at the country level. In order to achieve this, a two-stage sample random design is employed, where schools are sampled at a first stage

and one or more classes of students are selected from each of the sampled schools at a second stage (Joncas & Foy, 2012). Furthermore, large-scale surveys of the IEA emphasize quality in the data collection procedures in each participating country. Thus, to ensure consistency across the administration of each survey, TIMSS employs a set of standardized operational procedures, described in the relevant manuals, which must be followed by all the participants. National Research Coordinators are responsible for monitoring local administrators' adherence to these procedures (Martin, Mullis, & Hooper, 2016). Finally, a number of International Quality Control Monitors perform assessment site visits, so as to ensure the quality of the data collection process (ibid., 2016).

Along with the large number of different ways in which the data can be used in advanced secondary analyses come a number of potential pitfalls in terms of threats to validity. Such threats may be challenging to overcome. We consider Shadish, Cook, & Campbell's (2002) definition of 'validity' in this context as: "the approximate truth of an inference, or a knowledge claim" (2002, p. 33). While there exist a number of different definitions of validity (see also: Cohen, Manion & Morrison, 2017; Messick, 1995), this thesis draws upon the one suggested by Shadish, Cook, and Campbell (2002) as comprising construct-, external-, internal-, and statistical conclusion validity. Construct validity is associated with the validity of inferences that are made by the researcher about the higher order constructs that represent the persons and settings that are investigated in a study. External validity signifies the degree to which a study's results are generalizable to other populations/settings. Internal validity refers to the causal inferences that are made by the researcher with respect to observed co-variation between the variables used in a study. Because statistical conclusion validity, or the appropriate use of statistics to infer co-variation between an independent and a dependent variable (see Shadish et al., 2002) is closely related to other types of validity, it is directly integrated in the discussion of such. Construct validity is a key aspect to consider when one analyses data from large-scale educational assessments. This is explored further in the next section.

Construct validity in TIMSS: The case of teacher self-efficacy beliefs

Since our knowledge of reality is always fallible, we approximate our claims regarding reality to other sources of knowledge, theories, and our findings in

the empirical realm (Shadish et al., 2002). Obviously, it is not possible to have the perfect measure of any given construct, and the constructs that are used in this thesis are exceptions to this rule. In this section the construct of 'teacher self-efficacy beliefs' will be discussed. The construct is well-known for its long, and sometimes, troubled research history (Henson, 2002). Because it is based on the two related, yet distinct, theoretical foundations, namely, social cognitive theory (Bandura, 1986; 1997) and locus of control theory (Armor et al., 1976; Rotter, 1966), 'teacher self-efficacy beliefs' has suffered from being inadequately explicated, which has led to a subsequent confounding of the construct (Henson, 2002; Zee & Koomen, 2016).

There have been numerous efforts to establish precise measures of the teacher self-efficacy construct. For example, Bandura (1990) suggested how one might improve the construct validity of teacher self-efficacy beliefs. First, teacher self-efficacy beliefs is a complex multidimensional construct, which is, at the same time, task- and domain-specific. Items designed to measure self-efficacy are quite demanding in terms of their semantic structure. For example, in order to accurately reflect 'perceived capability' as the main feature of self-efficacy beliefs, the questions should (i) contain the expressions *can* or *be able to*; and (ii) address an individual with the pronouns *you* or *I* so as to yield a personal judgement regarding 'perceived capability'. Another important condition for successfully measuring self-efficacy addresses the degree to which a challenge or obstacle hinders successful performance, since self-efficacy reflects the level of difficulty individuals believe that they can overcome. If these precautions are not made, then 'ceiling effects' which are due to high ratings of self-efficacy beliefs on routine teacher tasks become unavoidable (Bandura, 1990).

Teacher self-efficacy scales that has appeared subsequent to Bandura's discussion, for example, the Ohio State Teacher Efficacy Scale (OSTES) (Tschannen-Moran & Hoy, 2001), the Norwegian Teacher Self-Efficacy Scale (NTSES) (Skaalvik & Skaalvik, 2007), and the Teacher Efficacy Beliefs System-Self (TEBS-Self) (Dellinger, 2008) generally follow Bandura's recommendations regarding the construction of items that interrogate 'self-efficacy beliefs'. Despite the fact that a number of dimensions differ across these above-mentioned scales, the key domains of teacher work (instruction, motivating students, and classroom management) are, in fact, identical across the scales.

The items comprising the teacher self-efficacy beliefs scale in the TIMSS 2011 teacher background questionnaire reflect two of the three key dimensions

mentioned earlier, namely: (i) self-efficacy for instructional strategies, and (ii) self-efficacy for student engagement. The dimension of teacher self-efficacy for classroom management was not represented in the scale, which may hinder the measure used in this thesis from fully capturing the complexity of the teacher self-efficacy beliefs construct, thereby resulting in construct under-representation (see Messick, 1995; Shadish, et al., 2002).

Another validity threat is posed by construct irrelevant variance (Messick, 1989) and teacher self-efficacy beliefs, as any self-reported measure, may be subject to such undesired influence. Responses to items that touch on capability beliefs are generally known to be influenced by a social desirability bias, which is a tendency for survey respondents to present themselves in ways deemed positive/acceptable according to certain cultural norms in a given society (Paulhus, 1991). Thus, teachers might feel that it is socially desirable to report high levels of confidence in performing essential teaching tasks. The Dunning-Kruger effect (Kruger & Dunning, 1999) is yet another factor, which may lead to bias in teacher responses on the self-efficacy scale, when more competent teachers actually report lower levels of self-efficacy beliefs, and vice versa.

Last, but not least, the TIMSS contextual questionnaires use retrospective questions, which is a common way to collect data in the social sciences. Responses to such questions, however, may be subject to additional bias, including recall effects which are connected to the omission of information, or reporting effects which are associated with relating past events with present events, to name just a few (Van der Vaart, Van Der Zouwen, & Dijkstra, 1995). There are a number of approaches that can be adopted in order to reduce the effect of the above-mentioned biases on the validity of responses to retrospective questions. One of those measures (which is also employed in some of the TIMSS questions) is 'bounding', a measure which delimits the timeframe for the response. An example from the student background questionnaire is the question regarding student bullying victimization: "During this school year, how often have other students from your school done any of the following things to you?"

It is also relevant to consider similar issues in relation to some of other constructs that are used in this thesis; including student-assessed instructional quality, school climate, and teacher job satisfaction, to name just a few. These variables concern complex abstract constructs which are not directly observable and are not easily operationalised. A latent variable approach, which is described in the following section, is instrumental to measurement of such constructs.

Latent constructs and multilevel phenomenon

A latent variable defines a construct, which is not directly observable through single indicators. However, it is possible to operationalise such theoretical constructs with the use of appropriate, multiple indicators (Bollen, 2002). Another useful feature of latent variables is that they do not suffer from measurement error, since the unique part of the variance remains separated from the unexplained part (Gustafsson, 2009). Analytical approaches such as confirmatory factor analysis (CFA) allow for the formulation of measurement models where a set of observable indicators are used as measures for one or more error-free latent variable (Brown, 2014).

CFA is a type of structural equation modelling that deals with measurement models in particular, by specifying the relationships between observed indicators and latent variables (Brown, 2014). Before conducting a CFA, it is necessary that the researcher assess the reliability of the scale that is to be used. Reliability, in this sense, is the ability of an instrument to provide consistent measures. In cases where a construct is measured by several indicators, it is important to make sure that these different indicators measure the construct in a consistent manner. In other words, we are interested in an indicator that will inform us that items in a scale are measuring the same construct, or items that are internally consistent (DeVellis, 2016). Reliability may thus be measured in several different ways. The more closely correlated the items in a scale are, the higher the reliability coefficient will be. However, a high reliability coefficient does not always reflect a high level of internal consistency among the scale items. Its value is also influenced by the number of items in the scale. This value increases with the inclusion of additional items (Field, 2018).

One of the main advantages of CFA is that it provides the researcher the opportunity to adjust for measurement error when estimating the relationship between variables. A CFA demands a solid empirical or conceptual foundation for the specification and evaluation of the factor model (Brown, 2014). Thus, CFA is usually used in later phases of scale development or construct validation. CFA is a commonly used method to assess construct validity of an instrument. Assessing model fit is an important step in the validation process, because it allows the researcher to conclude whether the formulated actually model fits the data. A CFA validation of measurement models of latent constructs is thus necessary before modelling their interrelations in structural equation models (SEM) (Brown, 2014).

SEM has become a widely-used analytical tool in the social sciences. It allows for the modelling of interrelations of latent variables in structural models (Brown, 2014). Its advantages over similar techniques include (i) the use of multiple indicator latent factors, (ii) the testing of direct and indirect effects, and (iii) the testing of reciprocal relationships (Gustafsson, 2009). Moreover, SEM allows the researcher to analyze data which is subject to a hierarchical observational structure which is a commonly-used structure in educational assessments like TIMSS (ibid., 2009). Such organization of the data may present a threat to statistical conclusion validity (Shadish et al., 2002). One of such threats is the drawing of incorrect inferences about co-variation if observations are not independent; for example, students in the same classrooms are likely to have similar responses to questionnaire items (Hox, 2002). This threat is addressed by means of multi-level structural equation modelling.

Multilevel modelling is often used in the social sciences in order to account for the hierarchical data structure (Hox, 2002). This is particularly relevant for the field of education, because educational systems have an inherently multilayered structure, where of students are nested within classrooms, classrooms are nested within schools, and all the schools in a country constitute a national education system.

Besides safeguarding statistical conclusion validity, multilevel modelling offers the researcher a number of conceptual advantages. For example, it permits the explanation of both within-cluster and between-cluster variability of an outcome variable (Hox, 2002). The variance of the outcome variable, that is, student achievement across classrooms/schools may be explained by using predictors at both the individual student level and classroom/school level. This becomes particularly pertinent, because a construct may have differing meanings at different levels of analysis (Gustafsson, 2013). For example, while student socio-economic status (SES) refers to student individual background, at the within-level, it is also an expression of social segregation/selection at the between-level. Having information on student achievement enables the researcher to investigate the degree to which student individual background and classroom/school composition are associated with student achievement at these different levels. Moreover, with information on aspects of teacher professional competence available, it is possible to examine whether teachers are able to compensate for the negative effects that a disadvantaged student background may bring.

As such, a two-level approach is based on breaking down the total variance into a within-group and a between-group component (Hox, 2002). The between-group variance is a measure of the degree of dependence of observations within groups and is referred to as the 'intra-class correlation'. The intra-class correlation (ICC) should be examined prior to engaging in a multilevel analysis, so as to assess its relevance. The intra-class correlation may also be considered to reflect group homogeneity. For example, a group is considered to be more homogeneous than another group if more individuals within it share common experiences than the other group. Another option to treat multilevel data is to aggregate or disaggregate variables to a common level. This method, however, may lead to a loss of statistical power (Hox, 2002). Conceptually, aggregation can contribute to a fallacy of automatically transferring relationships and attributes from one level to another (Roberts et al., cited in Lance & Vandenberg, 2015). On the other hand, as noted by Gustafsson (2013), the field of education is characterized by many relationships that exist at the level above the individual, for example, involving organizational features of the school as a workplace, therefore conducting an analysis at the aggregated level may actually prevent this 'reductionistic fallacy' (p. 280).

In both CFA and SEM, it is important to carefully examine model fit with several recommended fit indices. In this thesis, the most commonly employed fit indices are used, including the Chi2 to degrees of freedom ratio, RMSEA, CFI, and SRMR. A good fit in relation to the above indices reflects (i) a correct specification of the number of factors, (ii) the relationships of various indicators to the latent factors, and (iii) the relationships of various indicators among indicator errors (Kline, 2015). However, as Bollen (2014) warns, when evaluating a model, not only should the researcher consider model-data correspondence, but also whether a model is consistent with the real world. In many cases, the latter issue is overlooked by researchers, not least because it is more challenging than establishing model-data correspondence. Moreover, the assessment of model consistency with reality is actually not completely possible, because our knowledge of the real world is imperfect in itself. As summarised by Bollen (2014): "If a model is consistent with reality, then the data should be consistent with the model. But, if the data is consistent with a model, this does not imply that the model corresponds to reality" (ibid., p. 68). It may be then said that the researcher's ultimate goal is not to identify the best fitting model, but to identify the model which, while being reasonably consistent with the data, is also the most theoretically justified.

At the same time, we must take into account the fact that most of the fit indices also account for a model's simplicity (Hox & Bechger, 2007). Thus, a model that specifies all possible relations between the variables will have a perfect fit, but it will also be nearly as complex as the observed data. Therefore, model fit and complexity/simplicity should be balanced against each other. Moreover, given two models with the same fit, one is advised to choose the more parsimonious model (Hox & Bechger, 2007).

Large-scale cross-sectional assessments: A snapshot of the educational landscape

The TIMSS study has a cross-sectional design, which means that it takes a snapshot of student performance at one time point. In studies with a cross-sectional design, the internal validity (which is concerned with the causal inferences that are made in the study) is of utmost importance, but it is often compromised by the drawing of incorrect causal inferences (Shadish et al., 2002). This is a common issue in studies of educational effectiveness, where the intent to establish causality between input and output factors may sometimes result in the identification of a mere association, and not a causal relationship, between these factors (Gustafsson, 2013).

Another common threat to internal validity in studies with a cross-sectional design is the unfortunate omission of certain important variables in the analytical model, thereby leading to the introduction of bias in the estimation of the effects of the variables that are included (ibid., 2013). In the studies that are included in this thesis, examples of omitted variables may be student motivation, school type, location, and school resources, among others. In addition, in these studies, no information on students' prior achievement was available, and teachers may have taught certain groups of students for a limited amount of time only. Moreover, students and teachers may have self-selected themselves into certain types of schools. One way to address these threats is the use of control variables. For example, in the three studies included in this thesis, the relationships between teacher characteristics and student achievement, school climate and student bullying victimization, and student bullying and achievement are controlled for student SES and immigrant background, at the individual level, classroom level, and the school level, as applicable.

Yet another potential threat to internal validity is reverse causation, or the reverse impact of the hypothesized dependent variable on the assumed independent variable, or the effect of a reciprocal relation between the variables, in which case, a causal inference may be incorrect (Gustafsson, 2013). An example of this threat in this thesis is the impossibility of concluding whether it is teacher self-efficacy that leads to student achievement, because it may also be the case that student achievement (as a reflection of the teachers' mastery experience) leads to higher levels of teachers' confidence in their capabilities. Hence, the direction of influence may be reciprocal. Further, the effect of teacher self-efficacy on student achievement may be indirect, via other mediating variables, such as teacher content knowledge.

Ultimately, a cross-sectional design does not allow causal claims to be made in the investigation of complex phenomena, because of a lack of information concerning the temporal precedence of certain phenomena. For example, school climate may both precede and follow teacher agency in time. Teachers start to work in a school where there is *already* a certain social climate, which is the result of interactions between students, teachers, principals, and other school staff over time. School climate may thus be considered an established structure that affects a teacher's potential actions. Teachers then interact with the school leaders, their colleagues, and students within this structure, which is further elaborated or reproduced. Because any such elaboration must occur *over time*, there is apparently a need for at least two time points to be identified when one wishes to explain how school climate is created and sustained. If this is not done, it is challenging to investigate the nature of the reciprocal interplay between these two variables over time. However, cross-sectional studies may also contain information that may describe a phenomenon prior to its elaboration. For example, teacher education precedes classroom instruction and student achievement, and so we can, therefore, be confident on the direction of the influence of this variable when we investigate the relationship between aspects of teacher professional competence and student academic success.

Generalizability in studies with a cross-sectional design

External validity, which is a measure of the generalizability of an observed effect on a population, setting, and outcome (Shadish et al., 2002) is less of an issue in studies with a cross-sectional design. The TIMSS sampling procedure

(addressed in the previous subsection) allows the researcher to conclude that the results of the TIMSS study can be generalized over the Swedish 8th grade and 4th grade student population. Because teacher representativeness was not specifically sought after by TIMSS, one may, instead, speak of 'the teachers of representative samples of students' (Foy, Arora & Stanco, 2013). In the three studies included in this thesis, the representativeness of the teacher sample can be verified by relevant national census data. For example, according to the Swedish National Agency for Education (2017), during the period 2015-2016, a little over 70 percent of all Swedish secondary school mathematics teachers were certified as such (with 80% of mathematics teachers in public schools possessing certification versus approximately 67% of mathematics teachers in private schools). In the teacher sample included in Study II, for example, 83% of the teachers reported that they were certified to teach mathematics. Further, according to Statistics Sweden (2018), we note that there is an approximately equal distribution of women and men employed as teachers in secondary school education. With regards to the gender distribution pattern that is present in the teacher sample included in Study II, 51% of the teachers are female and 49% of the teachers are male. While no claims should be made regarding the generalizability of the results based on TIMSS data to the whole teacher population in Sweden, it may be safely concluded that the teacher sample in the TIMSS study corresponds relatively well to the Swedish census data.

However, external validity can be also compromised by missing information on one or more variables of interest, because conclusions that are based on a partial set of observations may differ from those drawn on a full set of observations. Such conclusions may compromise our claims of knowledge about the real world even further. A significant amount of missing data may also lead to loss of statistical power, meaning that it becomes difficult to detect the effects of certain variables in the population due to an insufficient sample size for rendering significant results (Brown, 2014).

Data may be missing either randomly or systematically (Allison, 2001). When data is missing completely at random, 'missingness' is independent of all observed variables. Also, in cases where data is missing at random, the missing data distribution may depend on any of the observed data. Finally, data which is not missing at random has a systematic pattern. In the empirical studies included in this thesis, the proportion of missing data was about 2-3% in the student background questionnaire, while it reached up to 15-20% in the teacher background questionnaire. Most of 'missingness' pertained to the complete

questionnaire rather than single items, and no systematic missing values were detected.

There are several ways in which a researcher can deal with missing data (Allison, 2000). The most common approaches to missing data in SEM is maximum likelihood estimation and multiple imputation (Brown, 2014). While the principle of multiple imputation is to fill in missing data estimates, maximum likelihood uses information from all available cases to estimate the most likely values. Maximum likelihood is considered to be one of the most efficient methods for handling missing data within SEM framework (Muthén & Muthén, 2007; Allison, 2003). Maximum likelihood estimation is employed in this thesis to handle missing data.

Reflections on the methodological framework

Ultimately, the studies included in this dissertation made use of the main advantages of the TIMSS study, while exercising caution in making strong causal claims. For example, this thesis exploited the possibility of simultaneously analysing a multitude of variables from both the international TIMSS questionnaire and its national Swedish adaptation. These factors included important aspects of (i) teacher professional competence, such as teacher coursework in mathematics, teaching experience, teacher self-efficacy beliefs, and exposure to professional development; and (ii) the school teaching and learning environment, such as teacher workload, teacher cooperation, leadership support, student behaviour, student bullying and school climate. Furthermore, information on teacher and student background factors, including teacher gender, student social and language background was employed in this dissertation. Last, but not the least, this dissertation also took advantage of the comparative approach by examining cross-national country patterns in student bullying and the role of school climate in reducing bullying in the Nordic region. Finally, by relating teacher characteristics, aspects of school working conditions, and the learning environment to student achievement, teacher instructional quality, teacher job satisfaction, and student bullying, it was possible to study patterns of the associations between these variables.

Clearly, given the inherently complex and situational nature of teaching, it is not possible to account for all of the factors which may explain variation in teacher quality and the ways teachers exercise their professional competence.

At the same time, the above relationships are "not random and not inexplicable" (Cochran-Smith et al., 2014, p. 112), allowing to draw a broad picture of the patterns with the help of the relevant methods.

Chapter 6: The Empirical Studies

This dissertation is comprised of three empirical studies. In this chapter, a brief account of these studies is provided, along with an integrated discussion of the results of these three studies.

Study I. The role of teacher characteristics for student achievement in mathematics and student perceptions of instructional quality

A school's teaching faculty is the most important resource it has for student success. However, teachers vary in quality and there is a multitude of teacher characteristics that affect student outcomes. The aim of Study I is to explore how the amount of teacher coursework in mathematics, years of teaching experience, and teacher self-efficacy beliefs were related to student achievement and student perceptions of instructional quality.

The data used in this study came from TIMSS 2011 (Trends in International Mathematics and Science Study) and included 5573 8th grade students and their 296 mathematics teachers, in Sweden. The analytical methods that were used primarily consisted of confirmatory factor analysis and two-level structural equation modelling. The main finding of the study was that the amount of teacher coursework in mathematics was positively associated with classroom average achievement in mathematics. That the effect of teacher studies in mathematics became apparent after controlling for student socio-economic background can be attributed to the fact that lower-SES classes had teachers who had studied the subject for longer time. Notwithstanding this observation, more coursework in mathematics did not enable teachers to compensate for their students' disadvantaged background, as indicated by the study's results. Moreover, teachers with higher self-efficacy beliefs tended to offer better instructional quality, as assessed by their students. However, teacher self-efficacy beliefs were not related to student achievement levels. Finally, relationships between teaching experience and student achievement followed a non-linear pattern, with the effect of teaching experience increasing up to about 20 years of in-service experience, and then declining afterwards. It was

concluded that students may have problems with estimating important aspects of instructional quality and that teacher content knowledge is crucial for student performance.

Study II. Teacher job satisfaction: The importance of school working conditions and teacher characteristics

There are several reasons why teacher wellbeing should be made a priority. Content teachers are less stressed than other teachers and more able to focus on exercising their immediate professional duties, which contributes to student wellbeing and academic success, cohesive schools, and enhanced teacher status. Study II investigated the relationships between teacher job satisfaction, school working conditions, and teacher characteristics for 200 eighth-grade mathematics teachers in Sweden. The TIMSS 2015 data from Sweden was used in this study. The main methods of investigation that were used were confirmatory factor analysis and structural equation modelling.

The results of this study revealed a substantial association between school working conditions and teacher job satisfaction. More specifically, teacher workload, teacher cooperation, and teacher perceptions of student discipline affected teacher job satisfaction, while student body composition did not. Regarding teacher characteristics, female teachers, teachers with more exposure to professional development, and teachers with higher self-efficacy beliefs tended to report higher levels of job satisfaction. In addition, it was found that job satisfaction of male teachers was more affected by teacher cooperation, while student discipline was more important for job satisfaction for teachers with lower self-efficacy beliefs.

Because teacher job satisfaction is a strong predictor of teacher retention, the implications of this study, in terms of creating a favourable school working environment, are obvious, especially in times of teacher shortage, which Sweden is imminently set to be confronted with. The importance of adequate school working conditions notwithstanding, the study also identified the role that self-efficacy beliefs play in this context, which may serve as a buffering mechanism against stressful working environment.

Study III. The role of schools and teachers in creating safe learning environments: A Nordic perspective

Because students spend a considerable amount of time at schools during their educational careers, the issue of their well-being requires close attention. Bullying is a serious threat to student well-being and school success; a threat which may be mitigated by a positive school climate. The aim of Study III was to examine the contribution that school climate makes to the presence of school bullying, and its association to student mathematics achievement. This study adopted a comparative perspective by identifying similarities and differences in relationships between Sweden and its Nordic neighbours: Norway, Finland, and Denmark. Data was derived from the TIMSS 2015 study, focusing on 4th grade students and their mathematics teachers, in these four countries. Analyses were conducted at the school-level, by using data on teacher perceptions of school climate, student perceptions of bullying victimization, and student mathematics achievement.

The results of this study revealed several interesting patterns, some of which were similar across the Nordic countries, whilst others revealed some differences between these countries. First, the nature of school-level bullying varied across these countries. The between-school variation in school-level bullying was rather low however, with Sweden having the highest between-school differences. Furthermore, in Sweden, schools with a higher proportion of immigrant students tended to have higher levels of bullying, while in Norway, higher levels of bullying prevailed in high SES schools. A similar feature that was identified for all four national settings was that a positive school climate was linked to lower levels of school bullying.

Relations between bullying and achievement were only found for the part of Sweden and Denmark, while no association was found for Norway and Finland. The relationship between bullying and achievement in Denmark was minor and could be mitigated by a favorable school climate. In Swedish schools, a strong negative link between bullying and achievement was observed, and could be reduced by the school climate to only a minor extent. The study underlines the significance of not only monitoring student achievement but also social outcomes of schooling.

Integrated discussion

The three studies included in this thesis reveal a wide array of interrelations between teacher agency and surrounding structures of the classrooms and schools. This integrated discussion addresses how teacher agency is supported or restricted by certain structures. Archer's notions of 'structure', 'agency', and 'morphogenesis/morphostasis' serve as an underlying framework for the discussion that follows. Three overarching themes emerge:

1. Implications for teacher education (Study I and Study III)
2. School as a working place for teachers and students (Study II and Study III).
3. Improving teachers' professional status (Study I and Study II)

Implications for teacher education

Teachers are agents who enter schools with embodied knowledge, skills, and beliefs that they have obtained during their teacher education, field experience, and their own experiences as learners. Their teaching abilities will be confronted with either their realization or they will be hindered by the practical order of the classroom and within the boundaries that the school structure imposes on their practices. The results of Study I reveal that students of teachers who are better equipped with content knowledge in mathematics have higher mathematics achievement levels. Furthermore, teaching experience is positively related to student achievement, but only until a certain point in the teacher's careers. Teacher content and pedagogical content knowledge enable teachers to bring about positive student learning outcomes; something which has been emphasized in a vast volume of previous research. The effects of subject-matter coursework on student achievement appear to be domain- and grade-level specific (Wayne & Youngs, 2003), and are most compelling in context of secondary school mathematics teaching (Baumert et al., 2010; Kleickmann et al., 2013). Since such indispensable knowledge is primarily acquired during formal teacher education programs (Ball, Thames, & Phelps, 2008; Darling-Hammond et al., 2005; Depaepe, Verschaffel, & Kelchtermans, 2013), ensuring a high quality in these programs is crucial.

However, teachers also work within the pre-existing structures of the classroom, in terms of student social and language background. In cases where classrooms are comprised of students with a lower SES/non-native language background, the results of study I indicate that teachers may have difficulties in

overcoming the impact of student background on achievement, thus reproducing the existing structures. These results of Study I are further corroborated by Hansson (2012) who suggests that Swedish mathematics teachers may not be able to counteract the influence that a less advantageous student background has on student performance.

Similarly, in Study III, the results imply that the structural conditions of the schools, in terms of student composition, restrained the Swedish teachers' agency with respect to the ability of the teachers to establish and sustain a positive school climate, which would, in turn, counteract bullying. In a comparative perspective, Danish teachers, although to somewhat a limited degree, managed to counteract bullying by means of forming and upholding a positive school climate, while Finnish and Norwegian teachers appeared to have succeeded better in mitigating bullying.

In summary, the results of Study I and Study III indicate that teachers in Sweden have but a limited ability to mitigate the influence of existing school structures on student learning and socio-emotional safety, pointing at potential morphostatical tendencies. Given this, policy-makers need to address problems associated with school segregation by equipping schools with large proportions of low-SES students and students with an immigrant background with better resources, in particular in terms of teacher quality. Teacher education programs may need to strengthen their resources that are aimed at increasing teacher quality, both in terms of content and pedagogical content knowledge, as well as general pedagogical knowledge. Such knowledge, with a special focus on their socio-emotional competence and classroom management skills, should enable teachers to more effectively address the needs of a diverse student population.

School as workplace for teachers and students

A school is not merely the location of a formal educational process, but it is also a place where teachers and students spend most of the time during their professional/learning careers. Besides teaching and learning processes, other important activities take place at school, including the establishment and maintenance of social relationships, the shaping of values and beliefs, and the realization of one's intellectual, professional-, civic-, and creative potential (Darling-Hammond & Cook-Harvey, 2018). Whether schools are to provide teachers and students with environments which support or hinder development and learning, thus, becomes a very pertinent question to ask in this context. The

findings of Study II revealed that a reasonable workload, teacher cooperation, teacher professional development, and student discipline were related to teacher job-satisfaction, while student body composition was not. These results are well in line with previous research demonstrating that, after taking into account school working conditions, characteristics of student intake became no longer relevant to teacher job satisfaction (Johnson, Kraft & Papay 2012; Ingersoll, 2017). In addition, a feasible workload, which would allow teachers to concentrate on a better lesson planning, addressing student individual needs, and collaborative professional development has been recognized as crucial for teacher job satisfaction (Liang & Akiba, 2017).

In a similar vein, Study III inquired whether school structural conditions in the four Nordic educational settings positively contribute to a safe school environment and student learning. It was found that, in Sweden and Denmark, student bullying victimization was related to lowered levels of mathematics achievement, while in Finland and Norway it was not. In addition, in both Sweden and Norway, school composition affected the presence of bullying. However, these conditions manifested themselves in a different way. In Sweden it was student immigrant composition that correlated with the presence of bullying, whilst in Norway, it was the intake of students with higher SES background. Previous studies have established a close interconnection between the school composition and climate, making it somewhat challenging for the researcher to disentangle their respective effects on student outcomes (Gustafsson, Nilsen & Yang Hansen, 2018). At least in part, the underlying causal mechanism of this phenomenon is constituted by students from certain backgrounds who self-select themselves to enrol into schools with more a favourable climate. However, as explained by Astor and Benbenishty (2018), the influences of the school composition, can be "buffered, mediated and moderated" (p. 13) by the school climate. Teachers then, are able to transform school climate, for example, by demonstrating and enforcing anti-bullying attitudes and behaviours.

Enhancing the professional status of teachers

The successful performance of a teacher in the practical order of reality is supported by addressing their needs in the natural- and social orders. Teachers who feel physically and emotionally fit are able to develop professionally, and those teachers who enjoy societal respect are likely to be more effective in the classroom. As the results of Study I reveal, teaching experience is positively

related to student achievement, although the relationship weakens after around 20 years of teaching service. This observation may point to a close connection of the teachers' career path with their life trajectory, which, with age, may involve a natural decline in ability (e.g., associated with a decline in physical health) paired with a declined motivation (Klassen & Chiu, 2010). In a similar vein, as revealed by Study II, a poor school working environment may undermine teacher job satisfaction. This may happen because of the stress that such working conditions cause teachers. Elevated levels of stress, in turn, may affect teacher instructional quality. However, teachers' experience of stress also has implications for the social standing of teachers. Teaching has been considered to be a particularly stressful professions (Kyriacou, 2001), which is compounded by its low occupational status. Furthermore, its low social standing makes it difficult for the teaching profession to recruit new graduates from teacher training programs in many countries.

For practicing teachers, the lack of (i) teacher professional status, (ii) societal respect, and (iii) opportunities for professional development may undermine their job commitment and satisfaction, thus increasing their propensity to leave the teaching profession. Improving working conditions for teachers may thus have multiple positive consequences. First and foremost, it can improve teacher well-being. Second, an occupation which prioritizes employees' well-being may attract more qualified students into teacher training programs and the better professionals into schools. Third, teachers who are satisfied with their working environment are likely to be more committed to their chosen profession. Teacher commitment, in turn, can raise instructional quality and enhance student learning (Day & Gu, 2009). Cumulatively, the above factors will trigger a higher professional status, which will reinforce a positive cycle of teacher recruitment and retention.

However, teachers daily have to find a balance between their own needs and the demands from students, parents, school leadership, and broader societal conditions. As revealed by the results of Study II, certain school structures may be transformed by teacher agency. Hence, the job satisfaction of teachers with higher self-efficacy beliefs was less affected by student discipline, while the job satisfaction of male teachers was more dependent on teacher cooperation. While research on the role of socially-acquired gender identities in tackling the school working environment is rare, the ability of teacher self-efficacy beliefs to moderate stressful working conditions at school is well documented in international educational research (Betoret, 2009; Caprara, 2006; Collie, Shapka,

& Perry, 2012; Klassen & Chiu, 2010; Skaalvik & Skaalvik, 2016). In agreement with Bandura's propositions (1997), teachers with higher self-efficacy beliefs may treat student discipline as a challenge that is possible to overcome, which will not undermine their job satisfaction and commitment to the profession. This may explain why many teachers will stay in the profession despite stressful and challenging school working conditions (Chesnut & Burley, 2015).

However, whether teachers will exercise their agency in the classroom or not may depend on other factors. Thus, the weakening teacher authority, an increased monitoring of teachers' work, and strengthened student and parental positions as 'customers' due to marketization reforms may be causal mechanisms why teachers underutilise their agency, as manifested, for example, by self-efficacy beliefs. Ultimately, teacher needs should be addressed so as to ensure physical retention, a "retention of quality" (Day & Gu, 2009, p. 452), but also a retention of commitment to the profession. This can help to attract, keep, and support the best teachers in the profession.

Chapter 7: Concluding Remarks

The first part of this chapter underlines the main contribution of the studies of this dissertation to existing knowledge. Suggestions for further research in the field are provided in the second part of the chapter.

Contribution

This dissertation contributes to existing knowledge in several ways. First, it identifies a positive relationship between the Swedish teachers' amount of coursework in mathematics and 8th grade student achievement in mathematics, as well as a positive relationship between teaching experience and 8th grade student mathematics achievement. These results point to the need to increase incentives for (i) the enrolment into and completion of teacher education programs, as well for (ii) retaining qualified teachers in schools.

A further empirical finding made in this dissertation is that teacher pedagogical skills cannot be easily captured by student assessments. This result is of interest in light of the current increased scope of assessments and evaluations of teacher performance that can be found within the school system. This observation becomes particularly relevant as numerous research studies have demonstrated the existence of the negative effects that the culture of performance monitoring and evaluation has on teacher well-being, their professional reputation, and attractiveness of the teaching profession.

Furthermore, the empirical evidence in this dissertation indicates that job satisfaction for the Swedish 8th grade mathematics teachers is dependent on the perceived adequacy of workload, opportunities for collegial cooperation, professional development, and student behaviour. There is also support for male teachers' job satisfaction being more affected by collegial collaboration, whilst student discipline is more important for teachers with low self-efficacy beliefs. These results suggest that teachers may mobilize their personal resources to navigate around potentially problematic aspects of their working conditions at school. On the other hand, based on the results of this dissertation, there is no support for the idea that that a schools' student composition is a decisive factor in the well-being of its teachers. However, the

results suggest that sufficient time be allocated to teacher collaborative professional development if teacher job satisfaction is to be realised.

Finally, this thesis' empirical findings indicate that bullying is relatively frequent in Swedish schools compared to other Nordic countries, and that bullying is also associated with lower student outcomes. The results of this study imply that, among the Swedish schools and teachers, there are, in some cases, under-utilized opportunities which they can avail themselves of to enhance school climate and thus reduce bullying incidents and their negative consequences, such as a lowered student academic performance.

Further research

Further research in this area should continue to explore teacher content and pedagogical content knowledge in their relation to various teacher and student outcomes, such as motivation, self-efficacy beliefs, and well-being. The relationship between teacher general pedagogical knowledge, in particular classroom management skills, and student socio-emotional adjustment should be explored in terms of its potential in creating a safe and stimulating learning environment. More fine-grained measures of teacher content-, pedagogical content-, and general pedagogical knowledge are warranted, with a particular attention to domain, grade, and the context specificity of such measures. In addition, teacher beliefs, motivational orientations, and self-regulation skills should be explored in a greater detail, including their reciprocal relations with teacher professional knowledge.

With regards to teacher-self-efficacy beliefs, the results of the studies that are included in this dissertation did not support their relationship to student achievement. Instead, teacher self-efficacy beliefs were found to act as a teacher self-regulatory mechanism, mitigating the influence of stressful working conditions on teacher job satisfaction. Therefore, longitudinal experiments may facilitate a more nuanced investigation of the development and the effects of teacher self-efficacy beliefs on their job satisfaction. In addition, TIMSS study could further develop the construct 'teacher self-efficacy beliefs' to include the key dimensions of instructional strategies, student engagement and classroom management.

Further to this, a wide range of school working conditions, including, but not limited to, teacher autonomy and decision-making opportunities, as well as relations with school leadership, parents, and colleagues needs to be

investigated in relation to teacher job motivation, teacher commitment, and turnover intentions.

Given the recent evidence from large-scale assessments of the increased achievement levels of Swedish students, a trend analysis could help identify the factors that allow students from diverse backgrounds to succeed. A favourable school climate may be one such factor, since it has been seen to assist in reducing the influence of student background, thereby contributing to the provision of equal opportunities for learning and development for all students. Research on bullying can be extended to include more countries, in order to increase our understanding of its nature and prevalence cross-nationally. Successful implementation of national practices that reduce and prevent bullying in schools could further contribute to increasing student well-being and opportunities to learn.

Methodologically, studies with a strong design, such as longitudinal experimental studies or trend analysis at the country level are warranted since they can be used to establish solid causal relationships between aspects of teacher professional competence, instructional quality and student as well as teacher outcomes.

Swedish Summary

I takt med en ökande globalisering har skolsystem världen över kommit att fästa allt större vikt vid frågan hur man bäst förser de unga med kunskaper och färdigheter som kan bidra till framgång för den enskilde och för samhället i stort (Darling-Hammond et al., 2017). Skolan förväntas också kunna erbjuda lika möjligheter till lärande och utveckling för alla elever. Forskningen har dock visat att vissa skolor lyckas bättre än andra med sitt uppdrag och att lärarkompetens utgör en nyckelfaktor i detta avseende (Darling-Hammond, 2000; 2014; Nye, Konstantopoulos, & Hedges, 2004; Hattie, 2009; Hanushek & Rivkin, 2012; Kyriakides, Creemers, & Antoniou, 2009; Muijs et al., 2014).

Bakgrund

Lärarna är de som ska förverkliga målen om att elever med varierande förutsättningar ska tillägna sig nödvändiga kunskaper och förmågor (Darling-Hammond, 2012; Paine & Zeichner, 2012). Trots en ökande samstämmighet om att lärarkvalitet är av stor betydelse för elevers framgångsrika lärande kvarstår emellertid i hög grad frågan om vilka faktorer som konstituerar lärarkvalitet och vilka lärarkaraktäristika som är viktigast för elevresultat (Goe, 2007; Scheerens & Blömeke, 2016). Ett ytterligare problem är att lärares status har sjunkit kontinuerligt under flera årtionden och i ett flertal länder. Detta har fått till följd att rekrytering till läraryrket kommit att utgöra ett växande problem.

Vidare har lärares sjunkande status och många gånger försämrade arbetsvillkor bidragit till att många lärare lämnar yrket i förtid, ibland efter bara ett fåtal års tjänstgöring (Ingersoll, 2017; Ingersoll & Smith, 2003). Lärares arbete sker i specifika sammanhang. Avreglering och marknadsutsättning av skolan jämte styrning enligt principer hämtade från New public management med dess fokus på standarder, kvantifierad prestation och konkurrens, har kommit att påverka lärare och deras arbete på flera viktiga sätt i många västländer inklusive Sverige (Ball, 2003; Evetts, 2009; Dovemark & Holm, 2017). Ett större inslag av extern kontroll, ökade möjligheter till att utkräva ansvar och en ökad arbetsbelastning bland annat i form av krav på dokumentation inverkar negativt på lärares välbefinnande och benägenhet att

stanna kvar i yrket (Perryman, Ball, Maguire & Braun, 2011). En traditionell läraridentitet baserad på professionell kunskap och tilltro till professionellas yrkesmässiga bedömningar utmanas av den ökande externa bedömningen (Ball, 2003; Zeichner, 2010) och en stark tendens till av-professionalisering kan observeras bland annat för svensk del (Lundahl et al., 2013).

Relationer mellan lärare och elever samt lärare och föräldrar har också kommit att förändras där elever och föräldrar har positionerats som kunder och fått en starkare ställning gentemot skolan. Skolutveckling utifrån kollegial standard har eroderat (Lundström & Holm, 2011). Med den individuella lärarens prestationer lätt tillgängliga för publik utvärdering har också risken för offentliggörande av det som kan beskrivas som enskilda misslyckanden ökat (Evetts, 2009; Dovemark & Holm, 2017). Det är därför angeläget att få ytterligare kunskap om vilka lärarkaraktäristika och arbetsvillkor som kan utgöra skyddsfaktorer med avseende på lärares trivsel.

Attraktiviteten hos läraryrket har således avtagit under en följd av år, bland annat i Sverige (Bertilsson, 2014; Universitetskanslersämbetet, 2017). Den ovan beskrivna utvecklingen med sjunkande status och försämrade arbetsvillkor för lärare i har i flera skolsystem sannolikt ytterligare försvårat möjligheten att rekrytera till lärarprogrammen och eventuellt också att behålla de redan yrkesverksamma (Borman & Dowling, 2008; Ingersoll, Merrill, & May, 2016). Brist på kvalificerade lärare har varit en fråga i det svenska utbildningssystemet under en längre tid. Skolverket (2018) har beräknat att 80 000 fler lärare kommer att behövas till år 2031. Ändå kan rekrytering av nya lärare vara en utmanande uppgift eftersom endast 11% av lärarna i Sverige anser att samhället värderar läraryrket (mot 35% av lärarna i Norge och 58% - i Finland) (Skolverket, 2019). Samtidigt kommer rekrytering av fler lärare inte att lösa lärarkrisen om ett stort antal av dessa lärare sedan lämnar yrket. Resultaten av ett antal studier som utförts av Ingersoll och kollegor i USA (2001; 2016; 2017) tyder på att lärarnas missnöje med skolans arbetsförhållanden är en av de mest inflytelserika faktorerna när det gäller beslut att lämna yrket. Verksamma åtgärder för att förbättra lärarnas arbetsförhållanden är följaktligen av största vikt.

En trygg och stimulerande arbetsmiljö där individer kan trivas och utvecklas är av avgörande betydelse också för elever. Trotts detta kämpar många skolor i världen med mobbningsproblematik. Mobbning har stora personliga konsekvenser som spänner över flera plan och påverkar lärandet i vid bemärkelse (Smith, 2013; Menisini & Salmivalli, 2017). Lärares och rektorers förmåga att skapa skol- och klassrumsklimat som genomsyras av respekt för

varandras olikheter utgör en viktig förutsättning elevers socio-emotionella och intellektuella utvecklingsmöjligheter (Kutsyuruba, Klinger & Hussain, 2015; Wang & Degol, 2016).

Det komplexa samspelet mellan å ena sidan, elever med varierande bakgrund, erfarenheter och kunskaper och å andra sidan, lärare med varierande grad av förberedelse för sitt uppdrag i skolmiljöer av skilda slag och med skilda förutsättningar, är utmanande för den forskning som ytterst syftar till att förbättra skolors möjligheter att fullgöra sitt uppdrag. Vissa problem är universella men hänsyn behöver också tas till kontextspecifika förhållanden i länder och skolor.

Mot bakgrund av ovanstående översiktliga problembeskrivning av har följande övergripande syfte formulerats:

Syfte

Det övergripande syftet med föreliggande avhandling är att utveckla förståelsen för innebörden av lärarkvalitet och hur den relaterar till elevresultat. Betydelsen av lärares arbetsvillkor och skolklimat undersöks också med avseende på effekter för elever och lärare.

Studie I undersöker relationerna mellan flera aspekter av lärares professionella kunskap (ämneskunskaper, ämnesdidaktiska kunskaper, självskattad undervisningsförmåga) och elevers bedömning av undervisningskvalitet liksom elevers matematikprestationer.

Studie II förskjuter fokus till lärares arbetstillfredsställelse som en nödvändig förutsättning för att de ska kunna utöva sin yrkeskompetens.

I studie III undersöks skolklimatets roll för att minska negativa effekter av mobbning och främja elevprestationer.

Sammantaget finns det många lärar-och skolkaraktäristika som kan bidra till att förklara variation i elevresultat. Det är därför av intresse att undersöka det relativa bidraget från olika indikatorer och hur de samspelar (Cochran-Smith & Zeichner, 2009). Denna avhandling syftar till att bidra med kunskap om faktorer som är avgörande för undervisningskvalitet.

Teoretisk referensram

Denna avhandling har tagit sitt teoretiska avstamp i kritisk realism (Bhaskar, 1975). Nedan följer en kort översikt över några av dess huvudsakliga argument. Kritisk realism bygger på ett ontologiskt antagande att verkligheten är stratifierad. Agent och struktur utgör skilda skikt av den sociala verkligheten och dessa har var för sig egna egenskaper och egna krafter. Kritisk realism förespråkar alltså idén om en stratifierad verklighet och även att ett fenomen på en högre nivå inte enbart kan förklaras från en lägre nivå. Vi kan inte förklara psykologiska fenomen enbart utifrån en biologisk nivå. Vi kan heller inte förklara skeenden på den sociala nivån enbart utifrån människors psykologiska egenskaper. Agent och struktur konstituerar dock varandra i ett samspel som försiggår över tid.

Archer (1995; 2000) har utvecklat Bhaskars tankegångar. Hon beskriver tid som ett centralt metodologiskt begrepp och poängterar just att förändring sker över tid, och i cykler, så kallade morfogenetiska cykler. Strukturella villkor föregår handlingar. Existerande strukturer villkorar alltså, men bestämmer inte, handlingar. När sedan agenter samspelar under, och med, strukturella villkor blir resultatet elaboration/transformation eller reproduktion. Utvecklingen eller förändringen sker således i cykler och som ett resultat av interaktion förändras eller modifieras de strukturella villkoren men också agenterna själva. Studier av verkligheten bör innefatta försök att blottlägga de kausala och icke observerbara mekanismer som orsakar reproduktion eller elaboration av sociala förhållanden.

Ett huvudargument inom kritisk realism är att verkligheten är fristående från vår kunskap om den. Verkligheten omfattar således det verkligas domän (en djupare nivå där sociala mekanismer verkar); den faktiska domänen (där skeenden pågår, oavsett om vi har kunskap om dem eller inte); och den empiriska domänen (där vi erfar specifika händelser) (Bhaskar, 1975; 2016). Det är viktigt att inte reducera verkligheten till de slutsatser vi kan dra utifrån empiriska observationer, detta leder till ett epistemologiskt felslut (Danermark, et al., 2002). Verkligheten omfattar betydligt mer än vad vi har kännedom om. Framför allt innehåller den orsaksmekanismer som inte är direkt synliga för oss. Kritisk realism syftar till att undersöka det verkligas domän, bestående av sociala objekt och deras relationer (Archer, 1995; 2000). Här innefattas de kausala mekanismer som inte är observerbara men vars effekter vi kan iaktta. Sociala objekt är i grunden relationella och det är objektens relationer som skapar strukturer (Danermark, et al., 2002). Till exempel skapas en skolas struktur,

förstådd som ett socialt objekt, genom lärares och elevers handlingar i förhållande till en redan existerande struktur i en process över tid och där också agenterna (lärare och elever) förändras som resultat av samspelet. Eftersom strukturer föregår agenters handlingar och samspel under strukturens villkorande inflytande, förespråkar Archer (2000) vad hon benämner som analytisk dualism.

Inom kvantitativ forskning finns möjlighet att använda uppgifter om strukturella villkor för att förklara effekter på exempelvis elevresultat. Det innebär att man till exempel kan testa om utbildningsnivån för läraren i ett ämne samvarierar med klassens kunskapsresultat i samma ämne. Lärares utbildningsnivå föregår deras interaktion med, och undervisning av, eleverna. Det är därför rimligt att anta att en eventuell positiv relation också kan vara en kausal relation.

Verkligheten är skiktad och det finns kausala mekanismer på olika nivåer. Det finns även statistiska tekniker för att separera effekter på individnivå från dem på gruppnivå. Man gör då flernivå-analyser. Med information om elevers individuella sociala bakgrund som grund kan man därför exempelvis undersöka i vilken grad elevresultat påverkas av skolans eller klassens genomsnittliga sociala bakgrund (till exempel som den tar sig uttryck i föräldrars utbildningsnivå). Om det finns ett stort förklaringsvärde av social bakgrund på grupp/skolnivå så innebär det också att skolan är segregerad. Skolklasser skiljer sig åt sinsemellan, på vissa skolor har det samlats elever med en mer gynnad bakgrund och på andra skolor har elever en mindre gynnad bakgrund. Detta utgör en orsak till att de genomsnittliga skolresultaten varierar mellan skolor. Man kan också föra in lärares utbildning i analysen och erhålla mått på i viken grad formell lärarkompetens är knuten till goda elevresultat. I samma tvånivå-analys kan man erhålla mått på vad den sociala bakgrunden har för betydelse för elever inom en klass. Om man har uppgifter om lärarens utbildning så kan man även studera i vilken mån lärare i sin undervisning verkar kunna kompensera för de skillnader i resurser via hembakgrund som påverkar elevers kunskapsnivåer.

I och med att orsaker föregår effekter eller, för att tala med Archer, elaboration av sociala objekt och förhållanden sker i morfogenetiska cykler, är ett önskvärt förhållande i sambandsanalys att det finns tillgång till flera mätpunkter över tid. Elever har exempelvis en viss kunskapsnivå vid tiden för att de börjar undervisas av en viss lärare och en annan kunskapsnivå när de har undervisats en tid av samma lärare. Ett önskvärt förhållande är då att man har

tillgång till mått på kunskapsnivån från två tillfällen mellan vilka interaktion/undervisning har skett. En stor del av den data som finns tillgänglig för analys har tyvärr inte denna egenskap. Det finns emellertid statistiska tekniker att tillämpa som kan, om inte undanröja, så i vart fall delvis överkomma, de problem som är behäftade med data från tvärsnittsstudier där det finns endast en mätpunkt. Inom den kritiska realismen beskriver man vikten av att undanröja alternativa orsaksförklaringar med argumentation. Det är ett betydelsefullt och i många fall tillgängligt redskap som bygger på att vetenskaplig verksamhet inte sker i vakuum utan att det finns tidigare forskningsresultat att luta sig på. Forskningen är i mångt och mycket kumulativ. Rent praktiskt innebär det till exempel att det kan vara värdefullt att föra in kontrollvariabler sin analys. Internationell forskning har under många årtionden bland annat visat att social bakgrund har en utomordentlig stor inverkan på elevresultat. Med kvantitativ teknik kan man, i de fall man vill studera effekter från lärare, också hålla ett sådant inflytande under kontroll och därmed få ett mer renodlat mått på lärareffekt. Det finns också mer förfinade tekniker tillgängliga som kan användas för att stärka trovärdigheten i resultaten. I följande avsnitt beskrivs den data och de metoder som har använts i föreliggande empiriska studier närmare.

Metod

Denna avhandling bygger på analys av data från det svenska deltagandet i TIMSS 2011 och TIMSS 2015 (Trends in International Mathematics and Science Study). TIMSS är en internationell studie som undersöker elevers kunskaper i matematik och naturvetenskap. Den genomförs av IEA (International Association for the Evaluation of Education Achievement) som har genomfört storskaliga jämförande studier av utbildningsresultat under de senaste 50 åren. TIMSS samlar in utbildningsresultat och information om pedagogiska sammanhang med relevans för matematik och naturvetenskap i årskurs fyra och åtta med syftet att erhålla information om trender i elevprestationer över tid (Mullis & Martin, 2013). Studien genomförs med en fyraårig cykel, den första undersökningen genomfördes 1995 och den senaste 2019.

TIMSS-studien använder rigorösa urvalstekniker för skolor och klassrum så att prestationer för elevpopulationen i sin helhet kan uppskattas genom att endast man endast bedömer ett representativt urval av elever från ett urval av

skolor. För att uppnå detta används en slumpmässig design i två steg, där skolor samplas i ett första steg och en eller flera klasser sedan väljs från var och en av skolorna i ett andra steg. Urvalet av klasser snarare än enskilda elever gör det möjligt att undersöka elevernas erfarenheter av läroplaner och undervisning (Joncas och Foy, 2012).

Den föreliggande avhandlingen drar nytta av TIMSS-data från två cykler, 2011 och 2015. I Studie I används data från 2011 för elever i åttonde klass och deras matematiklärare. I Studie II används data från 2015 för elever i åttonde klass och deras matematiklärare. I Studie III utnyttjas data från elever i fjärde klass och deras matematiklärare. Ett syfte med att välja data från elever i åttonde klass för studie I var att lärare i högre årskurser i regel är mer specialiserade i undervisningsämnet. I denna studie sattes lärares specialisering i ämnet i relation till elevresultat. Studie II fokuserade på lärarnas arbetstillfredsställelse, en faktor som i tidigare forskning har visat sig ha störst betydelse för matematiklärare i högre årskurser. För studie III där betydelsen av mobbning och skolklimat undersöktes motiverades valet av data av att mobbning i tidigare studier har visat sig var mest utbredd i denna åldersgrupp och att skolklimat bedömdes vara mer kritiskt för yngre elever.

Variabler

Variablerna för de empiriska studierna i denna avhandling är, förutom ett testresultat i matematik för samtliga elever, hämtade från elev-och lärarfrågeformulären i TIMSS 2011 och 2015. Vissa av variablerna utgörs av svenska nationella tillägg till den internationella designen (indikatorer som rör lärares självskattning av den egna undervisningsförmågan). Från elevfrågeformuläret har information om antalet böcker i elevens hem, språk som talas hemma hos eleven, utsatthet för mobbning och elevbedömning av lärarens undervisningskvalitet inhämtats. Variablerna från lärarfrågeformuläret inkluderar läraregenskaper såsom kön, självskattad undervisningsförmåga, kvalifikationer i form av omfattningen av studier i matematik, undervisningserfarenhet och arbetstillfredsställelse. Dessutom används lärarbedömda aspekter av skolmiljön, såsom lärares arbetsbelastning, samarbete, stöd från ledningen och skolklimat.

Analysmetod

De huvudsakliga analysmetoderna är konfirmatorisk faktoranalys och strukturell ekvationsmodellering

Konfirmatorisk faktoranalys

Konfirmatorisk faktoranalys (CFA) är en vanligt förekommande metod för att bedöma begreppsvaliditet och dimensionalitet för ett instrument. CFA är en mätmodell där förhållandet mellan observerade indikatorer och en latent variabel specificeras. En av de främsta fördelarna med en latent variabel formulerad genom CFA är att mätfelet separeras från den latenta variabeln vilket inte är fallet i konventionella skalvariabler (summor etc.). CFA kräver en solid empirisk eller konceptuell grund för specifikationen och utvärderingen av faktormodellen och flera anpassningsmått finns att tillgripa. För närmare presentation av dessa hänvisas till metodkapitlet i avhandlingen. Att bedöma modellpassning är ett viktigt steg i valideringsprocessen eftersom det gör det möjligt att dra slutsatsen om den formulerade modellen passar data. CFA-validering av mätmodeller för latenta begrepp är nödvändig innan man modellerar deras sammanhang i strukturella ekvationsmodeller (Brown, 2014).

Strukturell ekvationsmodellering

SEM har blivit ett allmänt använt analytiskt verktyg inom samhällsvetenskapen. Den möjliggör modellering av förhållanden mellan latenta variabler i strukturella modeller (Brown, 2014). Dess fördelar jämfört med liknande tekniker inkluderar användning av latenta faktorer som mäts med flera indikatorer, testning av direkta och indirekta effekter samt ömsesidiga förhållanden (Gustafsson, 2009). Dessutom tillåter SEM analyser av data som har en hierarkisk observationsstruktur (elever i klassrum, klassrum i skolor etc.), en vanligt förekommande struktur i undersökningar såsom TIMSS (ibid., 2009).

Flernivåmodellering

Flernivåmodellering används ofta inom samhällsvetenskapen i syfte att ta hänsyn till, och utnyttja information från, den hierarkiska datastrukturen (Hox, 2002). Inom utbildningsvetenskapen manifesteras hierarkisk datastruktur exempelvis med att elever i samma klassrum och skola, men även lärare i samma skola, delar mer likheter i sina svar än individer från olika skolor. Man kan alltså

inte ha det antagande om oberoende mellan individerna som man kan ha när det gäller data från rent slumpmässiga urval. Eftersom många statistiska metoder förutsätter oberoende mellan observationer riskerar man att underskatta standardfelet om inte flernivåmodellering används då data är hierarkisk. Förutom dess statistiska fördelar erbjuder flernivåmodellering också begreppsmässiga fördelar. En fördel är att den ger möjlighet att separera variation mellan individer från variation mellan individer som tillhör samma kluster. Dessutom tillåter flernivåmodellering beräkning av effekter, för exempelvis elevprestationer, som härrör sig från prediktorer på olika nivåer, till exempel elevers individuella bakgrund och karaktäristika för klassens lärare.

Resultat

Studie I

Mot bakgrund av den betydelse som har kunnat tillmätas lärares ämneskunskaper och ämnesdidaktiska kunskaper för elevresultat i tidigare forskning fokuseras här relationer mellan indikatorer på lärares ämneskunskaper och matematikkunskaper hos elever i årskurs åtta.

Resultaten visade på ett positivt samband mellan omfattningen av matematikstudier för lärarna och elevernas testresultat med elevers sociala- och språkliga bakgrund under kontroll. Lärare som skattade sin egen undervisningsförmåga högre undervisade också i klasser där eleverna skattade undervisningskvalitén som högre. Detta förhållande avspeglade sig dock inte i elevernas provresultat. Resultaten gav därför inte stöd för att elever i årskurs åtta är förmögna att bedöma lärarkvalitet i alla dess avseenden. Vidare framkom ett positivt samband mellan lärares undervisningserfarenhet och elevresultat. Mer ingående analyser av detta samband indikerade att det är kurvlinjärt och att positiva effekter av undervisningserfarenhet kan uppmätas till en viss punkt, ca 20 år, men att de därefter avtar eller försvinner.

Studie II

Utifrån den problematik som gäller en sjunkande attraktivitet för läraryrket och en oroande lärarbrist undersöks i denna studie hur ett antal olika aspekter av arbetsvillkor för matematiklärare i årskurs åtta relaterar till deras trivsel med arbetet.

Resultaten visade en betydande association mellan lärares arbetsvillkor och trivsel med arbetet. Mer specifikt var lärarnas arbetsbelastning, möjligheter till kollegial samverkan samt elevers ordning och uppförande betydelsefulla faktorer för lärarnas trivsel med arbetet. Intressant nog visade sig inte elevernas socioekonomiska bakgrund ha något samband med lärares trivsel med arbetet. När det gäller lärares personliga egenskaper tenderade kvinnliga lärare, lärare med högre grad av möjligheter till professionell utveckling och lärare som skattade sin undervisningsförmåga högre att vara mer nöjda med sitt arbete. Dessutom konstaterades det att relationen mellan kollegial samverkan och arbetstillfredsställelse var starkare för manliga lärare medan elevers ordning och uppförande var viktigare för arbetstillfredsställelsen för lärare som också skattade sin undervisningsförmåga lägre.

Studie III

Skolan är en arbetsplats som inbegriper både lärare och elever. Skolsystemen i Norden har många likheter men skiljer sig också åt på flera punkter och det kan finnas intressanta mönster som visar sig vid jämförelser mellan länder. I denna komparativa studie av elever i årskurs fyra ingår Sverige, Finland, Norge och Danmark. Här riktas ljuset mot elevernas trivsel i det att förekomsten av mobbning, sambandet mellan skolklimat och förekomsten av mobbning och dessutom hur mobbning och skolklimat relaterar till elevers matematikkunskaper studeras.

Generellt visade sig skillnader i graden av mobbning låg mellan skolor inom samma land. Sverige skiljde dock ut sig med de största skillnaderna mellan skolor. I Sverige tenderade dessutom skolor med högre andel invandrarelever att ha högre mobbningsnivåer, medan i Norge högre nivåer av mobbning rådde i skolor med elever från genomsnittligt högre social bakgrund.

För samtliga länder gällde att ett positivt skolklimat kunde kopplas till lägre nivåer av mobbning. När det gäller effekterna av mobbning på prestation kunde sådana noteras för Sverige och Danmark, medan samband saknades i Norge och Finland. Relationen mellan mobbning och elevers matematikprestationer var svag i Danmark och ett gott skolklimat mildrade ytterligare en sådan effekt. För Sveriges del visade det sig också att den avsevärda effekten av mobbning på elevprestationer var associerad med skolklimatet.

Diskussion och slutsatser

Avhandlingens kunskapsbidrag utgörs framför allt av identifiering av en positiv relation mellan lärares matematikstudier och elevers matematikresultat samt av en positiv relation mellan undervisningserfarenhet och elevers matematikresultat. Liknande resultat har också visats i tidigare forskning men de understryker att ur policysynpunkt bör ytterligare åtgärder vidtas för att få kvalificerade lärare att stanna kvar som yrkesverksamma samt för att öka incitamenten för att söka till, och fullfölja lärarutbildning.

Ett ytterligare empiriskt fynd är att lärares undervisningsskicklighet inte lätt låter sig fångas vare sig av deras egna eller elevernas bedömningar. Detta resultat är intressant mot bakgrund av den stora omfattningen av bedömningar och utvärderingar av lärares prestationer. Särskilt så, eftersom det myckna mätandet i en ökande mängd forskning har visat sig associerat med negativa effekter för lärares psykiska välbefinnande men också för lärarkårens anseende och dess attraktivitet.

Vidare indikerar empirin i denna avhandling att lärares arbetstillfredsställelse som i sin tur är beroende av en arbetsbörda som upplevs rimlig, möjligheter till kollegialt samarbete och elevers goda uppförande utgör preventiva faktor när det gäller avhopp från yrket. Det ges också visst stöd för att manliga lärare påverkas mer av kollegial samverkan och arbetstillfredsställelse.

Utifrån resultaten i denna avhandling ges däremot inget stöd för att skolors elevsammansättning skulle vara en avgörande faktor när det gäller lärares trivsel. Däremot kan det understrykas att lärares möjligheter till professionellt samarbete behöver försvaras och kanske i många fall utökas för att bibehålla och utveckla såväl kvalitet som trivsel på arbetsplatsen för lärare och elever.

Slutligen visas att mobbning förekommer förhållandevis frekvent i svenska skolor i jämförelse med andra länder i Norden och att mobbning också är associerad med lägre elevresultat. Resultaten tyder på att det finns, i vissa fall, outnyttjade möjligheter för skolor att påverka skolklimatet till det bättre och därmed reducera mobbningsproblematiken och dess följder samt höja kunskapsresultaten.

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