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# School mechanisms behind achievement differences: A systematic review of multilevel modelling studies in primary schools

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## ABSTRACT

The discourse on school effects on educational inequality has been extensively explored within the field of sociology of education. This systematic review of multilevel modelling studies conducted in primary schools aims to identify main school-level factors explaining achievement differences. A search of the Web of Science and ERIC databases yielded 36 articles meeting inclusion criteria. Findings reveal multifaceted school mechanisms behind achievement differences: school student composition, socio-physical conditions, school management, school climate, teacher composition, and curriculum and instruction. These mechanisms operate collectively rather than in isolation, contributing to educational inequality. Understanding their interplay is crucial for researchers. By examining the state of research, this study provides insights into how these school factors contribute to the complex nature of educational inequality.

## 1. Introduction

School impacts on differential student academic achievement from the lens of educational inequality have been an enduring topic in sociology of education. Differential student academic achievement, within the context of educational inequality, refers to the disparities and variations in learning outcomes and performance among students that are influenced by individual attributes, or axes of inequality, such as socioeconomic status, ethnicity, gender, or ethnic/language backgrounds (Gross et al., 2016; Steinmayr et al., 2014). Operationally, academic achievement encompasses various indicators, including knowledge acquisition, grades, performance on achievement tests, and educational degrees or certificates (Spinath, 2012; Steinmayr et al., 2014). Over the years, the research focus has shifted from extensively examining factors influencing student academic achievement to precisely attributing these factors to various hierarchical levels in education systems, with a collective scholarly effort to address the need for a comprehensive theory in the field (Scheerens, 2016). Taking the hierarchical/nested structures of schooling systems into consideration, research has hitherto identified both individual factors, such as familial characteristics, and scholastic predictors that influence academic achievement (Hattie, 2023) as early as in primary schooling (Teese, 2007). Nevertheless, systematic reviews distilling school effects from the school levels of multilevel modelling studies on differential student academic achievement in primary schooling remain scarce. Addressing the gap, this systematic review aims to uncover a list of main school effects on student academic achievement through examining multilevel modeling studies conducted with students in primary schools as well as their theoretical and methodological foundations.

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By thematically synthesizing these effects, the review mainly presents potential school mechanisms, drawing upon [Astbury and Leeuw's \(2010\)](#) conceptualization of mechanisms as underlying entities, processes, or structures operating at the school-level of multilevel modelling studies conducted in primary schools. Additionally, the review also provides theoretical and methodological areas requiring more scholar attention.

## 2. Conceptual background

### 2.1. Educational inequality

Although a comprehensive theory explaining the complex interplay between multilevel structures of education systems and differential student achievement is yet to be established ([Scheerens, 2016](#)), significant efforts have been devoted to understanding how individual attributes, particularly those relating to familial backgrounds, contribute to the perpetuation or exacerbation of educational inequality. Subsequently, these efforts emerged established explanations for differential academic achievement over the most common axes of inequality, regarding gender, ethnicity, and socioeconomic background.

The contributions of [Oakley \(1972\)](#) and [Ogbu and Simons \(1998\)](#) provide insights into educational inequalities arising from students' gender and ethnicity/language, respectively. According to [Oakley \(1972\)](#), educational institutions reinforce traditional gender stereotypes through their choice of curriculum, teaching methods, and classroom organization. This results in students being directed towards subjects that are considered "gender appropriate," with females encouraged towards language and arts, and males steered towards science and math. As a consequence, one gender group tends to excel in certain subjects more than the other. About ethnicity and language, [Ogbu and Simons \(1998\)](#) posit that minority students frequently encounter distinct social and cultural difficulties in relation to their ethnicity and language. These challenges arise from a potential disparity between the students' cultural heritage and the prevailing culture embedded within the curriculum and teaching practices. Such obstacles can include language barriers, a sense of disconnection from the dominant culture and its values, experiences of discrimination, and, as a result, differing expectations within the educational system.

[Bourdieu \(1986\)](#) and [Bourdieu and Passeron \(1978\)](#) propose that socioeconomic background significantly influences students' educational experiences and outcomes. They argue that individuals from different socioeconomic backgrounds possess varying levels of cultural capital, which includes knowledge, skills, and cultural resources acquired through socialization. This unequal distribution of cultural capital contributes to disparities in educational achievement, as students from privileged backgrounds have greater opportunities and resources to succeed academically, perpetuating social inequalities.

### 2.2. School mechanisms

Within the scope of this systematic review, the Context-Mechanism-Outcome (CMO) approach ([Archer, 1995; Bhaskar, 2008](#)) is utilized to select studies that investigate the interplay between specific school-level "mechanisms" within the "context" of primary/elementary school and their empirical associations with differential student academic achievement ("outcomes"). The investigation into predictors and mechanisms underlying differential student achievement within these learning environments has been driven by seminal reports such as the Coleman Report ([Coleman et al., 1966](#)) and the Plowden Report ([Peaker, 1971](#)). While the former primarily emphasized the influence of student socioeconomic background and peer effects, diverting attention from school resources like facilities and funding, the latter report highlighted the significance of child-centered teaching approaches and recognized the impact of instructional practices, interactions, and schools' social features such as class size. Over the years, scholarly attention in the field has broadened, as evidenced by a seminal meta-analysis by [Hattie \(2023\)](#), revealing research into achievement from various perspectives, including students, teachers, home, classroom, and school environments, and curriculum and instructional aspects. In our study, we aim to delve into the school aspect, investigating the mechanisms behind educational inequality by focusing on variables at the school level in multilevel modeling studies conducted with primary school students.

In school settings, student composition, or peer effects, emerges as significant external influences on individual academic outcomes, shaped by interactions with peers and their characteristics. These effects are multifaceted, stemming from peers' backgrounds or their current outcomes. Recent research by [Haskell \(2023\)](#) highlights a significant gap in academic achievement and well-being among socioeconomically dissimilar students, even after controlling for gender, particularly evident in low diversity learning environments. Conversely, racially dissimilar students in similar settings exhibit heightened participation in extracurricular activities, indicating a complex response to diversity. Moreover, high diversity environments foster nonconformity among racially diverse students, alongside improved academic outcomes. [Gustafsson et al. \(2018\)](#) further underscore the substantial and positive influence of school socioeconomic status (SES) on individual academic achievement across diverse educational systems. Additionally, [Marotta \(2017\)](#) points out that academic gains are more pronounced when students are placed in learning environments with higher achieving peers, although slight negative effects may arise from heterogeneity in peer abilities. Scholars have thus explored various models of composition, considering both homogeneity and heterogeneity as approaches to shaping the student body ([Sacerdote, 2011; Scheerens, 2016](#)). Nevertheless, [Scheerens \(2016\)](#) emphasizes the necessity of considering teacher dynamics, as they can significantly alter classroom dynamics.

Teachers play a crucial role in shaping the school dynamics ([Hattie, 2023; Scheerens, 2016](#)). Synthesizing a vast body of knowledge from meta-analyses to identify factors with a substantial impact on learning outcomes, John [Hattie \(2023\)](#) has identified several key aspects of teacher impact on student achievement, including teacher expectation, approach and attitude, responsiveness, and creating positive classroom environment. The teacher's expectations for their students' abilities and potential, and approaches and attitudes

towards teaching are some of the essential aspects (Aydin & Ok, 2022). Effective teachers are responsive to the individual needs of their students, creating an inclusive and supportive classroom environment that enhances learning opportunities for all, in return resulting in higher school engagement and better educational outcomes (Pinedo et al., 2021). Moreover, effective teachers cultivate a classroom and school climate where students feel supported, motivated, and actively engaged in the learning process (Wang et al., 2020; Wang & Degol, 2016). They create opportunities for student participation, encourage collaboration and discussion, and provide meaningful and relevant learning experiences (Wang et al., 2020; Wang & Degol, 2016). This positive classroom and school climate contributes to increased student engagement and promotes an interest towards learning (Wang et al., 2020; Wang & Degol, 2016), and even mitigate the educational inequality arising from students' socioeconomic background (Berkowitz et al., 2017). Additionally, teacher individual attributes such as gender and race and, professional knowledge and experience including degrees and certificates, and other occupational factors like self-efficacy and burnout can influence a teacher's effectiveness (Burroughs et al., 2019; Coenen et al., 2018; Klassen & Tze, 2014; Madigan & Kim, 2021).

Finally, school management factors contribute to the function of school effects on differential academic achievement. According to Hattie (2023), administrative and instructional perspectives are apparent in metaanalyses. For school administrations to follow, a recent systematic review on effective educational strategies to minimize differential achievement gap (Cabral-Gouveia et al., 2023) proposes the positive impacts of instructional initiatives of management such as schooling-subject-focused strategies and innovative teaching methods, and administrative initiatives such as school-state-community-bridging projects and programs addressing psychosocial effects of discrimination. Management can also entail in the emergence of school climate (Berkowitz et al., 2017; Wang et al.,

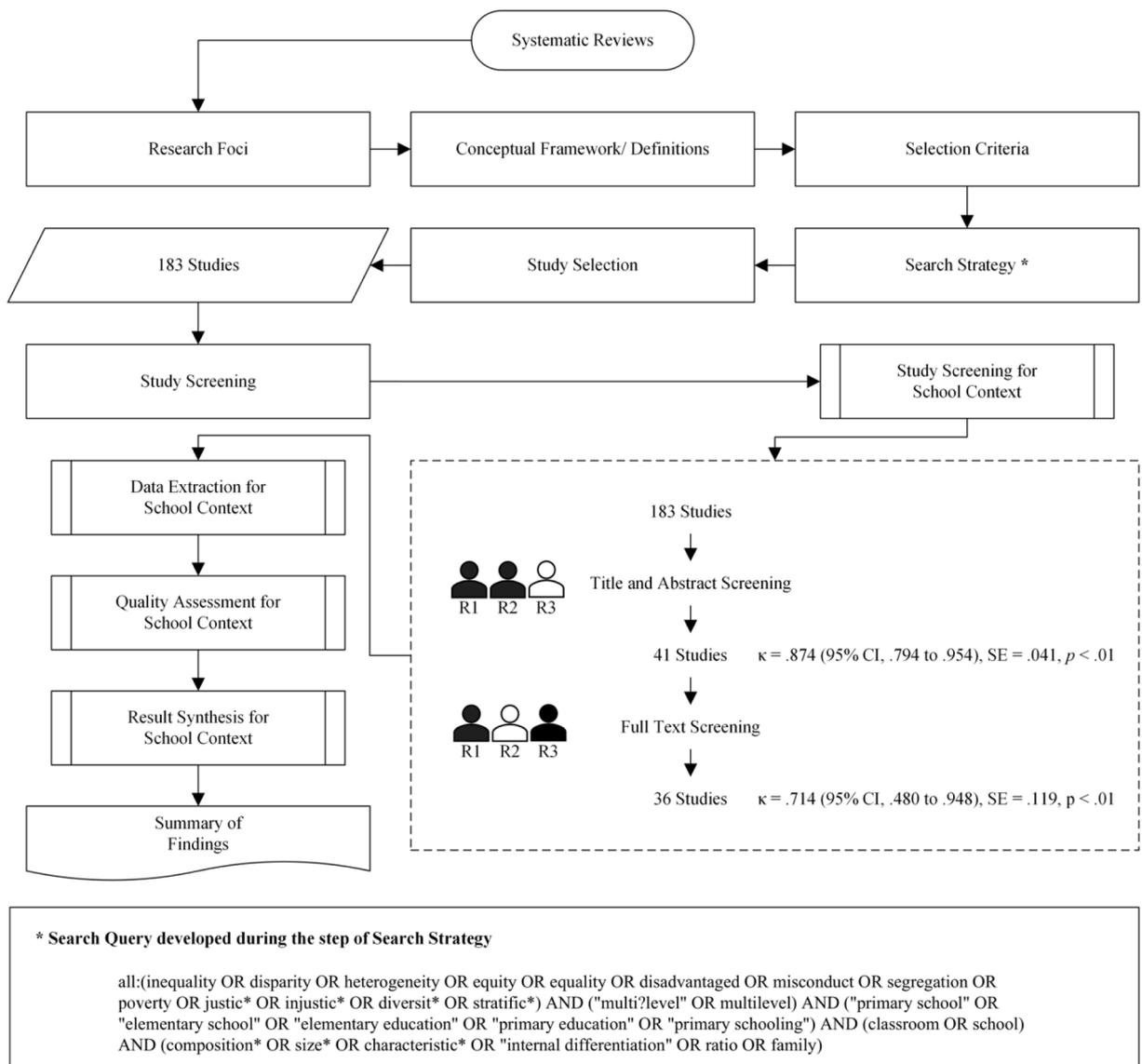


Fig. 1. Steps of the conducted systematic review.

2020; Wang & Degol, 2016), facilitating or inhibiting success of disadvantaged students. Finally, a lack of adequate social and physical resources such as crowded schools, inadequate learning materials, is another important impact on achievement differences, mostly observed in disadvantaged school districts (Blatchford & Russell, 2020; Darling-Hammond, 2013; Denton, 1996; Perry et al., 2022).

### 2.3. Multilevel focus

In line with the aim of capturing the complexity of school dynamics, this review specifically requires the inclusion of quantitative studies employing multilevel modeling with the presence of school context in their analyses. Multilevel modeling allows for the simultaneous, robust and precise examination of individual-level and school-level predictors of student achievement while accounting for the nested structure of the data. By modeling the variance at both levels, this approach provides insights into precise contribution of school-level factors in explaining the variance observed in student academic achievement in primary schools. Therefore, this ensures a comprehensive examination of the nuanced relationships between school-level factors and educational inequalities, facilitating the identification of effective mechanisms to address differential student achievement in primary schools.

### 2.4. Conceptual connections

These theoretical considerations highlight that possible disadvantages might arise from students' individual/familial attributes, such as gender, ethnicity, and socioeconomic background. Moreover, achievement-based educational inequalities along these axes become apparent in the early years of schooling (Teese, 2007). Therefore, in this systematic review, it is important to employ study selection criteria to look into studies accounting for their results in relation to at least one of these axes of inequality within the borders of primary education. This approach enables this review to embark upon a scholar exploration on main independent effects of school factors on academic disparities among students, after controlling for the aforementioned axes of inequality.

Situating peer, teacher and school management effects into the school context, Scheerens (2016) offers a hierarchical model that elucidates the intricate interplay between school dynamics on the influence of student outcomes. This model encompasses the main components of the school context, namely school environment, ecology/climate, leadership, policy and organization. The model specifies the path of influence of mechanisms from the school context onto individual student achievement goes through the classroom context hierarchically located under schools. The framework emphasizes the reciprocal relationship between school ecology and school leadership, policy and organization, predominantly shaped by school environment, but also influenced by broader factors such as educational system policies and ecology. Finally, given its hierarchical position within education systems, an examination of mechanisms on the school context necessitates the use of specific methodological inclusion criteria such as employment of multilevel modelling studies.

## 3. Review methodology

The present study employs a systematic review approach. The followed steps, suggested by Newman and Gough (2020), are illustrated in Fig. 1. To meticulously develop the research foci, the researchers further characterized the previously mentioned research aim. First, utilizing the critical realist's approach to the context-mechanism-outcome structure (Archer, 1995; Bhaskar, 2008), the researchers laid the present study's aim on the primary school level as its context and on achievement differences as its outcome for the search of school mechanisms behind disparities in academic achievement within primary schooling. To exhaustively examine the main school effects to conclude on school mechanisms, this process provided the researchers with invaluable clues for the development of the research foci. Accordingly, the research foci involved the conceptual foundations (both theoretical and methodological) utilized in the studies, variables utilized in the school levels of multilevel modelling studies, and the main effects of school level variables on achievement differences.

Relying on the research foci, developing the conceptual framework requires a clarification and delineation on the constructs of the study. Accordingly, this review requires a clarification of the school level as its context and of the broad term of academic achievement as its outcome in the CMO structure. Moreover, another clarification of the term mechanism is required to expound on the main aim of this review.

Drawing upon Scheerens's (2016) explanations, in this review, a (primary or elementary) school as a context refers to the comprehensive ecology of a formal educational institution that is characterized by its members' entry characteristics and backgrounds (compositional), by its formal and informal between-member interactions and by its contextual resources. The second aspect requiring a clarification in the conceptual framework is the achievement difference as the outcome component of the CMO structure. For this review, the examination of achievement differences corresponds to a focus on a disparity in educational trajectories, educational experiences, and outcomes (including gained competencies, earned grades and certificates) among students from diverse backgrounds (axes of inequality) (Gross et al., 2016; Jacobs, 1996). Finally, from a realist perspective, Astbury and Leeuw (2010) specify mechanisms as "underlying entities, processes, or structures which operate in particular contexts to generate outcomes of interest" (p. 368). Therefore, combining these definitions, this study establishes its focus around primary schools as its context and achievement differences as its outcome while scrutinizing systematically selected primary empirical research studies for revealing mechanisms, or in other words, specific compositional or contextual school conditions, properties or processes empirically reported as carrying potentials to impact the outcome when present or activated.

With the help of the developed conceptual framework, the selection criteria incorporate the following principles: (1) a methodological approach centering on multilevel modelling to adequately account for the multilevel research question and the related

hierarchical structure of the data, (2) the existence of the school level as context in the multilevel model, (3) achievement differences aligning with its operational definition as an outcome variable, and (4) the analysis centering on at least one axis of inequality. Relying upon the selection criteria, the developed search query is shown in Fig. 1.

During the last week of February 2021, the researchers run the developed query in all fields available for searching on two prominent scientific databases: Web of Science and ERIC. A strict attention is given to the utilization of the same search query without any adjustments to avoid any limitation/bias. The step of running the search query gathered 112 studies from WoS and 96 studies from ERIC. After the duplicate study analysis with Mendeley, 25 studies were confirmed as overlapping inputs by one of the researchers. Therefore, the study selection step was finalized with 183 unique study inputs.

For the screening process, the researchers utilized the help of Covidence (*Covidence: Systematic Review Software, 2022*). During each study screening stage, two researchers out of three blindly screened the studies in accordance with the selection criteria and the remaining researcher acted as a conflict resolver, which reduced the possible researcher bias in screening studies for inclusion. As shown in Fig. 1, this process was conducted in two phases: title and abstract screening and full-text review. Finally, Cohen's  $\kappa$  was run to check the agreement level between the screeners.

Following the completion of screening with 36 studies, two researchers extracted data aligning with the research foci of this review. Then, the remaining researcher administered the quality check, or the critical appraisal as Gough (2007) puts forward, through three elements over the extracted data: the alignment of study design, the relevance of it to the review foci, and the quality of execution of study methods. The critical appraisal process confirmed the readiness of the extracted data for the synthesizing and reporting processes. Finally, for synthesizing the results, the researchers utilized the inductive thematic analysis approach. Through categorizing the information under similar aspects for each research focus, comprehensive examinations and syntheses were conducted and reported.

#### 4. Findings

To present the findings from the systematically selected 36 studies, the present section extends upon the four research foci: *theoretical foundations*, *methodological foundations* of the studies examined, findings on *school variables* and their *empirical connection to achievement differences*.

##### 4.1. Theoretical foundations

An analysis of conceptual sections in the studies on school-level factors and educational inequality reveals a variety of theoretical foundations that often relate to a systematization of the state-of-research. Frequently, the studies start out from the influential work of Coleman et al. (1966) With most studies emphasizing Coleman's findings on classroom composition regarding student's socio-economic and ethnic backgrounds (e.g., Agirdag, 2018; Belfi et al., 2014; Boonen et al., 2014; Hungi & Thuku, 2010; Singh, 2015), while Bodovski et al. (2013) or Zhao et al. (2012) stress that the report showed that family factors are much more important than school-level factors such as instructional resources, teacher quality, and funding. Seabra et al. (2019) emphasize that more effort is necessary to explain school effects, to evaluate impacts of the composition regarding socio-economic and ethnic origins versus teacher effects (e.g., pedagogical measures). Boonen et al. (2014) base their study on Harker and Tymms (2004) who theorize four different background effects that may hide behind student composition effects: peer effects, facilities, teaching effects, and school functioning and how students react to this.

Searching for general inequality theories, only Schulze et al. (2009) sue the framework of Boudon (1974) and combine this concept with a contextual perspective. The emphasis of Schulze et al. (2009) is not on reasons for differential achievements between students of different socio-economic origins (primary effects), but on educational decisions by parents and teachers (secondary effects) regarding the placement of students into secondary school tracks in stratified education systems. The contextual perspective is introduced by the assumption that teacher evaluations of student achievement (e.g., grades, tracking decisions) are biased by classroom composition. A medium-performing student would have higher chances to receive better grades and an orientation towards higher tracks in an on-average lower achieving classroom than in a higher achieving classroom. While Bourdieu's inequality frameworks, namely the importance of cultural capital in the family and the socialized habitus for school achievement (e.g., Bourdieu & Passeron, 1978), are mentioned by a few studies (Goddard et al., 2001; Gubbins & Otero, 2020; Murillo & Graña, 2020; Schulze et al., 2009), they are not systematically linked to context effects.

School effectiveness including a special focus on the teacher is another dominant starting point in many studies (e.g., Agirdag et al., 2013; Cervini, 2009). Cervini (2009) argues that the link between school characteristics and student performance in school goes beyond socio-demographic student characteristics, as also many school-level factors relate to the classroom. He cites Creemers (1994, p. 201) emphasizing that "effective schools are schools which can achieve effective classroom". A crucial aspect of school effectiveness is teacher efficacy, thus, these concepts play an important role in theorizing the link between school-student or classroom composition and achievement differences as well as in theorizing educational inequalities in general. Agirdag (2018) refers to Hattie (2012), who brought the teacher into the center of educational research, and postulates that school student composition affects teachers and their beliefs (and a so-called 'teachability culture' on the school level), and these beliefs alongside characteristics of instructional quality moderate the link between socio-economic composition and achievement disadvantages for certain groups. Agirdag (2018) uses the conceptualization of staff culture by Van Houtte (2010) focusing on collective (school level) teacher beliefs and expectations as elements of this culture. Agirdag (2018) references two other conceptual frameworks from teacher research studies: Becker's (1952) argument that "a problematic teacher-student relationship emerged when working-class students did not meet the standards of the ideal pupil which teachers held" (Agirdag, 2018, p. 266), and the Pygmalion effect (Rosenthal & Jacobson, 1968) that teacher

expectations would become self-fulfilling prophecy as the children they believed were well-performing would make the best progress in reality.

Another conceptual theory applied in studies linking the school-level and individual student performance (Ersan & Rodriguez, 2020; Hungi & Thuku, 2010) is the concept of the Heyneman–Loxley effect postulating that the link between school and teacher quality and achievement is stronger and the effect of individual SES on achievement is weaker “the poorer the national setting in economic terms is” (Heyneman & Loxley, 1983, p. 1184).

#### 4.2. Methodological foundations

With a deliberate focus on multilevel modelling studies (multilevel linear and quadratic regression models, multilevel growth modelling, multilevel structural equation modelling, bivariate multilevel modelling, and logistic multilevel modelling) examining educational inequality regarding achievement differences, the present systematic review initially confined its search and study selection with the specified data analysis approach. Nevertheless, the selected studies still exhibit variations in their samples and outcome variables.

Due to the selection of studies embracing the stratified nature of social structures, such studies are expected to have different layers and therefore nested samples. Accordingly, considering the **samples**, the 36 studies indicated differences both in numbers of participants from each hierarchical level and in primary education grade levels which they focus. On the former, the studies range in the number of individuals and schools from 718 parents of grade 3 students within 47 schools in Chile (Gubbins & Otero, 2020) to 646,413 grade 5 students within 14,630 schools in Colombia (Murillo & Graña, 2020). On the latter, the earliest grade studied involves two panel studies from kindergarten to grade 3 in the USA (Bodovski et al., 2013; Konstantopoulos, 2009). The higher grade level studies corresponds to one longitudinal study with grade 5 and grade 7 students in Australia (Hancock et al., 2017). Besides, only 2 studies (Boonen et al., 2014; Crosnoe, 2005) out of 36 sample their participants solely from earlier grade levels (grade 1 and 2) of primary

**Table 1**  
Outcome variables.

Selected Studies	Outcome Variables								
	Math	Reading	Science	Writing	Language	Social Sciences	Citizenship	Track Recommendation	Repeater Status
Abbott et al., 2002	✓	✓							
Agasisti & Cordero, 2017									✓
Agirdag et al., 2013	✓								
Agirdag, 2018			✓						
Belfi et al., 2014		✓							
Bodovski et al., 2013	✓								
Boonen et al., 2014	✓								
Condon et al., 2012			✓						
Crislip & Heck, 2001				✓					
Crosnoe, 2005	✓								
D'Agostino & Borman, 1998	✓	✓							
Dijkstra et al., 2015							✓		
Ersan & Rodriguez, 2020	✓								
Gubbins & Otero, 2020	✓				✓				
Hancock et al., 2017	✓	✓		✓					
Hungi & Thuku, 2010	✓	✓							
J. Singh, 2016	✓				✓				
Kanyongo & Ayieko, 2017	✓								
Keller et al., 2015	✓	✓	✓	✓		✓			
Konstantopoulos, 2009	✓	✓							
M. Singh, 2013		✓							
M. Singh, 2015	✓								
Maerten-Rivera et al., 2010			✓						
Matsuoka, 2014	✓								
Meelissen & Luyten, 2008	✓								
Murillo & Graña, 2020	✓				✓				
R. A. Cervini et al., 2015	✓	✓							
R. A. Cervini, 2009	✓								
R. Cervini et al., 2016	✓	✓							
R. D. Goddard et al., 2001	✓	✓							
Rambo-Hernandez et al., 2019	✓	✓							
Sammons et al., 2009	✓	✓							
Schulze et al., 2009								✓	
Seabra et al., 2019	✓								
Y. L. Goddard et al., 2019	✓	✓							
Zhao et al., 2012	✓								

schools. Additionally, 5 more studies (Belfi et al., 2014; Bodovski et al., 2013; D'Agostino & Borman, 1998; Konstantopoulos, 2009; Zhao et al., 2012) include these earlier grades and/or kindergarten in their samples while also sampling students from later years of primary/elementary schools. Evidently, more research might be needed for the earlier grade levels of primary schooling.

Considering the **outcome variables** of the selected studies (see Table 1), while only 2 studies focus on the differences of educational trajectory and track recommendation (Schulze et al., 2009), and the determinants of grade-repeater status in 16 European countries (Agasisti & Cordero, 2017), the rest focuses on subject-specific performance.

The focus on subject-specific performance encompasses school marks or students' grades on some specific primary schooling subjects and their learning developments. Apart from 2 studies, the rest, 34 studies, focused either solely on one specific subject (19 studies) or conjointly with other schooling subjects (15 studies) under this category. Substantially, 26 studies examine mathematics performance, reading performance or both. Moreover, while 3 studies directly delve into science performances of primary/elementary-level pupils, Keller et al. (2015) extends their focus onto students' social science performances along with science, reading, and mathematics. Unlike any other, Dijkstra et al. (2015) inspects students' citizenship competences regarding their knowledge, skills, attitudes and reflection. Obviously, a major scholar focus is directed at math and reading performances of students.

#### 4.3. School variables and their empirical connection to achievement differences

With the main aim of unveiling school mechanisms behind achievement differences in primary schooling, this systematic review collected 191 variables introduced at the school level of multilevel modelling analyses from the selected primary research. After the inductive thematic analysis, six categories of variables emerged: *student composition*, *socio-physical conditions and characteristics of schools*, *school management*, *school climate*, *teacher composition*, and *curriculum and instruction* (see Table 2, indicated with a tick). Moreover, within each theme, findings related to the reported empirical linkage between these themes (or mechanisms) and achievement are also introduced (see Table 2, indicated with an asterisk).

##### 4.3.1. Student composition

Representing the most studied aspect, student composition emerges from 34 out of 36 studies. This prevalent research focus is, in fact, examined considering seemingly divergent but contextually analogous properties emerging from individual attributes students bring to the school context. These are subcategorized under five student composition types: socioeconomic status, ethnicity and language, cognitive and behavioral indicators, gender, and special education needs.

Student composition based on their **socioeconomic status** is the most common subcategory and emerges from 33 studies. The variables cover majorly continuous or discrete school aggregations of students' economic or cultural capital regarding parental education levels and/or income; or regarding household characteristics such as goods and services available; or regarding students' status on receiving free or reduced lunch assistance. The empirical influence of school's student SES composition is reported in 21 out of 34 studies. The converging conclusion emphasizes that schools accommodating higher proportions of lower SES students are estimated to perform lower in math, reading, and writing, language, and science. On the learning growth, Bodovski et al. (2013) propose that schools in the USA accommodating higher proportions of lower SES students are estimated to indicate lower achievement growth in math from kindergarten to grade 3. However, while the findings of D'Agostino and Borman (1998) align with the findings of Bodovski et al. (2013) only for math achievement growth within grade 1, they further suggest that schools of such conditions in the USA are estimated to indicate higher achievement growth in the same schooling subject within grade 3 (yet,  $p < .10$ ). Schulze et al. (2009) underline that students from schools with these conditions are estimated to have a lower probability of receiving higher educational track recommendations. Evidently, when schools' student SES compositions are more homogenic, between-school achievement differences become more pronounced in favor of schools accommodating higher SES pupils. Besides, the findings on achievement growth seem to slightly diverge.

Student composition based on their **ethnicity or immigrant statuses and language** on the school level is emerged from 18 research studies. The influence of school's student composition based on ethnicity and language is reported in 8 out of 18 studies. The studies report that schools accommodating higher proportion of ethnic minority students are estimated to perform lower in math and science, but also in reading, writing, language and social studies. On the language minority, 2 studies report that schools accommodating higher proportion of language minority students are estimated to perform lower in writing (Crislip & Heck, 2001) and in science (Condon et al., 2012). On the achievement growth, the results are intriguing. The US studies of Bodovski et al. (2013) and D'Agostino and Borman (1998) find that schools accommodating higher proportion of ethnic minority students are estimated to indicate higher achievement growth in math for Asian and for Hispanic students, respectively. On the other hand, D'Agostino and Borman (1998) highlight that schools accommodating higher proportion of ethnic minority students are estimated to indicate lower achievement growth in reading for African-American students. On the repeater status, Agasisti and Cordero (2017) stress that schools accommodating higher proportion of ethnic minority students are estimated to have higher chances for their students to become repeaters. Unlike others, the study of Dijkstra et al. (2015) examines the impacts of school ethnic diversity on citizenship competences and concludes that schools with higher ethnic diversity (calculated by the Herfindahl index) are estimated to perform higher in citizenship knowledge and reflection. Although the overarching conclusion might indicate that higher disadvantaged ethnic minority proportions on the school level reportedly have a negative impact on subject specific performances, the key to tackle educational inequality arising from these aspects might be finding the right balance for schools' ethnic composition or – as Dijkstra et al. (2015) addresses – increasing the diversity in schools.

Student composition based on their **cognitive and behavioral indicators** aggregated on school level is the third composition type that emerges from 13 studies. Cognitive indicators majorly refer to student age or their (prior) cognitive outputs on subject-specific

**Table 2**  
Utilized variables and significant main effects.

Selected Studies	Themes														
	Student Composition					Socio-Physical Conditions & Characteristics		School Management		School Climate		Teacher Composition	Curriculum & Instruction		
	Socioeconomic Status	Ethnicity & Language	Cognitive & Behavioral Indicators	Special Education Needs	Gender	Social Conditions	Physical Conditions	Administrational	Instructional	Academic	Socio-Affective	Professional Attributes	Individual Characteristics	Curricular Perspective	Instructional Perspective
Abbott et al., 2002	✓*					✓									
Agasisti & Cordero, 2017	✓	✓*					✓		✓*						
Agirdag et al., 2013	✓	✓	✓*			✓		✓*		✓*					
Agirdag, 2018	✓		✓*							✓*					
Belfi et al., 2014	✓	✓													
Bodovski et al., 2013	✓*	✓*						✓*	✓*	✓*					
Boonen et al., 2014	✓	✓	✓		✓			✓*	✓						
Condon et al., 2012	✓*	✓*	✓*	✓*	✓	✓					✓*				
Crislip & Heck, 2001	✓*	✓*	✓*	✓*		✓			✓*		✓				
Crosnoe, 2005	✓	✓*				✓		✓			✓*	✓	✓*		
D'Agostino & Borman, 1998	✓*	✓*				✓*	✓*		✓*						
Dijkstra et al., 2015	✓	✓*							✓*	✓	✓		✓*		✓*
Ersan & Rodriguez, 2020	✓*		✓*						✓	✓*	✓				
Gubbins & Otero, 2020	✓					✓*		✓							
Hancock et al., 2017	✓*														
Hungi & Thuku, 2010	✓	✓	✓*		✓	✓*	✓	✓	✓		✓	✓			✓
J. Singh, 2016															
Kanyongo & Ayieko, 2017						✓*	✓*	✓*							
Keller et al., 2015	✓*	✓*				✓*			✓*						
Konstantopoulos, 2009	✓*														
M. Singh, 2013	✓*	✓		✓											
M. Singh, 2015	✓*	✓		✓											
Maerten-Rivera et al., 2010	✓	✓	✓*	✓	✓*	✓*					✓				
Matsuoka, 2014	✓*						✓*			✓					✓
Meelissen & Luyten, 2008	✓*		✓*							✓*	✓*	✓*	✓*	✓*	✓*
Murillo & Graña, 2020	✓*														
R. A. Cervini et al., 2015	✓*														
R. A. Cervini, 2009	✓*		✓*				✓*								

(continued on next page)

Table 2 (continued)

Selected Studies	Themes														
	Student Composition					Socio-Physical Conditions & Characteristics		School Management		School Climate		Teacher Composition	Curriculum & Instruction		
	Socioeconomic Status	Ethnicity & Language	Cognitive & Behavioral Indicators	Special Education Needs	Gender	Social Conditions	Physical Conditions	Administrational	Instructional	Academic	Socio-Affective	Professional Attributes	Individual Characteristics	Curricular Perspective	Instructional Perspective
R. Cervini et al., 2016	✓*														
R. D. Goddard et al., 2001	✓										✓*				
Rambo-Hernandez et al., 2019	✓	✓	✓*												
Sammons et al., 2009			✓*												
Schulze et al., 2009	✓*	✓	✓*												
Seabra et al., 2019	✓*	✓				✓									
Y. L. Goddard et al., 2019	✓*							✓*							✓*
Zhao et al., 2012	✓*														

Notes: ✓: Studies utilizing a corresponding variable.

\*: Studies reporting a significant effect.

performance. The behavioral variables assemble aspects such as percentages of absenteeism, leaver, and repeaters. The influence of school student composition based on cognitive and behavioral indicators is supported in 12 out of 13 studies utilizing variables coded under this theme.

On the *cognitive aspect*, the studies report that schools accommodating higher proportions of high achievers are estimated to perform higher in math, science and reading. For the achievement growth, only one study (Agirdag, 2018) highlights that schools with the same social settings indicate higher achievement growth in science. Four studies examine either different contextual properties or different outcomes than the previously mentioned studies. First, Ersan and Rodriguez (2020) stress that schools accommodating higher proportions of cognitively ready students, measured as the extent to which a school's students "could do literacy and numeracy tasks when began primary school" (p. 13), are estimated to perform higher in math. Second, the study of Meelissen and Luyten (2008) reveals that schools using ability grouping indicate lower gender stereotype views in math, although this might be, as they propose, due to having low achievement differences between male and female students in their samples. Third, Schulze et al. (2009) underline that schools with higher proportions of high achievers have higher chances to receive higher track recommendations. Fourth, Rambo-Hernandez et al. (2019) reveal that school average performance in math is a positive predictor of the excellence gaps, meaning that schools composing higher achievers are estimated to indicate higher excellence gaps at the 90th-percentile between disadvantaged ethnic minority students and advantageous ethnic minority or majority students than their low-achiever counterparts.

On the *behavioral aspect*, first, Hungi and Thuku (2010) investigate the influence of pupils' behavioral problems (including class skipping, cheating, bullying, fighting, theft and more) and of average days of absenteeism on the school level. The researchers report that schools accommodating higher proportions of low-problem students perform higher in math and writing and that schools having lower average days of absenteeism perform higher in math. Second, Crislip and Heck (2001) conclude that schools with higher student stability (measured as the percentage of students remained enrolled for the entire academic year) perform higher in writing. Lastly, R. A. Cervini (2009) reports that schools accommodating higher proportions of repeaters are estimated to perform lower in math. In sum, when schools accommodate higher proportions of students with higher achievement average or higher cognitive readiness and less behaviorally disengaging, they are estimated to perform higher on subject matters, and to have higher chances of receiving higher track recommendations. Although these findings are not unexpected, this does not diminish the importance as these empirical findings remind that students' cognitive attributes and their behavioral patterns gather up to emerge as one of the most prominent school mechanisms.

Regarding the last two composition types on school level, student composition based on percentages of students with **special education needs** is examined in 5 studies, **gender** composition in only 4 studies. The influence of school composition based on SEN is reported from 2 out of 5 studies. Both studies report that schools accommodating higher proportions of SEN students are estimated to perform lower in writing and science. However, the influence of schools' gender composition is only reported in Maerten-Rivera et al. (2010) underlining that schools having higher proportions of female students perform lower in science. The findings signal a need for recognizing the potential impacts of these under-researched school composition types.

#### 4.3.2. Socio-Physical conditions and characteristics

Representing the second most studied school factor, the category of socio-physical conditions and characteristics is emerged from 18 out of 36 studies. This research focus is investigated from the two main attributes of a school context: social and physical.

On the social conditions of schools, the variables examine the student-teacher ratio, or the number of students in classrooms or in schools. The empirical results on this theme are contributed by 11 out of 18 studies. Four studies (D'Agostino & Borman, 1998; Gubbins & Otero, 2020; Kanyongo & Ayieko, 2017; Maerten-Rivera et al., 2010) suggest that schools accommodating higher numbers of students in their classes are estimated to perform lower in science, language and math. Kanyongo and Ayieko (2017) only highlights this finding for Kenya, but their study reveals the opposite for primary schools in Zimbabwe. On the achievement growth, D'Agostino and Borman (1998) highlight that schools accommodating higher numbers of students indicate higher achievement growth in reading within grade 3. In regards to another social aspect – teacher-student ratio, the studies of Condon et al. (2012), Hungi and Thuku (2010), and Keller et al. (2015) provide conflicting results. Keller et al. (2015) and Hungi and Thuku (2010) suggest that schools having higher teacher-to-student ratios perform higher in reading, math, writing, language, science, and social studies. Contrary to these 2 studies, Condon et al. (2012) suggest that schools with higher teacher-student ratios perform lower in science. Nevertheless, they further explain that the reason behind might be due to "schools [in their samples] with more struggling students decreasing their class sizes to improve student achievement" (p. V). Consequently, despite the scholar multilevel modelling attempts to figure out the direction of the association between student achievement and better social conditions of a school context (regarding teacher-to-student ratios and number of students), there seems to be yet no consensus.

On the other hand, the variables on physical conditions and characteristics of schools scrutinize environmental attributes (location, city, or region) and infrastructural attributes of schools (availability and conditions of school resources such as having a library with more than 5000 books, having computers available, or conditions of desks, recess-time area, and restrooms). The studies of Cervini (2009), Singh (2016), and Kanyongo and Ayieko (2017) underline that better equipped schools are estimated to perform higher in math and language. Besides, the studies of Matsuoka (2014), Bodovski et al. (2013), and D'Agostino and Borman (1998) propose that schools located in advantageous areas are estimated to either perform higher in math, or indicate higher achievement growth in math and reading. Variations regarding these conditions might result in between school differences and therefore educational inequality.

Ultimately, it is apparent that the scholars hypothesize that not only social conditions of primary schools regarding the number of students and school staff but also the availability and conditions of physical resources impact educational inequality.

#### 4.3.3. School management

The third theme emerging from 15 studies corresponds to school management and can be examined from two perspectives: administrative and instructional. On the administrative aspect, the variables analyze impacts of leadership, parental involvement such as providing a support service for families not speaking the medium of instruction, and sector of schools such as private, public, or religious schools. The results, supported by 5 out of 9 studies, introduce the influences from three standpoints: leadership, parental involvement, and school sector. Y.L. [Goddard et al. \(2019\)](#) show that schools with more effective principals' leadership in terms of their flexibility, visibility, culture, and knowledge of and involvement in curriculum, assessment, and instruction, perform higher in math and reading. [Boonen et al. \(2014\)](#) find that schools keeping in regular contact with parents perform higher in math. On the school sector, while 2 studies point towards a positive influence of private ([Kanyongo & Ayieko, 2017](#)) and religious schools ([Agirdag et al., 2013](#)) in math achievement, [Bodovski et al. \(2013\)](#) report that schools with private or religious orientations indicate lower achievement growth in math compared to their public counterparts. Ultimately, it can be concluded that the administrative aspect of the school management as a school mechanism suggests that schools with better leadership, and schools with better parental involvement are putting themselves into the advantageous side on between-school achievement differences.

On the instructional aspect, the variables of school management examine impacts of instructional cooperation among teaching staff, schools' focus on achievement or its improvement in schooling subjects, instructional time (school start times and teaching sessions in terms of days), and instructional values and rules such as not making an issue out of absenteeism and class disturbance. The results of 5 out of 8 studies are divergent yet positive. While [Crislip and Heck \(2001\)](#) find that schools with higher instructional focus in terms of aiming to improving students' writing performances are estimated to perform higher in writing, [Dijkstra et al. \(2015\)](#) utilizing the outcome variable of students' citizenship competences propose that schools achieving at least the expected levels in achievement indicate lower attitudes and skills, but not knowledge. Regarding instructional time, [Keller et al. \(2015\)](#) conclude that schools starting late in a day perform better in math, language, social studies, and writing. Furthermore, while [D'Agostino and Borman \(1998\)](#) point that schools having higher instructional cooperation between teaching staff indicate higher achievement growth in math and reading, within grade 1 and 3, [Agasisti and Cordero \(2017\)](#) introduce a different perspective that students of schools holding higher instructional values and rules in terms of not problematizing absenteeism have lower chances of becoming repeaters. Accordingly, findings from the systematic review underline the importance of the instructional management aspect as a school mechanism in educational inequality.

#### 4.3.4. School climate

Contributed by 9 studies, school climate corresponds to the fourth emerging theme that can be differentiated into two aspects: academic and socio-affective. Seven out of 9 studies stress the influence of school academic climate and socio-affective climate. The academic aspect explores a school climate through its disciplinary, academically (dis)engaging, task-oriented, instructional (such as teachers' teachability and students' futility culture) extensions. The empirical results point that schools with higher academically engaging and instructional climate (lower levels of student futility culture) are estimated to perform higher in math ([Agirdag et al., 2013](#); [Ersan & Rodriguez, 2020](#); [Meelissen & Luyten, 2008](#)) and indicate higher achievement growth in math ([Bodovski et al., 2013](#)), and slightly higher achievement growth in science ([Agirdag, 2018](#)).

The socio-affective aspect examines impacts of a respectful, safe or trustful school climate on students' achievement outcomes. The studies suggest that schools with safer climates in terms of facing less safety problems ([Crosnoe, 2005](#); [Meelissen & Luyten, 2008](#)), and schools with more trustful climates regarding teachers' trust on students and parents (R. D. [Goddard et al., 2001](#)) are estimated to perform higher in math and reading. Accordingly, schools are small communities bringing not only school staff and students but also their parents together. Thus, when school climate facilitates the shared goal and foster positive socio-affective sensations of their members, this mechanism acts most fruitful for educational equity.

#### 4.3.5. Teacher composition

Emerging from 6 studies, the teacher composition theme gathers the variables representing "emerging properties" of teachers in primary schooling. For the professional attributes, the studies ponder on the compositional influence of teachers' professional experience and qualifications, their instructional engagement, their behavioral problems (such as arriving late or skipping class) or employment stability within the school, and their performance. Some studies further scrutinize the compositional influence of teachers further individual characteristics such as their gender, age, and ethnicity.

Reported in 3 out of 6 studies, the influence of teacher composition is examined from three attributes of teachers: their ethnicity, gender, and experiences and qualifications. [Crosnoe \(2005\)](#) finds that schools with higher proportions of teachers sharing the same minority background with students (in their case; Mexican heritage) perform higher in math. On teachers' gender, [Meelissen and Luyten \(2008\)](#) underline that schools holding higher proportions of female teachers perform higher in math. On teachers' experiences and qualifications, 2 studies propose that schools with more experienced ([Condon et al., 2012](#); [Meelissen & Luyten, 2008](#)) and more qualified teachers ([Condon et al., 2012](#)) are estimated to perform higher in math and science.

Consequently, a scientific examination on the school level should not only recognize the possible influence emerging from the student composition but also the potential impacts of teacher composition.

#### 4.3.6. Curriculum and instruction

The theme of curriculum and instruction emerged from 5 out of 36 systematically selected primary research studies, and its significant influence is reported in 3 out of 5 studies. From a curricular perspective, the studies inspect potential impacts of curricular visions, objectives, emphasis on, or the number of topics in a specific schooling subject or curricular alignment to learners' needs.

Meelissen and Luyten (2008) report that schools covering and evaluating higher number of topics in curriculum are estimated to perform higher in math. Additionally, Dijkstra et al. (2015) reveal that schools utilizing higher extent of formulating curricular objectives, measured as a discrete variable with four levels (no objectives, general objectives, objectives formulated for each grade, and objectives formulated for each student), perform higher in citizenship knowledge but indicate lower citizenship skills.

From an instructional perspective, the studies look at potential impacts of educational assessment such as homework given per week, the style of instruction (e.g., student or teacher centered) or the number of students received the specific schooling subjects in focus. Y.L. Goddard et al. (2019) stress that schools with more differentiated instruction, measured by items such as “use of wide range of assignments, activities, materials, or activities matched to students’ needs” (p. 207), perform higher in math and reading. On the other hand, Meelissen and Luyten (2008) find that schools in which teaching staff rates the importance of student-oriented characteristics higher in relation to their teaching styles perform lower in math. Dijkstra et al. (2015) propose that schools with higher instructional opportunity for their students indicate higher citizenship attitudes, skills, and reflection.

As a result, the school mechanism of curriculum and instruction indicates that any variation in terms of these aspects on the school level might surely translate into between-school achievement differences by contributing to educational inequality.

## 5. Discussion

This systematic review aimed to examine the main effect of school-level variables on academic achievement among primary school students through multilevel modeling studies. By analyzing 36 selected studies, both theoretical and methodological aspects were explored, yielding insights for recommendation for further research. The thematic analysis of these studies revealed a list of school mechanisms contributing to educational inequality.

The findings regarding *student composition*, particularly the association between schools with higher proportions of advantaged pupils and elevated academic achievement, echo key themes present in the literature. Haskell’s (2023) work illuminates persistent disparities in academic achievement among socioeconomically dissimilar students, emphasizing the impact of student diversity on educational outcomes. Gustafsson et al. (2018) further underscore the significant influence of school socioeconomic status (SES) on individual academic achievement, suggesting that schools with more advantaged student populations tend to exhibit higher academic performance. Additionally, Marotta (2017) highlights the role of peer influence, indicating that academic gains are more pronounced in environments with higher achieving peers. These also align with major theories of educational inequality (e.g., Bourdieu, 1986; Bourdieu & Passeron, 1978). Familial resources significantly influence students’ advantages even before schooling begins. As privileged students carry their cultural-capital assets to school, homogeneous student compositions can exacerbate inequalities, as disadvantaged students already lack crucial resources to success, entailing in reproduction of class through schooling (Bourdieu & Passeron, 1978).

*Teacher composition* significantly influences achievement differences. This review highlights the impact of teachers’ gender, ethnicity, education, and experience levels on school performance. Matching disadvantaged students with teachers of similar socio-demographic backgrounds may mitigate achievement gaps (Hwang & Fitzpatrick, 2021), through role-modeling and subjective grading processes (Coenen et al., 2018). Moreover, teachers with higher qualifications and experience often possess better pedagogical content knowledge (Burroughs et al., 2019), enabling them to support diverse learning needs effectively, thereby reducing achievement disparities. It is crucial to recognize that while teacher composition might mitigate academic gaps, school management mechanism can also play a facilitating role in shaping this mechanism’s impact.

*Socio-physical conditions*, including school size, teacher-to-student ratios, and access to resources like libraries and favorable school locations, significantly influence student achievement. Scholars like Blatchford and Russell (2020) and Darling-Hammond (2010) underscore the positive impact of smaller school populations on learning outcomes, as they facilitate better peer interactions and support teachers in managing various tasks effectively. Insufficient resources, such as learning equipment and funding, particularly in schools located in disadvantaged areas, contribute to unequal educational outcomes (Darling-Hammond, 2013; Denton, 1996; Perry et al., 2022). Accordingly, it is clear that socio-physical conditions within schools play a crucial role in directly or indirectly shaping student achievement, emphasizing the need for equitable resource allocation and supportive environments across all educational settings.

This review also revealed *school management* and *school climate* among mechanisms influencing student achievement. The results indicated that effective school management strategies, such as setting instructional goals, targeted interventions for disadvantaged students, and fostering collaboration among staff and parental involvement, can mitigate achievement gaps. Similarly, creating a positive school climate, characterized by safety, trust, and academic optimism, significantly impacts student outcomes. Implementing local school policies addressing these aspects can activate positive impacts on achievement. Research emphasizes the importance of cultivating supportive environments that enhance student engagement, participation, and interest in learning, thus reducing educational inequalities (Berkowitz et al., 2017; Wang et al., 2020; Wang & Degol, 2016). This underscores the interconnected nature of school mechanisms, necessitating cohesive efforts across various levels to achieve equity goals.

The findings regarding *curriculum and instruction* underscore the importance of both curricular content coverage and differentiated instruction. Increased curricular content coverage provides greater opportunities for learning, influenced by stakeholders ranging from students and teachers to school management and educational systems (Perry et al., 2024). Thus, differential content coverage translates to varied opportunities for student learning, impacting academic achievement across schools. Additionally, the positive effects of differentiated instruction, as supported by literature such as (Ziernwald et al., 2022), stem from its ability to cater to the diverse needs of students in, especially heterogenous student compositions.

Ultimately, it is imperative to underline that these school mechanisms function in unison rather than in isolation and understanding

how these mechanisms function simultaneously helps school leaders, educational policy makers and researchers identify and develop more effective policies and interventions for inclusivity and equity.

### 5.1. Limitations of the study

While this systematic literature review offers valuable insights, it has limitations. Selection bias, stemming from search query keywords and researchers' biases in study inclusion, is a significant concern (Hammersley, 2020). To address this, our search query construction is transparent, allowing for replication. Mitigation measures include blind screening by two researchers and a third researcher as a tiebreaker for disagreements, introducing a fresh perspective. Cohen's kappa results for main selection stages are also provided.

Additionally, inductive thematic analysis was employed to identify school mechanisms from school level variables' main effects in multilevel modeling studies from Web of Science and ERIC. Findings, including variables and significant results under each mechanism, are openly reported. However, the study's scope is limited by the included research studies. Moreover, the use of a limited number of databases, while common in education research, may have restricted the inclusion of potentially relevant papers.

### 5.2. Recommendations for further research

A key benefit of conducting a systematic review is that it allows for identification of research gaps related to the research focus.

Regarding the *theoretical foundations* of the studies, this review found that most of the research studies lay their foundations on the study of Coleman et al. (1966) with an approach highlighting the influence of classroom composition, and on school effectiveness research with a special focus on the teacher by referencing Creemers (1994), Hattie (2012), Becker (1952), and Rosenthal and Jacobson (1968). Subsequently, a few studies follow more general inequality theories such as Boudon (1974) and Bourdieu (1986), yet they are not systematically linked to context effects. Thus, the main recommendation is in line with Scheerens' (2016) call for a theory that unites the contextual and compositional mechanisms of classrooms and schools in school effectiveness research.

The results on the *methodological foundations* of the multilevel studies under review have been examined in accordance with their samples, outcome variables, and data analysis methods. The compiled suggestions from these aspects of methodology underline the needs for more research (1) on the earlier elementary grade levels, (2) examining the variations in other subjects than only math and reading, and in other aspects of inequality than only academic performances such as educational trajectories and grade repeater status, and (3) investigating impact of school-level determinants on students' growth in subject specific performances.

The findings on the utilized *school-level variables* have been analyzed with the inductive thematic analysis. The most frequently examined school mechanism is student composition, more specifically the student SES composition. Yet, when the compositional mechanism is examined thoroughly, it comes to light that the number of the studies examining the impact of school student composition regarding SEN and gender seems considerably scarce. Among all the school mechanisms, the influences of school climate, teacher composition, and of curriculum and instruction are investigated in less than 25 % of all selected studies. Therefore, another recommendation for future research is to conduct further examination of the influences of school-level variables representing these underutilized mechanisms or themes, especially when their corresponding variables are available.

### 5.3. Concluding remarks

In conclusion, this systematic review of 36 studies underscores the critical role of school-level factors in shaping academic achievement differences among primary school students. The interplay of student composition, socio-physical conditions, school management, teacher composition, and curriculum and instruction highlight the complexity of educational inequality. Theoretically, these findings contribute to a deeper understanding of how multifaceted factors interact to influence student outcomes and advances the knowledge on educational inequality while guiding future research on systemic educational reforms.

Practically, the review emphasizes the need for a holistic approach to address educational disparities. By recognizing the diverse nature of schools and implementing targeted interventions tailored to the specific needs of different student populations, stakeholders can work toward creating more equitable and inclusive educational environments. Prioritizing strategies that promote diversity, improve teacher quality, address socio-physical conditions, implement effective school management practices, and cultivate positive school climates can guide policy makers, educators, and school administrators in their efforts to reduce academic achievement gaps. Ultimately, these actions will support the development of a more equitable education system that empowers all students to succeed.

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## CRedit authorship contribution statement

**Sercan Erer:** Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Andreas Hadjar:** Writing – review & editing, Writing – original draft, Validation, Supervision, Project administration, Methodology, Funding acquisition, Formal analysis, Conceptualization. **Susanne Backes:** Writing – review & editing, Writing – original draft, Validation, Investigation, Formal analysis, Data curation, Conceptualization.

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