

**Teaching quality and educational  
inequalities: An interdisciplinary inquiry  
of the relationship between student  
background and teaching quality**

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vorgelegt von  
Cansu Atlay, M. Sc.  
Aus Istanbul

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Dekan: Professor Dr. rer. soc. Josef Schmid

1. Gutachter: Professor Dr. Benjamin Fauth

2. Gutachter: Professorin Dr. Kathleen Stürmer

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# Abstract

It has been an ongoing debate in the Sociology of Education if the institution of school can be the “great equalizer” by compensating for lack of resources in the home environment. While earlier theoretical work suggested that schools often maintain or exacerbate inequalities by favouring those from high socioeconomic backgrounds based on their display of a certain “middle-class habitus”, more recent work advocated for the idea that schools also have the potential to compensate and even counter parental disadvantages. For instance, schools with high teaching quality may indeed reduce the disparities between the students. However, the role of teaching quality has not been given enough attention by the researchers examining the extent to which schools maintain, reduce or enlarge the existing inequalities between the students. We know from research on differential teaching, that teaching quality has an interactive relationship with student characteristics. There is, however, little consensus on how teachers’ practices and interactions with the students in the classroom can result in disparities in student outcomes. The question regarding the extent to which teaching can have differential effects on students with different socioeconomic backgrounds persists.

In order to gain a more thorough understanding of the role of teaching for educational inequalities, the relationship between student background and teaching quality should be carefully examined. For this purpose, I have investigated (1) if teaching quality interacted with the student socioeconomic background features in predicting academic outcomes, (2) if teaching quality is perceived differently among students from diverse socioeconomic backgrounds and (3) if teaching quality differed among classrooms with varying compositions of sociocultural, achievement-related, and motivational features. These questions were addressed in three studies that used data sets from two longitudinal studies in Germany.

The *first study* addressed the question of whether teaching practices reduce or exacerbate the achievement gap between students from lower and higher socioeconomic backgrounds. More specifically, the aim was to find out if students with lower socioeconomic status could gain more from particular teaching practices or if they would fall behind their peers from high socioeconomic backgrounds due to a lack of skills which would allow them to benefit from the mainstream teaching at the school. Three dimensions of teaching quality (cognitive activation, classroom management and supportive climate) were distinguished and tested with multilevel models to determine how each of them is related to higher achievement scores during 10th grade and if they act as moderators of the association between family background and achievement. The findings indicated that classroom management is positively associated with student performance: Students, regardless of their socioeconomic backgrounds, had better achievement scores in classrooms with better management. Nevertheless, cognitive activation and supportive climate positively

moderated the association between socioeconomic background and achievement levels, thus leading to a larger achievement gap.

In the *second study*, the focus was on the association between student socioeconomic background characteristics and their perception of teacher support. Additionally, the interaction of prior achievement with socioeconomic background was tested. Building on the sociological work by Lareau (2003) and Calarco (2011), we predicted a link between students' socioeconomic background and how they perceive support within the classroom. We expected that students from higher socioeconomic backgrounds would be more critical about the support they receive in the classroom and rate their teachers more negatively. Multilevel analysis of a sample of 10th graders confirmed that there is a negative association between socioeconomic background and children's perception of teacher support, which was in line with the "concerted cultivation" theory by Lareau (2003). Having higher prior achievement was associated with a more positive perception of teacher support, but it did not seem to interact with the socioeconomic background.

At the centre of the *third study* was the relationship between classroom composition and teaching quality. Similar to the first study, three dimensions of teaching quality (classroom management, supportive climate, cognitive activation) were examined. The association of teaching quality with the sociocultural, as well as the achievement-related and motivational characteristics of the classroom composition was tested in a sample of 3rd graders. While we expected to find a positive link between achievement-related and motivational classroom composition and ratings of teaching quality, we hypothesized that the sociocultural composition has a weak positive or insignificant influence on the teaching quality in the German context. Our results demonstrated that the achievement-related and motivational composition of the classrooms were associated only with classroom management rated by the students, whereas they were related to both classroom management and supportive climate rated by the external observers.

Following these sub-studies, a general discussion is presented. Here, findings of the three studies are summarized against the background of the current state of research that is relevant for the relationship between student background and teaching in the fields of sociology, educational science and psychology. Thereby, it is emphasized how the present thesis may be used to inform future research on educational inequalities as well as teaching quality and how the results may inform practice in schools to improve the way teaching quality can benefit students from diverse backgrounds.

# Zusammenfassung

In der Bildungssoziologie gibt es die anhaltende Debatte, ob die Institution der Schule ein "Equalizer" sein kann, indem sie Ressourcenmangel in der häuslichen Umgebung kompensiert. Während frühere theoretische Arbeiten darauf hindeuteten, dass Schulen Ungleichheiten häufig aufrechterhalten oder verstärken, indem sie Schüler mit hohem sozioökonomischem Status aufgrund eines bestimmten „Mittelklasse Habitus“ bevorzugen, plädierten neuere Studien für die Idee, dass Schulen auch das Potenzial haben, elterliche Benachteiligungen zu kompensieren. Beispielsweise können Schulen mit hoher Unterrichtsqualität die Unterschiede zwischen den Schülern tatsächlich verringern. Die Rolle der Unterrichtsqualität wurde jedoch von Forschern nicht ausreichend berücksichtigt, als sie prüften, inwieweit Schulen die bestehenden Ungleichheiten zwischen Schülern aufrechterhalten, verringern oder vergrößern. Aus der Forschung zu differenziellen Effekten des Unterrichts wissen wir, dass die Unterrichtsqualität auch mit den Eigenschaften der Schüler zusammenhängt. Es herrscht wenig Einigkeit darüber, wie die Praktiken und Interaktionen der Lehrer mit den Schülern im Klassenzimmer zu unterschiedlichen Resultaten auf Seiten der Schüler führen können. Die Frage, inwiefern der Unterricht verschiedene Auswirkungen auf Schüler mit unterschiedlicher sozialen Herkunft haben kann, bleibt bestehen.

Um ein besseres Verständnis der Rolle des Unterrichts bei Bildungsungleichheiten zu erlangen, sollte der Zusammenhang zwischen dem Hintergrund des Schülers und der Unterrichtsqualität sorgfältig geprüft werden. Zu diesem Zweck habe ich untersucht, (1) ob die Unterrichtsqualität mit den sozioökonomischen Hintergrundmerkmalen der Schüler bei der Vorhersage der Schulleistung interagierte, (2) ob die Unterrichtsqualität bei Schülern mit verschiedenen sozioökonomischen Hintergründen unterschiedlich wahrgenommen wird und (3) ob die Unterrichtsqualität in Klassenräumen mit unterschiedlichen Kompositionen aus sozioökonomischen, akademischen und motivationalen Merkmalen variiert. Diese Fragen wurden in drei Teilstudien behandelt, für die Datensätze aus zwei deutschen Längsschnittstudien verwendet wurden.

In der ersten Teilstudie ging es um die Frage, ob Unterrichtspraktiken die Leistungsdifferenz zwischen Schülern mit niedrigem und höherem sozioökonomischem Herkunft verringern oder verstärken. Im Besonderen bestand das Ziel darin, herauszufinden, ob Schüler mit einem niedrigeren sozioökonomischen Status mehr von bestimmten Unterrichtspraktiken profitieren könnten, oder ob sie aufgrund ihres Mangels an Fähigkeiten, die ihnen im klassischen Unterricht von Nutzen sein könnten, in der Schule zurückfallen.

Es wurden drei Dimensionen der Unterrichtsqualität (kognitive Aktivierung, Klassenführung und unterstützendes Klima) unterschieden und anhand von Mehrebenenmodellen getestet, um zu ermitteln, wie sie jeweils mit höheren Leistungsbewertungen in der 10. Klasse zusammenhängen, und ob sie als Moderator

des Zusammenhangs zwischen sozialem Hintergrund und Schulleistung fungieren. Die Ergebnisse zeigten, dass Klassenführung positiv mit Schülerleistung zusammenhängt: In Unterrichtsräumen mit besserem Management erzielten die Schülerinnen und Schüler unabhängig von ihrem sozioökonomischen Hintergrund bessere Leistungen. Nichtsdestotrotz moderierten kognitive Aktivierung und ein unterstützendes Klima den Zusammenhang zwischen sozioökonomischem Hintergrund und Leistungsniveau positiv, was zu größeren Leistungsunterschieden führte.

In der zweiten Teilstudie lag der Fokus auf dem Zusammenhang zwischen den sozioökonomischen Hintergrundmerkmalen der Schüler und ihrer Wahrnehmung der Unterstützung durch den Lehrer. Darüber hinaus wurde die Interaktion von früheren Leistungen mit sozioökonomischem Hintergrund getestet. Aufbauend auf der soziologischen Arbeit von Lareau (2003) und Calarco (2011) prognostizierten wir einen Zusammenhang zwischen dem sozioökonomischen Hintergrund der Schüler und der Art und Weise, wie sie Unterstützung im Unterricht wahrnehmen. Wir erwarteten, dass Schüler mit einem höheren sozioökonomischen Hintergrund die Unterstützung, die sie im Unterricht erhalten, kritischer beurteilen und ihre Lehrer negativ bewerten werden. Die mehrstufige Analyse einer Stichprobe von Zehntklässlern bestätigte, dass ein negativer Zusammenhang zwischen dem sozioökonomischen Hintergrund und der Wahrnehmung der Lehrer durch die Kinder besteht, was mit der Theorie der „concerted cultivation“ von Lareau (2003) übereinstimmte. Eine höhere vorherige Leistung war mit einer positiveren Wahrnehmung der Lehrerunterstützung verbunden, schien jedoch nicht mit dem sozioökonomischen Hintergrund zu interagieren.

Im Fokus der dritten Teilstudie stand der Zusammenhang zwischen der Zusammensetzung der Schülerschaft und der Unterrichtsqualität. Ähnlich wie in der ersten Teilstudie wurden drei Dimensionen der Unterrichtsqualität (Klassenführung, unterstützendes Klima, kognitive Aktivierung) untersucht. Die Beziehung zwischen Unterrichtsqualität und soziokulturellen sowie leistungsbezogenen und motivationalen Merkmalen der Schülerschaft wurde in einer Stichprobe von Drittklässlern getestet. Wir erwarteten, einen positiven Zusammenhang zwischen der leistungsbezogenen und motivationalen Klassenzusammensetzung und der Bewertung der Unterrichtsqualität zu finden, und nahmen an, dass die soziokulturelle Zusammensetzung der Klassen einen schwachen positiven oder unbedeutenden Einfluss auf die Unterrichtsqualität im deutschen Kontext hat. Unsere Ergebnisse zeigten, dass die leistungsbezogene und motivationale Zusammensetzung der Klassen nur mit dem von den Schülern bewerteten Klassenzimmermanagement in Verbindung steht, während sie allerdings mit dem von externen Beobachtern beurteilten Klassenzimmermanagement und unterstützendem Klima in Zusammenhang standen.

Im Anschluss an diese Teilstudien wird eine allgemeine Diskussion präsentiert. Die Ergebnisse der drei Studien werden hier vor dem Hintergrund des aktuellen Forschungsstandes zusammengefasst, der für die Beziehung zwischen Schülerhintergrund und Lehre relevant ist, sowohl für Forschung im Bereich



Soziologie, als auch in der Bildungsforschung und Psychologie. Dabei wird hervorgehoben, wie die vorliegende Arbeit herangezogen werden kann, um zukünftige Forschung zu Ungleichheiten im Bildungsbereich sowie zur Unterrichtsqualität zu bestimmen und wie die Ergebnisse die Praxis in Schulen beeinflussen können, um die Unterrichtsqualität für Schüler mit verschiedenen Hintergründen besser zu nutzen.

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# **1**

## Introduction and Theoretical Framework

# 1. Introduction and Theoretical Framework

Children and adolescents spend a significant part of their days at school. School is not only a place of learning but also an actual place of life. How students experience this place has been the focus of many research studies (Brock, Nishida, Chiong, Grimm, & Rimm-Kaufman, 2008; Mijs, 2016; Pomeroy, 1999; Scherer, Nilsen, & Jansen, 2016), however, the main concern has often been the academic and social outcomes of this experience, without paying much attention to the mechanisms which lead certain student background characteristics to result in better or worse outcomes. Before attending the first class, there are already major disparities among the students in cognitive abilities and skills based on their respective home environments (Cheadle, 2008). When students walk into a classroom, they bring their personal social and academic histories, which may lead to different learning needs among their peers. This scenario is particularly relevant in the German education system, which has experienced notable growth in the sociocultural diversity of its student body in the recent years, mainly owing to the increase in the number of students with war-related flight background (KMK, 2016). With the developments in diversity-friendly education discourse and more student-centred pedagogical approaches, teachers are facing more pressure in understanding and adapting to the diverse needs of their students with different parental backgrounds.

It can be argued that the fundamental goal of teaching is to trigger and promote insightful learning for every student. However, in the current context, education systems carry the burden for maximization of general achievement levels, rather than closing the achievement gap between students from diverse backgrounds (Van Avermaet, Van Houtte, & Van den Branden, 2011). Schools face difficulties in maintaining the two aims of equity and excellence of learning at the same time (Van de Werfhorst & Mijs, 2010; Wößmann, 2004). The challenge arises when teachers confront the multifaceted social condition of the classroom. Some of the traditional teaching approaches to maximize achievement levels may not fit all the students in the classroom and unintentionally increase the achievement gap between students from different socioeconomic backgrounds. This challenge is often aggravated by the probable interactions among students, which may diverge the class from the objective of learning (Wentzel, 1993). In this context, all students may not learn with the same kind of instruction: Whether they actively learn at the classroom depends eventually on the students themselves and to a certain extent, cannot be controlled by the teacher (Kunter, Baumert, et al., 2013). Concurrently, the vital role of the teacher is to choose the best teaching strategy to transmit the knowledge based on the given context, structure, and capacity of the class, which are significantly shaped by the socioeconomic and academic background of the students. Within this context, only if the teacher establishes a favourable, mutual interaction which can respond to the diverse learning needs of students from varying backgrounds, this can be defined as “good” instruction.



Against this background, a broader conception of teaching quality as an *interactive process* with the students should help us answer the open questions regarding the relationship between the student background, teaching quality and learning outcomes. By doing so, the aim of this dissertation is to extend the limited empirical evidence on (1) the interaction between student socioeconomic background and teaching quality in shaping student achievement, (2) the role of socioeconomic and achievement background for students' perception of teaching quality, and (3) the role of the classroom composition of student characteristics for teaching quality. In the course of this dissertation, student background will primarily be investigated regarding its socioeconomic aspects. Additionally, the achievement-related and motivational background features will be examined regarding their relationship with socioeconomic background and teaching quality. Three different studies all focus on the relationship between student background and teaching quality from different angles.

The present dissertation is therefore dedicated to dealing with the role of diversity in student background for teaching quality. In order to address diversity in the learning environments, this dissertation presents theoretical and empirical evidence from the fields of sociology, educational science and psychology. The sociological perspective on how educational inequalities are transmitted from parents to children within the institution of school lays the foundations for this investigation. Educational research approaches are brought in by focusing on the learning needs and achievement-related differences among individuals in the classroom. Finally, the psychological perspective is integrated to evaluate the variation in student perceptions based on their backgrounds. All three studies in this dissertation were conducted with this interdisciplinary approach, however, the particular disciplinary weight changes based on the focus of the specific study.

Before I introduce the mentioned studies, I present the theoretical assumptions as well as the state of research concerning the relationship between the student background and teaching quality within the classroom setting. The theoretical assumptions regarding the particular relationship between the student socioeconomic background and teaching quality will be summarized (Chapter 1.1). This will be followed by the elaboration of the definition, indicators and operationalization of teaching quality, with an emphasis on the student perspective (Chapter 1.2). Finally, building on this background, the derived study outline will be presented (Chapter 1.3).

## **1.1 From social to educational inequalities: definition, mechanisms and the missing role of teachers**

While sociological approaches often rely on the prominent cultural reproduction theory to explain the link between parental socioeconomic status and student outcomes, educational research emphasizes the role of prior achievement in shaping students' further performance at the school. Both approaches acknowledge that within the school context, teachers can play an essential role in addressing achievement differences due to the socioeconomic background. However, the actual role of teaching quality for achievement inequality was rarely addressed by earlier researchers, while studies from teacher effectiveness research remain inconclusive as these often focus on the general effect of teaching practices on student achievement, but not on differential effects related to socioeconomic background (Fraser, Walberg, Welch, & Hattie, 1987; Hattie, 2009; Scheerens & Bosker, 1997; Wang, Haertel, & Walberg, 1993). Hence, it is worthwhile to dedicate more attention to the in-classroom processes and to investigate the role of teachers for educational inequality. Following, I will first give a theoretical background on the definition of educational inequalities (Section 1.1.1) and present the understanding of educational inequalities in the German context (Section 1.1.2). Following, I will summarize the mechanisms of educational inequalities which are referred to in the sub-studies (Section 1.1.3). Later, I will address the role of teachers and focus on how teaching practices can have differential effects from students from different backgrounds, thus either reducing or exacerbating educational inequalities (Section 1.1.4).

### **1.1.1 Educational inequality**

The concept of educational inequality can be understood in different ways. Main discussions regarding its conceptualization revolve around the topics of whether inequality of access or outcome is of greater magnitude, the accurate indicators of these inequalities, and the definition of advantage and disadvantage in education (Ditton, 2007). A far less controversial idea than the promotion of equality in access or outcomes is the promotion of equal opportunities, which refers to the availability of equal prospects of attaining higher social positions and acquiring goods and privileges associated with them (Bell, 1972). The principle of equal opportunities implies a meritocratic allocation: higher social positions must be fundamentally available to all citizens, and all must have equal opportunities to reach high social positions, however, only insofar as they have the required skills and abilities to deliver the required services (Bell, 1972). In a democratic society, the regulation of access to high and scarce social positions takes place via terms of achievement, ability and effort, which are regarded as comprehensible and socially accepted, or at least, as generally

justifiable criteria. The framework offered by Roemer and Trannoy (2015) builds on this logic of meritocracy. They suggest that individuals are born into certain families by luck and therefore should be assessed only in comparison to those who have the same parental endowments. An impartial and ethical method to reduce inequalities would be to offer compensations to those who are born with fewer resources and evaluate their performance in comparison to those who share the same conditions. An interpretation of this perspective in the school context is that *equal* opportunities should be provided to all students to realize their capacity to the maximum.<sup>1</sup>

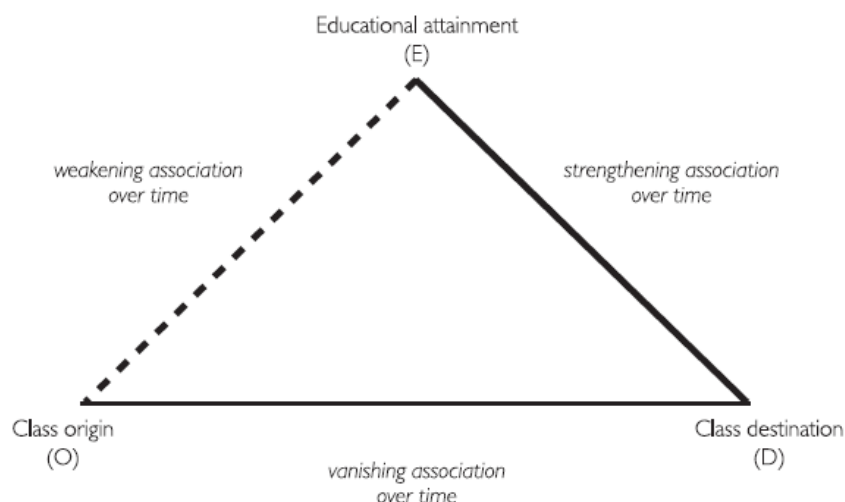
However, this is not the case in reality. In most of the modern societies, educational inequality is often *justified* by referring to the differences in the provision of services, which can lead to differences in educational success within the population (Ditton, 2007). If educational equality was actually achieved, there would be very small disparities among classes, schools or regions, and the only argument for these differences could be biological reasons, such as natural intelligence or aptitudes. The differences in school outcomes would still be present; nevertheless, these differences would not be associated with socioeconomic background characteristics.

A demonstration of these circumstances can be done by relying on Goldthorpe's interpretation of the theory of education-based meritocracy (2003, Figure 1). According to Goldthorpe, due to the "functional requirements of modern societies" (p.1), the link between class origin and educational attainment is weakening, which indicates greater equality of educational opportunities. Meanwhile, the association between educational attainment and the class destination is strengthening, since employment opportunities rely more heavily on individual aptitudes and achievements, rather than the parental background. Lastly, because of the increasing mediation by educational attainments, the direct association between the class origin and class destination is vanishing over time. Although this state-of-affairs is often the case for modern societies, the weakening of the link between class origin and educational attainment is a longwinded process. Despite the efforts of equalizing the opportunities within the educational system, several studies report that socioeconomic status is nonetheless as a strong predictor of academic performance in many countries (Bradbury, Corak, Waldfogel, & Washbrook, 2015; OECD, 2016a; Şirin, 2005).

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<sup>1</sup> In this dissertation, I start by focusing on differences in student outcomes due to socioeconomic differences as inequality of outcome (as indicated by standardized test scores), and move towards an "equality of opportunity" perspective by addressing the student-teacher interactions at the classroom environment (as indicated by different perceptions of teaching at the classroom).

**Figure 1.** The theory of education-based meritocracy (Goldthorpe, 2003, p. 234)



The concept of educational inequality, therefore, can be defined as children with different backgrounds being exposed to different opportunities to develop and build upon their full capacity. High educational inequality thus can be detected by significant positive associations between socioeconomic background and educational achievement, and consequently educational attainment.

### 1.1.2 Educational inequalities related to the socioeconomic background in the German context

In Germany, the positive association between class origin and the class destination is still evident (OECD, 2016b). There are significant differences in students' educational success in the German educational system depending on the socioeconomic background (Baumert et al., 2000; Baumert, Maaz, & Trautwein, 2009; Bos et al., 2003). Although educational inequality has diminished in Germany since the first Programme for International Student Assessment (PISA) in 2000, the socioeconomic status of students still accounts for 16% of the variation in science competence test scores according to the latest PISA results: In comparison to the other OECD countries, the education system in Germany is notably less equitable (OECD, 2016b).

Additionally, in Germany, when students transition from elementary school to secondary school, they are assigned to or choose different tracks during lower secondary education. Later on, they change to the upper secondary level of a high school or transfer to one of the forms of vocational training. Such transitions in the education system are crucial points which can manifest the effect of socioeconomic background on

student outcomes (Boudon, 1974; Breen & Goldthorpe, 1997; Erikson & Jonsson, 1996; Jackson, Erikson, Goldthorpe, & Yaish, 2007). Researchers emphasize that the tracking system in Germany can be a source of educational inequalities in the sense that the academic tracking of students is closely linked to a certain social tracking as well (Hillmert & Jacob, 2005, 2010). All in all, socioeconomic background remains as a determinant of academic achievement, as well as the educational opportunities for higher attainment in the formal schooling system in Germany.

Despite what the empirical evidence shows, there are no formal barriers in Germany that limit the possibility to have better (school) achievement and attainment for different students. The general assumption is that there is an open competition, in which no one may be disadvantaged or preferred due to their personal or socioeconomic characteristics (Ditton, 2007). For instance, an information document at the Conference of Ministers of Education regarding the transition from elementary to secondary school states: "For every child, the educational path which fits their educational skills should stay open, independent of the status or the wealth of their parents." (KMK, 2003, p.4). Nevertheless, Ditton (2004) suggest that this claim, which intends to underline the equal opportunities principle, actually brings along the primary issue of the reproduction of educational inequalities: On one hand, the irrelevance of the status or the wealth of the parents is emphasized, on the other hand, the concept of required educational skills is brought up. Ditton draws attention to the fact that the connection between these two factors is not addressed. Moreover, the issue of whether the school has the mission to compensate for the inequality in educational skills which are already present at the time of entering the school is not recognized. Based on the reasoning of Bourdieu and Passeron (Bourdieu & Passeron, 1971) it could be argued that, within the statement of the KMK, a merely socially widespread ideology of equal opportunities (in other words, meritocracy) is expressed, which may conceal the reproduction of educational inequality. The implication here is that although there is a merit-based selection system, the outcome is not directly serving the purpose of educational equality.

In reality, socioeconomic background is highly correlated with skill development: parents from high socioeconomic backgrounds often provide better conditions to prepare their children for successful school life, by facilitating the necessary skills and competencies from the early childhood period (Cheadle, 2008). The merit-based system overlooks the fact that children's development before attending school can differ significantly based on economic differences (Cheadle, 2008; Duncan, Brooks-Gunn, & Klebanov, 1994) or cultural variations in parenting approaches (Lareau, 2003). Not only in Germany but also in many other countries, children from more affluent parents usually grow up in an environment where they receive more scholastic resources, emotional encouragement and cognitively activating activities (Bradley and Caldwell 1979). As a consequence, they develop better cognitive abilities (Anders et al., 2012; Duncan et al., 1994) or skills to interact with educational authorities at the school setting (Calarco, 2011; Lareau, 2003). A meritocratic allocation system, justified by individual performance differences as stated by the KMK,

eventually reproduces these social inequalities by benefitting the children from high socioeconomic backgrounds, which leads the high social classes to maintain their high social status in the long-run. Within this context, even when equal opportunities are provided to everyone, existing structures that lead some students to have better achievement and attainment levels than the others are legitimized. As a consequence, the system does not take any responsibility for the existing educational inequalities, but in fact keeps those who are affected by these inequalities responsible (Ditton, 2007).

### 1.1.3 Mechanisms of educational inequalities related to the student socioeconomic background

Educational inequality, as mentioned above, arises when there is an association between parental socioeconomic background and educational outcomes. To tackle educational inequalities, a thorough understanding of different mechanisms underlying this link is necessary. So far, numerous studies aimed at explaining how the strong link between socioeconomic background and educational development has been maintained over generations (Blau & Duncan, 1967; Bradley & Corwyn, 2002; Erikson, Goldthorpe, & Portocarero, 1979; Ganzeboom, Treiman, & Ultee, 1991; Wagmiller, Lennon, Kuang, Alberti, & Aber, 2006). Several studies address the direct association between family socioeconomic background and educational achievement and show that children from lower socioeconomic backgrounds have lower academic performance levels (Kao & Thompson, 2003; Lee & Burkham, 2002; Machin, 2006) and also lower educational track choices (Maaz & Nagy, 2009; Maaz, Trautwein, Lüdtke, & Baumert, 2008).

One way of explaining this link is Bourdieu's cultural reproduction theory, which is one of the most well-known sociological theories for educational inequalities (Bourdieu 1986; Bourdieu and Passeron 1971). According to Bourdieu, parents from high social origins possess a greater cultural capital than those from low social origins, which is the main reason for differences in academic outcomes among students from different backgrounds. Cultural capital is thereby understood as high-status cultural signals (manners, preferences, formal knowledge, conduct, goods and credentials) which are widely-shared within certain social groups and used for social and cultural exclusion from the rest of the society (Bourdieu, 1986; Lamont & Lareau, 1988). According to Bourdieu, parents transmit their cultural capital to their children through either actively facilitating their scholastic culture (e.g. taking them to museums) or by being role models (e.g. exhibiting certain "high culture" behaviours at home). Children then translate this cultural capital to educational success within schools that are 'middle-class institutions': Educational practitioners mark and appreciate patterns of behaviour which signal high cultural capital and thus, membership to the middle-class (Bourdieu 1974).

In this regard, cultural capital has a symbolic value, because it can be perceived by teachers as academic supremacy. There is also evidence that cultural capital not only has a symbolic value but it also facilitates

children's cognitive skills, which leads to higher academic performance at school (de Graaf, de Graaf, and Kraaykamp 2000; Sullivan 2001). There exist studies that show that cultural capital is linked to subjective teacher grades (after their achievement levels are controlled, Jæger 2011; Jæger and Breen 2016) as well as to standardized test scores (Dumais 2002; DiMaggio 1982), which indicates that having high cultural capital has both symbolic and tangible consequences at the school.

Although differences in cultural capital is a strong determinant of certain skills which leads to higher academic achievement among students from a high socioeconomic background, there should be more mechanisms in action that maintain and even exacerbate these disparities through advancing years of schooling (Phillips, Crouse, and Ralph 1998). Evidence from educational research suggests that prior achievement history of the student is often a mediating mechanism of already existing differences. Even so, when controlled for prior achievement, the effect of social background on achievement outcomes diminishes significantly, however, does not completely disappear (Ditton, 2007). A plausible explanation for this situation is that the socioeconomic situation of the parents can influence the cost-benefit calculations of decisions regarding further education. Students' academic achievement and eventually, the decision regarding advanced studies can be shaped by parents' educational aspirations (Davis-Kean, 2005; Harvey, 2005) and educational recommendations of the teachers (de Boer, Bosker, & van der Werf, 2010). Students from lower socioeconomic backgrounds are already disadvantaged by the lower grading based on existing differences in the academic performance, and even when they have the same grades with those from high socioeconomic backgrounds, they have lower educational aspirations (Trusty, 1998) and recommendations (Glock, Krolak-Schwerdt, & Pit-ten Cate, 2015). Moreover, parents from higher social classes have a more extensive repertoire of courses of action to facilitate school success of the child, and they can encourage more ambitious further educational choices compared to those from the lower socioeconomic backgrounds. Teachers may also anticipate this while giving their further education recommendations (Timmermans, Kuyper, & van der Werf, 2015).

However, the role of teachers as a mechanism of educational inequalities is not limited to their recommendations. Although there exists abundant evidence regarding the mechanism of cultural reproduction and prior achievement, the role of teachers in compensating for or exacerbating parental disparities within the classroom context has not been given sufficient attention. Since most of the school experiences of the students take place in their most proximal learning environment of the classroom, it is worthwhile to consider how teaching quality can act as a link between students' background and their educational outcomes. Next section will present evidence on how teachers can shape educational inequalities with their conduct in the classroom as well as their interactions with the students.

#### 1.1.4 The role of teachers for educational inequalities due to socioeconomic differences between students

The extent to which schools can work as an “equalizer” is a classic debate in educational sociology (e.g. Bourdieu, 1974; Downey & Condrón, 2016; Goldthorpe, 2007). For instance, Goldthorpe (2007) emphasizes the potential of schools to reduce inequalities and suggests that schools can indeed complement, compensate and even counter parental disadvantages. This idea of school as a compensatory mechanism contradicts Bourdieu’s (1974) notion of “schools as a conservative force” which provide a “middle-class environment” and reward “middle-class behaviour” (*habitus*) from students. Disadvantages of working-class children thus emerge through a maladaptation to the teaching practices in school. Downey and Condrón (2016) regard schools as “refractors” of inequality: schools may maintain, reduce or enlarge the existing inequalities.

Within this context, only a few studies considered the extent to which schools refract inequalities. For instance, Bryk and Raudenbush (1992) put forward that the association between socioeconomic background and academic performance was not the same in public and private schools in the US. They found almost no difference between the public and private schools regarding the achievement levels of students from high socioeconomic classes; whereas students from low and middle socioeconomic backgrounds vastly differed in their performance levels in different schools. This finding suggests that public schools may not be as effective to close the achievement gap compared to private schools in the US. Moreover, a study by Muijs and Reynolds (2010) has shown that, in schools with a small population of students from the low socioeconomic background, the correlation between teaching quality and student outcomes were weaker. This implies that the actions of a teacher are less strongly correlated with the academic performance of more advantaged students, probably because students from the high socioeconomic background are provided with more learning support at their home environment (Muijs & Reynolds, 2010).

To fully understand the role of school as a “refractor” of inequality, it is essential to consider the learning environment of the classroom, where the students spend most of their time during their school life. Research has shown that students’ learning outcomes, in the sense of value-added learning facilitated by the school, is mainly shaped by classroom-level determinants (Creemers, 1994; Kyriakides, Campbell, & Gagatsis, 2000; Scheerens & Bosker, 1997). In this classroom setting, teachers can influence learning outcomes mainly through their actual teaching activities and interactions with the students. Nevertheless, it is difficult for theoretical models to take all the complexities of teaching into account to fully assess the exact role of teachers in facilitating learning. Main difficulties have to do with the diverse background of students in the classroom. Teaching is reactive, to a so far unspecified extent, to the social and academic background of the students, as well as the composition of the class (Rjosk et al., 2014). However, a common



assumption in educational research is that a teacher is regarded as effective if, in a given time frame, an average student had higher scores, often on a standardized test, than the expectation based on their prior performance (Campbell, Kyriakides, Muijs, & Robinson, 2012). In other words, it is often presumed that a teacher's contribution can be measured by the achievement gain of an *average student* concerning cognitive abilities and socioeconomic status.

There are few studies which address if teachers continue to be “effective” when they teach students from different socioeconomic backgrounds. For instance, a study in the Netherlands found that effective schools with a larger composition of low-achieving students with migration background benefitted more from well-structured teaching which underlines the basic academic skills (Campbell et al., 2012). This may suggest that providing highly challenging tasks, which require high-order thinking skills, may render the class content more difficult for students from low socioeconomic backgrounds. On the other hand, some argued that students from low socioeconomic backgrounds could engage in higher-order thinking better than most assume, and therefore should be presented with equally intense teaching as their peers from high socioeconomic backgrounds (Guthrie, Guthrie, Van Heusden, & Burns, 1989). Supporting evidence for this argument can be driven from the results of the Iowa Test of Basic Skills, which revealed that limiting the curriculum to essential skills did not succeed in boosting the academic achievement among schools with low socioeconomic status in the two years (Philips, 1996). Moreover, an attempt to transfer the curriculum of an elite private school to two disadvantaged schools in the US (with the provision of additional teacher training and support) improved the achievement as well as the attendance levels in both schools (McHugh & Stringfield, 1998). Based on these findings, it is also plausible that exposure to a less stimulating, deprived instruction may, in the end, harm students from low socioeconomic backgrounds and consequentially exacerbate the social achievement gap rather than reducing it.

Moreover, low SES students may need more structured classes alongside more rapid and proactive feedback and support (Brophy, 1992). There is also evidence that praise, even if it is not related to the classroom assignment, is more beneficial for students who have low socioeconomic background and achievement levels since they often have greater issues with maintaining self-confidence (Brophy 1992). They also gain more from more concrete, real-life examples relating learning to daily functions, which may reduce distraction while facilitating learning (Henchey, 2001; Hopkins & Reynolds, 2002). It was also put forward that clear rules and an orderly learning environment (Finn & Rock, 1997) may compensate for the disadvantage of students from low socioeconomic backgrounds in elementary schools (Decristan et al., 2016; Seiz, Decristan, Kunter, & Baumert, 2016) and students with migration background in 9<sup>th</sup> and 10<sup>th</sup> grades (Gaskins et al., 2012). A study by Curran (2003) also showed that students with lower social origins participate more actively in classrooms with clear rules and rare interruptions, which may boost their academic performance.

Contrariwise, teachers' classroom practices may not always reduce the achievement gap. For instance, a study by Borman and Kimball (2005) refers to the student achievement gap by investigating if teachers with higher evaluation ratings could better moderate the negative effects of high-risk background on achievement compared to teachers with lower evaluation ratings. Their findings suggested that students who evaluated their teachers better also had higher achievement scores, but overall highly-rated teachers did not achieve to close the achievement gap. Only in the fourth grade, teachers with higher evaluation ratings narrowed the gap in reading performances of low- and high-risk students (Borman & Kimball, 2005). Moreover, a study by Konstantopoulos and Chung (2011) exploited the longitudinal Project STAR dataset and concluded that teacher effectiveness did not influence student groups in a differential way that would lead to benefits for disadvantaged students in primary school.

It should be noted that researchers addressing differential teaching effects sometimes tend to treat the differences in the achievement levels as a natural outcome of low and high socioeconomic backgrounds. As a result, differential teaching effects are interpreted as the interaction of teaching with students' prior achievement levels, rather than with students' socioeconomic backgrounds. There is strong evidence that students from a low socioeconomic background often have lower achievement levels compared to high SES students (Bornstein & Bradley, 2003; Bradley & Corwyn, 2002) and a notable overlap exists between SES and prior achievement as antecedents of future academic outcomes. However, these background characteristics are not perfectly correlated (Ditton, 2007). Students from low and high socioeconomic backgrounds often have very different experiences while growing up, which may equip those from high socioeconomic backgrounds with skills that allow them to benefit more from some teaching practices, regardless of their prior achievement. For instance, students from high SES households are more likely to be exposed to a child-rearing approach called "concerted cultivation" where parents actively facilitate their children's cognitive development, coach them to engage in discussion and negotiation with authorities, and take an active role in managing their social and academic performance at the school (Lareau, 2003). As mentioned in the earlier section, this sort of "cultivation" works as an advantage for high SES students in their interaction with the teachers, for instance when they need to ask for learning support (Calarco, 2011, 2014a). Therefore, a link between socioeconomic background and academic achievement independent of the students' achievement levels is highly plausible.

On the whole, findings for differential effects of teaching in different countries lead to little consensus on whether teachers' practices and interactions with the students in the classroom can reduce or aggravate disparities in educational outcomes. Furthermore, the misinterpretation of differential teaching effects due to different student achievement levels as a direct result of socioeconomic background differences may lead to the underestimation of the persisting role of socioeconomic background for educational outcomes.

Against this background, the question regarding the extent to which teaching can have differential effects on students with high and low parental background persists.

## **1.2 Teaching quality: conceptualization and measurement**

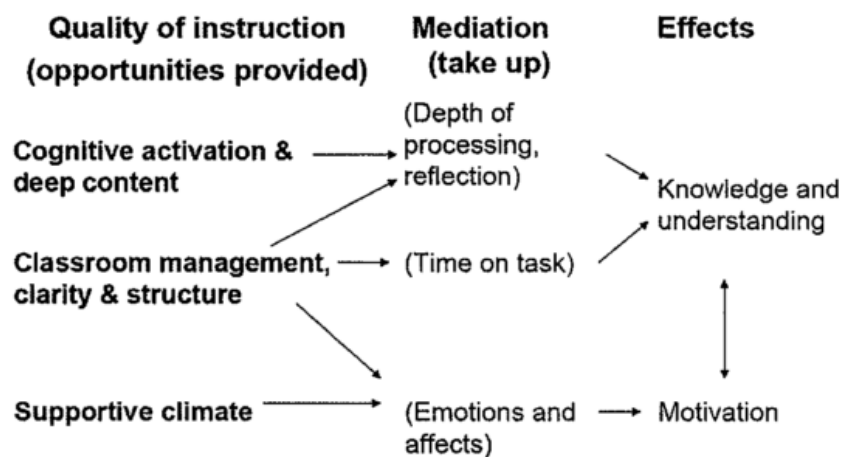
In order to assess the role of teachers in reducing achievement gaps among students from different socioeconomic backgrounds, it is essential to address their actual conduct in the classroom, as well as their interactions with the students, both of which make up the concept of teaching quality. The features of teaching quality can be captured by the ratings of the third-party observers, teachers and students. Compared to the teacher and observer ratings, students' perceptions can offer a deeper insight into the relationship between student background and teaching. While using student ratings of teaching quality, careful consideration of the background factors which may influence student perceptions and a correct formulation of student perception survey items are crucial. Accordingly, the next sections will present the definition of teaching quality (section 1.2.1) and ways of assessing teaching quality based on different perspectives (section 1.2.2). These will be followed by a section describing the particular relevance of student ratings as indicators of teaching quality (section 1.2.3). Later on, factors that might influence student perceptions will be discussed (section 1.2.4). Finally, the survey measurements of student perceptions of teaching quality will be described (section 1.2.5).

### **1.2.1 Definition of teaching quality**

In order to determine the factors which influence the effectiveness of a teacher, researchers distinguished (1) teachers' individual characteristics (such as content knowledge or competence), (2) features of the teaching practices in the classroom (such as structured instruction or classroom management), and (3) student outcomes (such as standardized test scores or non-cognitive outcomes), (Kunter, Klusmann, et al., 2013; Rimm-Kaufman & Hamre, 2010). Against this background, the concept of teaching quality is often built on the second factor and understood as teachers' authentic practices in the classroom alongside the teacher-student interactions (Brophy, 2000; Doyle, 2006).

There is a considerable consensus among researchers on the features of teaching quality which are essential for the academic and social outcomes of students (Brophy, 2000; Good, Wiley, & Florez, 2009; Seidel & Shavelson, 2007). First, efficient classroom management with minimum disruption and maximum time on task is a critical determinant of learning outcomes (Emmer & Stough, 2001; Hattie, 2009). Second, a well-managed classroom should also have a warm and respectful climate established by a supportive

teacher (Allen et al., 2013; Cornelius-White, 2007; Davis, 2003; Pianta & Hamre, 2009). Third, teachers should also adopt a cognitively activating approach that renders the learning process more engaging and stimulating by offering challenging and thought-provoking tasks to students and allowing them to take part in the classroom discourse (Lipowsky et al., 2009). To address teaching quality empirically, the model of instructional quality brings together classroom management, supportive climate and cognitive activation as the three facets (deep structures) of teaching quality, which shapes students' academic and social outcomes in mathematics classes (Klieme, Pauli, & Reusser, 2009; Klieme, Schümer, & Knoll, 2001, see Figure 2).



**Figure 2.** A theoretical model of basic (deep) structure dimensions of teaching quality and their effects on student learning and motivation (Klieme, Pauli & Reusser, 2009)

First distinguished in the 1995 TIMMS evaluation for Germany (Baumert, Lehmann, & Lehrke, 1997; Klieme et al., 2001), the model is conceptualized as being generic and hence is considered as applicable across school subjects, grade levels, and potentially even countries and cultures. The theoretical foundation of this framework is based on general theories of schooling and teaching, whereas the psychological mechanisms mediating the impact of the dimensions on student outcomes were added later, based on well-established cognition and motivation theories (Praetorius, Klieme, Herbert, & Pinger, 2018).

So far, several studies have put forward that three basic dimensions of teaching quality have an impact on student outcomes (Klieme et al., 2009; Lipowsky et al., 2009; Pianta & Hamre, 2009). Due to its strong theoretical foundations and well-established association with students' academic and social outcomes (Kunter, Baumert, et al., 2013), we rely on this model to conceptualize and evaluate teaching quality in different classrooms in this dissertation. Basic dimensions of teaching quality will be described in detail within the scope of the sub-studies in the following chapters (see chapters 2, 3 and 4).

### 1.2.2 Teaching quality from the perspectives of the observers, teachers and students

Teaching quality can be assessed both by video recordings and outside observers, for instance, by external or internal class observers in the context of class visits, as well as by the teachers and students themselves. Most of the formal teaching quality assessment systems rely on third-party observations (Hill & Grossman, 2003). The main reason can be that, in comparison to other indicators, observer ratings are regarded as more objective, since they reflect an outsider's perspective (Helmke, 2010). The detailed recording of the conduct of the teacher by an expert makes an in-depth exploration of teaching quality possible. However, observer ratings also have some disadvantages. First, they can only offer a snapshot of what the teacher is doing in the classroom. Even when there are multiple observation points, observer ratings only provide a collection of snapshots rather than the full representation of the teacher behaviour throughout the academic year (Praetorius, Pauli, Reusser, Rakoczy, & Klieme, 2014). Second, teachers are likely to behave in a different way when there is a third-party observer present in the classroom. They may consciously try to "show off" by giving more effort, or unconsciously act differently due to elevated carefulness and anxiety (Ward, Clark, & Harrison, 1981). Therefore, the presence of observers can act as a disruptive factor and thus increase error variance (Steltmann, 1992). Thirdly, in the case of classroom observations, for reasons of reliability, at least two or more observers should be present, which involves considerable organizational and logistical effort, which often bears very high costs for the researchers (Praetorius, Lenske, & Helmke, 2012; Praetorius et al., 2014).

Another way of collecting data on teaching quality is teacher surveys. Teachers have expertise in different teaching styles and a high knowledge of the classroom pedagogy. Moreover, as the providers of instruction in the classroom, they can accurately report their conduct and interactions in the classroom (Porter, 2002). In this regard, investigation of the teacher surveys can particularly be useful to capture interactions of teachers with students from diverse backgrounds. Nevertheless, teacher ratings are essentially self-evaluation reports and may entail the self-serving bias or be influenced by the beliefs and values of the teachers (Wubbels, Brekelmans, & Hooyman, 1992). Moreover, teacher surveys about their own instructional practices can be intimidating or stressful for the teachers, and they can be as costly as acquiring observer ratings (Muijs, 2006).

A somewhat underused method is to collect student answers regarding teaching practices. The recording of the teaching quality from the student's perspective has significant advantages: Student ratings are a very efficient and economical source of data, because they require a relatively small expenditure and thus, allow a cost-efficient data pool in the size of the respective class size at time of the instruction (Clausen, 2002; De Jong & Westerhof, 2001). Moreover, student ratings are results of their experiences of multiple

lessons throughout an academic year, and they also account for more variance in learning outcomes than other classroom-level variables (Ellet, 1997; Fraser, 1995a). Instruction in the classroom is a repetitive situation created by the interaction of the teacher and student behaviours and entails typical features that persist over time (Clausen, 2002). Therefore, it is useful to rely on the student information, which is based on a relatively long observation period and thus a more extended period of familiarity with the teaching practices (Helmke, 2007). Students can have a differentiated spectrum of observations because they see their teachers in comparison with other teachers and can perceive the changing behaviours of teachers across different situations (Ditton, 2000).

Student ratings convey valuable information on the classroom processes because they are not only based on the respective objective teaching practices, but also the subjective judgement of that behaviour. Although several studies indicate that student perceptions of teaching quality are valid and reliable indicators, and can be used for professional teacher evaluations as well as for research in various levels of the grading system (Ferguson & Danielson, 2015; Kane, McCaffrey, Miller, & Staiger; Peterson, Wahlquist, & Bone, 2000), there are still some concerns regarding the use of student answers to assess teaching quality (Aleamoni, 1999; Fraser, 1995b; Marsh & Roche, 1997).

Current suspicions regarding the validity of student ratings are mostly directed towards the perceptions of younger children in primary schools (De Jong & Westerhof, 2001; Ferguson, 2012, Kunter & Baumert, 2006). Two questions which frequently come forward within this context are (1) if students can discriminate different dimensions of teaching quality and (2) if they are influenced by how much they like the teacher (teacher popularity) in their answers. Concerns regarding the first issue stem from the assumption that, compared to observers or teachers, who have professional pedagogical training, students do not have a very clear idea of the differences between teaching quality constructs (Van der Scheer, Bijlsma, & Glas, 2018). This issue has been addressed by multiple studies, which have asserted that students are usually able to distinguish between different aspects of teaching quality (Fauth, Decristan, Rieser, Klieme, & Büttner, 2014b; Kyriakides, 2005; Wagner, Göllner, Helmke, Trautwein, & Lüdtke, 2013). The second concern is based on the finding that teacher popularity is often moderately correlated with the student ratings of teaching quality (Fauth, Decristan, Rieser, Klieme, & Büttner, 2016). This may be due to the tendency of students to rate the teachers they like better in terms of teaching quality, or because teachers who offer high teaching quality, according to the students, are liked more (Wagner, 2008). This association is found to be the strongest for the dimension of supportive climate since it is more open to an emotional interpretation of teacher-student relations compared to other dimensions for teaching quality (Fauth et al., 2016).

Concern about the validity of student answers is also addressed by research showing that students' perception of teacher behaviour explains a moderate amount of variation in student outcomes. For instance, Anderson and Walberg (1974) compare the prediction performance of the LEI (Learning Environment

Inventory, Fraser, Anderson, & Walberg, 1982) as an instrument to capture the learning environment with the predictor of IQ. They have shown that 30 percent of the variance in cognitive, affective and behavioural learning outcomes can be assessed through the recorded student perceptions of the classroom climate and only 7 percent by the intelligence quotient of the students. Based on the synthesis of the evidence from 12 studies, Haertel, Walberg and Haertel (1981) put forward that learning outcomes were positively correlated with the students' perception of class cohesion, task difficulty, formality and goal direction. Utilizing generalizability theory, Kyriakides (Kyriakides, 2003) also showed that students' perceptions were valid measures of teaching quality.

In addition to the criterion of validity, reliability can also be addressed to justify student answers as acceptable indicators of teaching quality. Inter-class correlation is a frequently used measure to assure inter-rater reliability in this respect (Lüdtke, Trautwein, Kunter, & Baumert, 2006). Student ratings often display good reliability levels when aggregated at the classroom level. Intraclass correlations (ICCs) of student ratings often range from 0.5 to .25 which implies a notable proportion of consensus among the students regarding teaching quality (Fauth, Decristan, Rieser, Klieme, & Büttner, 2014a; Lüdtke, Robitzsch, Trautwein, & Kunter, 2009; Wagner et al., 2016). The ICC2 scores, which are calculated based on ICC1 scores, indicates sufficient reliability (above 0.70) at the classroom level (LeBreton & Senter, 2008; Lüdtke et al., 2009).

All things considered, student answers have strong advantages compared to teacher and observer ratings when teaching quality is the matter of investigation. Moreover, abundant empirical evidence emphasizes that student ratings are valid and reliable measures to assess teacher practices and interactions in the classroom environment.

### 1.2.3 Particular relevance of the student ratings for teaching quality

The classroom is a social environment where students' perception of the learning environment is a vital component (Eder, 2001; Moos, 1979). Within this context, the way students' perception of teaching quality is shaped by the students' social conditions have significant pedagogical relevance (see Dreesmann, 1982). As a pedagogical field element, the students' subjective perception of teaching quality is a crucial determinant of a good teaching climate. Whether a teacher is "supportive" based on checklists completed by observers is not decisive for the relationship between the teacher and the students, but whether the class feels the teacher's behaviour as supportive is what matters (see Steltmann, 1992). In the classroom setting, it is the collection of students' *subjective* perceptions, judgements and experiences of the teaching-related aspects that shape the classroom or teacher effects on student outcomes. In this regard, the influence of the

teaching quality (input) on the student behaviour and learning outcomes (output) can be mediated by the students' perceptions (Helmke, Schneider, & Weinert, 1986).

When student perceptions are addressed as indicators of teaching quality, their individual and shared components should be considered. Earlier work in the field of Psychology has suggested that an individual's behaviour is determined by the given environmental influences that actually exists (*alpha press*), the perception of these real environmental influences (*beta press*), (Murray, 1938). Further differentiation of the beta press is offered by Stern, Stein and Bloom (1956) as *private beta press*, which is the personal environmental perception and *consensual beta press*, which is the collective perception of a group based on shared opinions and experience.

In light of this background, individual ways of interpreting, and thus, judging the teacher, is shaped by the personal characteristics of the students, as well as their contextual characteristics based on their classroom group dynamics. Therefore, an individual student answer comprises the student's interpretation of the teachers' behaviour, as well as the shared opinion of the class as a group (Göllner, Wagner, Eccles, & Trautwein, 2018). For instance, all students may agree that their teacher provides learning support, however individual ratings may display differences in the degree of support that each student perceives. Teaching quality research suggests that both of the components of student assessments of teaching quality should be considered (Lüdtke et al., 2009). Consequently, student perceptions as the class mean is not sufficient alone to assess teaching quality since it only represents the collective perception of teaching, which is constituted by individual perceptions. Class mean should be regarded with caution as an indicator of teaching quality, because the error variance is not only based on measurement errors in the classical sense, but also on individual student components of variance, which can be lost in the aggregation process (Göllner et al., 2018).

#### 1.2.4 Socioeconomic and achievement-related factors influencing students' perception of teaching quality

According to Dreesmann (1979), the perception of teaching results from "cognitive processes as situationally influenced by personal traits" (p. 80). Teaching perceptions are subjective because they are the result of selective absorption of classroom stimuli and their emotional and cognitive processes. Like social perception processes (Clausen, 2002) they are also influenced by the goals, needs, attitudes and perceptions of the interaction partners. Although several factors have been proposed to influence students' perception of teaching (Fisher, den Brok, & Rickards, 2006) the primary focus of this dissertation is the role of socioeconomic background in shaping students' perceptions of teaching quality.



How do students from different socioeconomic backgrounds interpret social situations? Social psychology research demonstrates that interpretations of social situations can change from one group to another. Evidence in this field emphasizes interpretive and situational processes of actors and suggests that people respond to situations based on the meaning they take out of that situation (Blumer, 1986; Schwalbe, Godwin, Schrock, Thompson, & Wolkomir, 2000). In line with these arguments, experimental studies have shown that social class affects systems of meaning via its link to “sociocultural models of self” (Stephens, Markus, & Fryberg, 2012). For instance, members of high social classes take up a model of self which is independent, which entails beliefs that they can have an impact on the environment, be apart and distinct from others, and behave in ways resembling their free choices, individual aims and likings (Stephens, Fryberg, Markus, Johnson, & Covarrubias, 2012, p. 1180). On the other hand, people from lower social classes embrace a rather interdependent model of self, which orientate individuals to be more adjustable to the circumstances of the setting, be related to others and be affected by demands, choices and likings of others (Stephens, Fryberg, et al., 2012). These models of self, play a major part in "systematically shaping how people construe situations" (Stephens, Markus, et al., 2012, p. 723). For instance, in an educational setting, students from high SES backgrounds reflect their model of self by seeking more frequent and immediate support from their teachers, because they feel entitled to the individual attention by the teacher. On the contrary, students from low SES backgrounds, often are more hesitant to ask for help, even when they need it urgently because they are afraid to occupy or even upset their teachers (Calarco, 2011)

Similar to social psychology research, sociological research also demonstrates that social class can affect people's perceptions (Calarco, 2014b). Mehan (1992, p. 3) suggested that the specific social class culture, as a "system of meaning", offers a framework to make sense of situations, and mediates the link between social background and behaviours. These systems of meaning are implicit mental frameworks which are influenced by explicit structures like gender and social class, and guide people in perceiving and consequently acting on specific situations (Dimaggio & Markus, 2010; Shepherd & Stephens, 2010). Previous work in this field primarily focused on social classes concerning their ways of interpreting situations (Bourdieu, 1990; Lareau, 2000) and relied on educational and occupational attainment status to distinguish social classes (Aschaffenburg & Maas, 1997; Condrón, 2009). In this manner, they put forward that low and high social classes have different perceptions of institutional authorities. For instance, a study by Kohn has shown that (1969) occupational status is associated with values: self-determination is valued by the middle class, whereas complying with authority is valued by the working class. Likewise, Calarco (2011) showed that children from middle-class families express their demands in their interactions with teachers while working-class children often conform to authority. Lareau (2003) suggests that a sense of entitlement and sense of constraint may be the causes of such differences in behaviours. These findings

imply that students from low and high socioeconomic backgrounds may perceive their teachers' classroom practices and interactions differently due to the sense of entitlement or constraint.

Besides the socioeconomic background, educational research has focused on the role of level of achievement in predicting student perceptions of teaching quality (see Marsh, 1984; Moos, 1979). When students perform well at school, their assessments of their teachers are more positive than those with lower performance levels (Ditton, 2002; Levy, Wubbels, Den Brok, & Brekelmans, 2003; Seidel, 2006). Babad (1996) focuses on the other direction in this student-teacher interaction and states that the teachers' differential treatment depending on the performance level of the pupils can be an explanation for this. In alignment with this, Gruehn (2000) shows that, mainly at the class level, there are substantial links between the perception of the learning environment and performance gains, whereas the relationships at the student level are significantly lower. Further research is needed, however, to clarify how much of the student perceptions are shaped by their background characteristics and how much is shaped by the actual differential treatment by the teacher based on these characteristics.

These arguments have important repercussions for the investigation of teaching quality. First, one should always consider the interpretive and situational nature of student evaluations of what happens in the classroom. Secondly, educational inequalities do not only originate from the mismatch of individual and institutional cultures as Bourdieu (1974) argued (see section 1.1.3), but also from students' different interpretive approaches which leads to different behaviours towards teachers (and other gatekeepers) in educational settings (Calarco, 2014a). Thirdly, the role of prior achievement should be taken into account when considering how students' socioeconomic background may influence their perceptions of teaching practices.

### 1.2.5 Measurement of student perceptions of teaching quality with surveys

The way student perceptions are measured can significantly influence their validity and reliability. Although there is a variety of methods for the measurement of student perspectives such as interviews and vignettes, easiest method to capture their experience of teaching is a questionnaire with statements about the learning environment, which are to be assessed by the students (Fraser, 1994; Levy et al., 2003; Mihaly, McCarey, Staiger, & Lockwood, 2013). The questionnaire method has economic advantages, but it can also entail methodological measurement issues, mainly due to complex item formulations which may be difficult for students to process cognitively. In particular, there are three significant aspects which define the complexity of an item: the evaluative content, the perceptual perspective, and the reference perspective.

First aspect of the item formulation is the *evaluative content* of the item (Eder, 2001, 2002), which is 'judgmental' (e.g. "Our teacher knows very well, what each of us can manage", PISA-I-Plus item, Prenzel et al., 2013) or 'descriptive' (e.g. "Class is frequently interrupted", PISA-I-Plus item, Prenzel et al., 2013). This aspect is also related to the observability of the behaviour, which shapes the level of inference. Low-inference items (e.g. "Class often does not start punctually", PISA-I-Plus item, Prenzel et al., 2013) address observable behavioural aspects that can be detected relatively 'objectively' due to their specificity (Clausen et al., 2003). These items directly address objective observations and rarely require any cognitive processing or interpretation by the raters. Therefore a relatively high agreement within the class is possible when using this item type (Dreesmann, 1982). By contrast, high-inference items (e.g. "Our teacher immediately knows which tasks are difficult for us", PISA-I-Plus item, Prenzel et al., 2013) require more interpretive effort by the raters. In this case, the student is no longer an observer but has to judge the teacher. According to Dreesmann (1982), a mixture of items with different degrees of inference requirements can help to assess both observable and unobservable teaching aspects.

The second aspect of item generation is the *perceptual perspective*. Based on the classification by den Brok et al. (den Brok, Brekelmans, & Wubbels, 2006), Wagner (2008) distinguishes the addressee of the teacher behaviour in terms of the class versus the individual student as the target of teacher behaviour and the perception perspective as group perception versus personalized perception (Table 1).

**Table 1.1** The matrix of perception perspective vs addressee of teacher behaviour according to Wagner's classification (2008)

		Addressee of teacher behavior	
		Individual student	Class
Perception perspective	Individual perspective	"I think the teacher handles mistakes so that I could learn something from them"	"I think the teacher handles mistakes so that we could learn something from them"
	Class perspective	"We think the teacher handles mistakes so that I could learn something from them"	"We find that the teacher handles mistakes so that we could learn something from them"

Based on this framework, the perspective of "we" seems to be the most cognitively demanding item formation to investigate student perceptions. The assessment of the teacher behaviour from the individual perspective is often less problematic for the students and seems to require only low cognitive effort. In this case, it is more likely that the measurement errors will be due to mental errors of judgment, which can also occur in all other types of items. On the other hand, if an individual perspective is used to assess the teachers'

overall treatment of the class, the unevenness of the target and the rater can require additional processing capacity. If there is an aggregated assessment of the item content or a representative class opinion at the class level, it must be additionally compared with one's own opinion or experience in order to make a conclusive judgment based on the student ratings (Wagner, 2008).

Lastly, regarding the *judgement reference*, the retrospective self-report character of the survey procedure is addressed. The answers thus can be associated with memory distortions. The reference to a recent lesson, for example, is less prone to distortion effects than a reference to a lesson that took place a long time ago of which requires more effort to recall the specific memories of teacher behaviour. More recent (e.g. information from a recent class is more accessible than information about a class which took place a long time ago) and more frequent (e.g. in the classroom, when the teacher takes a long time to quieten the class down and begin teaching, this would be known to all students) information is more available to the students. They can make better judgements based on information that is readily available and ignore other potentially relevant but not easily available information (Sudman, Bradburn, & Schwarz, 1996).

In summary, it can be argued that a careful and explicit formulation of the measured constructs and survey items can allow analyses which would correctly contribute to the knowledge on student perceptions of teaching quality (den Brok et al., 2006). A careful consideration the nature of the assessment (judgemental or descriptive), the addressee of the teacher behaviour (towards a single student or all of the students in the classroom), the perspective of the observers (individual perception or group/class perception), and the availability of the information requested are essential for student perception surveys. Like other people, students' capacity may be exhausted when they have to complete surveys with complex item formulations with varying perspectives, requiring reconstruction of hard-to-recall memories (Bless & Schwarz, 2002). Clear and straightforward item formulations can make cognitive processing easier while keeping their motivation high to complete surveys. This, in turn, reduces the overall measurement error in the assessment of student perceptions.

### 1.3 Outline of the studies

Earlier research has shown that classroom factors, and in particular, teachers, have a considerably large impact on student outcomes (Hattie, 2009). Although there exist a plethora of studies examining the link between teaching practices and achievement (Fraser et al., 1987; Hattie, 2009; Scheerens & Bosker, 1997; Wang et al., 1993), the underrepresentation of studies on the relationship between teaching quality and student socioeconomic background features is astonishing. Besides, the perspective of the students regarding teaching quality is rarely addressed and discussed concerning students' socioeconomic backgrounds (Baumert et al., 2010; Curby, Rimm-Kaufman, & Ponitz, 2009; Pianta & Stuhlman, 2004). Moreover, most of the studies have also overseen that the classroom composition of student background can also shape teaching quality (see Dumont et al., 2013, and van Ewijk & Slegers, 2010a, 2010b). Apart from a few educational research studies focusing on differential teacher effectiveness (Decristan et al., 2016; Gaskins, Herres, & Kobak, 2012; Hamre & Pianta, 2005), little is known about the relationship between social origin-related student characteristics and teaching quality. This dissertation is intended to address this desideratum.

To achieve this, the present thesis addresses these limitations of prior research in three studies. All three studies conceptualize teaching quality not only as the actual behaviour of the teacher in the classroom but also as the quality of interactions between the teachers and students. Moreover, all studies build on the assumption that there is more to teacher effectiveness than managing a classroom and acquiring higher achievement scores averaged at the classroom-level. In a broad sense, all studies have the major sociological concern to examine mechanisms which translate socioeconomic background features to differences in the ways that students experience teaching at the classroom setting, which eventually leads to disparities in terms of academic and social outcomes. Additionally, since the subjective perception of teacher behaviour from the students' point of view is an essential element that shapes the actual teaching quality, the studies integrate approaches from psychology and educational research to address the students' cognitive processes to interpret teaching quality. The interdisciplinary approach allows for an examination of the relationship between student background, teaching quality and academic achievement mainly from the student perspective.

**Figure 1.3.** Conceptual diagrams of the three studies within the dissertation

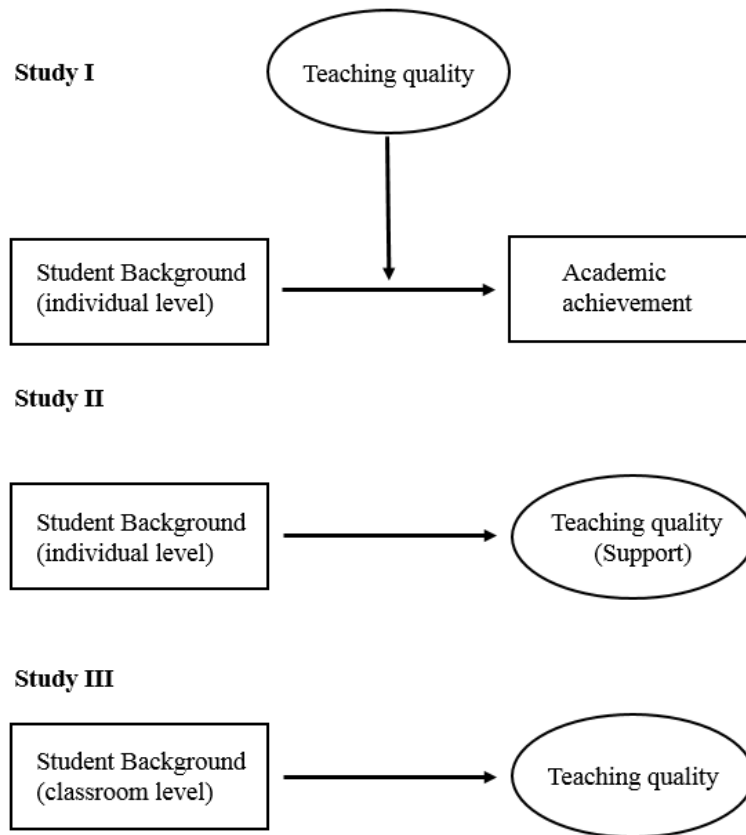


Figure 1.3 shows the conceptual diagrams of the three studies within the scope of this dissertation. Study 1 targeted the role of teaching quality as a moderator of the link between student socioeconomic background and achievement. Here, the primary goal was to examine whether teaching practices reduce or exacerbate the achievement gap between students from lower and higher socioeconomic backgrounds. Therein, we estimated multilevel models predicting achievement scores during 10<sup>th</sup> grade by including three dimensions of teaching quality (cognitive activation, classroom management and supportive climate) distinguished at the classroom level (Hox, 2010; Marsh et al., 2012). Furthermore, the cross-level interaction between the student socioeconomic background and teaching quality was assessed to find out if students with lower socioeconomic status could benefit more from certain teaching practices or if they would fall behind their peers from high socioeconomic backgrounds due to a difference in the type of skills gained through socialization at home. These topics were addressed by using the German extension to the PISA 2013 Study (PISA-I-Plus), in a sample of 3,738 students in 194 classes.

Study 2 targeted the link between student background and the *perception* of the teacher support dimension of teaching quality. Building on the sociological work by Lareau (2003) and Calarco (2011), the

potential of socioeconomic background in shaping the way students interpret teachers' supportive efforts were assessed. Additionally, an interaction between student background and prior achievement in predicting students' perceptions of teacher support was tested. A potential negative association between socioeconomic background (measured in parental educational attainment and wealth) and children's perception of teacher support was investigated. Moreover, higher prior achievement was included as a moderator into these models to examine if higher prior achievement among students from high socioeconomic backgrounds would lead to more positive perceptions of teacher support. This study utilized the PISA-I-Plus dataset with 2,030 students at the 10<sup>th</sup> grade in 195 classrooms.

Study 3 focused on the association between classroom composition characteristics and teaching quality, with the aim of understanding the role of teaching quality as a mechanism underlying compositional effects. Another goal of this study was to examine how teaching quality can be influenced by the student body that is taught. With this purpose, teaching quality was predicted by the classroom composition regarding three groups of student characteristics (sociocultural, measured by socioeconomic and migration background; achievement-related, measured by cognitive abilities and reading competence; and motivational, measured by interest and volition). Additionally, same compositional effects were investigated by performing correlation analyses of student characteristics at classroom level and teacher and video ratings of teaching quality. This study relied on the IGEL dataset with 1,070 3<sup>rd</sup> grade students in 54 classes.

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# 2

## Instructional quality and achievement inequality: How effective is teaching in closing the social achievement gap?

Atlay, C., Tieben, N., Fauth, B., Hillmert, S. (under review). Instructional quality and achievement inequality: How effective is teaching in closing the social achievement gap? *Learning and Instruction*.

## **Abstract**

Previous empirical studies have shown that there is an association between parental socioeconomic status (SES) and educational achievement. There is also evidence that high-quality teaching contributes to student achievement and that low-achieving students in particular profit from good teaching. In this paper we investigate if teaching quality contributes to minimizing the disadvantage of students from lower socio-economic background. Using German panel data and multilevel modelling, we examined the interaction between three dimensions of teaching quality and student background. Our results suggest that, overall, classroom management is positively associated with student performance. Students with high socio-economic backgrounds seem to profit more from cognitive activation and supportive climate compared to their peers with middle and low socio-economic backgrounds: These two indicators of teaching positively moderated the association between socio-economic background and achievement levels, thus leading to a larger achievement gap.

## **Keywords**

Socioeconomic background, achievement, educational inequality, teaching quality, interaction

## **2. Instructional quality and achievement inequality: How effective is teaching in closing the social achievement gap?**

### **2.1 Introduction**

Considering the literature showing that alongside the home environment, teacher effects on academic achievement are significantly large (Hattie, 2009), it is surprising that only a few studies in educational psychology have made an effort to investigate the role of teachers in contributing to or compensating for social achievement inequalities (Decristan et al., 2016; Gaskins, Herres, & Kobak, 2012; Hamre & Pianta, 2005; 2014). Moreover, very little attention has been given to the association of teaching quality – in terms of what teachers actually do in the classroom – with the reproduction of achievement gaps in education. Although social achievement inequality in education is a prominent topic in education research and many studies have shown how important teaching quality is for students' performance, only a few researchers have investigated possible connections between the two. In this study, we aim to investigate if certain teaching practices have the potential to reproduce, or even exacerbate social achievement inequalities or if they reduce them. By social achievement inequality, we refer to the inequality in terms of the association between socioeconomic background and students' standardized test scores.

Current education systems and education policies generally bear a demand for maximization of general achievement levels (Van Avermaet, Van Houtte, & Van den Branden, 2011). Nevertheless, studies point out the difficulties faced by the schools in maintaining the two aims of equity and excellence of learning simultaneously (Van de Werfhorst & Mijs, 2010; Wößmann, 2004). Some of the established teaching strategies to maximize achievement levels may be not well-suited for all the students in the classroom and unintentionally lead to an increase in the achievement gap between students from different socioeconomic backgrounds. Drawing on a three-dimensional concept of teaching quality developed by Klieme et al (2001), we aimed to understand if certain dimensions of teaching quality reproduce or exacerbate social inequalities, while others would particularly facilitate learning among students from lower socioeconomic backgrounds and reduce the social achievement gap.

Here, it is important to note that, students from a low socioeconomic background often have on average lower achievement levels compared to students from a high socioeconomic background. Although not a perfect one, there is considerable overlap between socioeconomic status (SES) and prior achievement as antecedents of future academic outcomes. However, students from low and high socioeconomic backgrounds often have very different experiences while growing up, which may equip those from high

socioeconomic backgrounds with skills that allow them to benefit more from some teaching practices. Therefore, it is important to consider the variation in academic achievement due to socioeconomic background independent of prior achievement. In this study, we investigated the mechanisms through which the classroom teaching may contribute to or compensate for the achievement inequality among students from different socioeconomic backgrounds, and not among those with low and high prior achievement levels.

## 2.2 Background

### 2.2.1 Social achievement inequality in education and the missing link to teaching quality

Several studies acknowledge the direct association between family socioeconomic background and educational achievement and show that children from lower socioeconomic backgrounds have lower performance levels (Kao & Thompson, 2003; Şirin, 2005). Theoretical approaches suggest that this is because parents transfer resources to their children which are then translated into educational success (Bourdieu & Passeron, 1977). However, socialization does not only take place in the family, but also the educational system. As Goldthorpe (2007, p.14) emphasizes, the schools “can function as important agencies of re-socialization – that is, can not only underwrite but also in various respects complement, compensate for or indeed counter family influences in the creation and transmission of ‘cultural capital’, and not just in the case of *Wunderkinder* but in fact on a mass scale”. Downey and Condrón (2016) offer a broader perspective and refer to schools as “refractors of inequality”: Within this framework, schools may have a neutral, exacerbating or compensatory effect on inequality, depending on the schools’ versus the families’ effectiveness as an environment for learning and skill development. According to their perspective, characteristics of the school environment and the characteristics of the children interact, so that school is beneficial for some children, but not for others.

Teaching quality has been identified as one of the key factors of school environments that explain differences in academic achievement (Fraser, Walberg, Welch, & Hattie, 1987; Hattie, 2009; Scheerens & Bosker, 1997; Wang, Haertel, & Walberg, 1993). While numerous studies of teacher effectiveness address the role of teaching quality for general achievement, only a few give insight into differential effects related to the socioeconomic background (Baumert et al., 2010; Curby, Rimm-Kaufman, & Ponitz, 2009; Pianta & Stuhlman, 2004). As an exception, some studies considered interactions between teacher effectiveness and student background factors, (Carolan, 2016; Konstantopoulos & Chung, 2011), and found that some teaching practices seemed to work better for higher SES students compared to lower SES students (and vice versa). However, these studies either utilized a single SES score based on a large range of variables,

including parental education in years or relied on migration background. Hence, it is worthwhile to dedicate more attention to the role of teaching quality in educational inequality while focusing on the socioeconomic background to capture the mechanisms that may lead to differences in achievement scores.

### 2.2.2 Dimensions of teaching quality

According to Hanushek et al. (1992) being taught by a “good” and “bad” teacher can result in a full grade level of achievement in a single school year. Although it seems plausible at first glance that “good teaching” is closely connected to student achievement, it is difficult to define “good teaching” and even more difficult to measure it with its complexity (Berliner, 2005). Several studies have developed measurements (Creemers & Kyriakides, 2008; Goldhaber & Brewer, 2000; Hamre et al., 2013; Rice, 2003), and a number of studies have put forward that three basic dimensions of instructional quality have an impact on student outcomes (Baumert et al., 2010; Fauth, Decristan, Rieser, Klieme, & Büttner, 2014; Klieme, Pauli, & Reusser, 2009; Lipowsky et al., 2009). These dimensions are cognitive activation, classroom management and supportive climate (Klieme et al., 2001). For our study, we rely on these three dimensions because this framework is based on solid theoretical grounds and enables us to capture a detailed description of the observable and more latent features of teaching quality in mathematics classes (Klieme et al., 2009; Praetorius, Klieme, Herbert, & Pinger, 2018). First distinguished in the 1995 TIMSS evaluation for Germany (Baumert, Lehmann, & Lehrke, 1997), these dimensions have been frequently shown to be relevant for academic and motivational student outcomes (Krauss, Baumert, & Blum, 2008) and emerged consistently as being crucial for motivational outcomes in mathematics (Lazarides & Ittel, 2012). This framework is similar to the Teaching-through-Interactions framework by Pianta and colleagues (Pianta & Hamre, 2009) in a sense that it regards the student as an active recipient of the teacher’s instruction and suggests that teaching quality emerges in interactions between students and teachers (Hamre et al., 2013). On the other hand, cognitive activation dimension does not pay special attention to language modelling like the instructional support dimension of CLASS does. Moreover, with regard to classroom management, the three-dimensional framework emphasizes the organizational structure in the classroom more explicitly, which also addresses the variation in instructional learning formats (Pianta & Hamre, 2009).

#### 2.2.2.1 Cognitive activation

The dimension of cognitive activation addresses features of the instruction, which facilitates students’ abstract understanding by adopting, for instance, tasks that are challenging or alternative ways of solving a problem (Lipowsky et al., 2009). Moreover, students are given a chance to participate in the classroom discourse, which should stimulate their cognitive processing (Walshaw & Anthony, 2008).

Earlier studies show that approaches such as cognitive activation can have an overall positive association with student achievement in mathematics (Baumert et al., 2010; Carpenter, Fennema, Franke, Levi, & Empson, 2000; Desimone, Smith, & Frisvold, 2007; Lipowsky et al., 2009) However, there is only scarce evidence for the exact consequences of high cognitive activation for students from diverse socioeconomic backgrounds. Empirical results suggest that highly cognitively activating tasks in the classroom may not be equally effective for all students but rather benefit those who already are highly motivated and appreciate challenging tasks (Lipowsky et al., 2009). Although cognitive activation is an approach which should theoretically lead to promote learning among all students, it may unintentionally contribute to increasing the achievement gap if the approach does not benefit those from low socioeconomic backgrounds. It has not been investigated yet in which way high cognitive activation differentially affects students from different socioeconomic backgrounds. However, earlier research indicated that the discovery learning method, which requires student self-regulatory skills in a similar way to cognitive activation does may overall have no effect on the reading comprehension of students who are considered to be under demographic (e.g. low SES, migration status) risks (Vanlaar et al., 2014). A potential explanation for this observation may be that this instruction practice is more compatible with the cognitively stimulating child-rearing practices of parents with high SES, and unfamiliar to those who come from lower-status households (Bourdieu, 1974; Lareau, 2003). In a similar manner, we can also predict that a potential “mismatch” of skills between the students from low socioeconomic backgrounds, whose parents prioritize self-care and practical knowledge as qualities which allow them to succeed in their specific communities and homes (Barbarin, Downer, Odom, & Head, 2010) and not skills of self-regulation and higher-order thinking, which are frequently taught by parents with higher socioeconomic status and are necessary to benefit from constructivist teaching methods in the classroom (Connor, Morrison, & Katch, 2004; Gao, 2014; Lareau, 2003)

#### *2.2.2.2 Classroom management*

Classroom management is one of the most frequently examined aspects of teaching quality. It is regarded as more than simply using strategies to settle disrupting behavior: it obliges the teacher to be always attentive and to provide clear learning objectives in the classroom regarding the content and the social norms of the classroom (Emmer & Stough, 2001; Kounin, 1970; Seidel & Shavelson, 2007). Especially in classrooms with a diverse social composition, and where problems and interruptions frequently take place among students, it is vital to provide effective classroom management to make sure that there is adequate time for learning activities. Instructional quality and learning gains among students are significantly associated with the effective use of classroom time via good classroom management (Borman & Kimball, 2005; Creemers & Kyriakides, 2008).

There is evidence that clear rules and a non-disruptive learning environment (Finn & Rock, 1997), may compensate for the disadvantage of students at-risk in elementary schools (Decristan et al., 2016; Seiz, Decristan, Kunter, & Baumert, 2016) and students with migration background in 9<sup>th</sup> and 10<sup>th</sup> grades (Gaskins et al., 2012). It may be that a non-disruptive learning environment reduces the cognitive load for the learners and particularly benefits students who have lower self-regulatory skills and motivation to learn (see Artino, 2008). Palardy (2008) also suggested that the perceived level of discipline is associated with better learning outcomes among students from lower socioeconomic backgrounds. A study by Curran (2003) suggests that students with demographic risks are more likely to show active and confident participation in classrooms with clear rules and scarce interruptions, which seems to contribute to faster growth of their math achievement. Although these previous studies have addressed the differential effects of classroom management, they were conducted either among younger cohorts or they particularly focused on minorities. Building on this research, we argue that students from lower SES backgrounds in secondary schools may feel more comfortable participating and interacting in classrooms with explicit rules and less disturbance. Moreover, they often need more time on a task. Hence a quiet and orderly classroom would prevent potential distractions and allow them to benefit from teaching (Seiz et al., 2016).

### *2.2.2.3 Supportive climate*

The third dimension of instructional quality is supportive climate which addresses features of social interactions in classrooms (Curby et al., 2009; Pianta & Stuhlman, 2004). This construct is constituted by characteristics of teacher-student relations, feedback by the teacher, mutual respect and a proactive attitude towards student mistakes and misunderstandings (Baumert & Kunter, 2006). The concept of supportive climate comprises the attentive and sensitive attempts of teachers to address comprehension difficulties in the classroom, while maintaining a caring ethos (Baumert & Kunter, 2006). It may indirectly influence performance by enhancing the motivation of the students (Klieme et al., 2009) and therefore especially benefit socioeconomically disadvantaged students who often experience academic struggles (Becker & Luthar, 2002; Niemiec & Ryan, 2009). Prior research shows that especially students from lower socioeconomic backgrounds suffer from behavioral problems and seem to be less confident in their interaction with teachers and peers (Pianta & Stuhlman, 2004). Besides, working-class students, in comparison to their peers from middle-class families, often have less assertive ways of asking for help from their teachers (Calarco, 2011), they do not participate in the classroom as much as their peers from high-status families, and they often show less interest to learn (Finn & Rock, 1997). For these students, it may be especially important that teachers promote motivation and academic engagement and thus facilitate academic achievement.

## 2.3 Present study

The primary purpose of this study is to examine if teaching quality according to the three basic dimensions has differential effects on the learning outcomes of students from lower and higher socioeconomic backgrounds. We, therefore, ask the following research question: How is teaching quality associated with the student achievement among students from low and high socioeconomic backgrounds?

In accordance with the background, we expect that cognitive activation will not reduce the social achievement gap, but will enhance it, because it may be more beneficial for higher SES students than for low SES students (H1). We also hypothesize that classroom management will reduce the social achievement gap among students because it can minimize the potential disruptions in the class and allow low SES students to better participate and interact in classrooms with explicit rules and less disturbance (H2). Finally, we expect that supportive climate will reduce the social achievement gap since a teacher who creates a supportive climate in the classroom and demonstrates patience and understanding for students who experience difficulties may potentially mitigate the disadvantage of students from lower socioeconomic backgrounds (H3).

## 2.4 Method

### 2.4.1 Data

We used the longitudinal data from PISA-I-Plus, which is a part of the German national extension to PISA 2003 study (Prenzel et al., 2013). As an extension, PISA-I-Plus contains student answers from the original PISA 2003 study but includes an additional national follow-up, which was conducted in 2004. For the purposes of the national PISA sample in 2003, which was a grade based extension to the international study, at least ten grade 9 students were randomly drawn from the selected classrooms in 198 schools providing general education. The follow-up took place among those students in the national PISA sample, who were finishing the 10<sup>th</sup> grade.

The German system of secondary education is tracked and students usually are assigned to one of the tracks at the age of 10. The highest or academic track (*Gymnasium*) leads to an entry qualification for higher education after grade 12 or 13<sup>2</sup>. The lower tracks consist of lower secondary schools (*Hauptschule*), intermediate secondary schools (*Realschule*), multitrack schools (*Schule mit mehreren Bildungsgängen*) and comprehensive schools (*Gesamtschule*). These prepare for entering vocational training after grade 9 or 10. Schools which do not offer grade 10 did not participate in the follow-up. They were missing by design and were not included in the longitudinal dataset. In order to fully consider the longitudinal development of

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<sup>2</sup> Duration depends on federal states.



classroom-level variables, we followed Kunter and colleagues' (2006) approach: We limited our sample to those classes which remained intact and which were taught by the same Mathematics teacher in grade 9 and 10. One classroom with less than ten students was excluded. The analytic sample included students who have provided information about their family and who have taken the assessment test in both years (Kunter et al., 2006). The Final sample included 3,738 students in 194 classes in multitrack (11.05%), intermediate track (44.22%), comprehensive track (6.34%) and academic track (38.39%) schools.

## 2.4.2 Measures

### 2.4.2.1 *Dependent variable*

Since it is important to consider that different tracks in the German education system may be adopting different versions of 9<sup>th</sup> and 10<sup>th</sup> grade curriculums for Math, we use the scores generated via the general competence tests in PISA-I-Plus, which is designed by PISA to assess students' "ability to use their knowledge and skills to meet real-life challenges" rather than evaluating their mastery of a specific school curriculum (OECD, 2005, p. 8). This way, PISA differs from other large scale surveys like TIMSS, which are explicitly curriculum-dependent.

The general competence test in 2003 covered 77 items ( $\alpha = .77$ ). In 2004, 23 new items were added ( $\alpha = .85$ ), (Prenzel & PISA-Konsortium, 2006). The items included domains of arithmetic, algebra, geometry and stochastic. The tests were scaled to fit the Rasch model with Weighted Likelihood Estimation (WLE).

### 2.4.2.2 *Independent variables*

We relied on parental education as an indicator of the socioeconomic background of students. A clear advantage of using parental education is that we do not depend on income as a measure of socioeconomic status (Entwisle & Astone, 1994). Moreover, research puts forward that educational attainment of parents is a stronger predictor of child achievement than parental income, wealth or occupational status (Davis-Kean, 2005; Duncan & Brooks-Gunn, 1997). To measure the parental educational attainment level, we used a three-category version of the highest International Standard Classification of Education (ISCED) in the family (Division of Statistics on Education, 1975), (high: ISCED 5A and 6; medium: ISCED 5B and 4; low: ISCED 3, 2, and 1).

Instructional quality was assessed by aggregating student evaluations of teachers on a classroom level (Hox, 2010; Marsh et al., 2012). To adopt a careful and theoretically sound approach, we followed Marsh

et al (2012), who suggest that teaching quality is essentially a classroom-level construct (due to the assumption that there is one objective measure of teaching quality in each classroom) and to compare classes in terms of teaching quality, classroom level is the correct unit for analysis. Aggregated student ratings have been proved to be valid and reliable across different age groups (Fauth et al., 2014; Wagner, Göllner, Helmke, Trautwein, & Lüdtke, 2013). Since we are not interested in the idiosyncratic perceptions of students or their dyadic relationships with the teachers, we included the individual-level student ratings of teaching quality only as a control.<sup>3</sup>

For three dimensions of instructional quality, we used 12 sub-scales of teaching quality provided by PISA-I-Plus dataset based on Likert-scaled items with the range of 1 to 4; 1 representing the opinion “strongly disagree” and 4 “strongly agree”. We calculated the proportion of item variance due to group differences (ICC1) and indicators of the accuracy of the class-mean ratings (ICC2) and aggregated the individual sub-scale scores for each classroom at level 2 (Lüdtke, Robitzsch, Trautwein, & Kunter, 2009). Although ICCs showed similarities with earlier studies which investigated the same teaching quality constructs (Table 2.1), ICC2s for cognitive activation were not so high, which was a likely result of the multi-matrix design by PISA, where only half of the students in a classroom have answered questions regarding teaching quality, whereas the other half was given another set of items. This led to the calculation of ICC2 values with an average of around 10 students per classroom. Reverse scales were recoded so that higher scores indicated better teaching quality in the classroom. In order to understand if these sub-scales can be reduced to three dimensions of teaching quality, we conducted a confirmatory factor analysis (CFA) at the classroom level. Based on lower loadings and weak fit of the model to the data (RMSEA = 0.29, CFI = 0.70, SRMR = 0.14,  $\chi^2(51) = 16322.02$ ), we excluded four scales in total: Two from the classroom management and two from the supportive climate dimension. The remaining items were pooled into three dimensions: cognitive activation dimension included cognitive activation tasks and cognitive independence measured by 16 items (i.e. “...assigns tasks for which one needs time and further thinking”), classroom management included disturbance, waste of time and disciplinary climate with 10 items (i.e. “Class is frequently interrupted”) and supportive climate included diagnosis of problems, adaptive relief and teacher support with 14 items (i.e. “The teacher helps students with their learning”) (see a detailed overview of instruments in the table A2 in the Appendix). As a result, goodness of fit greatly improved (RMSEA = 0.08, CFI = 0.97, SRMR = 0.02,  $\chi^2(17) = 435.30$ , (Chen, Curran, Bollen, Kirby, & Paxton, 2008). For a better interpretation and visual representation, we performed linear transformations to achieve a minimum of 0.

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<sup>3</sup> Including the group-mean centered Level 1 student ratings did not change the associations we have found for classroom-level teaching quality indicators, socioeconomic background and achievement. Therefore we did not include these variables in the final models for a more parsimonious presentation.

**Table 2.1.** Chosen scales assessing basic dimensions of teaching quality, their reliability and. intra-class correlations

Construct	Scale	Cronbach's $\alpha$	ICC (1)	ICC (2)	Items
Cognitive activation	Cognitive activation tasks	0.72	0.14	0.62	8
	Cognitive independence	0.71	0.12	0.58	8
Classroom management	Disturbance	0.86	0.39	0.87	3
	Waste of time	0.80	0.35	0.85	3
	Disciplinary climate	0.84	0.32	0.90	4
Supportive climate	Diagnosis of problems	0.85	0.25	0.77	5
	Adaptive relief	0.83	0.29	0.81	4
	Teacher support	0.85	0.32	0.90	5

Source: PISA-I-Plus 2003, 2004

#### 2.4.2.3. Controls

Since differences in test scores can be associated with the attainment that students acquired before they came into the classroom, we used the scores of the math competence test, which was taken by the same student a year ago in 2003, as a control. To account for the variance in school types, we included a dummy variable for the academic track in the analysis. We considered this variable because the current secondary school tracking system in Germany is socially, as well as academically, selective (Hillmert & Jacob, 2010). We also controlled for the gender and immigration background of students. After the coding, the sample included 2123 (56.80%) females and 593 (15.86 %) students with one or both parents born outside Germany.

At level 2 we generated a contextual control variable which was based on the aggregation of the specific level 1 student characteristics SES (Marsh et al., 2012). Since previous research has shown that student performance and teaching style may be influenced by classroom social and ethnic composition (Luyten, Schildkamp, & Folmer, 2009; Rjosk et al., 2014; Rjosk, Richter, Hochweber, Lüdtke, & Stanat, 2015), we have considered the percentage of students from low SES backgrounds. To ascertain that the associations we find are not merely attributable to SES composition of the classroom, we controlled for the percentage of low SES students in the classroom. The mean percentage of low SES students in the sample was 24% ( $SD=16\%$ ,  $Min=0\%$ ,  $Max=85\%$ ).

#### 2.4.3 Analytic strategy

Multilevel analyses were conducted with using the MIXED command in software STATA 14 (StataCorp, 2015). For our analyses, we relied on a covariance analytic model controlling for the prior

achievement. After computing latent constructs of cognitive activation, classroom management and supportive climate, we applied multilevel models to examine the association between these teaching quality dimensions and student achievement. In a second step, we investigated the extent to which each of these dimensions moderates the relationship between parental education and student achievement within a multilevel, mixed effects model. We introduced cross-level interactions between each of the teaching quality dimensions and parental education with a random slope across classrooms (Rabe-Hesketh & Skrondal, 2008). Since the contrast is maximized by using either the lowest or the highest category as a reference, we chose the low parental education category as the reference group to make the interpretation of the interaction coefficients easier. We estimated separate models for each of the three teaching quality dimensions since they were highly correlated and we were particularly interested in variance components that the dimensions have in common. Following, we tested for non-linearity in the interaction effects by treating teaching quality as a categorical variable (low, middle and high groups according to quintiles and standard deviations from the mean). Likelihood-ratio tests indicated that this does not result in a better model fit, we hence considered the linearity assumption as justified.

## 2.5 Results

### 2.5.1. Descriptive results

Table 2.2 shows the descriptive results of the students who were tested in 2003 and 2004. The average achievement for mathematics at the end of grade 10 was 544.2 ( $SD=78$ ), 562.3 ( $SD=75$ ) and 590.6 ( $SD=77$ ) for low, middle and high socioeconomic groups respectively. This achievement gap was further evidenced by a one-way ANOVA test. There was a statistically significant difference in the math achievement in 2004 between groups as determined by ( $F(2,3735) = 101.42, p = .000$ ). A Tukey post-hoc test revealed that math achievement scores were statistically significantly higher in the high socioeconomic groups compared to the lower ones (middle vs. low  $18.10 \pm 3.18$  points,  $p = .000$ ; high vs. low  $46.38 \pm 3.36$  points,  $p = .000$ ; high vs. middle  $28.29 \pm 2.88$  points,  $p = .000$ ). Moreover, three teaching quality dimensions were highly correlated (Cognitive activation and classroom management  $r = .52$ , cognitive activation and supportive climate  $r = .86$ , supportive climate and classroom management  $r = .45$ , all correlations significant at  $p \leq .001$  at the classroom level).

**Table 2.2** Means/proportions among student from low/middle/high socioeconomic background

		Low SES	Middle SES	High SES
Individual level indicators	N	885	1621	1232
General Math Test Score 2004	mean	544.17	562.27	590.55
	SD	77.97	74.84	76.96
General Math Test Score 2003	mean	520.16	538.25	567.74
	SD	74.73	78.12	81.5
Female	N	516	959	648
	Percent	24.31	45.17	30.52
Migration Background	N	217	193	183
	Percent	36.59	32.55	30.86
Gymnasium	N	164	501	770
	Percent	11.43	34.91	53.66

## 2.5.2. Multilevel analyses

### 2.5.2.1. Association between teaching quality and student achievement

The first three columns in table 2.3 show that, among three dimensions of the teaching quality, cognitive activation and a supportive climate did not generally seem to be associated with higher math scores in the overall student sample. Only classroom management had a direct positive association with student test scores at the end of grade 10. Effective classroom management seemed to improve the overall student achievement by 5 points even after we controlled for previous achievement, gender, migration background and academic track of the students. In other words, students in classes in which teachers who effectively prevented disturbances, minimized the waste of learning time and established a structured, disciplinary climate performed better in math achievement test compared to students in classes with teachers who were not as effective in this regard.

The basic models also showed that girls generally achieved lower scores than boys net of the instructional quality measure included in the model. Similarly, students with migration background scored less than students with no migration background in all basic models. We observed slightly higher achievement scores among students from higher socioeconomic backgrounds, but the differences were not significant. Since the achievement gap between low and high SES groups often develops between school forms in Germany, controlling for the school form might have accounted for this gap. Regarding class composition, for each additional percentage of lower status students in the classroom, students in that class achieved around 27 to 30 ( $p < .05$ ) points less.

**Table 2.3**

Parameter estimates and explained variance of models predicting average and interaction effects of instructional quality

	Model 1: Cognitive activation		Model 2: Classroom management		Model 3: Supportive climate		Model 4: Cognitive activation, with CLI		Model 5: Classroom management, with CLI		Model 6: Supportive climate, with CLI	
	B	s.e.	B	s.e.	B	s.e.	B	s.e.	B	s.e.	B	s.e.
<b>Individual level</b>												
SES parents												
middle	1.21	2.39	1.21	2.39	1.17	2.39	-12.34	6.93	-6.75	6.86	-11.46	7.03
high	4.61	2.87	4.60	2.87	4.58	2.87	-13.87	8.09	-1.80	8.08	-12.55	8.24
Math score 2003	0.58	0.01	0.58	0.01	0.58	0.01	0.58	0.01	0.58	0.01	0.58	0.01
Female	-6.42	1.81	-6.60	1.80	-6.42	1.81	-6.45	1.80	-6.58	1.80	-6.41	1.81
Migration Background	-7.46	2.48	-7.31	2.48	-7.38	2.48	-7.42	2.48	-7.26	2.48	-7.33	2.48
<b>Classroom level</b>												
Gymnasium	19.13	3.67	19.43	3.61	18.89	3.72	19.11	3.66	19.44	3.62	19.11	3.71
% of low SES students	-26.16	11.16	-23.10	10.96	-28.62	11.12	-26.59	11.13	-23.56	10.99	-28.01	11.07
Cognitive activation	4.11	3.22					-6.92	5.46	2.77	2.77		
Classroom management			5.35	1.59								
Supportive climate			-0.07	1.59							-4.75	2.60
<b>Cross-level interactions</b>												
Cognitive activation X SES												
middle							11.21	5.37				
high							15.07	6.16				
Classroom management X SES									3.38	2.73		
middle									2.73	3.18		
high												
Supportive climate X SES												
middle											4.93	2.59
high											6.68	3.02
<b>Variance components</b>												
Between-classroom variance	439.40		421.21		425.61		419.44		421.93		408.14	
Within-classroom variance	2614.46		2612.53		2613.90		2615.33		2611.32		2615.27	
Slope (L2) variance	82.32		82.73		81.50		68.74		81.39		70.79	
Intercept-slope (L2) cov.	-138.48		-136.85		-130.10		-122.14		-135.69		-117.51	
Snijders/Bosker R <sup>2</sup> (L1)*	0.55		0.55		0.55		0.55		0.55		0.55	
Snijders/Bosker R <sup>2</sup> (L2)*	0.84		0.85		0.84		0.84		0.85		0.84	
N	3738		3738		3738		3738		3738		3738	
Log Likelihood (LL)	-20129.9		-20125.2		-20130.7		-20126.8		-20124.4		-20128.1	

Note. \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ . CLI: Cross-level interaction. Low SES parents is the reference group. Model 0: constant (random intercept) = 561.01, between-classroom variance = 2247.73, within-classroom variance = 3960.44, slope (L2) Variance = 197.79, intercept-slope (L2) cov. = -94.48, log likelihood = -21066.

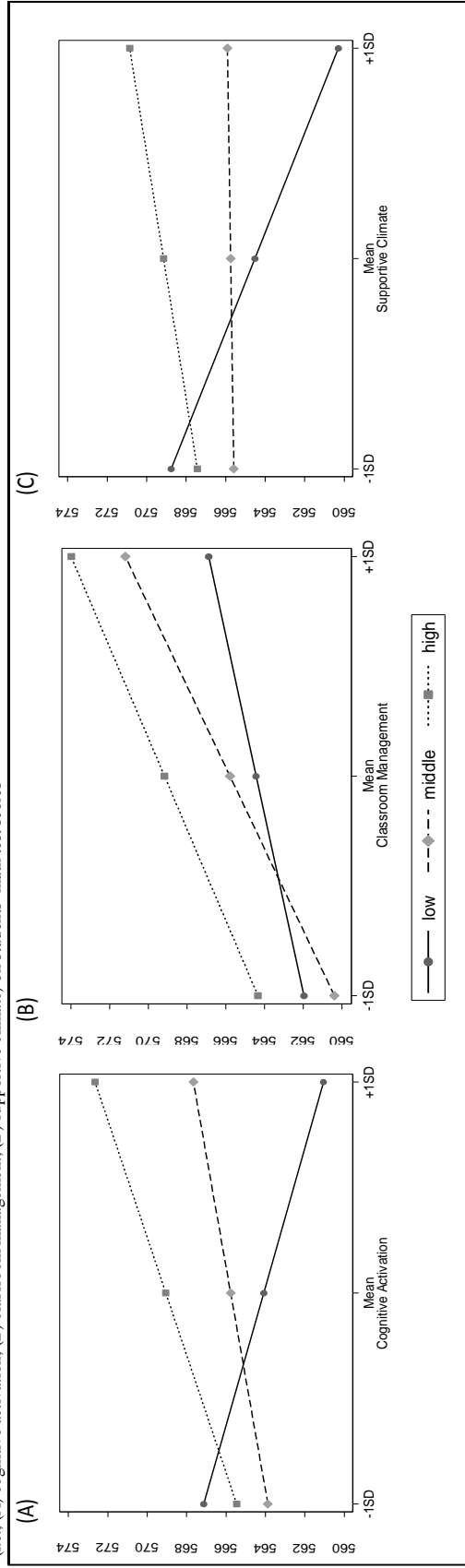
### 2.5.2.2 Cross-level interaction between instructional quality and family background

In order to test if the three dimensions of teaching quality have differential effects for students from high and low socioeconomic backgrounds, we included cross-level interactions in our models. Out of the three dimensions of instructional quality, cognitive activation and supportive climate interacted with the socioeconomic background of students in their influence on student math achievement. The results showed that there is a significant difference between students from lower and higher socioeconomic backgrounds regarding the association between cognitive activation (Model 4) and math achievement. Higher status students seemed to benefit more from cognitive activation: higher level of cognitive activation is associated with an increase in the achievement gap between the two groups of students ( $B_{\text{highSESxCog. Act.}} = 15.07, p < .05$ ). On the other hand, high cognitive activation was associated with a decrease in the achievement scores among students from low SES backgrounds (Figure 2.1A). Therefore our first hypothesis that higher status students will be more responsive to cognitive activation in terms of improving math test scores was confirmed. Although showing an overall additive effect, classroom management (Model 5 and Figure 2.1B) showed no significant interaction with the socioeconomic background of the student. Here, our second hypothesis that classroom management will reduce the achievement gap was not confirmed. The third dimension, supportive climate, interacted with socioeconomic background with regard to student achievement. Similar to the interaction between cognitive activation and achievement, supportive climate (Model 6) demonstrated a positive association with the test scores of students with high SES ( $B_{\text{highSESxTeach. Sup.}} = 6.68, p < .05$ ). Supportive climate seemed to moderate the influence of socioeconomic background on math achievement positively and therefore leading to a larger achievement gap between the two groups (Figure 2.1C). Consequently, our third hypothesis that supportive climate would be more beneficial for lower status students was also not confirmed.<sup>4</sup>

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<sup>4</sup> As an extra control, we ran the interaction models separately for the academic and non-academic school tracks. With the exception of a slightly significant interaction coefficient for classroom management and middle SES group within the academic track students, the results did not differ from those we have acquired for the whole population. To clarify if different tracks interact with teaching quality and socioeconomic background in predicting achievement, we have included a three-way interaction in the model, which did not indicate any significant interaction.

**Figure 2.1:** Interaction effects of students' socioeconomic background and instructional quality (i.e., (A) cognitive activation, (B) classroom management, (C) supportive climate) on students' math test scores





## 2.6 Discussion

Following a concept of teaching quality developed by Klieme and colleagues (2001), we distinguished three dimensions of teaching quality and tested in which way each of them is associated with higher achievement scores during 10<sup>th</sup> grade and if they act as moderators of the association between parental education and achievement. In our theory section, we suggested that cognitive activation is challenging for students and requires a good level of higher-order thinking skills. Cognitive activation, therefore, might be more beneficial for students who are already at ease with challenging tasks, a skill which is often more facilitated by parents with higher socioeconomic status. For this reason, we expected that cognitive activation may not compensate for socioeconomic disadvantages, but rather enhance them (H1). We did not find an overall association between cognitive activation and achievement, which may be a result of rather low ICCs of the sub-scales of cognitive activation measurement. Compared to other two dimensions, cognitive activation measure included items asking for teacher practices which are harder to observe, which can lead to a larger within-classroom variance in student ratings. Additionally, the main effects of cognitive activation were not always as pronounced as researchers would have assumed (Fauth et al., 2014; Praetorius et al., 2018). Nevertheless, this dimension is an essential element of the teaching quality math classes where “analytical thinking” instead of memorizing the content is the main objective. On the other hand, the results of our study indicate that this dimension of teaching quality does seem to benefit students from higher socioeconomic backgrounds more than students from less privileged backgrounds. To rule out the possibility that this result is driven by the interaction of prior achievement and cognitive activation, we controlled for this interaction in an additional analysis, which yielded non-significant coefficients ( $B_{ACH \times Cog. Act.} = .008, p > .05$ ). The interaction between parental education and cognitive activation remained significant ( $B_{highSES \times Cog. Act.} = 14.08, p < .05$ ).<sup>5</sup> We, therefore, confirm hypothesis 1.

Regarding cognitive activation, we assumed a mismatch between the culture of the classrooms and the home culture of students from lower status families. It may be that ways and methods of high cognitive activation are already part of the child-rearing practices among higher status families and that those students have been socialized to deal with cognitive stimulation at home, long before coming to grade 10. Previous literature has indeed underlined the risks of implementing approaches similar to cognitive activation in classrooms where some of the students may not have the motivation, volition or pre-requisite higher-order thinking skills to fully benefit from high cognitive activation (Johnson & Johnson, 1999; Lipowsky et al., 2009; Slavin, 1995). Providing necessary preparation to students who lack such attributes may lead to improvement in the math achievement scores among students from lower status background as well as those from higher status backgrounds.

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<sup>5</sup> These models were generated as extra control measures and not included in the tables presented.

Our second hypothesis stated that students from lower status parents might profit more from good classroom management with clear guidelines and structure as this may minimize the potential confusion regarding the class content. The general association between classroom management and student achievement was positive and significant. However, we did not find a significant cross-level interaction between classroom management and family background. Hence, we cannot confirm hypothesis 2. This result is in line with studies by Borman and Kimball (2005) and Vanlaar and colleagues (2014). Gaskins and colleagues (2012), to the contrary, reported compensatory effects of classroom management among disadvantaged minorities in fourth and fifth grades. One explanation for these diverging results may be due to the different age groups. It might be that teenagers are less responsive to disciplinary efforts than younger children or that teachers' techniques to maintain order in the classroom are different in primary school. According to Lewis (2001), primary school students receive more "relationship-based discipline" in the classroom, whereas secondary school teachers make more use of coercive techniques. Lastly, classroom management which was found to be compensating for disadvantages of a migration background, and not for a socioeconomically disadvantaged background per se, may be related to higher levels of aspiration among students with migration background (Hao & Bonstead-Bruns, 1998). High aspirations may be interacting with effective classroom management and hence benefitting them in terms of achievement scores in the earlier grades.

We also suggested that a supportive climate in the classroom may benefit students from lower status families more than students from higher status families (Hypothesis 3). Our results revealed that a supportive climate did not have a direct association with general student achievement. Moreover, the negative cross-level interaction indicated that students from higher socioeconomic family backgrounds profit more from a supportive climate. Hypothesis 3, therefore, was not confirmed.

While it is plausible that cognitive activation is not particularly suitable to close the achievement gap, it is surprising that a supportive climate seems to enhance social achievement inequalities in the classroom. In this regard, our findings again were not in line with an earlier study of younger children aged 5 to 6 years, which put forward that instructional support may especially benefit those who report low levels of language stimulation and learning practices in the home environment (Hamre & Pianta, 2005). Our deviating results may again be due to the older age groups we examine in our study. Another explanation could be that, unlike teachers in primary school, teachers in secondary school may have higher incentives to assign their support to more promising students. An experimental study by Auwarter and Aruguete (2008) demonstrated that teachers rated students from lower status family backgrounds as "having less promising futures" than students from higher status families with identical IQ levels. Previous research also pointed out that teachers evaluate students from higher status backgrounds more positively than their peers from lower status backgrounds, regardless of their actual performance levels (Hamilton, Sherman, & Rulvolo, 1990). Teachers

who consider socioeconomic status as a strong determinant of a student's educational achievement may feel unsuccessful when teaching students from lower family backgrounds. This sense of low gratification and satisfaction may result in weaker efforts to support those who need it the most, and consequently, maintain (or even increase) the achievement gap between students from lower and higher status families. More empirical research is needed to explore these post-hoc hypotheses within the educational context.

## **2.7 Conclusion**

This investigation adds an important facet to our knowledge about the social achievement gap in secondary education. While previous studies of instructional practices largely addressed the effect of teaching on overall student achievement, sociological approaches focus on issues like the classroom and school composition or school resources. By combining perspectives of sociology of education with approaches from educational effectiveness research, we achieved a more detailed impression of how classroom contexts might affect social inequality. The findings of this study are particularly remarkable in that they demonstrate how different dimensions of instructional quality, even when they are often associated with greater overall gains in achievement, seem to work differentially for students from diverse socioeconomic backgrounds. As a consequence, they might even increase the achievement gap. An interpretation of the results is that certain aspects of instructional quality may unintentionally cause detriment to students from socioeconomically disadvantaged backgrounds who may experience a mismatch between the practices at home and school. Unfamiliarity with cognitively activating methods or the nature of the support and care provided by teachers may lead to lower achievement scores among students from lower socioeconomic backgrounds. These results, by no means, suggest approaches such as cognitive activation should be abandoned by teachers. It is important to be aware that students from low socioeconomic backgrounds may not always be at ease with certain methods in the classroom. In this case, offering preparation to students from lower socioeconomic backgrounds in accordance may enhance their math achievement along with those from higher status backgrounds. Cognitively activating methods in combination with a sensitive and fitting individual support may be a way for achieving “equity and excellence” in education simultaneously.

## **2.8 Limitations and future outlook**

The present study does face a number of limitations in explaining the interaction between classroom practices by teachers and background characteristics of the students. First, as mentioned earlier, students were already at a rather advanced stage in their educational careers and had experienced certain parental,

communal and educational histories, all of which we may not have succeeded to account for. It is well known that achievement gaps are diverging across the life course and “compensating instruction” may be more effective in earlier stages of the educational career. Second, our operationalization of teaching quality was based on student ratings, which may entail a certain bias which we might not have managed to eliminate. Although aggregating the student answers to the classroom level accounted for the validity issue concerning student answers to a certain extent, additional analyses of the teacher or third person (expert) evaluations (i.e. Kane, McCaffrey, Miller, & Staiger, 2013) can add to the strength of the measurement in further studies.

Further investigating how teachers may add to, moderate or mediate existing cycle of social reproduction would lead to a better understanding of student academic outcomes and, more broadly, students’ development. Since the Coleman Report, there has been very little progress in investigating this relationship from an interdisciplinary perspective. In the following years, researchers should work more thoroughly in isolating teacher effects, investigating differential effects of instructional practices and understanding the influence of teachers in shaping social inequalities within different contexts. Future interdisciplinary research on teacher effects may offer substantial and empirical knowledge which would guide schools in determining their criteria for high teaching quality and systems to monitor and evaluate classroom processes.

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## 2.9 Supplementary Material

### Appendix A. Measures and variables.

		N	Percent	Mean	SD
Dependent variable					
	Math test score (2004)	3738	100	567.31	78.32
Individual level					
	Parental Education				
	low	885	23.68		
	medium	1621	43.37		
	high	1232	32.96		
	Individual level controls				
	Pre-test score	3738	100	543.69	80.55
	Gender				
	0= male	1615	43.20		
	1= female	2123	56.80		
	Migration background				
	At least one parent born outside the country				
	0=No	3145	84.14		
	At least one parent born outside the country				
	1=Yes	593	15.86		
	School track				
	0= non-Gymnasium	2303	61.61		
	1= Gymnasium	1435	38.39		
Classroom level					
	Instructional quality (classroom means)				
	Cognitive Activation			1.24	0.44
	Classroom Management			2.40	0.87
	Supportive Climate			2.57	0.89
	Classroom level controls				
	Social composition of class				
	Percentage of low-SES students in the classroom			24	16

Source: PISA-I-Plus 2003, 2004

**Appendix B.** Instructional quality indicators & instruments

Indicators	Items	Answers
<b>Cognitive Activation</b>		
Cognitive activation tasks	Our math teacher...	
	<ul style="list-style-type: none"> <li>...asks questions, which cannot be answered spontaneously, but requires further thinking.</li> <li>...assigns tasks without one clear answer and explains these to us.</li> <li>...assigns tasks for which one needs time and further thinking.</li> <li>...changes the format of tasks, so that one recognizes if s/he really understood the mathematical idea behind</li> <li>...assigns varying tasks, so that one recognizes what s/he understood.</li> <li>...assigns tasks which not only require calculation but also finding the correct approach.</li> </ul>	
	In the math class...	
	<ul style="list-style-type: none"> <li>...we do exercises for which we often use things that we learned before.</li> <li>...we have tasks with which we can see if we really understood the concept.</li> </ul>	1= "strongly disagree" 2= "disagree" 3= "agree" 4= "strongly agree"
Cognitive independence	Our math teacher...	
	<ul style="list-style-type: none"> <li>...compares and evaluates different ways of solving a problem.</li> <li>...allows us to make guesses and go astray until we notice it by ourselves.</li> <li>...sometimes accepts our mistakes and allows us to go on until we notice that something is not right.</li> <li>...assigns tasks for which one should come up with more than one solution.</li> <li>...often allows us to fully explain our ways of thinking.</li> <li>...often requires us to justify the steps of our work in detail.</li> </ul>	
	I can solve the tasks by our math teacher the way I personally find correct.	
	I can come up with my own strategies to solve the difficult tasks by our math teacher.	
<b>Classroom Management</b>		
Disturbance	Class is frequently interrupted.	
	There is a constant loud chattering in the class.	
Waste of time	Students constantly make nonsensical things in the class.	
	It takes a long time until the students are quiet and start working in the class.	
Disciplinary climate	A lot of time is idled away.	
	The class often does not start punctually.	
	Students don't listen to what the teacher says.	
	The teacher has to wait a long time for students to quieten down.	
	Students cannot work well.	
	Students don't start working for a long time after the lesson begins.	
		1= "in every class" 2= "in most classes" 3= "in some classes" 4= "never or almost never"
<b>Supportive Climate</b>		
Diagnosis of problems	Our math teacher...	
	<ul style="list-style-type: none"> <li>...knows very well, what each of us can manage.</li> <li>...immediately notices it when someone did not understand something.</li> <li>...immediately knows which tasks are difficult for us.</li> <li>...immediately knows what we haven't understood.</li> <li>...immediately notices when a student is not following the class.</li> </ul>	
Adaptive relief	Our math teacher...	
	<ul style="list-style-type: none"> <li>...gives good examples to make the tasks more understandable.</li> <li>...assigns tasks according to the student's capability.</li> <li>...makes the formulas very clear, that I can use them for new tasks.</li> <li>...explains difficult parts particularly slow and carefully.</li> </ul>	
Teacher support	The teacher shows an interest in every student's learning.	
	The teacher gives extra help when students need it.	
	The teacher helps students with their learning	
	The teacher continues teaching until the students understand.	
	The teacher gives students an opportunity to express opinions	
		1= "in every class" 2= "in most classes" 3= "in some classes" 4= "never or almost never"

Source: PISA 2003 Survey and authors' own translation from PISA-I-Plus 2003, 2004

**Appendix C.** Final results for CFA model.

	Unstandardized value	Standardized value
<b>Loadings</b>		
scale1: Cognitively activating tasks	1.00 (fixed)	0.96***
scale2: Cognitive independence	0.79***	0.86***
<b>Variances</b>		
error.scale1	0.02	0.08
error.scale2	0.04	0.25
Cognitive Activation	0.20	1 (fixed)
<b>Loadings</b>		
scale3: Waste of time	1.88***	0.97***
scale4: Waste of time	1.17***	0.91***
scale5: Disciplinary climate	1.00 (fixed)	0.94***
<b>Variances</b>		
error.scale3	0.20	0.07
error.scale4	0.21	0.16
error.scale5	0.10	0.11
Classroom Management	0.79	1 (fixed)
<b>Loadings</b>		
scale6: Diagnosis of problems	1.06***	0.92***
scale7: Adaptive relief	1.23***	0.95***
scale8: Teacher support	1.00 (fixed)	0.88***
<b>Variances</b>		
error.scale6	0.17	0.15
error.scale7	0.13	0.09
error.scale8	0.23	0.22
Supportive Climate	0.84	1 (fixed)
<b>Covariances</b>		
Cognitive Activation with Classroom Management	0.49	0.20
Cognitive Activation with Supportive Climate	0.82	0.34
Classroom Management with Supportive Climate	0.43	0.35

Note. \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$

# 3

## The Role of Socioeconomic Background and Prior Achievement for Students' Perception of Teacher Support

Atlay, C., Tieben, N., Fauth, B., Hillmert S. (under review). The Role of Socioeconomic Background and Prior Achievement for Students' Perception of Teacher Support. *British Journal of Sociology of Education*.

## **Abstract**

This study examines the association between prior achievement, student socioeconomic background and their perception of teacher support and the interaction of prior achievement with this association. Building on the sociological work by Lareau (2003), we suggest that there is a link between students' prior achievement, socioeconomic background and how they perceive the teacher's support within the classroom. We expect that students from higher socioeconomic backgrounds would be more critical about the support they receive in the classroom and rate their teachers more negatively while those with higher prior achievement would perceive teacher support more positively. Multilevel models confirmed that there is a negative association between wealth and students' perception of two dimensions of teacher support, and a negative association between parental educational attainment and one dimension of teacher support. We also found a positive association between prior achievement and perception of teacher support. Our findings were in line with the "concerted cultivation" theory by Lareau (2003). Having higher prior achievement was associated with a more positive perception of teacher support, but it did not seem to interact with the socioeconomic background.

## **Keywords**

Socioeconomic background, student perceptions, achievement, teacher support, teaching quality, secondary school

# **3. The Role of Socioeconomic Background and Prior Achievement for Students' Perception of Teacher Support**

## **3.1 Introduction**

In OECD countries, during primary and lower secondary education, a student spends around 7,750 hours in the classroom. This time increases considerably when adding non-compulsory secondary school and higher education (OECD, 2013). Given the large amount of time students spend in the classroom, the quality of the classroom experience is highly important for student outcomes. Regarding the classroom experience of students, we know from previous research that students' perception of the classroom climate is equally, if not more, important than other classroom-level factors for students' learning and eventually, academic and socioeconomic outcomes (Brock, Nishida, Chiong, Grimm, & Rimm-Kaufman, 2008). For instance, if students perceive the classroom as a place of care and support where they are appreciated and regarded, they demonstrate higher levels of participation in the learning process (Lumsden, 1994) and higher motivation (Wentzel, 1988).

Students' perceptions of the classroom have been receiving growing attention from researchers who aim to predict student outcomes (Mijs, 2016; Pomeroy, 1999; Scherer, Nilsen, & Jansen, 2016). However, the antecedents of these perceptions, such as their socioeconomic and academic backgrounds still need further exploration. To investigate these aspects, we build on Lareau's (2002) argument that students from families with higher socioeconomic status have a stronger sense of entitlement. This situation may lead to socioeconomic background differences in the perception of teacher support. Furthermore, previous research has shown that prior achievement level also has a strong association with the perception of the classroom climate indicators: students with higher prior achievement have a more positive perception of teacher support (Ditton, 2002; Levy, Wubbels, Den Brok, & Brekelmans, 2003; Seidel, 2006). Based on this, we extend this argument by shedding more light on the interplay between social background and academic achievement. Finally, in line with the "sense of entitlement" idea, students from higher socioeconomic backgrounds may be more likely to attribute academic failures to external reasons, such as lack of support from their teachers. When they have low achievement levels, they may tend to "blame the teacher" and rate the provision of support more negatively. Although this approach is promising, there has not been any effort in previous research to understand how socioeconomic background and prior achievement may interact in shaping students' perceptions of teacher support.

Accordingly, the present study investigates the differences in student reports of teacher support based on socioeconomic and academic background—a mostly unexamined, yet important topic in the

sociology of education. We concentrate on students' perceptions of their teacher support, which is an important dimension of classroom climate and has been repeatedly linked with students' motivational and academic outcomes (Ruzek et al., 2016; Schenke, Lam, Conley, & Karabenick, 2015).

We raise the following research questions:

- (1) Are socioeconomic background characteristics associated with students' perception of teacher support?
- (2) Is prior achievement associated with students' perceptions of teacher support?
- (3) Does prior achievement moderate the association between student background and perception of teacher support?

In the following sections, we first discuss existing literature on associations between socioeconomic background, prior achievement and perception of teacher support. Later on, we present our theoretical framework and hypotheses. To test these hypotheses, we apply multilevel multivariate models to the PISA-I-Plus dataset, a national longitudinal extension to the international PISA 2003 study.

## **3.2 Previous Research and Theory**

### **3.2.1 Socioeconomic Background and Perception of Teacher Support**

So far, there has only been a little effort to go beyond differences in ethnicity and gender while examining differences in student perceptions of teacher support. An exception is the school climate study by Fan and colleagues (2011), where the authors examined possible associations between social risk factors, such as having parents with lower educational attainment or income, and the perception of general teacher-student relationships at the school level, but did not find any significant relation. In a similar study, ratings of the relationship with teachers did not differ among students from different affluence levels (Shackleton, Allen, Bevilacqua, Viner, & Bonell, 2018). In contrast to these studies, which investigated the link between individual background and reports of the general teacher-student relationships at the school level, there is still considerable ambiguity regarding how socioeconomic background is related to students' perceptions of teacher support within their most proximate environment of the classroom. While there are several aspects contributing to a high-quality learning environment, such as classroom management or cognitive activation (Lipowsky et al., 2009), we concentrate on teacher support, which is constituted by characteristics of teacher-student relations, mutual respect and a proactive attitude towards student mistakes and misunderstandings (Baumert & Kunter, 2006). There are two major reasons for addressing the student perceptions of teacher support as an outcome. First, low SES students are often hesitant to seek support in the classroom, and if they do, they are still concerned that they might upset their teachers (Calarco, 2011).



For these students, it may be especially important to be motivated and engaged by their teachers, which can facilitate academic achievement (Wentzel, Battle, Russell, & Looney, 2010; Wentzel & Watkins, 2002). Second, while maintaining order is more applicable to the whole classroom, teachers' supportive attitude may target individual needs of the students. Differences in the perception of teacher support might tell us a lot about how much support they actually need. Therefore, teacher support is a rather subjective dimension of teaching quality, which can be perceived differently by the students in the same class based on their demand for support.

So how do students from different socioeconomic backgrounds differ in their interpretations of teacher support in the classroom? Previous research has put forward that children from low and high socioeconomic backgrounds have different perceptions of institutional authorities like teachers. Lareau (2003) suggests that children from higher socioeconomic backgrounds develop a certain kind of attitude as a result of their parents' child-rearing practices, which are specific to their social class. While parents with low socioeconomic status tend to adhere to the model of an "accomplishment of natural growth" as the main norm of their child-rearing style, parents from high socioeconomic status rely rather on "concerted cultivation" (Lareau, 2002, p. 3). Concerted cultivation indicates that the parents are responsible for delivering a structured life to their children, which is a balance between curricular and extra-curricular activities where children develop skills to interact and also negotiate with institutional authorities. Furthermore, parents encourage their children to think critically, negotiate and pose challenging questions to adults.

In comparison, "accomplishment of natural growth" indicates that children themselves decide on their free time activities and that they are addressed with directives rather than logical arguments by their parents. Based on her observations of the home environment and classroom interactions of children from low and high social classes, Lareau indicates that children who are raised with "concerted cultivation" acquire a "sense of entitlement". The sense of entitlement has an "important role in institutional settings, where middle-class children learn to question adults and address them as relative equals" (Lareau, 2003, p. 2). Lareau reports that children from families with higher socioeconomic status were more likely to behave as they have the right to pursue their personal choices and take up an active role in managing interactions in institutional settings. According to Lareau, "they appeared comfortable in these settings; they were open to sharing information and asking for attention" (Lareau, 2003, p. 6). On the other hand, children from lower socioeconomic backgrounds did not develop such a strong sense of entitlement. Consequently, they did not acquire skills to relate to institutions in a manner which fitted their personal interests; they often did not question people of authority and did not demand more than what was provided (Lareau, 2003). Based on this background, it can be expected that students with a higher socioeconomic background may demand immediate and appropriate support from their teachers and be more critical about their teachers' ability to

be supportive. It is possible that they may not find the support provided by the teacher satisfactory, as the duration or the quality of support a teacher can give to each student in a classroom may not suffice to meet their demands.

Additionally, parents who employ concerted cultivation often spend extra effort to advocate for their children, for instance, to ascertain that the teachers concern themselves with the child's individual needs or problems (Lareau & Weininger, 2003). They are more likely to be actively involved with the educational progress of their children, seek information exchange on an informal basis (rather than restricting teacher contact to formal parent-teacher conferences) and feel more at ease when communicating with the teachers. This possibly creates a certain attitude within the family of origin which leads children from higher socioeconomic backgrounds to perceive teachers less of an authority figure but rather as a mentor.

The theoretical framework offered by Lareau regarding how background influences the way individual students perceive teachers' supportive efforts can be supported by social psychological research as well. According to Mehan (1992, p. 3), culture offers a "system of meaning", a framework to make sense of situations, which mediates the link between social background and behaviour. These systems of meaning are implicit mental frameworks which are influenced by explicit structures based on gender and social class. They guide people in perceiving specific situations (Dimaggio & Markus, 2010, p. 347; Shepherd & Stephens, 2010). In line with these arguments, experimental studies have shown that socioeconomic background affects systems of meaning via its link to "sociocultural models of self" (Stephens, Markus, & Fryberg, 2012). For instance, members of high social classes take up a model of self as having an impact on the environment, being apart and distinct from others, and behaving in ways resembling their free choices, individual aims and likings (Stephens, Fryberg, Markus, Johnson, & Covarrubias, 2012, p. 1180).

On the other hand, people from lower social classes embrace a rather interdependent model of self, which orientates individuals to be more adjustable to the circumstances of the setting, be related to others and be affected by demands, choices and likings of others (Stephens, Fryberg, et al., 2012). These models of self, play a major part in "systematically shaping how people construe situations" (Stephens, Markus, et al., 2012, p. 723) and therefore have a similar foundation with Lareau's concerted cultivation argument with regard to how socioeconomic background may lead to differences in the way individuals perceive a given situation. Moreover, according to experimental narcissism research conducted by Piff (2013), individuals from higher social classes, particularly those with a higher financial status, act in a more self-focused and self-interested fashion than those from lower social classes. They may also exhibit a stronger sense of entitlement. These findings parallel with studies which have proposed that wealth may be linked to increased entitlement and narcissism (Kraus, Piff, Mendoza-Denton, Rheinschmidt, & Keltner, 2012; Piff, Kraus, Cote, Cheng, & Keltner, 2010) which may lead to a more critical perspective towards the supportive efforts of teachers among students from more affluent households.

So far, there are only very few quantitative studies in Sociology which have addressed the relationship between sense of entitlement and perception of support in educational settings. An exception is a study by Cardona and colleagues (2015), where the authors developed a scale to measure the sense of entitlement construct, which included items such as “Teachers are there to explain things to me” and “Teachers have to give good classes”. The study solely focused on the relationship between indicators of cultural resources and academic achievement and did not show any association between the sense of entitlement and school grades. Despite these efforts, the association between socioeconomic background and perception of teacher support is still not well-understood.

### 3.2.2 Prior Achievement and Perception of Teacher Support

When attempting to assess the link between students’ socioeconomic background and their perceptions of teacher support, it is essential to account for prior achievement. Studies have shown that, even when there is a constant stimulus of a given situation, earlier achievement can lead to major differences in people’s perceptions. Accordingly, individuals with different kinds of prior knowledge may differ in the way they cognitively process and react to the stimuli (Bless, Fiedler, & Strack, 2004). Previous classroom climate research demonstrates the link between prior knowledge of students and their perception of their learning environments: Students with higher prior knowledge (often measured by grades or standardized test scores) have more positive assessments of their classroom (Ditton, 2002; Levy et al., 2003; Seidel, 2006). Moreover, primary school students who have low prior knowledge perceive cognitive demand to be higher in the classroom (Fauth, Decristan, Rieser, Klieme, & Büttner, 2016).

A potential reverse causality issue may arise here: There can be two ways that prior achievement is associated with the students’ perceptions of a supportive climate. First, the educational history of the students may influence their perception and evaluation of the classroom experience. Students with higher prior achievement levels may be positive about their class in general and therefore be more inclined to perceive a specific teacher to be more supportive than students with lower achievement levels (Anderman, 2003). Second, students’ prior achievement may interact with the quality of the supportive environment. For instance, in a given classroom, the level of support provided by the teacher may depend on the students’ achievement status (Seidel, 2006). Rating of the teacher support, in this case, may differ among students with different levels of prior achievement.

### 3.2.3 Relation between Prior Achievement and Socioeconomic Background

Although far less prominent than the variations due to the socioeconomic background (Calarco, 2011), students with different achievement levels also diverge in their demands of support from the teacher. This suggests the possibility of an interaction between socioeconomic background and prior achievement. On the one hand, the “sense of entitlement” argument implies that students from higher socioeconomic

backgrounds are more likely than their peers from lower socioeconomic backgrounds to attribute eventual failures to external reasons (e.g. their teachers' lack of support). When students from high socioeconomic backgrounds have low achievement levels, they could be more likely to be strongly negative about the provision of teacher support, in other words, "blame the teacher" for their low academic performance compared to low SES students. When they have high achievement levels, however, they should be satisfied with the support they get and their ratings may be similar to their peers from low socioeconomic backgrounds.

On the other hand, if the sense of entitlement among students from high socioeconomic backgrounds is as established as it is argued by Lareau, having higher achievement levels may not have a particularly positive influence on the perception of teacher support. In this case, students with a strong sense of entitlement would be more critical of the provision of support by the teacher, irrespective of their achievement levels. If this holds, an interaction between socioeconomic background and achievement is unexpected. Although this question is worth further exploration, previous studies did not address a potential interaction between socioeconomic background and achievement directly. It is therefore still an open question if there exists an interaction or not. Consequently, we examine which strain of reasoning can be confirmed by our empirical analyses.

### **3.3 The Present Study**

The primary purpose of this study is to examine the role of the socioeconomic background while accounting for prior achievement levels in predicting students' perception of the teacher's support. We also aim to understand if there is an interaction between prior knowledge and socioeconomic background in shaping these perceptions.

In line with the previous literature, we expect that students from higher socioeconomic backgrounds will perceive teacher support more critically due to a sense of entitlement and therefore have more negative ratings compared to their peers from lower socioeconomic backgrounds (Hypothesis 1). We also expect that students with high levels of prior achievement will have more positive perceptions of teacher support (Hypothesis 2). Finally, based on two different lines of reasoning, we test with our dataset if there is an interaction between prior achievement and socioeconomic background in predicting the students' perception of teacher support.

## 3.4 Methods

### 3.4.1 Data

We used the longitudinal data from PISA-I-Plus, which is a part of the German national extension to PISA 2003 study (Prenzel et al., 2013). As an extension, PISA-I-Plus contains student answers from the original PISA 2003 study but includes an additional national follow-up, which was conducted in 2004. The follow-up took place among those students in the national PISA sample, who were finishing the 10<sup>th</sup> grade.

The German system of secondary education is tracked, and students usually are assigned to one of the tracks at the age of 10. The highest track (*Gymnasium*) leads to an entry qualification for higher education after grade 12 or 13<sup>6</sup>. The lower tracks consist of lower secondary schools (*Hauptschule*), intermediate secondary schools (*Realschule*), multitrack schools (*Schule mit mehreren Bildungsgängen*) and comprehensive schools (*Gesamtschule*). These prepare for entering vocational training after grade 9 or 10. Schools which do not offer grade 10 did not participate in the follow-up and hence, were not included in our dataset by design. In order to fully consider the longitudinal development of classroom-level variables, we followed Kunter and colleagues' (2006) approach: We limited our sample to those classes which remained intact and which were taught by the same Mathematics teacher in grade 9 and 10. Due to time restrictions, PISA utilizes a matrix design where half the students in a class are chosen to complete the same set of items. The other students answered a different set of items. With the additional exclusion of students who did not provide background information, the sample included N = 2030 students with valid responses on the teaching support dimensions in 195 classrooms in 125 schools. On average, 11 students per class provided data on their math teachers' teaching quality.

### 3.4.2 Measures

Table 3.1 describes the variables which were used in the analyses.

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<sup>6</sup> Duration depends on federal states.

**Table 3.1** Measures and variables for N=2.030 students in 194 classrooms

	N	Percent	Mean	SD	Min	Max
<b>Dependent variable*</b>						
Adaptive relief	2,030		1.30	66.35	-160.24	114.27
Patience by mistakes	2,030		1.44	72.02	-150.83	115.58
Social orientation	2,030		1.55	73.29	-153.48	128.21
<b>Individual level</b>						
Parental Education	2,030	100				
low	485	23.89				
medium	897	44.19				
high	648	31.92				
Wealth Possessions	2,030		0.02	0.51	-2.62	0.89
Pre-test score (group-mean-centred)	2,030		-0.32	64.86	-198.35	258.55
<b>Individual level controls</b>						
Gender	2,030	100				
male	857	42.22				
female	1,173	57.78				
Migration background	2,030	100.00				
At least one parent born outside the country (0=No)	1688	83.15				
At least one parent born outside the country (1=Yes)	342	16.85				
<b>Classroom-level controls</b>						
Percentage of girls			56.99	16.71	18.75	100
Percentage of students with migration background			14.66	13.62	0	85
Percentage of students with low-SES background			22.52	14.85	0	83.33
Percentage of students in the lowest wealth quartile			26.52	15.26	8.69	90

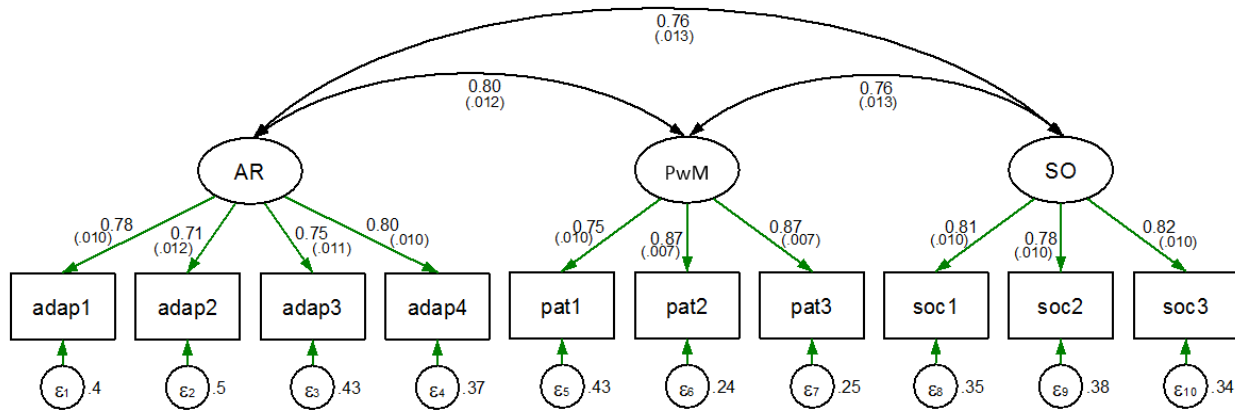
*Note.* Dependent variables rescaled by multiplying by 100 for an easier interpretation

### *Teacher Support*

For teacher support, we used 10 items measuring three dimensions of teacher support based on Likert-scaled items with the range of 1 to 4; 1 representing the opinion “strongly disagree” and 4 “strongly agree” (Ramm, Adamsen, Neubrand, & PISA-Konsortium, 2006). These were adaptive relief (i.e. the teacher explains difficult parts particularly slowly and carefully), patience with mistakes (i.e. the teacher takes time for those who take a long time to understand something) and social orientation (i.e. the teacher cares about the problems of students). PISA-I-Plus included these three scales to measure the student perceptions of teacher support at the end of grade 10 (Ramm et al., 2006). The scales capture the most prominent features of teacher support (See Appendix 1 for the detailed items). Several studies provide evidence for the validity of these scales (Fauth, Decristan, Rieser, Klieme, & Büttner, 2014; Kunter et al., 2013; Wagner, Göllner, Helmke, Trautwein, & Lüdtke, 2013; Wagner et al., 2016). While adaptive relief and patience with mistakes

variables denote the attentive and sensitive attempts of teachers to address comprehension difficulties in the classroom, social orientation variable depicts maintaining a caring ethos (Baumert & Kunter, 2006). To construct latent scales for the three dimensions of teacher support, we conducted a simultaneous confirmatory factor analysis (CFA) with full information maximum likelihood to account for the 135 missing observations in some of the items (Acock, 2013). The final model fit was good (RMSEA = 0.05, CFI = 0.96); (see Figure 3.1). Finally, we generated factor scores, which accounted for the weight of each item based on how salient they are to the construct under inquiry. For a better interpretation and visual representation, we multiplied the values with 100.

**Figure 3.1** Confirmatory factor analysis of items measuring teacher support



*Note.* Standardized coefficients are given, with standard errors in parentheses. AR: adaptive relief, PwM: patience with mistakes, SO: social orientation. Model-fit:  $\chi^2=216.929$  diff(32);  $p < 0.000$ . CFI=0.96. TLI=0.98. RMSEA=0.051.

Student ratings are frequently used to evaluate different quality dimensions of teachers' classroom practices, such as classroom management, cognitively activating learning situations, or the emotional climate within classrooms (e.g. Den Brok, Brekelmans, & Wubbels, 2007; Turner & Meyer, 2000). It is acknowledged that the variance within classrooms, as much as between classrooms, can provide valid and valuable information about how students experience their learning environments (Göllner, Wagner, Eccles, & Trautwein, 2018). In line with our research questions, we mainly try to understand these differences in perception of teacher support and rely on the student answers at the individual level. In order to decompose the variance within and between classrooms regarding perceived teacher support, we utilize a multilevel (hierarchical linear) model (further explained in the section on our analytical strategy below).

*Independent variables*

We used parental education and wealth possessions as indicators of the cultural and financial dimensions of the socio-economic background of students. Research has put forward that educational attainment of parents is a strong predictor of concerted cultivation practiced in the family (Cheadle & Amato, 2010; Weininger, Lareau, & Conley, 2015) which results in the sense of entitlement in the child. We also composed a ‘wealth possessions’ scale based on students’ yes/no answers indicating whether there is a personal room at home for the child, internet connection, a dishwasher, or a garden as well as the number of cell phones, televisions, computers, cars and bathrooms belonging to the family (Ramm et al., 2006). Items indicating a number of possessions are rescaled to have a range of 0 to 1. We did not use the original wealth possessions scale provided by PISA because some of the items within that scale were closely related to the learning environments in the parental home (having a newspaper subscription, learning software and musical instrument). As we aimed to carefully separate monetary resources from learning resources, we utilized this new wealth scale that we generated ( $\alpha = .67$ ).

We used the achievement scores generated via the general competency test at the end of grade level 9 which is designed by PISA to assess students’ “ability to use their knowledge and skills to meet real-life challenges” rather than evaluating their mastery of a specific school curriculum (OECD, 2005, p. 8). The items included 77 items in the domains of arithmetic, algebra, geometry and stochastics. The test was administered in a multi-matrix design and was scaled to fit the Rasch model ( $\alpha = .77$ ).

### 3.4.3 Controls

We controlled for gender and migration background of students to improve the model because both variables are commonly considered to be associated with the perception of teaching (Battistich, Solomon, Kim, Watson, & Schaps, 1995; Koth, Bradshaw, & Leaf, 2008). After the coding, the sample included 1,173 (57,78%) females and a moderate proportion of students with one or both parents born outside Germany (N= 342, 16.85%).

It is essential to keep in mind that in the German context, due to specific mechanisms of school and track allocation, the student composition regarding social background, migration background and gender, as well as prior achievement varies between classrooms (see Hillmert & Jacob, 2010). This classroom composition may influence individual perceptions of teacher behaviour. We, therefore, controlled for the following classroom composition factors by calculating the classroom percentages from student answers: students with low parental education, students who are in the lowest quartile of the wealth possessions scale, female students, and students with migration background.

The mean percentages of classroom composition features can be found in Table 1.



#### 3.4.4 Analytic Strategy

To obtain the measures of teacher support, we conducted simultaneous confirmatory factor analysis at the individual level. After computing the latent constructs of adaptive relief, patience with mistakes, and social orientation, we examined the association between student socioeconomic background, prior achievement, and perception of these aspects with separate multilevel models. We added control variables to the models for gender and migration background, which are acknowledged to be associated with math achievement and students' perceptions. We also controlled for classroom composition of these characteristics, to take into account any kind of compositional effects among students (Marsh et al., 2012). In a second step, we investigated the extent to which prior achievement moderates the relationship between social class and perception of teacher support within a hierarchical linear model (Rabe-Hesketh & Skrondal, 2008). Following that, we performed sensitivity analyses to verify that these models are robust against alternative specifications.

### 3.5 Results

#### 3.5.1 Descriptive Results

We began our analysis by calculating bivariate correlation coefficients at level 1 (see Table 3.2). Latent variables of adaptive relief, patience with mistakes and social orientation were positively and significantly correlated with each other (Adaptive relief and patience with mistakes  $r = 0.87$ , adaptive relief and social orientation  $r = 0.85$ , patience with mistakes and social orientation  $r = 0.83$ , all correlations significant at  $p = \leq .001$  at the individual level). Although the means of perception of support were lower at the highest level of parental education ( $M = 0.85$  for adaptive relief,  $0.42$  for patience with mistakes,  $-3.16$  for social orientation), our bivariate analyses did not show any significant correlation between the socioeconomic background indicators and perception of teaching at this stage. In line with our expectations, prior achievement was positively and significantly correlated with the perception of all dimensions of teacher support ( $r = 0.09$ ,  $0.05$  and  $0.06$  for adaptive relief, patience with mistakes and social orientation respectively at  $p < .05$ ). There were no significant correlations between gender, migration background and perception of teacher support.

**Table 3.2.** Correlations among students' perceptions of teacher support and predictor variables at the individual level

	1	2	3	4	5	6	7	8
1. Adaptive relief	1							
2. Patience by mistakes	<b>0.870</b>	1						
3. Social orientation	<b>0.850</b>	<b>0.830</b>	1					
4. Parental education	-0.005	-0.010	-0.035	1				
5. Wealth possessions	-0.034	-0.028	-0.036	<b>0.150</b>	1			
6. Prior achievement	<b>0.090</b>	<b>0.050</b>	<b>0.060</b>	<b>0.240</b>	<b>0.012</b>	1		
7. Female	-0.030	-0.020	-0.016	-0.038	<b>-0.09</b>	<b>-0.16</b>	1	
8. Migration background	0.010	-0.006	0.001	<b>-0.06</b>	<b>-0.24</b>	<b>-0.11</b>	0.009	1

*Note.* Pairwise Spearman correlations. Coefficients significant on the 5% level in bold. Factor scores were used for latent constructs.

### 3.5.2 Multilevel Analysis

The tables 3.3a, 3.3b, and 3.3c show the results of the multilevel models for adaptive relief, patience with mistakes and social orientation respectively. To answer our research questions, we have analyzed basic models with only socioeconomic background indicators (Model1), only prior achievement (Model 2), with socioeconomic background indicators and prior achievement scores simultaneously (Model 3) and with interaction terms (Model4). We report the findings for each dimension of teacher support in the following subsections.

#### 3.5.2.1 Adaptive Relief

The findings in Table 3.3a confirmed that there was a negative association between wealth and perception of adaptive relief ( $B_{\text{wealth}} = -6.26, p < .05$ ). According to Model 2, students with higher prior achievement reported adaptive relief to be higher in their classroom. When we controlled for the prior achievement of the students, wealth possessions still seemed to have an association with a more negative perception of adaptive relief ( $B_{\text{wealth}} = -6.03, p < .05$ ). Finally, results of Model 4 showed that prior achievement did not interact with parental education or wealth possessions of the students in predicting their perceptions of adaptive relief.

#### 3.5.2.2 Patience with Mistakes

Results presented in Table 3.3b indicated that there was no relationship between socioeconomic background indicators and perception of patience with mistakes. Similar to the findings regarding the adaptive relief dimension, students with higher prior achievement rated their teachers to be more patient in the face of students making mistakes. This tendency persisted in Model 3 when we included socioeconomic background indicators in the model as well. We also did not detect any interaction between prior achievement and socioeconomic background indicators with regard to the perception of patience with mistakes.

### 3.5.2.3 Social Orientation

Findings presented in the first column of Table 3.3c indicated that students with more wealth possessions at home rated the social orientation of the teacher to be weaker, compared to their peers with fewer wealth possessions ( $B_{\text{wealth}} = -6.96, p < .05$ ). Again, the basic model for prior achievement showed that higher prior achievement was positively associated with the perception of the social orientation of the teacher. When we considered the socioeconomic background indicators and prior achievement simultaneously, alongside wealth possessions, high parental education also seemed to have a significant negative relationship this dimension of teacher support ( $B_{\text{wealth}} = -6.79, B_{\text{Par.Ed.}} = -8.31, p < .05$ ). As a final point, when we added the interaction terms, we did not find a significant interaction as in the earlier analyses of other dimensions of teacher support.

Overall, our analyses also showed that gender or migration background was not connected to a more positive or negative perception of teacher support concerning any of the dimensions. The proportion of the classroom population regarding socioeconomic background, gender or migration background was not related to idiosyncratic differences among students regarding teacher support either.

**Table 3.3a.** Parameter estimates and explained variance of models predicting the perception of adaptive relief

	Model 1		Model 2		Model 3		Model 4	
	B	s.e.	B	s.e.	B	s.e.	B	s.e.
<b>Individual level</b>								
Math score 2003 (group mean-centered)			0.09	0.02 ***	0.09	0.02 ***	0.11	0.04 **
Female	-2.32	2.65	0.79	2.68	0.13	2.69	0.09	2.69
Migration Background	2.61	3.7	5.34	3.6	3.57	3.69	3.70	3.70
Parental education level								
low (ref.)								
middle	-2.66	3.33			-3.02	3.31	-3.16	3.32
high	-3.07	3.76			-4.37	3.75	-4.54	3.75
Wealth	-6.26	2.69 *			-6.03	2.68 *	-6.04	2.68 *
<b>Classroom level</b>								
% of students with low parental education	-0.02	0.22	0.02	0.22	-0.04	0.22	-0.04	0.22
% of students in the lowest wealth quartile	-0.1	0.19	-0.04	0.19	-0.11	0.19	-0.11	0.19
% of female students	-0.07	0.18	-0.10	0.18	-0.09	0.18	-0.09	0.18
% of students with migration background	-0.15	0.25	-0.17	0.25	-0.16	0.25	-0.16	0.25
<b>Interactions</b>								
Parental education X Prior achievement								
low (ref.)								
middle							-0.03	0.05
high							-0.02	0.05
Wealth X Prior achievement							0.01	0.04
<b>Variance components</b>								
Between-classroom (L2) variance	1433.81		1425.36		1430.74		1431.2	
Within-classroom (L1) variance	2906.82		2887.97		2875.91		2874.98	
Log likelihood	-11148		-11142		-11138		-11138	
Wald chi2	9.42		22.64		29.95		30.51	
Prob < chi2	0.399		0.002		0.0009		0.004	
N	2030		2030		2030		2030	

\* p<0.05; \*\* p<0.01; \*\*\* p<0.001

**Table 3.3b.** Parameter estimates and explained variance of models predicting the perception of patience with mistakes

	Model 1		Model 2		Model 3		Model 4	
	B	s.e.	B	s.e.	B	s.e.	B	s.e.
<b>Individual level</b>								
Math score 2003 (group mean-centered)			0.06	0.02	***	0.06	0.02	**
Female	-0.79	2.82	1.70	2.86		1.03	2.87	
Migration Background	0.93	3.95	3.11	3.86		1.65	3.94	
Parental education level								
low (ref.)								
middle	-2.59	3.55				-2.86	3.54	
high	-4.55	4.00				-5.52	4.00	
Wealth	-5.43	2.87				-5.26	2.87	
<b>Classroom level</b>								
% of students with low parental education	-0.02	0.25	0.04	0.24		-0.03	0.25	
% of students in the lowest wealth quartile	0.02	0.24	0.08	0.21		0.02	0.22	
% of female students	-0.12	0.20	-0.14	0.20		-0.14	0.2	
% of students with migration background	-0.26	0.28	-0.28	0.28		-0.26	0.28	
<b>Interactions</b>								
Parental education X Prior achievement								
low (ref.)								
middle								-0.01 0.05
high								-0.01 0.06
Wealth X Prior achievement								
low (ref.)								-0.01 0.04
middle								-0.01 0.05
high								-0.01 0.06
<b>Variance components</b>								
Between-classroom (L2) variance	1813.55		1804.41			1813.73		1811.78
Within-classroom (L1) variance	3299.92		3294.32			3282.29		3282.27
Log likelihood	-11286		-11284			-11281		-11281
Wald chi2	7.2		11.21			17.25		17.43
Prob < chi2	0.62		0.13			0.07		0.18
N	2030		2030			2030		2030

\* p<0.05; \*\* p<0.01; \*\*\* p<0.001

**Table 3c.** Parameter estimates and explained variance of models predicting the perception of social orientation

	Model 1		Model 2		Model 3		Model 4	
	B	s.e.	B	s.e.	B	s.e.	B	s.e.
<b>Individual level</b>								
Math score 2003 (group mean-centered)			0.06	0.02	**	0.06	0.02	**
Female	-0.63	2.85	2.11	2.9		1.15	2.9	
Migration Background	2.51	3.99	4.83	3.9		3.2	3.99	
Parental education level								
low (ref.)								
middle	-1.65	3.59				-1.92	3.58	
high	-7.36	4.04				-8.31	4.05	*
Wealth	-6.96	2.9	*		*	-6.79	2.9	*
<b>Classroom level</b>								
% of students with low parental education	0.07	0.25	0.16	0.25		0.06	0.25	
% of students in the lowest wealth quartile	-0.11	0.22	-0.03	0.21		-0.11	0.22	
% of female students	-0.07	0.21	-0.09	0.21		-0.09	0.21	
% of students with migration background	-0.3	0.29	-0.34	0.29		-0.3	0.29	
<b>Interactions</b>								
Parental education X Prior achievement								
low (ref.)								
middle								
high								
Wealth X Prior achievement								
low (ref.)								
middle								
high								
<b>Variance components</b>								
Between-classroom (L2) variance	1905.9		1897.13			1904.25		1905.08
Within-classroom (L1) variance	3372.12		3378.62			3355.77		3352.38
Log likelihood	-11310.2		-11311.7			-11305.6		-11304.7
Wald chi2	13.87		11.00			23.16		25
Prob < chi2	0.13		0.14			0.01		0.02
N	2030		2030			2030		2030

\* p<0.05; \*\* p<0.01; \*\*\* p<0.001

### 3.5.3 Sensitivity Analysis

We tested the same models by including the parental education and wealth indicators separately in order to rule out that multicollinearity distorts the results. This did not yield any different results than the final models where both indicators are included simultaneously. Additionally, since the secondary school tracking system in Germany is academically selective, we assumed that being placed in a certain track may lead to differences in the actual levels of support that students receive (e.g. students at lower tracks may be receiving more learning support than those in academic track). To rule out the differences due to school tracks, we also ran the models within the sub-samples of students in the academic and non-academic tracks, and although not significant at  $p < 0.05$  level, a likely consequence of a remarkable decrease in the sample size, we have found very similar coefficients in the same direction of the coefficients in the full sample. Therefore, there was no evidence for an interaction between the school track and socioeconomic background in predicting student perceptions of teacher support.

## 3.6 Discussion

The purpose of this study has been to examine the relationship between socioeconomic background, prior achievement and student perceptions of the teacher support. We have also aimed to understand the role of prior achievement in the moderation of the link between socioeconomic background and students' perception of teacher support. Using internationally well-known instruments of teacher support, we have distinguished three dimensions (adaptive relief, patience with mistakes and social orientation) and tested how socioeconomic background and prior achievement are associated with the perception of these three dimensions in a multilevel model. We have also included interaction terms to our models to investigate if socioeconomic background interacted with prior achievement in predicting how students perceive these dimensions of teacher support.

In our theory section, we suggested that sense of entitlement among children raised with concerted cultivation would lead to a more critical perception of the supportive efforts of teachers. As this style of parenting is more common in families with higher socioeconomic status, we expected that students from these families would be more negative about their teachers' support, because they would feel more entitled to appropriate and immediate help from their teachers compared to their peers from lower socioeconomic backgrounds. In accordance with our predictions, we have found a negative association between the wealth possessions and perception of two dimensions of teacher support, and again a negative association between parental education and perception of social orientation of the teacher, even after controlling for prior achievement levels and several dimensions of classroom composition. The negative association between both measures of socioeconomic background and student perceptions of the social orientation of the teacher

may be resulting from the structure of the relevant question: This dimension of teacher support addresses the teacher's character in general, rather than specific actions of offering assistance and scaffolding. The items such as "Our teacher cares about the problems of the students" or "Our teacher strives to fulfill the wishes of students as much as possible" may be measuring a construct which is more about the general helpful and caring nature of a teacher, and not explicitly what she or he does to assist individual students with regard to learning processes. The teacher's social orientation may therefore be more sensitive to different interpretations by students from diverse backgrounds.

It is worth noting that after controlling for prior achievement, students with more wealth possessions perceived two out of three dimensions of teacher support more negatively, while parental education only seemed to be linked to a more negative perception of the social orientation. A potential explanation for why wealth was a stronger predictor of teacher support than parental education can be derived from the work by Chin and Philips (2004). The authors suggested that middle-class parents employ more concerted cultivation not because they have different parenting philosophies or values than the working class parents, as Lareau emphasized, but because they have better financial resources to practice concerted cultivation, for instance, to arrange organized and varied activities for their children where they learn to better interact and negotiate with institutional authorities (Chin & Phillips, 2004). In this sense, having parents with more wealth possessions might be a stronger predictor of a sense of entitlement development than having parents with higher educational attainment. These findings are also in line with the social psychological work on narcissism in a sense that people with more wealth have a greater sense of entitlement. Hence, they may regard themselves as the major source of their own success and not attribute it to external factors (Piff, 2013). In our case, students from more affluent families may have perceived both the learning-oriented support and the general caring nature of the teacher not to be satisfactory. We can therefore confirm hypothesis 1, with regard to the perception of adaptive relief and social orientation among students who have more wealth possessions than their peers, and with regard to the perception of social orientation among those who have parents with higher educational attainment.

Our second hypothesis stated that students with higher prior achievement scores would perceive teacher support more positively. Findings from our basic and conditional models have been in the direction of earlier research: students who are high-achievers perceive the support level by the teacher to be higher. This result is in line with studies by Ditton (2002), Levy and colleagues (2003) and Seidel (2006). Therefore, we could confirm hypothesis 2. It is important to note that within the scope of our data analysis, we cannot clearly identify whether this relationship is a result of high-achieving students' satisfaction with the support provided by the teacher (and classroom environment in general) reflected in better evaluations of the teacher's efforts, or of the teacher's actual way of providing support by, for instance, delivering more attention and help to the high-achieving students, regardless of their background characteristics.



We also tested if prior achievement interacted with socioeconomic background in predicting the student perceptions of teacher support. Our results did not reveal such an interaction, neither for parental education nor for wealth possessions as indicators of socioeconomic background. An explanation for this situation could be that, regardless of their prior achievement, students from more affluent families have a more established sense of entitlement, which may foster a certain perspective on their relationship with teachers. A potential explanation can be drawn from Kohn's (1969) research: Middle-class parents value self-determination more than working-class parents, and they convey these values to their children already in early childhood. In this manner, students with a stronger sense of entitlement might actually see their achievement as a product of their own endeavors and do not rate the learning support by the teacher to be particularly high even when they are high achievers. Contrastingly, similar students, when they have lower achievement scores, may believe the teacher is to be blamed for not providing enough support in their learning process. In both ways, students from high socioeconomic backgrounds may have more negative perceptions of teacher support, irrespective of their academic achievement history.

### **3.7 Limitations**

Our results should be interpreted in light of some limitations. First, based on the study sample, the issue of generalizability arises. Although our large sample of German secondary schools and the use of internationally recognized instruments to evaluate teacher support are major strengths of this study design, differences in school grade levels and school tracks may still influence the results. Our findings therefore may not be universal, yet, we believe that they resonate with fundamental human judgement processes (Hoyt, 2000), which may as well take place outside secondary schools, for instance when children from diverse socioeconomic background interact with other institutional authorities. Nevertheless, it would be fruitful if future studies investigate further how socioeconomic background influences students' perceptions of support in diverse settings.

Second, we have used the PISA items, which are frequently modified and utilized in international research investigating students' views of teacher support. Even so, any future research aiming to capture individual perceptions could also compare alternative item wordings, for instance, "the teacher cares about the problems of students" vs. "the teacher cares about my problems" (Turner & Meyer, 2000). As might be expected, putting emphasis on the individual student may be more suitable to capture what their personal perceptions are (Göllner et al., 2018). Items which can capture how teachers provide support to individuals may shed more light on the validity of students' individual perceptions.

Third, since classroom composition and teaching quality are likely to be confounded, we have included a number of classroom-level composition variables to account for this situation. However, we still have little

knowledge about interdependencies between classroom composition, adaptive teacher behavior and individual perceptions of teacher behavior. A teacher has to judge the requirements of the entire group as a whole as well as the needs of individual students. Furthermore, it seems plausible that students do not evaluate teacher support independently of their observation of the teacher's interaction with classmates. The questionnaire we use is not designed to capture these fine-grained nuances of teacher-group interactions and teacher-individual interactions. Although these issues seem hard to be solved in practice, it is important for prospective studies to better examine the role of classroom composition in shaping the teacher's supportive efforts, as well as students' perception of it.

### **3.8 Conclusion**

The present study contributes to existing literature on teacher support as an essential element of instructional quality. We have placed special emphasis on students' perceptions, which have been given very little attention so far with regard to students' socioeconomic background. We have focused on the perception of three dimensions of teacher support (adaptive relief, patience with mistakes and social orientation). Moreover, we have tested how socioeconomic background indicators and prior achievement play a role in shaping these perceptions. Finally, we have connected these analyses by testing a potential interaction between prior achievement and socioeconomic background in predicting students' perceptions of teacher support. We have found that there is a negative association between parental education and perception of social orientation dimension of teaching quality. We have also found that wealth had a negative association with the perception of adaptive relief and social orientation dimensions of teaching quality. The findings demonstrated that student ratings comprise essential information on the association between a student's socioeconomic background and his or her interpretation of support in the classroom. It is notable that, although students have a modest amount of shared perceptions regarding how supportive their teachers are, they may vary in their opinions based on their socioeconomic backgrounds. By bringing together sociological and psychological approaches, we have illustrated how students perceive their teachers may have roots in the kind of socioeconomic context they were born into and raised in. By doing so, this study underlines the importance of considering background factors for improving teacher-student interactions.

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### 3.9 Supplementary material

#### Appendix A. Teacher support indicators and instruments

Indicators	Items	Answers
Adaptive relief	Our math teacher... ...gives good examples to make the tasks more understandable. ...assigns tasks according to the student's capability. ...makes the formulas very clear, that I can use them for new tasks. ...explains difficult parts particularly slow and carefully.	
Patience by mistakes	...is also patient when he / she has to explain things several times. ...takes time for those who take a long time to understand something. ...also stays patient if a pupil does not come along	1= "strongly disagree" 2= "disagree" 3= "agree" 4= "strongly agree"
Social orientation	How is your impression of your math teacher? ...always takes the time when the students want to talk to him / her about something ...cares about problems of the students. ...strives to fulfill the wishes of the students as much as possible.	

*Note.* PISA 2003 Survey and authors' own translation from PISA-I-Plus 2003, 2004

# 4

## Does what you get depend on who you are with? Effects of student composition on teaching quality

Atlay, C., Fauth, B., Dumont, H., Decristan, J. (submitted). Does what you get depend on who you are with? Effects of student composition on teaching quality. *Learning and Instruction*.

## **Abstract**

This study focuses on the association between classroom composition characteristics and teaching quality, with the aim of understanding the role of teaching quality as a mechanism underlying compositional effects. We also examine how teaching quality can be influenced by the student body that is taught. Multilevel analyses of a sample of 1,070 3<sup>rd</sup> graders have indicated that achievement-related and motivational composition of the classroom had an association with the classroom management dimension of teaching quality, whereas sociocultural composition did not seem to influence any of the teaching quality dimensions rated by the students. Correlations at the classroom level have also pointed at a relationship between the teachers' and observers' ratings of classroom management and the composition of general cognitive abilities and interest. As a contrast to student ratings, there was a significant negative correlation between the composition of students from low socioeconomic background and classroom management rated by the observers. Our findings have shown that the student body represents a very critical "situational factor" which has to be considered while investigating teaching quality.

**Keywords:** classroom composition, sociocultural background, motivation, achievement, teaching quality



## **4. Does what you get depend on who you are with? Effects of student composition on teaching quality**

### **4.1 Introduction**

Students' experience of their learning environment, and consequently their achievement outcomes, are significantly shaped by who is with them in their classroom. This was one of the fundamental insights of an influential study by Coleman (1966), which showed that the social composition of a school affects student achievement. Since then, different disciplines such as the educational sciences, sociology, psychology and economics have addressed these so-called composition effects in order to investigate the impact of class-aggregated characteristics on students' individual learning outcomes, over and above the particular student characteristics at the individual level (Harker & Tymms, 2004; Thrupp, 1995; Van Ewijk & Slegers, 2010; Zimmer & Toma, 2000). Although empirical studies have shown that the composition of the classroom may lead to different learning conditions and therefore may influence student performance (Driessen, 2002; Goldsmith, 2011; Opdenakker & Damme, 2007; Peetsma, van der Veen, Koopman, & van Schooten, 2006), they have not paid much attention to the mechanisms behind this relationship.

One of the essential mechanisms in the classroom impacting composition effects may be teaching quality (Rjosk et al., 2014; Wilkinson, Hattie, Parr, & Townsend, 2000). Evidence suggests that classroom characteristics are likely to influence the quality of teaching, (Helmke, 2010) and less privileged students usually attend classes with lower teaching quality. However, these arguments are mostly supported by theoretical predictions or qualitative data (Gamoran, 1993; Oakes, Gamoran, & Page, 1992; Page, 1991). The teaching quality literature shows that there is an association between high teaching quality and better student outcomes (Baumert et al., 2010; Fauth, Decristan, Rieser, Klieme, & Büttner, 2014b; Goodenow, 1993; Klieme, Pauli, & Reusser, 2009; Lipowsky et al., 2009; Urdan & Schoenfelder, 2006). Yet despite the large number of research findings regarding the link between classroom composition and learning outcomes, as well as the link between teaching quality and learning outcomes, there is very limited knowledge regarding the relationship between classroom composition and teaching quality. So far, very few studies have empirically investigated whether teaching quality indeed differs according to classroom composition (Hattie, 2002; Rjosk et al., 2014; Rjosk, Richter, Hochweber, Lüdtke, & Stanat, 2015). Researchers have not been able to clearly identify which characteristics of classroom composition matter the most. Such knowledge, however, is vital if we are to understand what role teachers' classroom practices

play for compositional effects on student outcomes and if we hope to address undesired compositional effects.

In the present study, we aim to shed light on the association between classroom composition characteristics and teaching quality. More specifically, we analyze classroom composition with regards to three sets of student characteristics (sociocultural, achievement-related and motivational) and their relationship to teaching quality in a sample of third graders. In doing so, we not only provide evidence of potential mechanisms underlying compositional effects but also contribute to research on teaching quality by investigating how teaching quality is affected by students.

## 4.2 Background

### 4.2.1 Definition of composition effects

In education research, the term composition effects (or compositional effects) is typically used to define the influence of student body composition in a school or a classroom on students' academic performance (Baumert, Stanat, & Watermann, 2006; Van Ewijk & Slegers, 2010). Student body composition is usually operationalized by aggregating the students' relevant individual characteristics. Importantly, composition effects entail the effects of aggregated individual characteristics at the classroom or school level, *over and above* these characteristics' effects at the individual level. These effects can be reported when the group-level aggregate of an individual-level variable *independently* contributes to the prediction of a change in the outcome variable (Harker & Tymms, 2004). For instance, a classroom composition effect would arise if two students with identical social and academic backgrounds were placed in two different classrooms with different compositions of students but developed differently.

It is surprising that despite the number of studies on this topic, only a few have attempted to examine the how exactly school or classroom composition could influence individual student outcomes (Van Ewijk & Slegers, 2010). Researchers have put forward several mechanisms to explain composition effects: interaction between students, available resources of a class or a school, and last but not least, teaching quality (Harker & Tymms, 2004; Harris, 2010; Rumberger & Palardy, 2005; Wilkinson et al., 2000). There are reasons to believe that within the classroom context, teaching quality might be the most relevant mechanism, as it is most salient for students' academic development (Wilkinson et al., 2000). We therefore focus on how the configuration of a classroom in terms of student characteristics can predict teaching quality. Before providing an empirical overview of the research on classroom composition and teaching quality, we present a definition of teaching quality below.

#### 4.2.2 Teaching quality: A three-dimensional model

Teaching quality is conceptualized as a teacher's actual conduct in the classroom along with teacher-student interaction (Brophy, 2000; Doyle, 2006). Many researchers have developed indicators for teaching quality (Allen et al., 2013; Creemers & Kyriakides, 2008; Goldhaber & Brewer, 2000; Rice, 2003), and a number of studies suggest that there are three basic dimensions of instructional quality that matter most for student outcomes (Baumert et al., 2010; Fauth, Decristan, Rieser, Klieme, & Büttner, 2014a; Klieme et al., 2009; Lipowsky et al., 2009). These dimensions are classroom management, a supportive climate, and cognitive activation (Klieme, Schümer, & Knoll, 2001).

The first dimension, classroom management, includes classroom supervision and efficient time keeping. Teachers should provide clear and structured activities (Fricke, Ackeren, Kauertz, & Fischer, 2012) and keep student interruptions to a minimum (Wang, Haertel, & Walberg, 1993). Classroom management describes a teacher's strategies to maintain order as well as the students' response to these efforts. It is "both a condition for students getting attentive (e.g., through teacher monitoring) and an indication of students being attentive (e.g., lack of interruptions)" (Praetorius, Klieme, Herbert, & Pinger, 2018, p.3). Studies have shown that effective use of classroom time through good classroom management is associated with learning gains for students (Borman & Kimball, 2005; Wang et al., 1993)

Second, we consider the dimension of supportive climate, which addresses the quality of social interactions between teachers and students (Curby, Rimm-Kaufman, & Ponitz, 2009; Pianta & Stuhlman, 2004). A supportive classroom climate is determined by characteristics of teacher-student relations, feedback from the teacher, mutual respect, and a proactive attitude towards student mistakes and misunderstandings (Baumert & Kunter, 2006). The concept of supportive climate involves the attentive and sympathetic attempts of teachers to address comprehension problems in the classroom while maintaining a caring ethos (Baumert & Kunter, 2006). A supportive climate may indirectly influence performance by enhancing students' motivation (Klieme et al., 2009), for instance, by facilitating the feeling of relatedness in the classroom (Reinboth, Duda, & Ntoumanis, 2004).

The third dimension of teaching quality refers to cognitive activation, which describes teaching practices that facilitate students' understanding of the learning content by engaging them in tasks that are thought provoking or encourage alternative ways of solving a problem (Lipowsky et al., 2009). Moreover, students are given the opportunity to participate in class discussions, which challenges their cognitive processing (Walshaw & Anthony, 2008). Earlier studies show that cognitively activating teaching practices may be positively associated with student achievement, especially in mathematics classes (Baumert et al., 2010; Lipowsky et al., 2009). However, this practice can also enhance learning in other subjects in primary school (Hamre, Pianta, Mashburn, & Downer, 2007).

For our study, we rely on these three dimensions of teaching quality because this framework is based on strong theoretical grounds and encompasses a detailed description of both the observable and latent features of teaching quality (Klieme et al., 2009; Praetorius et al., 2018). These dimensions are frequently evaluated through student feedback (even in primary schools), and their reliability and validity are supported by empirical studies (Fauth et al., 2014b). Research has shown that aggregated student ratings at the classroom level are reliable measures of teaching quality (Lüdtke, Robitzsch, Trautwein, & Kunter, 2009). Alongside student ratings, researchers also regard teacher ratings as valid measures of teaching, as teachers have sufficient pedagogical and didactic expertise to evaluate the instructional quality in the classroom (Desimone, Smith, & Frisvold, 2010). Their judgments, however, may be distorted if they perceive their own teaching in a more positive light (Wubbels, Brekelmans, & Hooymayers, 1992). Depending on the measured dimension, their judgments about the classroom may be shaped by their self-assessments to a certain degree (Kunter & Baumert, 2006). As a result, some scholars consider judgments from external (video) observers to be the optimal way to describe and evaluate lessons (Helmke, 2010). Such observers are both highly objective and have a well-trained methodical and didactic view. However, video and observation studies are often intensive in required time and effort, which results in a limited number of lessons per class observed by the experts (one to a maximum of five). This leads to questions regarding the validity of these ratings (Praetorius, Pauli, Reusser, Rakoczy, & Klieme, 2014). Research shows that there is often very little correspondence between different judgment perspectives (Kunter & Baumert, 2006; Lüdtke, Trautwein, Kunter, & Baumert, 2006). Thus, researchers should use different data sources to examine whether certain effects occur only from certain perspectives or whether effects can be confirmed from different perspectives.

#### 4.2.3 The role of teaching quality in classroom composition effects

A central and widespread theory concerning the effect of student body composition on individual student achievement relates to organizational, curricular, and didactic reactions of teachers to classroom composition (Dreeben & Barr, 1988; Harker & Tymms, 2004). To achieve the best possible student outcomes, teachers are expected to adapt their instruction to the needs of students in their classroom. From the teacher's perspective, it is hard to address every learner's needs in the given time. As a result, the approach they choose may be shaped by the overall student composition. For instance, a teacher may expend more effort in providing better cognitive activation in a class in which the majority of the students have high cognitive abilities, compared to a class with a lower cognitive ability composition. Similarly, it will be easier to keep the classroom well managed when students are highly motivated, whereas unmotivated students will cause more disruptions and disturbances. It is therefore plausible that teaching quality, and thus the academic

outcomes promoted by teaching, may vary based on classroom composition. Consequently, teaching quality might significantly impact what the link between classroom composition and student outcomes looks like (Rjosk et al., 2014).

There is still a considerable lack of knowledge concerning the nature of the link between classroom composition and teaching quality, especially regarding the three generic dimensions classroom management, supportive climate, and cognitive activation. In the limited number of related studies, the sociocultural background of the students has received the most substantial attention so far. Researchers suggest that teachers often have lower performance expectations in classrooms with students from lower socioeconomic and migration backgrounds (Ready & Wright, 2011; Rumberger & Palardy, 2005). Low expectations influence teachers' behavior: For instance, they may offer less stimulating learning situations or slow their instruction down (Brault, Janosz, & Archambault, 2014). Teachers may also interact less with their students in classrooms with more ethnic minority students, meaning they less frequently praise them or give proactive feedback, which leads to a less supportive climate. This argument is mainly found in US-based research, which suggests that European American teachers do not treat African American or Latino students the same way they treat European American students (Casteel, 1998; Tenenbaum & Ruck, 2007). The study by Levy and colleagues (1997) also implies that teachers behave differently in classes with different cultural compositions. When a classroom had a higher proportion of students from minority ethnic groups (measured by place of birth and the main language spoken at home), teachers increased the structure and guidance of learning situations rather than giving students more responsibility (see den Brok & Levy, 2005). Lastly, a more recent study by Rjosk and colleagues (2014) found that teachers in classes with students from lower socioeconomic backgrounds provided less demanding teaching in terms of linguistic promotion, which was associated with lower achievement among students. The study detected no mediation effects for student orientation and structuring by the teacher. In another study (Rjosk et al., 2015), the same authors did not find any impact of the effects of the proportion of native speakers on intrinsic motivation from the teaching climate. A study by Hattie (2002) also showed that teaching quality is not strongly connected with classroom composition.

In addition to the sociocultural composition, indicators of student achievement are another important dimension of teaching quality. These indicators range from subject-specific competencies like reading comprehension to more general abilities like intelligence. Since the achievement-related composition of the classroom manifests more clearly in the actual academic performance of the students, it might be a stronger determinant of teaching quality than the sociocultural composition. The earliest theoretical arguments for achievement-related composition effects can be drawn from Dreeben and Barr's study (1988), which found an association between the achievement compositions of different learning groups and first grade reading performance. Nikolova (2011) found evidence of the so-called Pygmalion effect in a sample of elementary

schools, where teachers expected more from learners in high achievement composition classrooms and then transferred these expectations to them, which indirectly promoted classroom performance. Thus, similar to the findings of studies focusing on sociocultural composition cited earlier, teachers often adjust their expectations as well as their teaching efforts to the classroom's achievement level (Dreeben & Barr, 1988; Harker & Tymms, 2004; Harris & Sass, 2011). More recent studies have shown that achievement composition effects are also mediated by teacher cooperation and learning climate (Zimmer & Toma, 2000), teachers' reference norms (Zurbriggen, 2016) as well as teacher's expectations and academic climate (Rumberger & Palardy, 2005). Opdenakker and colleagues (Opdenakker & Damme, 2007; Opdenakker & Van Damme, 2001, 2006; Opdenakker, Van Damme, De Fraine, Van Landeghem, & Onghena, 2002) have demonstrated multiple times that the link between classroom and school composition and academic achievement is mediated by school process variables such as the learning climate, teacher expectations and the cooperation between teachers.

The final compositional characteristic that is also highly relevant for teachers is the motivational composition of the classroom. There are two different aspects of student motivation: While students' subject-related *interest* refers to the intrinsic value of the course, students' *volition* refers to their ability to be attentive even if they struggle to stay focused. Since teachers are very perceptive of the level of motivation in the classroom, this characteristic is likely to influence teachers' behavior in a way comparable to achievement-related characteristics. For instance, an overall display of high interest may encourage teachers to provide more stimulating instruction as well as more learning support, even when the classroom achievement composition is low. This situation may, in turn, result in an even greater increase of interest and volition among students. Additionally, students with higher interest and volition will cause fewer problems related to classroom management (Tomlinson et al., 2003). Older teaching quality research often did not consider this reciprocal relationship between motivational features in the classroom and teaching quality by conceptualizing teaching as an antecedent and not a consequence of the classroom's level of interest or volition (see Gilbert et al., 2014; Kunter, Baumert, & Köller, 2007; Wentzel, 1997). However, given that teachers are reliant on students and their willingness to learn and to cooperate, these features will probably also be important for teaching quality. One of the few studies that addressed this dimension at the student level is Skinner and Belmont's work (1993), which shows that behaviorally disengaged students received more aversive teacher responses. It is plausible that a low level of interest and motivation in the classroom leads to a less beneficial style of teaching. Nevertheless, to our best knowledge, such a mechanism has not yet been directly assessed so far.

Although there is evidence that classroom composition, mediated through a teachers' style of teaching, could have an impact on student outcomes (Dreeben & Barr, 1988; Harker & Tymms, 2004; Ready & Wright, 2011), we still lack a thorough understanding of the exact relationship between classroom

composition and teaching quality. Moreover, the existing literature largely focuses on sociocultural composition effects, while in classroom settings, ability levels (via performance in ability tests) and motivational characteristics (via demonstration of interest and volition) might actually be more visible and therefore more relevant to shaping teachers' expectations and practices. Therefore, by addressing sociocultural, achievement-related and motivational classroom composition features, we aim to further extend current knowledge on how classroom composition may affect teaching quality. At the same time, this also informs research on teaching quality, namely whether and how teaching quality differs depending on student composition.

### **4.3 The present study**

The primary purpose of this study is to examine the impact of classroom composition on teaching quality in order to contribute to the knowledge on mechanisms of classroom composition effects. More specifically, we test whether the class-aggregated sociocultural, achievement-related and motivational student characteristics are associated with teaching quality. We measure this by looking at student ratings of three dimensions of teaching quality: classroom management, supportive climate and cognitive activation. We expect to find more pronounced composition effects for cognitive abilities and motivation because these features are more salient in the classroom and more proximal to student learning (Hanushek, Kain, Markman, & Rivkin, 2003; Hutchison, 2003) and thus probably also more relevant to the teaching practices of teachers. By contrast, we expect that the sociocultural composition of the classroom will only be weakly linked to teaching quality compared to the composition of achievement-related and motivational characteristics.

In a second step, we analyze whether it is possible to replicate similar associations when considering teacher and observer ratings of teaching quality as outcomes. Based on older literature, we also anticipate that ratings by students, teachers and observers can differ in their relationships to classroom composition features on teaching quality. This may particularly be the case for the dimensions of supportive climate and cognitive activation, for which there are less evident and tangible indicators than classroom management (Clausen, 2002), and which are thus more susceptible to different interpretations from receivers, providers, and outside observers.

## 4.4 Methods

### 4.4.1 Data

We used a dataset provided by the IGEL-study; which is an intervention in elementary schools in central Germany aiming to assess the effectiveness of different teaching approaches (Decristan, 2015). 1,070 third-grade elementary school students (49% female) with a mean age of  $M = 8.8$  years ( $SD = 0.50$ ) took part in the study in the academic school year 2010/2011. The dataset also included teacher assessments and video observations of teaching quality. 96% of all students in the 54 classes under consideration participated in the study. The mean class size was 19 students.

Student ratings were collected at the end of the third grade level in 2011. Students' background characteristics (sociocultural background, achievement and motivation) were assessed at the beginning of the same school year. Teacher and observer ratings of teaching quality were collected in the second half of the school year. During that period, two units on the topic of floating and sinking were taught in the participating classes, and teacher and observer ratings collected over this period concerned the teaching quality during these units. These units were part of a larger research design evaluating the impact of different teaching practices (see Decristan, 2015). In this study, each teacher received the same materials on the topic of floating and sinking and used them during their usual classroom instruction in science education. Accordingly, teacher and observer ratings referred to teaching quality during these units, whereas students' ratings referred to teaching quality in science education in general.

### 4.4.2 Measures

#### 4.4.2.1 *Teaching quality*

A detailed table of the measures and variables used in this study can be found in the supplementary materials section (Appendix A).

We used a student questionnaire that has been validated in previous studies to measure teaching quality in primary schools (Decristan et al., 2015; Fauth et al. 2014, Decristan et al., 2017). Students answered items on a Likert scale ranging from 1 = strongly disagree to 4 = strongly agree. The classroom management scale included six items ( $\alpha = .92$ ) on the incidence of disciplinary problems and disruption in the classroom (e.g., "In our science class, students are quiet when the teacher speaks"). The supportive climate scale covered nine items ( $\alpha = .91$ ) addressing the quality of social interaction between teacher and students (e.g., "Our science teacher encourages me when I find a task difficult"). The cognitive activation scale covered seven items ( $\alpha = 0.81$ ) relating to the teacher's approach and their setting of thought-provoking and highly stimulating tasks (e.g., "Our science teacher asks questions that I have to think about very thoroughly").



Student ratings of teaching quality were aggregated for each class and used as level 2 variables. Indices of intra-class correlations (ICCs) demonstrated notable agreement within classes and reliability of indices (ICC1s were 0.32, 0.19, and 0.15; ICC2s were 0.90, 0.81 and 0.76 for classroom management, supportive climate and cognitive activation, respectively) (Lüdtke et al., 2006).

Teachers rated teaching quality using items that covered the same dimensions as the student ratings. The three scales consisted of five items on cognitive activation ( $\alpha = 0.67$ ), eight items on supportive climate ( $\alpha = 0.79$ ), and four items on classroom management ( $\alpha = 0.86$ ). External observers rated teaching quality on three high-inference items: “challenging tasks and questions” (cognitive activation), “recognition and respect towards students” (supportive climate), and “dealing with disruptions and discipline” (classroom management). Items were rated on a 4-point scale. Raters received extensive training (approximately 40 hours) and assigned their ratings according to a coding manual. Interrater reliability was sufficient (ICC > .70 for two independent raters; Shrout & Fleiss, 1979). Previous studies confirmed the validity of teacher and observer rating items in the prediction of student learning and students’ ratings of teaching quality (Fauth et al., 2014b).

#### 4.4.2.2 *Student characteristics*

We used the number of books per household as an indicator of socioeconomic status, and set migration background as an indicator of ethnic background, both of which constitute the sociocultural dimension of a student’s background. The number of books in a household relates to the scholarly culture of the parents, which is an essential facet of high socioeconomic background (Evans, Kelley, Sikora, & Treiman, 2010). We defined a migration background as referring to a student with one or both of parents born outside of Germany. This definition was also used in large-scale surveys like IGLU and PISA (Bos et al., 2005; OECD, 2016). To measure cognitive abilities, we utilized students’ Culture Fair Intelligence Test (CFT) scores, which indicate their level of logical reasoning (Weiß & Osterland, 2012), as well as the Reading Comprehension Test for first- through sixth-graders (*Ein Leseverständnistest für Erst- bis Sechstklässler*, ELFE), which indicates their level of language comprehension at word, sentence and text levels (Lenhard & Schneider, 2006). Finally, as indicators of motivational features, we used the student interest (measured by a five-item scale,  $\alpha = 0.92$ , e.g., “Science education is fun for me”) and volition (measured by a 9-item scale,  $\alpha = 0.79$ , e.g., “I put effort into science education even when it’s boring”).

#### 4.4.3 Analytical strategy

We conducted all analyses with the Mplus 7 software (Muthén & Muthén, 1998–2012). In order to test whether the sociocultural, achievement-related and motivational student characteristics have compositional effects on teaching quality rated by the students, we included these variables at the individual level and at the classroom level to predict student ratings of teaching quality. Following Marsh et al. (2012), we centered level 1 variables at their group mean and subtracted the within-classroom effect (level 1) from the between-classroom effect (level 2) for each variable of interest in order to receive an estimate of the compositional effects. In each of the models, we controlled for all background variables at the individual level. These control variables accounted for variation within classes as well as variation between classes. Each of the compositional dimensions was tested in separate models.

In the case of teacher and observer ratings, no individual effect could be controlled for. Accordingly, we only interpreted bivariate correlations between teacher and observer ratings of teaching quality and classroom averages of students' background variables to examine whether these analyses would yield results similar to the student ratings.

Missing values occurred in 7.1 to 14.9% of cases at the individual level (student background variables and student ratings of teaching quality). Additionally, 6.9 to 9.4% of teacher ratings and one classroom observation were missing. There was no indication of systematic missing data patterns across scales or time points of measurement. We used the full information maximum likelihood procedure to deal with missing data (Enders, 2010).

### 4.5 Results

Table 4.1 shows all correlations between variables at the classroom level. Zero-order correlations of student background variables at the classroom level show that the two indicators we considered for each dimension of student composition were significantly correlated: Owning a low number of books was correlated with migration background, cognitive abilities were correlated with reading comprehension, and interest was correlated with volition. Additionally, we observed smaller yet significant correlations between sociocultural and achievement-related composition factors in the range of  $r = -.22$  to  $r = -.26$ .

**Table 4.1** Correlations among 3rd grade teaching quality and compositional variables at the classroom level

Classroom-level variables	1	2	3	4	5	6	7	8	9	10	11	12
1. Number of books	<b>1</b>											
2. Migration Background	<b>0.51</b>	<b>1</b>										
3. Cognitive abilities (CFT)	<b>-0.26</b>	<b>-0.22</b>	<b>1</b>									
4. Reading competence (ELFE)	-0.05	-0.15	<b>0.63</b>	<b>1</b>								
5. Interest	-0.05	0.12	0.07	-0.04	<b>1</b>							
6. Volition	-0.19	-0.09	0.23	0.17	<b>0.53</b>	<b>1</b>						
7. Classroom Management (T)	-0.17	-0.07	<b>0.35</b>	0.23	0.05	0.06	<b>1</b>					
8. Supportive Climate (T)	-0.10	0.00	0.08	-0.17	0.08	-0.17	<b>0.40</b>	<b>1</b>				
9. Cognitive activation (T)	0.15	0.07	-0.02	-0.25	-0.08	-0.10	<b>0.38</b>	<b>0.60</b>	<b>1</b>			
10. Classroom management (V)	<b>-0.28</b>	-0.06	<b>0.42</b>	<b>0.33</b>	<b>0.26</b>	0.16	<b>0.53</b>	-0.05	-0.16	<b>1</b>		
11. Supportive climate (V)	0.04	-0.12	<b>0.28</b>	0.24	<b>0.29</b>	<b>0.27</b>	<b>0.27</b>	-0.09	-0.17	<b>0.56</b>	<b>1</b>	
12. Cognitive activation (V)	-0.05	-0.02	0.14	0.18	0.20	0.04	0.22	0.08	-0.17	<b>0.46</b>	<b>0.29</b>	<b>1</b>

*Note.* Pairwise Spearman correlations. Coefficients significant on the 5% level in bold. T: Teacher ratings, V: Video observer ratings.

#### 4.5.1 Sociocultural composition effects

The findings in Table 4.2a showed that there was no significant association between the sociocultural composition of the classroom and any of the teaching quality dimensions. Although the number of books per household and the migration background of students were related to individual perceptions of classroom management and cognitive activation, no sociocultural compositional effects manifested in our analyses. Thus, having a classroom with a higher percentage of students with a low number of books per household and a higher percentage of students with a migration background was not linked to any changes in students' ratings of teaching quality. Insignificant correlations of the sociocultural composition with the teacher ratings also confirmed this finding. Conversely, a higher composition of students from low sociocultural backgrounds was negatively correlated with classroom management rated by the observers ( $r = -0.28, p < 0.05$ ).

#### 4.5.2 Achievement-related composition effects

The findings in Table 4.2b demonstrate that there was a positive association between cognitive ability composition of the classroom and student ratings of classroom management *above and beyond students' individual cognitive abilities*. When considered separately, both cognitive ability and reading comprehension test scores seemed to have compositional effects on the teacher's ability to establish order and silence in the classroom ( $\beta_{\text{CFT}} = 0.26, \beta_{\text{ELFE}} = 0.22, p < 0,01$ ). When we included them in the model simultaneously, the compositional effect of language comprehension level on classroom management was not significant anymore. Composition effects of cognitive ability levels remained despite a slight decrease in the regression coefficient in the last model ( $\beta_{\text{CFT}} = 0.20, p < 0.05$ ). *This means that students reported that classroom management was better in classes with a higher average level of students' cognitive abilities. Neither of the achievement-related indicators was significantly linked to supportive climate or cognitive activation in the classroom. Thus, both the cognitive activation and the individual support provided by teachers were independent of the achievement level in the class.* Cognitive ability composition was positively correlated both with teachers' and observers' ratings of classroom management ( $r = 0.35, p < 0.01$  and  $r = 0.42, p < 0.001$  respectively), whereas reading language comprehension was correlated with observer ratings of classroom management ( $r = 0.33, p < 0.05$ ).

**Table 4.2a. Parameter estimates of models predicting teaching quality (Sociocultural characteristics)**

	Classroom Management			Supportive Climate			Cognitive Activation		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$
<b>Individual level</b>									
Number of books	0.19 *	0.09	0.20 *	0.09	0.13	0.08	0.17 *	0.09	0.17 *
Migration Background	0.16 *	0.07	0.15 *	0.07	-0.02	0.08	0.08	0.10	0.10
Cognitive abilities (CFT)	-0.01	0.03	-0.01	0.03	0.02	0.03	-0.05	0.03	-0.05
Reading competence (ELFE)	-0.04	0.03	-0.04	0.03	-0.03	0.03	-0.01	0.03	-0.01
Interest	0.08 *	0.03	0.08 *	0.03	0.12 **	0.04	0.14 ***	0.15 ***	0.15 ***
Volition	0.09 **	0.03	0.09 **	0.03	0.07 *	0.04	0.08 **	0.08 *	0.08 **
<b>Classroom level (comp.)</b>									
Number of books	0.19	0.64	-0.23	0.67	-0.02	0.41	-0.08	0.39	0.16
Migration Background	0.50	0.32	0.58	0.33	-0.20	0.23	-0.25	-0.28	-0.33

\* p<0.05; \*\* p<0.01; \*\*\* p<0.001

**Table 4.2b. Parameter estimates of models predicting teaching quality (Achievement-related characteristics)**

	Classroom Management			Supportive Climate			Cognitive Activation		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$
<b>Individual level</b>									
Number of books	0.20 *	0.09	0.19 *	0.09	0.13	0.08	0.17 *	0.08	0.17 *
Migration Background	0.16 *	0.07	0.16 *	0.07	-0.02	0.08	0.08	0.08	0.08
Cognitive abilities (CFT)	-0.04	0.03	-0.02	0.03	0.00	0.04	-0.07	0.03	-0.07 *
Reading competence (ELFE)	-0.05	0.03	-0.06	0.03	-0.03	0.04	-0.01	0.03	0.00
Interest	0.09 *	0.04	0.09 *	0.04	0.12 **	0.04	0.14 ***	0.14 ***	0.14 ***
Volition	0.08 *	0.03	0.08 *	0.03	0.07 *	0.03	0.08 *	0.08 *	0.08 *
<b>Classroom level (comp.)</b>									
Cognitive abilities (CFT)	0.26 ***	0.07	0.20 *	0.09	0.11	0.06	0.09	0.06	0.13
Reading competence (ELFE)	0.22 **	0.08	0.11	0.09	0.04	0.07	-0.04	0.02	-0.06

\* p<0.05; \*\* p<0.01; \*\*\* p<0.001

**Table 4.2c. Parameter estimates of models predicting teaching quality (Socioemotional characteristics)**

	Classroom Management			Supportive Climate			Cognitive Activation		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$
<b>Individual level</b>									
Number of books	0.20 *	0.09	0.20 *	0.09	0.13	0.08	0.17 *	0.08	0.17 *
Migration Background	0.16 *	0.07	0.16 *	0.07	-0.02	0.08	0.08	0.08	0.08
Cognitive abilities (CFT)	-0.01	0.03	-0.01	0.03	0.02	0.03	-0.05	0.03	-0.05
Reading competence (ELFE)	-0.04	0.03	-0.04	0.03	-0.03	0.03	-0.01	0.03	-0.01
Interest	0.05	0.03	0.08 *	0.03	0.13 **	0.04	0.14 ***	0.14 ***	0.15 ***
Volition	0.08 **	0.03	0.08 *	0.03	0.07 *	0.04	0.08 *	0.08 *	0.08 *
<b>Classroom level (comp.)</b>									
Interest	0.20 *	0.08	0.24 *	0.10	-0.05	0.06	-0.01	0.06	-0.02
Volition	0.04	0.08	-0.09	0.10	0.07	0.01	0.07	0.01	0.02

\* p<0.05; \*\* p<0.01; \*\*\* p<0.001

### 4.5.3 Motivational composition effects

Similar to the results analyzed for cognitive ability composition, motivational student characteristics also demonstrated a significant positive association with classroom management. Table 4.2c shows that student interest levels were associated with students' ratings of classroom management above and beyond students' individual subject-related interest. This effect remained significant even after the level of volition was included as another compositional factor ( $\beta_{\text{interest}} = 0.24, p < 0.05$ ). The composition of volition, however, did not predict any variation in classroom management. Once again, none of the motivational compositional factors was significantly related to supportive climate and cognitive activation. Moreover, student interest composition was positively correlated both with the observer ratings of classroom management and supportive climate ( $r = 0.26, p < 0.05$  and  $r = 0.29, p < 0.05$  respectively), while volition was only correlated with the observer ratings of the supportive climate ( $r = 0.27, p < 0.05$ ). We found no significant correlations between motivational features of the classroom and teacher ratings of teaching quality.

## 4.6 Discussion

Research on the effects of student composition on student outcomes has shown that the characteristics of classroom peers impacts their academic development. The underlying mechanisms of these effects, however, have rarely been explored empirically. Effects of student composition on student outcomes have even been considered a “black box” (Van Ewijk & Sleegers, 2010, p. 135). We know that they exist, but we do not know how they develop. This contribution seeks to shed light on potential mechanisms behind such effects.

The major finding of the present paper is that the primary school students in our study are exposed to different learning environments depending on the composition of their class: The quality of teaching that a particular student receives depends on who else is sitting in the classroom. This finding adds not only to the theoretical knowledge on mechanisms behind composition effects but also points to opportunities of dealing with undesired effects of student composition.

We examined three different dimensions of classroom composition: sociocultural, achievement-related and motivational. Among these, achievement-related and motivational composition turned out to be the most important. Thus, as expected, those student characteristics that are the most salient as preconditions to student learning were also the ones that were related to teaching quality. Interestingly, these composition factors mainly pertained to classroom management. Among the dimensions of teaching quality, classroom

management is most affected by students' actual behavior in the classroom, which might explain the prominent role it plays in relation to student composition.

Remarkably, the effects we found using student ratings of teaching quality were largely confirmed either by teacher's reports of teaching quality or ratings by external observers. There seems to be a consensus among these three data sources that less classroom-management-related problems occur in classes with more high-achieving and motivated students. It is a particular strength of the present study that we did not have to rely only on student reports. Instead, we could draw on three different sources to measure teaching quality. In the following sections, we discuss our findings in detail.

#### 4.6.1 Implications for research on compositional effects

Previous research has provided strong evidence that students learn more in classes with a higher average level of achievement (Burns & Mason, 2002; Duru-Bellat & Mingat, 1998; Hanushek et al., 2003). Regarding the mechanisms behind these effects, some researchers have argued that classes with a more favorable achievement composition might be exposed to more favorable learning environments (Dreeben & Barr, 1988; Harker & Tymms, 2004; Harris & Sass, 2011). In the present study, we were able to confirm these assumptions empirically.

Additionally, we have made a significant contribution to the field by answering with more specificity the question of which aspects of the learning environment are affected by class composition. It seems that classroom management plays a particularly important role for the effects of student composition on teaching quality. Regarding achievement-related classroom composition, it is indeed plausible that it is easier for teachers to maintain order in the classroom and to spend more time on task in classes with students of higher cognitive abilities.

As we were also considering student motivation, we were able to identify another relevant dimension of classroom composition that has rarely been examined so far. Regarding the outcomes considered in our study, however, it is plausible that the quality of teaching is not independent of students' motivation. Again, this argument particularly holds true for classroom management, as unmotivated students are indeed more likely to behave disruptively and to cause more disciplinary problems, both of which are directly related to teachers' classroom management.

Our findings build on Skinner and Belmont's discovery (1993) that teachers respond to the level of student motivation in the classroom: In a way that is similar to student achievement, it is easier for teachers to maintain an orderly learning environment when the classroom composition of interest is high. Also, in classrooms with high levels of interest, social contagion may lead peers to influence each other, which may

reduce the incidence of disruption or disorder in the classroom. Assessments of classroom management capture students' behavior in the classroom more directly than instruments measuring cognitive activation and supportive climate (Fauth, 2014; Wallace et al., 2016). In fact, these differences reflect a theoretical understanding of classroom management as an interactive process between teachers and students (Doyle, 2000; Praetorius, Klieme et al., 2018). By contrast, a supportive climate is mostly conceptualized through the friendliness, warmth and respect the teacher displays towards students. It is plausible that emotional support of this kind rated by the students does not strongly depend on the average level of students' achievement or motivation.

We did not find any effects on teaching quality stemming from sociocultural composition factors. Researchers have long studied the effects of the sociocultural composition of the student body on student outcomes (Portes & Hao, 2004; Rumberger & Palardy, 2005; Van Ewijk & Slegers, 2010). Research on teachers' expectations suggests that while teachers may adjust their teaching behavior based on performance expectations, these expectations seem to be shaped by their students' family background (Ready & Wright, 2011; Rumberger & Palardy, 2005). These expectation effects operate either in relation to only specific students or the whole class (Brault et al., 2014; Rubie-Davies, 2007).

However, our findings indicate that teachers did not challenge students less or provide them with less support based on the socioeconomic and migration-related composition of the class. We found effects of students' individual backgrounds on their perception of teaching quality, but these effects occurred only at the individual level of analysis and did not become relevant at the classroom level. Thus, previous indications from secondary education research, for instance that teachers may adopt a less challenging approach to language instruction when there are more language learners in a classroom (Rjosk et al., 2014), cannot be applied to the field of primary science education.

#### 4.6.2 Implications for research on teaching quality

Most education researchers theoretically conceptualize teaching quality as co-constructed by teachers and students (Praetorius et al., 2018). However, empirical research often treats teaching quality as a dependent variable that is more or less determined by the quality of the teacher and his or her professional competence (e.g., Kunter et al., 2013). Accordingly, both researchers and policy makers sometimes think of teaching quality as something grounded in a teacher's personal characteristics (Gitomer & Bell, 2013; Kennedy, 2010).

Perhaps it is only natural to blame the teacher for everything that happens in the classroom. In everyday life, we all tend to overestimate the influence of personal characteristics on observed behavior, and we underestimate the influence of the situation itself. This widespread effect is known as the fundamental



attribution error (Ross, 1977). Kennedy (2010) convincingly argues that we might also succumb to this fundamental attribution error when we try to understand teaching quality: “I suggest that we have veered too far toward the attribution of teaching quality to the characteristics of teachers themselves, and are overlooking situational factors that may have a strong bearing on the quality of the teaching practices we see” (Kennedy, 2010, p. 591).

Apparently, the student body represents a critical “situational factor” that has to be considered if we want to understand the mechanisms underlying the quality of teaching. As Kennedy argues, “[s]tudents influence teaching practices when they are restless, gregarious, or frustrated, and even when they are happy. And they interrupt the learning of other students as well” (Kennedy, 2010, p. 595). The compositional effects reported in this paper provide excellent examples of factors that are, at least partly, beyond the teacher’s responsibility but nonetheless have an impact on the quality of teaching we see in the classroom.

These are interesting considerations from a theoretical point of view, but they also have practical implications. Ratings from students and external observers are used globally to evaluate the job performance of teachers. For example, most teachers in the United States undergo high-stakes evaluations based on classroom observations that rate their performance in only one classroom (National Council of Teacher Quality, 2018). The results of the present study show how problematic this approach can be. A teacher could easily demonstrate good classroom management in one particular class and have a much harder time in another.

## **4.7 Limitations and Outlook**

Three limitations apply to the present study. First, the fact that we found no effects on teacher and observer ratings might result from the particular design of our study in which teacher and observer ratings were related to two specific teaching units for which all teachers used the same materials. We know that the quality of tasks plays a vital role in cognitive activation. Although establishing the same conditions for each teacher in the present study made it easier to attribute differences in teaching quality to student composition, in the case of cognitive activation it might also have led to a restricted variation and thus decreased effects. Maybe teachers would have chosen different materials for their class based on achievement and motivational composition. Future studies with totally untreated samples will have to show if this interpretation is correct.

Second, by definition, a compositional effect occurs when a level 2 predictor has an effect over and above the effect of the same predictor at level 1. In the case of teacher and observer ratings, however, the outcome variables had no level 1 variance. Thus, it was impossible to estimate an effect at the individual level that could be used to correct classroom level effects. Therefore, the comparison of compositional

effects based on different raters' perspectives should be interpreted with the consideration that the predictive models for teaching quality ratings by teachers and observers were not as robust as those for student ratings. Further research utilizing teacher and observer data that addresses individual students could offset this shortcoming in the future.

Finally, we can speculate that in the context of educational systems with tracking after primary school, the sociocultural composition of the classroom might become more relevant for teaching quality in the later stages after the tracking, but these (undesired) effects were not present in grade three. Additionally, future research will have to show whether stronger measures of students' SES background will yield similar findings. In the present study, we could only use student reports to assess SES, which limited the possibilities of taking into account the actual parental education and income appropriately.

## **4.8 Conclusion**

In summary, the findings of our study are important in at least three ways: (1) By thoroughly examining the impact of composition on teaching quality, we were able to provide empirical evidence for the theoretical understanding of the mechanisms behind composition effects. (2) Such knowledge is not only of scientific interest but can also offer starting points for approaches seeking to address undesired effects of student composition: If teachers and policymakers are aware of the potential effects of student composition on teaching quality, they will then be able to develop strategies to diminish these effects. (3) Third, our findings also add to the theoretical understanding of teaching quality as an interactional process between students and teachers. They show that teaching quality is not merely a product of certain teachers' actions in the classroom (Kennedy, 2010). Instead, teaching quality is co-constructed through interactions between students and teachers (Rimm-Kaufman & Hamre, 2010). Hence, our results suggest that class composition also matters.

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## 4.9 Supplementary Material

### Appendix A Measures and variables

	N	Mean	SD	Min	Max	%	$\alpha$
<b>Student ratings of TQ</b>							
Classroom Management	989	0	1	-3.36	1.14		0.92
Supportive Climate	989	0	1	-1.54	1.82		0.91
Cognitive Activation	981	0	1	-3.28	0.97		0.81
<b>Student characteristics</b>							
Number of books							
More than 25 books	797					80.18	
25 books or less	197					19.82	
Migration Background							
No migration background	510					55.98	
One / both parents born outside Germany	401					44.02	
Cognitive abilities (CFT)	991	0	1	-2.77	3.24		
Reading competence (ELFE)	981	0	1	-2.67	3.7		
Interest	992	0	1	-2.35	0.98		
Volition	993	0	1	-5.35	0.95		
<b>Classroom composition</b>							
Number of books	54	0.56	0.18	0.15	0.93		
Migration Background	54	0.44	0.21	0.00	0.83		
Cognitive abilities (CFT)	54	0.04	0.95	-2.79	2.97		
Reading competence (ELFE)	54	0.04	0.94	-2.47	2.02		
Interest	54	0.00	0.98	-2.40	1.34		
Volition	54	0.02	0.97	-3.38	1.86		
<b>Teacher ratings of TQ</b>							
Classroom Management	50	-0.07	0.71	-0.17	6.93		0.84
Supportive Climate	41	-0.01	0.99	-2.70	1.20		0.86
Cognitive Activation	48	-0.00	0.98	-2.18	1.20		0.76
<b>Observer ratings of TQ</b>							
Classroom Management	53	0.03	0.96	-2.06	0.99		
Supportive Climate	53	0.03	0.99	-2.81	1.27		
Cognitive Activation	53	0.01	0.96	-2.4	0.81		

*Note.* All continuous variables are standardized.  $\alpha$ : Cronbach's  $\alpha$ , TQ: Teaching quality



**Appendix B.** Correlations among student background variables and student teaching quality ratings

<b>Individual-level variables</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
1. Number of books	-							
2. Migration Background	<b>0,24</b>	-						
3. Cognitive abilities (CFT)	<b>-0,16</b>	<b>-0,15</b>	-					
4. Reading competence (ELFE)	<b>-0,08</b>	<b>-0,15</b>	<b>0,37</b>	-				
5. Interest	0,00	0,05	0,05	0,00	-			
6. Volition	<b>-0,03</b>	0,01	0,01	0,05	<b>0,45</b>	-		
7. Classroom Management	<b>0,11</b>	<b>0,15</b>	0,00	<b>-0,03</b>	<b>0,22</b>	<b>0,16</b>	-	
8. Supportive Climate	0,05	0,01	0,02	<b>-0,02</b>	<b>0,18</b>	<b>0,15</b>	<b>0,31</b>	-
9. Cognitive activation	<b>0,08</b>	0,06	<b>-0,05</b>	<b>-0,04</b>	<b>0,23</b>	<b>0,17</b>	<b>0,35</b>	<b>0,78</b>

*Note.* Pairwise Spearman correlations. Coefficients significant on the 5% level in bold.



# 5

## General Discussion

## **5. General Discussion**

### **5.1 Summary of the results**

The present dissertation is devoted to examining the interdependencies between students' backgrounds and teaching quality in three studies. The main aim of this work is to offer a detailed understanding of how teaching quality can be experienced, and simultaneously, shaped by students from different socioeconomic backgrounds. This topic has been of interest to educational researchers and practitioners since the Coleman Report; however, there has been very little interdisciplinary effort to investigate the role of teachers in shaping educational inequality through their practice and interactions in the classroom. Within this context, this work brings together analytical perspectives from the fields of Sociology, Educational Science and Psychology to address this issue.

In three studies, this thesis investigated the connections between student background (both as an individual aspect and as a classroom composition feature), teaching quality and student outcomes. Study 1 addressed the question of whether teaching practices reduce or exacerbate the achievement gap between students from lower and higher socioeconomic backgrounds. In particular, the aim was to find out if students with lower socioeconomic status could gain more from particular teaching practices or if they would fall behind their peers from high socioeconomic backgrounds due to a difference in the type of skills they may/may not have acquired at home. Three dimensions of teaching quality (cognitive activation, classroom management and supportive climate) were distinguished and tested with multilevel models to predict the extent to which each of them is associated with higher achievement scores during 10<sup>th</sup> grade and investigate if they act as moderators of the association between family background and achievement. Results have shown that classroom management was positively associated with student performance: Students, regardless of their socio-economic backgrounds, had better achievement scores in classrooms with better management. However, cognitive activation and supportive climate positively moderated the association between socioeconomic background and achievement levels, thus leading to a larger achievement gap.

Study 2 focused on the association between student socioeconomic background characteristics and their perception of teacher support and the interaction of prior achievement with this association. Based on the sociological work by Lareau (2003) and Calarco (2011), a link between students' socioeconomic background and how they perceive support within the classroom was predicted. The expectation was that the students from higher socioeconomic backgrounds would be more critical about the support they receive in the classroom and rate their teachers more negatively. Multilevel analysis of a sample of 10<sup>th</sup> graders confirmed that there is indeed a negative association between parental education and perception of the social orientation dimension of teaching quality. We have also found that wealth had a negative association with

the perception of adaptive relief and social orientation dimensions of teaching quality, which was in line with the “concerted cultivation” theory by Lareau (2003). Having higher prior achievement was associated with a more positive perception of teacher support, but it did not seem to interact with the socioeconomic background.

Finally, study 3 targeted the relationship between student background as a classroom composition feature and teaching quality. In this last study, a new feature was the consideration of students’ motivational background characteristics in addition to their socioeconomic and general cognitive abilities background. We also investigated if the relationships between the classroom composition and the three dimensions of teaching quality rated by students could be replicated with teacher and observer ratings of the same constructs. Multilevel analyses of a sample of 3<sup>rd</sup> graders have indicated that achievement-related and motivational composition of the classroom had an association with the classroom management dimension of teaching quality, whereas sociocultural composition did not seem to influence any of the teaching quality dimensions rated by the students. Correlations at the classroom level have also pointed at a relationship between the teachers’ and observers’ ratings of classroom management and the composition of general cognitive abilities and interest. As a contrast to student ratings, there was a significant negative correlation between the composition of students from low socioeconomic background and classroom management rated by the observers. Our findings have shown that the student body represents a very critical “situational factor” which has to be considered while investigating teaching quality.

Main characteristics of the three studies are summarized in Table 5.1.

Following, I will present the theoretical implications of this thesis in reference to what has been presented in the theoretical framework. Next, I will describe the practical implications of the three studies, discuss strengths and limitations of the thesis, and conclude with some final remarks on potential future steps to address the relationship between the student background and teaching quality in the classroom setting.

**Table 5.1** Summary of the studies

	<b>Study 1:</b> Teaching quality as a moderator of the link between socioeconomic background and achievement	<b>Study 2:</b> Student socioeconomic background as a predictor of the (perceived) teaching quality	<b>Study 3:</b> Classroom composition of student background as a predictor of teaching quality
Dataset	PISA-I-Plus	PISA-I-Plus	IGEL
School grade	9th and 10 <sup>th</sup>	9th and 10th	3rd
Sample size	3,738	2,030	1,070
Number of classrooms	194	195	54
Federal state coverage	All Germany	All Germany	Hessen
Domains	Mathematics	Mathematics	Science
Student background measures considered	Socioeconomic	Socioeconomic, Achievement	Sociocultural, Achievement-related, Motivational features
Teaching quality measures considered	Cognitive activation, Classroom management, Supportive climate	Teacher support	Cognitive activation, Classroom management, Supportive climate
Main findings	Classroom management is related to overall achievement levels, whereas cognitive activation and supportive climate may benefit students from high socioeconomic backgrounds more.	Students from high socioeconomic backgrounds perceive certain aspects of teacher support more negatively than their peers from low socioeconomic backgrounds.	Classroom management rated by students, teachers and the observers has an association with the achievement-related and motivational composition of the classroom.

## 5.2 Theoretical implications

Firstly, this thesis contributes to the body of knowledge about the social achievement gap in secondary education. While sociological studies mainly addressed the issue of differential effects of teaching on students from different backgrounds at a theoretical level, previous educational research work often focused on the effect of teaching on overall student achievement. By combining the perspectives of the sociology of education with approaches from educational effectiveness research, this thesis provides an insight into how teaching practices might shape educational inequalities. The findings of study 1 are particularly remarkable within this regard, in a way that they demonstrate how different dimensions of instructional quality, even when they often lead to better average achievement scores in the classroom, might work differentially for students from diverse socioeconomic backgrounds. Consequently, teaching might even increase the achievement gap if provided without the consideration of different learning needs of students from different backgrounds, who may or may not have acquired the skills at their home environment to benefit from the offered teaching practices fully. It is therefore essential for future studies in the sociology of education and teacher effectiveness to consider the potential of teaching quality to have differential effects among socioeconomically heterogeneous groups.

Secondly, this thesis demonstrated that student ratings entail vital information on the relationship between the students' socioeconomic and achievement backgrounds and their perception of support in the classroom. As study 2 showed, although students have a notable amount of shared perceptions regarding the supportive efforts of their teachers, they also have their idiosyncratic ways of interpreting teacher support based on their backgrounds. Here again, by bringing together sociological and psychological perspectives, it has been pointed out that the kind of socioeconomic context children was born into and raised in is associated with their ways of interpreting teacher behaviour in the classroom. Similarly in study 3, relying on student answers allowed for a more insightful explanation of the link between classroom composition and teaching quality. Both studies have demonstrated that the student answers are valuable sources of teaching quality assessment and within-classroom variation in teaching quality measures should be given more attention and not merely be disregarded as measurement error in teaching quality research (Göllner, Wagner, Eccles, & Trautwein, 2018).

Thirdly, this work re-confirmed that teaching quality should theoretically be conceptualized as a co-construction between teachers and students, and not solely as the actions of a teacher in the classroom context. By doing so, this thesis offers a critical look at the previous empirical research which often regards teaching quality as an outcome variable which is largely shaped by the characteristics and competencies of the teachers (e.g., Kunter et al., 2013). In all three studies, we have shown that the student background, individually and as a body, signifies a significant contextual factor for the development of teaching quality.

In the light of our findings, we emphasized that students' socioeconomic as well as achievement-related and motivational characteristics influence the quality of teaching, which should be considered independent of the teachers' area of responsibility in the conceptualization and the measurement of teaching quality.

### **5.3 Practical implications**

A practical implication of the results suggests that certain aspects of instructional quality may unintentionally cause detriment to students from socioeconomically disadvantaged backgrounds who may experience a mismatch between their practices and interactions with adults at home and school. For example, study 1 has shown that students with low socioeconomic backgrounds can fall behind their peers from the high socioeconomic background in terms of achievement, since they may not be accustomed to cognitively activating methods or the supportive style of the teachers. In practice, these results do not suggest that teachers should entirely avoid constructive approaches such as cognitive activation. Practitioners working with heterogeneous groups should be conscious of the issues that students from low socioeconomic backgrounds may experience when they are not cognizant of certain methods in the classroom. Offering appropriate preparation before the exposure in the class may be a way to facilitate academic performance among the students from low socioeconomic backgrounds (concerning Study 1, math achievement in particular) along with those from higher status backgrounds. A blended approach of cognitive activation and individual learning support in the classroom may bring about a weakening of the link between socioeconomic background and academic achievement.

It is worthwhile to consider student background factors, not only for the effectiveness of teaching practices in the form of academic achievement, but also for improving teacher-student interactions. Although specific learning needs of students from low socioeconomic backgrounds are essential to address educational inequalities, knowledge of how teaching is received by those from high socioeconomic backgrounds may also help teachers in addressing diversity in the classroom. Ultimately, students' perception of the teaching, and not what the teacher does in the classroom, matters the most for the student outcomes. Therefore, practitioners should be aware that students from different backgrounds may interpret their supportive efforts differently, even within the same classroom. Acknowledging that the student perceptions can to a certain extent be influenced by the socioeconomic and achievement background and that the sense of entitlement or constraint is linked to student perceptions may benefit the practitioners in interpreting the responses of students from diverse backgrounds to teaching practices.

Finally, the findings of this work also underline that the context of the classroom, with all its constituting elements, should be considered before "blaming the teacher" for issues with teaching quality.



Experts conducting formal evaluations should not fall into the fundamental attribution error and overestimate the role of the teachers' characteristics and competencies for their performance in the classroom. Professional proficiency of teachers are often based on the ratings from students and external observers worldwide, and in some cases, teachers have to undergo critical evaluations based on classroom observations which assess their performance during a single class session. This approach can be very problematic, since even the best teacher who can establish high-quality teaching in one class may have difficulties to establish order, support the students or offer a stimulating content in another class with students from different backgrounds.

## **5.4 Limitations and outlook**

The present thesis does face a number of limitations in its investigation. Firstly, in Study 1 and Study 2, the student sample may not have been entirely appropriate to test the sort of associations we wanted to test. Students were already at a rather advanced stage in their educational lives and placed into academic and non-academic tracks. They already had diverse parental, societal and educational histories until this point that may have influenced their achievement levels. Especially regarding the interpretation of Study 1, it should be kept in mind that achievement gaps often grow across the life course and it may already be rather late in the 9<sup>th</sup> and 10<sup>th</sup> grades for instructional practices to compensate for the accumulated disadvantages.

Moreover, the issue of generalizability is present since our samples consisted of students in certain grades and were exposed to teaching practices to convey specific subject domains (math and science). In study 1 and 2, our large sample of German secondary schools and the use of internationally recognized instruments to evaluate teacher support are major strengths of this study design. However, differences in school grade levels and school tracks may still influence the results. In study 3, our sample consisted of students from one federal state in Germany, rating their science classes. Accordingly, implications might be limited to the respective region or the domain again. Our findings may not be universal, yet, we believe that they resonate with fundamental human judgement processes, which may as well take place outside secondary schools, for instance when children from diverse socioeconomic background interact with other institutional authorities. Nevertheless, it would be fruitful if future studies investigate these patterns using more diverse samples regarding federal state, age, and school track.

Another concern stems from the measurement of teaching quality. In Study 1, teaching quality was treated as an objective, classroom-level variable based on student ratings, which may have been influenced by the rating tendencies of the students. Although validity issues related to student answers were eliminated to a certain extent by aggregating the ratings to the classroom level, ratings from teacher or external

observers could further validate our operationalization of teaching quality as a classroom-level characteristic (i.e. Kane, McCaffrey, Miller, & Staiger, 2013). The utilization of student ratings of teaching quality as level-1 indicators in study 2 and 3, aimed to offer an alternative approach and complement study 1 in this respect.

Another limitation which needs to be mentioned is that, although we have used the PISA items, which are acknowledged to be valid and reliable measures of teaching quality, they were in the classroom perspective format and were designed to evaluate the teacher's approach to the overall classroom, rather than to the individual raters. Hence, our assumptions regarding the differential treatment of teachers of individual students should be studied with the consideration of the specific item formatting. Further research aiming to capture individual perceptions could also contrast different item formats such as, "our teacher immediately knows which tasks are difficult for us" versus "our teacher immediately knows which tasks are difficult for me". It is plausible that students' perceptions may be captured more accurately by emphasizing the individual perspective (Göllner et al., 2018). Utilization of items which are worded according to the individual perspective format can also contribute to the debate on the validity of students' ratings.

Furthermore, since classroom composition and teaching quality are likely to be confounded, we have included some classroom-level composition variables to account for this situation in Study 1 and 2. However, there existed very little knowledge on the connections among classroom composition, adaptive teacher behaviour and individual perceptions of teacher behaviour. A teacher has to assess the requirements of the classroom as a whole alongside the individual learning needs of students. Additionally, student ratings are often influenced by their observations of the teacher interacting with the other students. The PISA-I-Plus teaching quality items were not formulated with the aim to capture these nuances of teacher-group interactions and teacher-individual interactions. Study 3 aimed to offset this shortcoming. By relying on another dataset with which compositional effects of different student characteristics on teaching quality could be modelled, the findings contributed to our knowledge of the link between classroom composition and teacher practices. Nevertheless, it is crucial for prospective studies to better examine the role of classroom composition in shaping the teachers' behaviour, as well as the students' perception of it.

Finally, although this study offers an elaboration of the concept of teaching quality as a perspective-specific construct, we did not manage to adequately compare and contrast the perspectives of students, teachers and external observers due to the limitations of the datasets we have utilized. In study 1 and 2, we did not have teacher or external observer ratings of the teaching quality measures. In study 3, we could not calculate sound composition effects, since a compositional effect occurs when a level-2 predictor has an effect over and above the effect of the same predictor at level-1. In our dataset, the teaching quality values assigned by teachers and observers did not vary at level-1. Therefore, it was not possible to estimate an effect at the individual level that could be used to correct classroom level effects. Therefore, we could not

provide impeccable comparisons of individual background and classroom composition effects based on student, teacher and observer ratings.

Further investigating how teaching quality may add to, moderate or mediate the influence of socioeconomic background on student outcomes would lead to a better understanding of how educational inequalities are refracted within the educational career of the students. To achieve this, it is vital to consider students' perceptions of teachers' behaviour and interactions to understand how teaching can act as a mechanism of reproduction or compensation for disadvantages. It is surprising how little empirical evidence exists on this relationship since the Coleman Report brought the issue to the attention of the public interest. Further studies should address the teacher effects in better isolation from confounding factors, examine student characteristics both as a condition and target factors for teaching quality, and carefully consider the dependency between individual students and classroom as a whole in influencing teaching quality. There is no doubt that interdisciplinary efforts within this regard would offer rich empirical evidence which can inform schools in setting better standards for high teaching quality and developing better classroom strategies for reducing educational inequalities.

## **5.5 Conclusion**

Already in 1931, Cattell surveyed 254 people consisting of educational practitioners and teachers and concluded that the five most important features of a “good teacher” are: personality and will, intelligence, sympathy and tact, open-mindedness and a sense of humour (Cattell, 1931). Within this context, good teaching cannot be conceptualized as exclusively instrumental, with the sole aim to maintain order in the classroom and produce academic outcomes. It is surprising that studies which address the teacher characteristics as summarized by Cattell are still called as “black-box” research (Kyriacou, 2009). This implies that they concentrate on the input (student and teacher characteristics) and output (academic performance) but oversee the importance of the student-teacher interactions in the classroom.

The importance given to teacher characteristics such as “sympathy and tact” or “open-mindedness”, a finding from 1931 but still highly relevant today, suggest that teaching quality should entail certain values that might also be useful to address diversity within the classroom context. Teaching practice itself should manifest, and hence expose the students to the value of fair and respective treatment for everyone. So far fairness is rarely – and mostly symbolically- addressed as a feature of high teaching quality (Prenzel et al., 2013). Most of the teaching quality research focus on what teachers do in the classroom, such as the classroom management, but these often fail to capture the values behind the actual conduct of teachers and how they relate to their students from different socioeconomic backgrounds. Although integrating fairness as an indicator of high quality teaching can be useful to address teachers' role in dealing with socioeconomic

background differences in the classroom, it is still a highly subjective and vague construct to empirically measure. Regarding the findings of this dissertation, the still unanswered question is if a more tangible set of indicators, linked to teaching quality can be distinguished, which would principally serve to evaluate the role of teachers in addressing disparities due to socioeconomic background among their students.

In this regard, the value of “inclusiveness” can be a noteworthy suggestion. Inclusiveness refers to respecting and committing to empowering all students to fulfil their capabilities (Campbell, Kyriakides, Muijs, & Robinson, 2012). A classroom setting should, therefore, be an environment where teachers build warm relationships with their students, treat all of them equally without stereotypes or biases and consider the opinion of every student (Dunne & Wragg, 1994). Moreover, classes should be carefully designed to allow all students to participate in class activities fully and also regard themselves as a valuable member of the class (Pollard 1997). Pollard suggests that a competitive ethos –which can be an unintended outcome of the schools’ quest for excellence- conflicts with the idea of inclusiveness and brings harm to some of the students due to a standard definition of achievement. One on hand, there are classes where all the strong and weak points of children are acknowledged, and the actual level of prior achievement of each student is considered as a base point; on the other hand, there are classes where certain features or skills are seen as more valuable than others in absolute terms, which are easily noticed and reinforced by the teachers. In this context, some students continually benefit more from teaching practices and the interactions with the teacher, while the disadvantaged fall even more behind. The first classroom scenario will lead to a better classroom climate and more tolerant and respectful setting for all students, in contrast to the second one which focuses on the specific characteristics and the achievements of the few (Pollard 1997).

Teaching quality aiming to reduce socioeconomic disparities can be understood with regard to the maintenance of this inclusiveness. Here the emphasis is not on how teachers feel or have beliefs about the differences in parental and educational histories. The main issue is how they *behave* in the face of these differences. To guide teachers, models of teaching quality can incorporate the value of inclusiveness by addressing how different pedagogical approaches may be more suitable to address the learning needs of students with different social origins. This approach, maintained by the teachers’ commitment to inclusiveness, would lead to a better classroom climate and thus better outcomes for all students, than the one favouring certain social groups with a particular set of skills.

Within the grand scheme of educational inequalities, it would clearly be unrealistic to expect the teachers alone to break the cycle of reproduction of social inequalities in educational settings. Teachers function in schooling systems, which reflect their respective educational and societal milieus. Although this dissertation demonstrates that teaching practices have an essential role in rendering the institution of school more of an “equalizer”, there is still a need for increased permeability and connectivity of educational pathways to reduce educational inequalities on the whole. Although educational expansion in the last

century paved the way for better educational paths compared to before, most of the connection possibilities are still used comparatively seldom by those who come from lower social classes (Ditton, 2007). In the German system, the most prominent manifestation is the rather early decision, usually influenced by teachers, regarding the educational pathways of the students. There are approaches which aim to minimize such educational inequalities, such as the comprehensive schools which offer an alternative to the three-track school system. However, to achieve a more significant weakening of the link between “class origin” and “class destination” as anticipated by Goldthorpe (2003), many other aspects such as school attendance, educational attainment and career opportunities should be considered. Reforms in the schooling system cannot achieve educational equality alone but should be complemented by direct measures to reduce inequality in society as a whole (Jencks et al., 1972). An inclusive teaching approach, in an inclusive education system can only be maintained in a perfectly equal society. More innovative research is not only needed to improve the understanding of the teaching quality as a construct which should entail inclusiveness, but also to precisely diagnose the conditions of the reproduction of educational inequality in schools, and in the society. With the empirical evidence and guidance provided by researchers, policy makers and the society as a whole should contribute to the efforts to reduce educational inequalities.

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