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A Bibliometric Review of Research on Inequality of Educational Achievement, 1934 to 2023

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In this bibliometric review of the research landscape on achievement gaps, we analyze temporal trends and geographic distributions, identify key scholars and publications, and uncover the intellectual structure and thematic focus of achievement gap research. By examining 1,607 achievement gap studies between 1937 and 2023, we find that the scholarship has evolved through four distinct stages: pre-1960, 1960-1999, 2000-2010, and post-2010. Author co-citation analysis reveals six major schools of thought that underpin how scholars conceptualize and study achievement gap: Child Development, Economic Analysis, Social Contexts of Schools, Schooling Process, School Discipline, and Psychological Dynamics. Our findings underscore the need for more interconnected, interdisciplinary approaches that integrate various paradigms to address the achievement gap comprehensively. We advocate for future research to move beyond isolated impacts by promoting collaborative efforts among all stakeholders from multiple disciplines.

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A Bibliometric Review of Research on Inequality of Educational Achievement, 1934 to 2023

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Abstract

In this bibliometric review of the research landscape on achievement gaps, we analyze temporal trends and geographic distributions, identify key scholars and publications, and uncover the intellectual structure and thematic focus of achievement gap research. By examining 1,607 achievement gap studies between 1937 and 2023, we find that the scholarship has evolved through four distinct stages: pre-1960, 1960-1999, 2000-2010, and post-2010. Author co-citation analysis reveals six major schools of thought that underpin how scholars conceptualize and study achievement gap: Child Development, Economic Analysis, Social Contexts of Schools, Schooling Process, School Discipline, and Psychological Dynamics. Our findings underscore the need for more interconnected, interdisciplinary approaches that integrate various paradigms to address the achievement gap comprehensively. We advocate for future research to move beyond isolated impacts by promoting collaborative efforts among all stakeholders from multiple disciplines.

Keywords: achievement gap, inequities in student achievement, bibliometric review, schools of thought

The persistent and pervasive issue of unequal educational achievement, commonly framed as “achievement gaps”, has been a critical focal point for educators, researchers, and policymakers worldwide. This persistent issue reflects deep disparities and inequalities in achievement between groups of students. While often examined through lenses of gender, race, and class, other dimensions of social categorizations that marginalize students are also examined in studies. These include, but are not limited to, special needs (e.g., Gilmour et al., 2019; Kohli et al., 2015), languages (e.g., Goodrich et al., 2021; Kieffer & Thompson, 2018), and immigration status (e.g., Azzolini et al., 2012; Pomianowicz, 2023). These gaps not only underscore a longstanding moral, historical, and educational debt (Ladson-Billings, 2006), but also have profound consequences on the economy, society, and communities.

Given the salience of this issue, a myriad of research has been undertaken on the patterns, explanations, and consequences of achievement gaps, as well as on policies, programs, and strategies aimed at reducing the achievement gap. Various reviews and meta-analyses have also been produced to synthesize the state of knowledge. Some meta-analyzed the sizes of achievement gaps (e.g., Collins et al., 2018; Gilmour et al., 2019); some summarized the theoretical explanations used to explain achievement gaps (e.g., Gregory et al., 2010; Kao & Thompson, 2003; Warikoo & Carter, 2009); some attempted to identify factors and strategies that best reduce achievement gaps (Cabral-Gouveia et al., 2023; Jeynes, 2010, 2015); and others estimated the effects of a specific factor on achievement gap, such as Gilmour et al.’s (2019) meta-analysis on active learning, and Strello et al.’s (2021) study of tracking. However, these syntheses have only addressed specific aspects of the issue. To our best knowledge, no researchers have ever systematically and historically reviewed the intellectual structure and knowledge base of the research on achievement gap. Given the prevalence and intricacies of the

issue of achievement gap, along with the richness of related research and diversity of perspectives, there is a need for a comprehensive study that examines the entire corpus of achievement gap literature, expanding our understanding of achievement gap over temporal, spatial, topical, and disciplinary dimensions.

In response, this study aims to provide a holistic review of the evolution and structure of the knowledge base of achievement gap as a field of study through bibliometric analysis. Bibliometric analysis analyzes large volumes of bibliometric data of publications to reveal the intellectual structure and the emerging trends of a research field (Donthu et al., 2021). More specifically, it evaluates the contributions of research constituents, such as authors, journals, institutions, and countries, to a specific field of study over a period of time. In addition, using approaches such as co-citation analysis, and co-word analysis, bibliometric science mapping is useful to reveal and visualize the major themes and schools of thought of the field (Lim & Kumar, 2024; Donthu et al., 2021).

In pursuit of the overarching purpose, this study identified 1,607 research documents on achievement gaps from Scopus database, published between 1934 and 2023. The bibliometric information associated with those publications was extracted and analyzed using science mapping methods. Our guiding research questions are as follows:

Research Question 1: What was the volume, growth trajectory, and geographic distribution of publications addressing “achievement gap”?

Research Question 2: What journals, authors, and publications have demonstrated the greatest citation impact?

Research Question 3: What constitutes the intellectual structure within the knowledge base of achievement gap?

Research Question 4: What have been the topical foci and trends of research on "achievement gap"?

Methods

Data Collection

To begin, a systematic search and identification of literature on achievement gap (AG) was conducted using the Scopus database. Scopus is widely used for bibliometric analysis because it not only provides extensive coverage of publishers in a wide range of subject fields, but also allows exporting the bibliographic meta-data of publications for research, including author details, citation information, abstracts, keywords, funding data, and others (Hallinger, 2023; Hallinger & Kovačević, 2019). Boolean keyword terms ("achievement gap" OR "attainment gap" OR "outcome gap" OR "discipline gap" OR "gap in educational achievement" OR "achievement disparities" OR "disparity in achievement" OR "test score gap" OR "disparities in test score" OR "differences in achievement" OR "achievement stratifications" OR "achievement*equality" OR "achievement*equity") were used for the search. Aside from limiting the search to studies published in English, no other restrictions were applied.

The initial search produced 4,189 records. We then screened the titles, abstracts, and keywords of those documents with the assistance of a free web-based text mining tool, Abstrakr (Wallace et al., 2012). To be included, studies must have a direct focus on the issue of achievement gaps, defined as disparities among groups based on social identities that influence individuals' opportunities, experiences, and access to resources. Studies on other types of achievement disparities are excluded. For example, Konstantopoulos's (2008) study was excluded due to its focus on the achievement gap between high and low achievers. To ensure comprehensiveness, we included conceptual, empirical, meta-analytical, and methodological

manuscripts that approach the issue of achievement gaps from various perspectives and employ different types of methodologies.

Two independent researchers screened all records for relevance and determined the publications that would progress to the next phases of analyses. Both researchers consistently engaged in conversations resolving discrepancies as well as other issues raised during the screening process, ensuring it was rigorous and transparent. Screening resulted in 1,617 documents being retained, published between 1934 and September 2023, 10 of which were editorials, erratum, and notes. After deleting those 10 documents, 1,607 publications remained including 1,316 peer reviewed journal articles, 19 books, 156 book chapters, 18 conference papers, and 98 reviews. In order to retrieve the most recent meta-data of documents, all selected studies were then identified from Scopus website using DOI and names search. The bibliographic data of those records, including citation information, bibliographic information, abstracts, keywords, funding details, as well as references were exported and saved in comma-separated values format for data analysis. The Scopus citation data was current up to December 25, 2023, when the study was conducted.

Data Analysis

One common data cleaning issue with bibliographic data is alternate forms in the dataset that authors, source titles, and keywords may appear in (e.g., Reardon, S. and Reardon, S. F.; *Rev. Educ. Res* and *Review of Educational Research*). In order to indicate different names in fact refer to the same value and merge different variants, a thesaurus file was created and used for author name, article title, source title, and keywords, separately. The thesaurus file includes two columns: a “label” column comprising the original labels in the dataset, and a “replace by” column containing alternative labels to replace the original ones (van Eck & Waltman, 2023).

Therefore, synonyms, abbreviated and full forms, terms of multiple spellings, as well as singular and plural forms, are consolidated.

Next, four types of bibliometric analyses were conducted: performance analysis, citation analysis, co-citation analysis, and keyword co-occurrence analysis. Performance analysis, descriptive in nature, analyzes the overall volumes of achievement gap publications and scientific productivity in the field by year and geographical locations. We visualized the results of temporal trends and spatial distribution of achievement gap scholarship using Excel and Tableau. VOSviewer program (van Eck & Waltman, 2010) was used for citation, co-citation, keyword co-occurrence analysis, and science mapping intellectual structures of achievement gap scholarship.

Citation analysis. In bibliometric studies, citation analysis is used to analyze the contribution of constituents to the knowledge and scholarly impacts. Specifically, citation analysis identifies the most highly cited authors, publications, and journals in a given research field (Donthu et al., 2021; Zupic & Čater, 2015). In this study, we identified the top-20 lists of the most influential authors, studies, and journals on the topic of achievement gap based on the number of Scopus citations they receive. It is important to acknowledge that relying on citation as a gauge of scholarly impact is not devoid of biases, given the intricate array of factors beyond study quality that contribute to citation patterns (Wang, 2023). Citation analysis may disadvantage recent publications and non-dominant scholarly communities (Hallinger, 2023). Concentrating on the most-cited documents may also inadvertently disregard the significance of the informal dialogues, conferences, and non-academic work in shaping the discourse (Trujillo & Long, 2018). Nevertheless, citation patterns provide an objective and collective assessment of

scientific literature in a way that "aggregates the opinions of multiple scholars working in the field" (Zupic & Čater, 2015, p. 429).

Co-citation analysis. Another commonly used approach in bibliometric analysis is co-citation analysis (Hallinger & Kovačević, 2019). Different from citation analysis, which is performed on the core documents, co-citation analysis measures the number of times within which two units were jointly cited in the reference lists of these citing documents (i.e., the 1,607 included achievement gap studies) (Small, 1973). The unit of analysis for co-citation can be authors, journals, and documents. Co-citation analysis not only captures a broader scope of literature, but also is able to reveal the units that have received the most peer-recognitions indicated by citation patterns within the knowledge base of AG research, which refers to a collection of scholarly literature that forms the conceptual, empirical, and methodological foundation for studying and understanding a research topic (Zupic & Čater, 2015). Another strength of co-citation analysis lies in the capability of analyzing the patterns of how two units (authors, publications, or journals) are co-cited. When two units are frequently co-cited, it suggests a strong thematic and intellectual connection between them. Groups of closely linked units imply schools of thought sharing common research interests and knowledge frameworks. By science mapping the relationships and flows among nodes, co-citation analysis therefore unveils intellectual structures, representing the dominant schools of thought that constitute a body of knowledge (Donthu et al., 2021; Zupic & Čater, 2015). In summary, co-citation analysis aids in identifying the central, peripheral, and connecting nodes (i.e., scholars, journals, articles), as well as detecting locally densely connected intellectual communities or clusters.

Keyword co-occurrence analysis. While citation and co-citation analysis focus on citation patterns, keyword co-occurrence analysis examines the actual content of the publication.

It typically uses the author identified keywords from the publication and calculates the frequencies of two keywords or phrases occurring together in an article. The assumption of this approach is that keywords provide good representations of the content of a document. The more co-occurrences between a pair of keywords, the higher similarities in the underlying ideas associated with those words (Donthu et al., 2021; Zupic & Čater, 2015). Consequently, keyword co-occurrence analysis enhances our understanding of underlying themes, topics of literature, as well as the conceptual network of a research field (He, 1999; Leung et al., 2017). Moreover, by calculating the mean years of appearance of each keyword and assigning temporally ordered color to the keywords, the keywords co-occurrence map reveals the changes in the conceptual space over time and helps forecast future research.

Results

Volume, Trajectory, and Distribution of Achievement Gap Literature

This review identified a total of 1,607 achievement gap studies that had accumulated over the past nine decades. We found that AG studies can be traced back to the 1930s, but it was not until the 1960s that the topic began to receive some attention (see Figure 1). The last two decades have witnessed a substantial growing interest in achievement gap with two notable surges in the number of publications: one in the early 2000s, and the other around 2010. The number of publications per year has increased sharply, growing tenfold from less than 10 publications per year at the beginning of 2000 to nearly 100 publications per year in recent years. AG has been and will continue to be a heated topic for research.

The geographical distribution of the achievement gap scholarship is shown in Figure 2 and Table 1. The map shows that scholars in 59 different countries have contributed to the topic, but the majority of publications originate from authors in five Western countries characterized by

significant racial/ethnic, linguistic, and immigrant diversities: the United States (1,130 studies), the United Kingdom (105 studies), Germany (41 studies), Canada (37 studies), and Australia (26 studies). Studies authored in the United States far surpassed other countries, accounting for more than 70% of the total volume. The analysis of Scopus citation patterns by countries (Table 1) showed a similar pattern, with the United States ranked at the top followed by the United Kingdom, Netherlands, Germany, and Canada.

Influential Sources, Authors, and Documents

This section of the analysis aims to identify the most influential documents, authors, and sources of achievement gap literature. Table 2 lists the top 20 most influential publications, topic of focus, methods, sources, and Scopus citations. Several interesting patterns stand out. First, 17 of the top-20 most cited studies were published between 2003 and 2013, aligning with the notable surge in AG publications during that period. Second, the most cited publications are either quantitative or review studies. Third, a wide array of social identities has been utilized in those studies as structural frame to analyze achievement gaps, including sex (e.g., Anderson, 2008; Nosek et al., 2009), race and ethnicity (e.g., Walton & Cohen, 2001), socio-economic status (e.g., Reardon et al., 2011), language (e.g., Hoff, 2013). Fourth, these top-cited studies tend to concentrate on two topics. One is the sizes of and explanations for achievement gaps (12 studies, e.g., Gregory et al., 2010; Reardon et al., 2011; Kao & Thompson, 2003). For example, using data from 19 nationally representative assessments, Reardon (2011) traced the changes of the achievement gap between children from low- and high-income families from the 1970s to 2010s. The widely discussed explanations in the literature include social capital, cultural beliefs, cultural mismatches, stereotype threats, and structural barriers, among others (Kao & Nosek et al., 2009; Thompson et al., 2003; Van de Werfhorst & Mijs, 2010). The other focal point is

examining the effects of intervention programs on closing achievement gaps (eight studies). These interventions target either students' feelings and beliefs regarding school and learning (e.g., Cohen et al., 2006; Miyake et al., 2010; Walton & Cohen, 2001) or school curriculum and instruction (e.g., Haak et al., 2011; Theobald et al., 2020).

Table 3 lists the top 20 co-cited studies identified by co-citation analysis. Co-citation analysis examines the reference lists of the included documents and tracks the frequency with which two articles are cited together. It provides a complementary perspective to citation analysis due to its ability to encompass literature outside of our databases. We observed that, despite the prevailing dominance of quantitative and review studies, a few conceptual frameworks have made their way onto the list. One noteworthy example is Ladson-Billing's (2006) paper on "educational debt". Holding the second position on the list, this paper advocates for reframing the achievement gap language as "educational debt". Ladson-Billing asserts that the term achievement gap reflects a deficit perspective and fails to address the very root of the issue. Instead, the concept of "educational debt" helps to understand how achievement gap is a logical consequence of the cumulative debts accrued over years in history, economics, society, morality, and policy.

Our next goal was to identify the most influential scholars on the topic of achievement gap. Table 4 lists the top 20 scholars along with document counts and total Scopus citations of these documents. The five preeminent scholars, based on the number of published documents included in our database, are Sean Reardon, Jaekyung Lee, Geoffrey Cohen, David Quinn, and Helen F. Ladd. When ranked by Scopus citations, the five leading scholars are Geoffrey Cohen, Gregory Walton, Sean Reardon, Anne Gregory, and Roland Fryer, Jr.

The authors on the list approach the issue of achievement gaps from diverse paradigms and perspectives. Some paradigms are psychological (e.g., Cohen, Darnon, Gregory, Walton, Stephens), economic (e.g., Reardon, Fryer, Jr., Hanushek, Ladd, Vigdor), social (e.g., Downey, Farkas, Noguera), and educational (e.g., Quinn, Strand). Regarding research focus, some scholars aim to explore the patterns and causes of achievement gaps (e.g., Reardon, Fryer, Jr., Hanushek), while others focus on psychological interventions to narrow achievement gaps (Cohen, Darnon, Gregory, Walton, Stephens). Furthermore, this list contains scholars with a wide array of specialties, including literacy development of linguistically diverse students (i.e., Kieffer), inequities in students' mathematics outcomes (i.e., Lubienski), as well as the disproportionality in school discipline (i.e., Gregory). In terms of gender and geographical diversity, only five of the 20 most highly cited scholars are female. Surprisingly, despite a pressing concern about achievement worldwide, all top-cited scholars are located in the United States with two exceptions: Steve Strand from the UK and Céline Darnon from France. This list does not include any scholars from developing countries.

Author co-citation analysis was also performed to identify key authors whose work is more frequently cited in the included studies on achievement gaps, thereby underpinning the foundation of research in this field (see Table 5). Comparing these two lists, we found that five researchers appeared in both (i.e., Reardon, Hanushek, Duncan, Cohen, and Fryer, Jr). The added value of co-citation analysis becomes more evident when it brings to light influential scholars who might have been overlooked due to database limitations, including anthropologist Ogbu (renowned for his work on the concept of "oppositional culture"), sociologist Coleman (famous for the Coleman report), and psychologists Steele and Aronson (notable for their "stereotype threat" theory). Furthermore, some scholars appear in the list of co-citations because of their

methodological influence, such as Raudenbush and Bryk, whose hierarchical linear model was widely adopted.

Shifting attention to the most influential sources, the 1,607 included studies originated from 616 different sources, with 74 of them having published at least five articles each. This broad dispersion across journals and books indicates a positive trend, signifying that discussions on achievement gap are not confined to a few specialized journals dedicated to race, urban education, and equity. The achievement gap scholarship was not only prevalent in educational journals across diverse subfields and different levels of education, but also in journals within the areas of sociology, economics, psychology, and science.

Ranking journals by the number of published achievement gap studies shows the top 20 sources are nearly all education-related (see Table 6). *Educational Researcher*, *Teachers College Record*, *Economics of Education Review*, *Education and Urban Society*, and *Journal of Educational Psychology* are the top five journals that published the greatest number of articles on this topic. A shift occurs when considering the total citations received. *Science*, *Educational Researcher*, *American Educational Research Journal*, *Proceedings of The National Academy of Sciences of The United States of America* stand out as journals with the highest citation impacts. In addition, the top-20 lists based on citations feature more non-educational journals, such as *American Sociological Review, Annual Review of Sociology, Journal of Policy Analysis and Management, Psychological Science,* each having a premier position within their respective fields.

Results of journal co-citation analysis showed that sources most frequently co-cited in the reference lists of achievement gap articles are *Sociology of Education* (1,284 co-citations), *Child Development* (1,182 co-citations), *Journal of Educational Psychology* (989 co-citations),

American Educational Research Journal (941 co-citations), and *Educational Researcher* (851 co-citations). Fourteen sources have also appeared in both top-20 lists identified through journal citation analysis and co-citation analysis. Similarly, the highly co-cited sources are associated with a wide breadth and diversity of disciplines, including science, psychology (e.g., *American Psychologist*), sociology (e.g., *Annual Review of Sociology*), economics (e.g., *American Economic Review*), public policy (e.g., *Journal of Human Resources*), and education (e.g., *Educational Researcher*). This implies that achievement gaps are complex phenomena influenced by multidisciplinary factors, and knowledge on achievement gaps has been generated by researchers from various fields.

Intellectual Structures of the Achievement Gap Scholarship

The intellectual structure of achievement gap literature was visualized using author co-citation analysis. Setting a threshold to at least 25 co-citations, Figure 3 maps a co-citation network of 786 scholars. The bubble represents an author, and its size reflects the relative frequency of the scholar being co-cited. The link between two bubbles indicates the extent to which two scholars are co-cited together. Another beauty of co-citation analysis is clustering scholars based on the similarities of co-citation patterns. These clusters manifest major schools of thought underpinning the intellectual structure in the research field (Hallinger & Kovačević, 2019). Six distinctive schools of thought emerged from the analysis: Children Development (red cluster), Economic and Policy Analysis (green cluster), Psychological Processes (yellow cluster), and Social Context of Schools (blue cluster), Schooling Process (purple cluster), and School Discipline (orange cluster).

The first cluster centers on child development and its relationship to the achievement gap. This cluster consists of 176 scholars, including key scholars such as Greg Duncan, Jeanne

Brooks-Gunn, Katherine Magnuson, George Farkas, Jane Waldfogel, and Robert C. Pianta. These scholars are dedicated to improving the lives and opportunities of children, delving into various aspects of child development, including cognitive, social, emotional, and other dimensions. This school of thought emphasizes the importance of the early years of a child's life, family dynamics, and child development programs to strengthen school readiness and eliminate the achievement gap (e.g., Brooks-Gunn & Markman, 2005; Duncan & Magnuson, 2005; Duncan & Sojourner, 2013; Magnuson et al., 2004).

The school of "Economic and Policy Analysis," led by Sean Reardon, Eric A. Hanushek, Roland G. Fryer Jr., Meredith Phillips, James Heckman, Steven D. Levitt, Christopher Jencks, Larry Hedges, and Helen F. Ladd, includes 163 scholars, primarily from the field of education economics and policy. Adopting a macro-level policy perspective and primarily employing econometric analysis, scholars in this cluster focus on analyzing the trends, causes, and economic consequences of educational and social inequalities (e.g., Fryer & Levitt, 2004; Hanushek et al., 2022; Reardon, 2011; Reardon & Galindo, 2009). In addition, they investigate issues including unequal distribution of resources such as teacher quality and school funding, along with the impact of policy choices on achievement gaps such as accountability, school choice, and school segregation (e.g., Bifulco & Ladd, 2007; Hanushek & Raymond, 2005; Reardon et al., 2016).

The blue cluster in the middle of the diagram is comprised of 156 scholars who investigate achievement gaps from sociological and structural perspectives. The representative scholars are Karl L. Alexander, James Samuel Coleman, Doris R. Entwisle, Stephen Raudenbush, Anthony Bryk, Adam Gamoran, Doug Downey. Researchers in this cluster investigate how social capital, social stratification, and cultural reproduction contribute to educational disparities. A classic research question for this cluster is the role of schooling in

shaping educational trajectories and achievement gaps. Does school matter for inequalities in educational outcomes? If so, are schools equalizers or amplifiers? The Coleman Report documented large achievement gaps between white and black students and suggested that schools play a minor role in explaining these gaps when compared to family background factors (Coleman et al., 1966). Other scholars, through seasonal studies, have attempted to address this question by comparing changes of achievement gaps during summer vacation and the school year. They have found that achievement gaps primarily emerge during the summer months, implying that schools serve as important equalizers (Alexander et al., 2001; Alexander et al., 2007; Downey et al., 2004; Downey & Condron, 2016).

The yellow cluster on the right side of the map consists of 137 scholars who study "Psychological Dynamics" underlying achievement gaps. This cluster is represented by Claude Steele, Geoffrey Cohen, Joshua Aronson, Gregory M. Walton, Julio Garcia, Jacquelynne Eccles, and Carol Dweck. These scholars have contributed significantly to understanding the impacts of psychological factors on gender and racial disparities in educational achievement, including stereotype threats (Good, Aronson, & Inzlicht, 2003; Steele & Aronson, 1995; Steele, 1997), sense of belonging (Walton & Cohen, 2011), self-perceptions and affirmations (Cohen et al., 2006, 2009; Miyake et al., 2010), mindsets (Claro et al., 2016). Their findings suggested that a well-designed psychological intervention can help students overcome psychological obstacles to academic success (Spitzer & Aronson, 2015; Yeager & Walton, 2011).

The core school of thought of the purple cluster located in the top middle of the map revolves around "Schooling Process." This group is composed of 106 scholars who explore the attitudes, life experiences, and cultures of children and families in marginalized communities in order to understand educational disparities. For example, despite facing extensive criticisms,

John Ogbu proposed the theory of the "oppositional culture" and "acting white" to explain black academic underperformance (Ogbu, 2004). In addition, scholars of this school advance our understanding of how various aspects of school process, such as teacher expectations (Ferguson, 2003), teacher preparation and learning (Darling-Hammond, 2008), pedagogy and curriculum (Banks, 1993; Ladson-Billings, 1995), tracking systems (Oakes, 2005) as sources of the gap. Collectively, these scholars advocate for dismantling structural barriers within the school system and creating inclusive, diverse, and culturally responsive schools.

The orange cluster located at upper right corner consists of 48 scholars associated with "School Discipline." Different from scholars in other schools focusing on test score disparities, these scholars, including Russell J. Skiba, Anne Gregory, Rhona S. Weinstein, Catherine P. Bradshaw, center their work on how certain groups of students, particularly black students face disproportionately higher rates of disciplinary sanctions (e.g., Gregory & Weinstein, 2008; Skiba et al., 2002, 2011). They examine the effects of behavior interventions and explore discipline practices in order to address this discipline gap, which contributes to lagging academic achievement experienced by students of color (e.g., Bradshaw et al., 2010; Skiba et al., 1997).

The spatial proximity of author nodes and clusters suggests the degree of thematic or intellectual connection. It can be observed that four clusters (i.e., Economic and Policy Analysis, Social Context of Schools, Children Development, and Schooling Process) are densely connected to each other, and with some overlaps, but the other two schools, Psychological Dynamics as well as School Discipline, are obviously distanced from the other four schools, displaying weaker connections. On the one hand, this pattern suggests that these two schools of thought provide intellectually unique perspectives on understanding achievement gaps. On the other hand, it indicates a lack of intellectual exchanges, wherein knowledge and wisdom

generated from these two specialized communities are not well disseminated to the broad network and vice versa.

Likewise, authors who are near each other share common research foci. This principle of proximity holds within each cluster. For instance, in the red cluster, scholars such as Greg Duncan, Jeanne Brooks-Gunn, and Katherine Magnuson have stronger similarities with scholars located at the lower end of the cluster such as Holly K. Craig and Carol M. Connor. It is also noticeable that although scholars such as Sean Reardon and Karl L. Alexander are categorized into different clusters, their nodes are closely connected and physically positioned at the boundaries of multiple clusters (also the heart of the overall diagram). This positioning indicates their multifaceted research interests and their role as hubs across clusters. In contrast, economist Eric A. Hanushek, as impactful as Sean Reardon, is centered within the cluster of Economic and Policy Analysis, signifying his more specialized intellectual focus and expertise, as well as his core role within the cluster.

Furthermore, some scholars emerge as crucial connections that bridge otherwise disconnected clusters. For example, Jacquelynne Eccles is associated with the Psychological Dynamics cluster but located at the boundary of the cluster, indicating their role as "boundary spanners" and "bridge builders" (Long et al., 2013). Similarly, despite being part of the School Discipline cluster, Rhona S. Weinstein's position at the boundary of the cluster sets her apart from other scholars within the same cluster. This positioning reflects her research interests and expertise in both school discipline (e.g., Gregory & Weinstein, 2008) and psychological dynamics (e.g., McKown & Weinstein, 2008).

Topical Trend in the Achievement Gap Literature

We also analyzed the co-occurrence of author-defined key words to uncover the underlying topic foci within the achievement gap scholarship. Key word co-occurrences serve as an indicator of the degree of shared conceptual relationships. The higher frequency of two or more words appears together within a given document suggests stronger interconnectedness and semantic relationships between the terms (Ding et al., 2001; Zupic and Čater, 2015). The initial analysis has yielded 2,529 co-occurring key words that have co-occurred at least co-occurred once. To concentrate on the most frequently co-occurring key words, further analyses were conducted on those having at least five cases of co-occurrence. A key word thesaurus file was also created with the aim of eliminating unnecessary redundancies, such as consolidating singular and plural forms of words (e.g., achievement gap and achievement gaps).

Figure 4 visualizes the frequencies of the 155 most popular co-occurring key words and their connections. The node size represents the frequencies of co-occurrence, and a sequential color palette was applied to show the temporal changes of terms. Terms with a lighter yellow color are more prevalent in recent years. The 20 most frequently used key words by the authors were achievement gap (357 times), academic achievement (79 times), race (64 times), achievement (61 times), education (61 times), socioeconomic status (55 times), gender (46 times), equity (45 times), educational inequality (39 times), stereotype threat (36 times), PISA (34 times), mathematics (29 times), ethnicity (29 times), poverty (26 times), educational policy (24 times), urban education (21 times), inequality (21 times), reading achievement (20 times), student achievement (20 times), and social class (19 times).

As shown in Table 6, those 155 keywords can be classified into six main categories: achievement gaps and equity, academic achievement, social identities, education, theories and factors, and methodology. The first group of keywords are the variations of terms that were used

to refer to the issue of achievement gap. Some terms indicate merely differences and disproportionality (e.g., gaps and disparities), but other terms take steps further by emphasize broader issues of imbalanced educational and social systems (e.g., educational inequality, social justice, equity, opportunity gap). The second category includes a set of terms pertaining to student achievement and specific subjects, especially STEM outcomes. The third category is composed of terms related to social identities. This category, which predominantly represents race, class, and gender terms, also incorporates terms of language and immigration. Terms such as identity and intersectionality reflect a trend in research which considers how race, gender, class, and language operate as reciprocally operating phenomena (Collins, 2015) and how the intersection of these identities emphasizes complex social inequalities.

The next cluster encompasses terms associated with education, including the educational system and process, educational policy and reform, education level, and school discipline. This marks one main task within the field, examining questions such as how achievement gaps are present across different levels of education, and how school structures and systems (e.g., urban education, charter schools, tracking), policy (e.g., accountability, No Child Left Behind, school segregation), and process (e.g., teacher expectation, school climate, parent involvement, leadership, active learning) contribute to academic as well as behavior outcomes. The fifth category of high probability keywords are the sociocultural and psychological theories and concepts that researchers draw upon to consider and explain the existence of the achievement gap such as critical race theory, cultural capital, cultural responsiveness, oppositional culture, as well as stereotype threat, self-efficacy, self-regulation, self-affirmation, and resilience. The last category of keywords consists of high frequency terms in research methods, such as intervention, longitudinal studies, regression analyses, descriptive analysis, hierarchical linear modeling,

meta-analysis, as well as terms related to data set, including Programme for International Student Assessment (PISA), Trends in International Mathematics and Science Study (TIMSS), National Association of Educational Procurement (NAEP).

Turning into a temporal view of those keywords, the patterns revealed in Figure 4 suggested that keywords such as accountability, No Child Left Behind, school reform, gender/sex differences appeared more frequently in early studies. However, the latest topical trend emerging within the literature centers on social justice, school discipline and suspension, opportunity gap, executive function, active learning, and Covid-19.

Discussion

This study provides for the first time a bibliometric review of literature on achievement gaps from 1934 to 2023. The strengths of this study include the following. First, this study traces the understanding of achievement gaps scholarship from temporal and geographical perspectives. Second, this study identifies influential readings, scholars, and sources across various disciplines on the topic, promoting interdisciplinary understanding and thinking. Third, this study unpacks the evolutionary nuances of the intellectual structures, underlying topics, and emerging trends in the field. In this section, we discussed the major findings as well as their implications.

Summary and Interpretation of Major Findings

Temporal trends. Our study found that the achievement gap scholarship has a long history that developed in four stages (i.e., pre-1960, 1960-1999, 2000-2010, and post-2010). With the increase during 1960-1999 and a surge post-2000, AG remains a hot research topic. This trend is likely associated with significant political, legal, and social changes as well as policy development, particularly in the United States. In the 1960s, the passage of The Elementary and Secondary Education Act (ESEA) gave birth to compensatory education and

increased the role of federal and state governments in ensuring equal educational opportunities for all (Thomas & Brady, 2005). The Coleman Report released in 1966 discussed, for the first time, the achievement gaps across racial and socioeconomic lines and claimed that achievement gaps arose largely from families rather than schools (Coleman et al., 1966). As foundational, evidence-based research for understanding achievement gaps, the legacy of Coleman Report remains influential in educational research and policy (Hanushek, 2016). The surges of achievement gap research in the early 2000s coincided with the enactment of the No Child Left Behind Act of 2001 (NCLB). NCLB was the first legislation that required states to ensure test-based accountability for raising educational achievement as well as closing the racial achievement gap (Fusarelli, 2004; Shaul & Ganson, 2005). The second significant increase in AG scholarship was witnessed around 2010 when the federal testing and accountability policies continued under Obama administration, despite providing more flexibility to states. The recently passed bill Every Student Success Act, which replaced NCLB in 2015 once again emphasized the goal of providing equal and high-quality education for all students, highlighting the closure of achievement and opportunity gaps. In addition to the direct impact of policies on research, the availability of datasets and advances in research methodologies have also contributed to the growth of research. For example, international assessments including PISA and TIMSS offer opportunities to compare achievement gaps worldwide, and longitudinal datasets such as Early Childhood Longitudinal Studies (ECLS) allow researchers to trace how achievement gaps have changed over time across different student cohorts and schooling years (e.g., Morgan et al., 2016; Quinn & Cooc, 2015).

Geographic distribution. Based on the number of studies and citations, achievement gap scholarship has been produced predominantly by researchers in Western industrialized countries,

particularly those in the US and UK. However, this pattern might be due to the research capacity and access to publishing for scholars in the Western industrialized world and does not necessarily mean the AG issue is not as prevalent and severe as in non-Western countries. The achievement gap between different groups of students has in fact been a global issue, and each country has unique foci and priorities related to achievement gaps. For example, racial/ethnic achievement gap might be the most pressing in the US, but the achievement gap between urban and rural schools, as well as between developed and undeveloped areas, might be more of the focus in China.

Problem domain. The achievement gap is a complex issue. Our review of the literature suggests that achievement gap scholarships have mainly focused on three questions: (a) "What are (have been) the achievement gaps?," (b) "Why are there achievement gaps?," and (c) "How should achievement gaps be addressed?" The documentation citation analysis highlighted articles that received the most citations are those that predominantly examined the sizes and causes of achievement gaps or examined the effects of an intervention program. The temporal analyses of key words indicated that the AG research field is evolving with a more recent focus on disciplinary and opportunity gaps and factors that are more amenable to policy interventions. In other words, the research in AG moves from a more deterministic perspective to a more opportunistic perspective.

School of Thought. The citation analysis of journal sources and authors indicates that achievement gap is an important topic not only in education but also in sociology, psychology, economics, political science, and other disciplines. With co-citation analysis, we empirically identified six schools of thought that comprise the intellectual structures of AG research: Child Development, Economic Analysis, Social Contexts of Schools, Schooling Process, School

Discipline, and Psychological Dynamics. This suggests AG studies delve into different dimensions of achievement gaps from various paradigms, including sociological, psychological, economic, educational, etc. These paradigms range from the macro (e.g., examining the impact of economic and social factors on achievement gaps) to the micro levels (e.g., examining how a student's development and psychological mechanism influence achievement gaps). Nevertheless, there appears to be a deep disciplinary influence of economics on achievement gap research, as most top co-cited scholars have a background or interest in economics. Furthermore, our findings suggest a fragmented and divided nature across schools of thought and disciplines. For example, the clusters of School Discipline and Psychological Dynamics are weakly connected with other clusters. These findings have implications for interdisciplinary work in achievement gap scholarship.

Methodology. Aligning with the dominance of the economic paradigm, achievement gap research has been predominantly quantitative. The results of article citation and co-citation analyses showed that 14 of the 20 top-cited and 16 of the 20 top co-cited articles were quantitative studies. It appears that impactful theoretical and qualitative work could be a growth area for the field. The keyword co-occurrence analyses also demonstrated the divergence of quantitative research methods, including regression analysis and hierarchical linear models, as well as econometric analysis and experiment studies. Experimental studies are found predominantly in those psychology papers.

Implications

The findings from this study have several implications. First, through bibliometric analysis, we have identified some "canonical texts or authors" in the field across diverse disciplines that feature the highest level of citations. Our study helps identify relevant literature

and scholarly communities that may be overlooked in standard disciplinary-oriented literature searching approaches. This provides future scholars with an opportunity to quickly grasp who the experts are on the topic of achievement gap (in their own or different disciplines), what has been researched in the past, and what requires further exploration. It should be noted that an article with the highest citation does not necessarily guarantee the accuracy of its explanations or the superiority of its lens of knowing, nor does it constrain the path for future inquiry. It might also indicate the contradictions, controversies, and criticisms that these studies have introduced and confronted within the field (Wang, 2023). Nevertheless, understanding, questioning, critiquing, re-thinking, and advancing beyond explanations and perspectives of previous research is the way knowledge accumulates and evolves.

The second implication relates to intellectual structure and conceptual space. The disconnected nature of achievement gap scholarship suggests a need for engaging in an inter-paradigm and interdisciplinary understanding of achievement gap (Artiles, 2011; Warren et al., 2020). Engaging in an interdisciplinary approach requires us to keep three ideas in mind. The first idea centers on acknowledging the heterogeneity and multiplicity of knowledge and ways of knowing. The achievement gap is a complex issue that requires an integration of all paradigms as well as a whole and systematic approach that reconciles diverse perspectives from different disciplines (Jeynes, 2015; Darling-Hammond, 2013). This includes not only the economic, psychological, social, educational, and other paradigms illustrated in this study, but historical, philosophical, and anthropological perspectives that did not emerge as primary clusters in our findings. Second, we as the field must have a critical stance towards existing paradigms and be aware of the dangers of over-reliance on a specific paradigm, such as the economic paradigm, as it not only results in the neglect of other possible explanations and an inadequate representation

of the issue (Jabbar & Menashy, 2021), but also constrains the lens through which practitioners and policymakers approach educational issues, which in turn leaves the core roots untouched. Third, an interdisciplinary approach requires ongoing and deep dialogue across disciplines, such as psychological and socio-economic paradigms, to facilitate knowledge communication and transfer between disciplines, bridge segregated communities, and expedite knowledge integration. Simultaneously, researchers from different fields should seek to embrace ideas and advances from other disciplines for a comprehensive rethinking and investigation of the issue (Artiles, 2011; Potter et al., 2013; Trujillo & Long, 2018). A research and intervention program aimed at educational equity will also benefit from involving scholars from different disciplines.

The third implication is that researchers should connect more with the practice by paying more attention to tackling the inequalities perpetuated in the school process and identifying the strategies and approaches that educational practitioners can implement in their schools. Current achievement gap research largely either focuses on the micro level through a psychological approach studying how a student's thoughts, feelings, and behaviors, that were influenced by other people or groups (by their beliefs and behaviors, such as bias, stereotypes, discrimination, expectations), contribute to achievement gaps, or is grounded in a distributive paradigm, prioritizing macro-level policies that ensure proper distribution of resources and services (e.g., school funding and access to quality teachers). However, both these two approaches tend not to have direct implications for schools' daily practices. The micro approach that focuses on interventions to remedy "broken" students attributes all problems to the individual. The macro approach that attributes the problem to social and political forces, which leads to an illusion that there is nothing much the administrators, teachers, and community members can do (Carey, 2014).

We need to move toward a third approach that all educational researchers, policymakers, practitioners, as well as the public reflect "own role in creating and replicating problems" (Carey, 2014, p. 452). This approach requires us to unpack the schooling process by considering how inequalities perpetuate in the schooling process including school policies, curriculum, instruction, leadership, assessments, school climates, as well as the interactions among teachers and students (Wu et al., 2021), and how changes in those conditions would lead to different outcomes. Experimental studies on the whole school and neighborhood transformation would help answer some of these questions.

In addition, "Large-scale social change requires broad cross-sector coordination" (Kania & Kramer, 2011, p. 36). As some psychologists suggested, social-psychological intervention can only be effective when delivered in accordance with the school context and used in conjunction with leadership efforts that unravel opportunity gaps within school systems and promote real positive organizational changes (Bryan et al., 2021; Yeager & Walton, 2011). The third approach requires moving beyond "isolated impact" model to involving all stakeholders, including school principals, teachers, school counselors, parents, policymakers, and researchers, from different disciplines working together to understand the nuances of the context and make collective impacts.

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Table 1

Distribution of literature by First Author's Countries/Regions

	Rank by Documents		Rank by Citations	
	Countries/Regions	Docs	Countries/Regions	Cites
1	United States	1,130	United States	53,477
2	United Kingdom	105	United Kingdom	2,286
3	Germany	41	Netherlands	1,143
4	Canada	37	Germany	913
5	Australia	26	Canada	809
6	China	20	Australia	633
7	Belgium	18	Belgium	488
8	Netherlands	15	New Zealand	475
9	New Zealand	15	Israel	473
10	Israel	15	China	285
11	Sweden	11	Norway	280
12	South Korea	11	France	259
13	Norway	10	Switzerland	220
14	Turkey	9	Italy	123
15	Ireland	9	Sweden	100
16	Hong Kong SAR	8	South Africa	93
17	Switzerland	7	Hungary	90
18	Denmark	7	Denmark	89
19	Colombia	7	Taiwan	87
20	Spain	7	Hong Kong SAR	86

Table 2

Most Highly Cited Papers.

Rank	Document	Focus	Methods	Source	Scopus Cites
1	Walton, G. M., & Cohen, G. L. (2011). A brief social-belonging intervention improves academic and health outcomes of minority students.	Intervention and program	Quant	*Science*	1,098
2	Reardon, S. F. (2011). The widening academic achievement gap between the rich and the poor: New evidence and possible explanations.	Sizes and explanations	Quant	*Whither Opportunity? Rising Inequality, Schools, and Children's Life Chances*	1,066
3	Anderson, M. L. (2008). Multiple inference and gender differences in the effects of early intervention: A reevaluation of the Abecedarian, Perry Preschool, and Early Training Projects.	Intervention and program	Quant	*Journal of the American Statistical Association*	893
4	Yeager, D. S., & Walton, G. M. (2011). Social-psychological interventions in education: They're not magic.	Intervention and program	Review	*Review of Educational Research*	888
5	Kao, G., & Thompson, J. S. (2003). Racial and ethnic stratification in educational achievement and attainment.	Sizes and explanations	Review	*Annual Review of Sociology*	830
6	Gregory, A., Skiba, R. J., & Noguera, P. A. (2010). The achievement gap and the discipline gap: Two sides of the same coin?	Discipline gap; Sizes and explanations	Review	*Educational Researcher*	791
7	Cohen, G. L., Garcia, J., Apfel, N., & Master, A. (2006). Reducing the racial achievement gap: A social-psychological intervention.	Intervention and program	Quant	*Science*	750
8	Stephens, N. M., Fryberg, S. A., Markus, H. R., Johnson, C. S., & Covarrubias, R. (2012). Unseen disadvantage: how American universities' focus on independence undermines the academic performance of first-generation college students.	Sizes and explanations	Quant	*Journal of Personality and Social Psychology*	663
9	Hoff, E. (2013). Interpreting the early language trajectories of children from low-SES and language minority homes: implications for closing achievement gaps.	Sizes and explanations	Review	*Developmental Psychology*	629
10	Nosek, B. A., Smyth, F. L., Sriram, N., Lindner, N. M., Devos, T., Ayala, A., ... & Greenwald, A. G. (2009). National differences in gender–science stereotypes predict national sex differences in science and math achievement.	Sizes and explanations	Quant	*Proceedings of the National Academy of Sciences of the United States of America*	620
11	Haak, D. C., HilleRisLambers, J., Pitre, E., & Freeman, S. (2011). Increased	Intervention and program	Quant	*Science*	607

	structure and active learning reduce the achievement gap in introductory biology.				
12	Fryer Jr, R. G., & Levitt, S. D. (2004). Understanding the black-white test score gap in the first two years of school.	Sizes and explanations	Quant	*Review of Economics and Statistics*	565
13	Cohen, G. L., Garcia, J., Purdie-Vaughns, V., Apfel, N., & Brzustoski, P. (2009). Recursive processes in self-affirmation: Intervening to close the minority achievement gap.	Intervention and program	Quant	*Science*	546
14	Theobald, E. J., Hill, M. J., Tran, E., Agrawal, S., Arroyo, E. N., Behling, S., ... & Freeman, S. (2020). Active learning narrows achievement gaps for underrepresented students in undergraduate science, technology, engineering, and math.	Intervention and program	Review (Meta-analysis)	*Proceedings of the National Academy of Sciences of the United States of America*	531
15	Miyake, A., Kost-Smith, L. E., Finkelstein, N. D., Pollock, S. J., Cohen, G. L., & Ito, T. A. (2010). Reducing the gender achievement gap in college science: A classroom study of values affirmation.	Intervention and program	Quant	*Science*	481
16	Van de Werfhorst, H. G., & Mijs, J. J. (2010). Achievement inequality and the institutional structure of educational systems: A comparative perspective.	Sizes and explanations	Review	*Annual Review of Sociology*	441
17	Parsons, J. E., Adler, T., & Meece, J. L. (1984). Sex differences in achievement: A test of alternate theories.	Sizes and explanations	Quant	*Journal of Personality and Social Psychology*	434
18	Alexander, K. L., Entwisle, D. R., & Olson, L. S. (2007). Lasting consequences of the summer learning gap.	Sizes and explanations	Quant	*American Sociological Review*	400
19	Hanushek, E. A., & Raymond, M. E. (2005). Does school accountability lead to improved student performance?	Sizes and explanations	Quant	*Journal of Policy Analysis and Management*	393
20	Benbow, C. P. (1988). Sex differences in mathematical reasoning ability in intellectually talented preadolescents: Their nature, effects, and possible causes.	Sizes and explanations	Quant	*Behavioral and Brain Sciences*	392

Table 3

Most Highly Co-Cited Paper

	Document	Methods	Source	Co-cites
1	Sirin, S. R. (2005). Socioeconomic status and academic achievement: A meta-analytic review of research	Review	*Review of Educational Research*	63
2	Ladson-Billings, G. (2006). From the achievement gap to the education debt: Understanding achievement in US schools.	Conceptual	*Educational Researcher*	45
3	Fryer Jr, R. G., & Levitt, S. D. (2004). Understanding the black-white test score gap in the first two years of school	Quant	*Review of Economics and Statistics*	43
4	Lee, J. (2002). Racial and ethnic achievement gap trends: Reversing the progress toward equity?	Quant	*Educational Researcher*	43
5	Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans	Quant	*Journal of Personality and Social Psychology*	43
6	Steele, C. M. (1997). A threat in the air: How stereotypes shape intellectual identity and performance	Quant	*American Psychologist*	42
7	Reardon, S. F., & Galindo, C. (2009). The Hispanic-White achievement gap in math and reading in the elementary grades	Quant	*American Educational Research Journal*	39
8	Jencks, C., & Phillips, M. (Eds.). (1998). The Black-White test score gap	Quant	Book	36
9	Downey, D. B., Von Hippel, P. T., & Broh, B. A. (2004). Are schools the great equalizer? Cognitive inequality during the summer months and the school year	Quant	*American Sociological Review*	34
10	Cohen, G. L., Garcia, J., Apfel, N., & Master, A. (2006). Reducing the racial achievement gap: A social-psychological intervention.	Quant	*Science*	29
11	Gregory, A., Skiba, R. J., & Noguera, P. A. (2010). The achievement gap and the discipline gap: Two sides of the same coin?	Review	*Educational Researcher*	28
12	Kao, G., & Thompson, J. S. (2003). Racial and ethnic stratification in educational achievement and attainment.	Review	*Annual Review of Sociology*	27
13	Fryer Jr, R. G., & Levitt, S. D. (2006). The black-white test score gap through third grade	Quant	*American law and economics review*	26
14	Hedges, L. V., & Nowell, A. (1999). Changes in the black-white gap in achievement test scores	Quant	*Sociology of Education*	26
15	Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement.	Quant	*Econometrica*	26
16	Alexander, K. L., Entwisle, D. R., & Olson, L. S. (2007). Lasting consequences of the summer learning gap.	Quant	*American Sociological Review*	25
17	Lankford, H., Loeb, S., & Wyckoff, J. (2002). Teacher sorting and the plight of urban schools: A descriptive analysis.	Quant	*Educational Evaluation and Policy Analysis*	25

18	Oakes, J. (2005). Keeping track: How schools structure inequality.	Conceptual	*Book*	25
19	White, K. R. (1982). The relation between socioeconomic status and academic achievement	Quant	*Psychological Bulletin*	23
20	Heckman, J. J. (2006). Skill formation and the economics of investing in disadvantaged children	Review	*Science*	22
21	Lee, V. E., & Burkam, D. T. (2002). Inequality at the starting gate: Social background differences in achievement as children begin school.	Quant	*Book*	22
22	Walton, G. M., & Cohen, G. L. (2007). A question of belonging: race, social fit, and achievement	Quant	*Journal of Personality and Social Psychology*	22

Note. Co-citation analysis was conducted by setting a threshold of at least five co-citations.

Table 4

Top Cited Scholars

Rank	Author	Nation	Institution	Docs	Cites	TLS
1	Cohen, G.L.	US	Stanford University	11	3,456	88
2	Walton, G.M.	US	Stanford University	5	2,559	48
3	Reardon, S.F.	US	Stanford University	15	2,488	46
4	Gregory, A.	US	Rutgers University	8	1,547	11
5	Fryer, Jr. R.G.	US	Harvard University	5	1,393	14
6	Ladd, H.F.	US	Duke University	9	1,110	28
7	Stephens, N.M.	US	Northwestern University	5	1,104	35
8	Noguera, P.A.	US	University of South California	5	913	12
9	Lee, J.	US	University at Buffalo	13	747	8
10	Hanushek, E.A.	US	Stanford University	5	673	16
11	Duncan, G.J.	US	University of California, Irvine	7	657	15
12	Kieffer, M.J.	US	New York University	5	568	2
13	Vigdor, J.L.	US	University of Washington	6	541	18
14	Lubienski, S.T.	US	Indiana University	6	521	13
15	Borman, G.D.	US	Arizona State University	8	478	60
16	Strand, S.	UK	University of Oxford	6	455	5
17	Quinn, D.M.	US	University of Minnesota	11	402	31
19	Darnon, C.	France	Clermont Auvergne University	7	336	7
18	Farkas, G.	US	University of California, Irvine	5	330	10
20	Downey, D.B.	US	Ohio State University	7	318	28

Table 5

Top Co-cited Scholars

Rank	Author	Institution	School of Thought	Co- Cites	TLS
1	Reardon, S.F.	Stanford University	Economics and Policy Analysis	648	38,534
2	Hanushek, E.A.	Stanford University	Economics and Policy Analysis	609	32,091
3	Duncan, G.J.	University of California, Irvine	Child Development	590	40,619
4	Steele, C.M.	Stanford University	Psychology Dynamics	512	32,639
5	Brooks-Gunn, J.	Columbia University	Child Development	431	27,567
6	Cohen, G.L.	Stanford University	Psychology Dynamics	428	37,305
7	Ogbu, J.		Schooling Process	357	18,893
8	Coleman, J. S.		Social Context of Schools	347	16,381
9	Raudenbush, S. W.	University of Chicago	Social Context of Schools	340	18,107
10	Aronson, J.	New York University	Psychology Dynamics	339	23,520
11	Alexander, K. L.	John Hopkins University	Social Context of Schools	333	20,803
12	Fryer, Jr. R.G.	Harvard University	Economics and Policy Analysis	330	18,134
13	Bryk, A. S.	Carnegie	Social Context of Schools	328	15,190
14	Phillips, M.	University of California, Los Angeles	Economics and Policy Analysis	318	17,262
15	Heckman, J.J.	University of Chicago	Economics and Policy Analysis	308	16,408
16	Eccles, J.S.	University of California, Irvine	Economics and Policy Analysis	307	17,428
17	Magnuson, K. A.	University of Wisconsin- Madison	Child Development	306	23,020
18	Entwisle, D. R.		Social Context of Schools	296	18,600
19	Levitt, S.D.	University of Chicago	Economics and Policy Analysis	280	14,776
20	Jencks, C.		Economics and Policy Analysis	274	14,417

Table 6

The Most Influential Journals for Achievement Gap Research by Publications and Citations

	Ranked by Publications				Ranked by Total Citations			
Rank	Source	Docs	Cites	TLS	Source	Docs	Cites	TLS
1	*Educational Researcher*	41	3,054	191	*Science*	5	3,482	88
2	*Teachers College Record*	30	697	61	*Educational Researcher*	41	3,054	191
3	*Economics of Education Review*	28	1,198	61	*American Educational Research Journal*	20	2,180	127
4	*Education and Urban Society*	28	473	85	*Proceedings of The National Academy of Sciences of The United States of America*	5	1,840	26
5	*Journal of Educational Psychology*	24	1,628	108	*Journal Of Personality and Social Psychology*	7	1,823	59
6	*American Educational Research Journal*	20	2,180	127	*Journal of Educational Psychology*	24	1,628	108
7	*Aera Open*	20	958	62	*Review of Educational Research*	7	1,622	48
8	*Phi Delta Kappan*	20	573	19	*Sociology of Education*	19	1,363	109
9	*No Child Left Behind and The Reduction of The Achievement Gap: Sociological Perspectives on Federal Educational Policy*[1]	20	71	0	*American Sociological Review*	7	1,331	65
10	*Sociology of Education*	19	1,363	109	*Economics of Education Review*	28	1198	61
11	*Journal of Negro Education*	19	573	39	*Aera Open*	20	958	62
12	*Education Policy Analysis Archives*	19	259	45	*Psychological Science*	5	851	47
13	*Urban Education*	18	718	51	*Journal of Policy Analysis and Management*	5	848	32
14	*International Journal of Educational Development*	18	327	29	*Educational Evaluation and Policy Analysis*	13	830	54
15	*Journal of Educational Research*	15	559	21	*Developmental Psychology*	5	813	13
16	*Education Economics*	15	246	25	*Child Development*	11	757	48
17	*Educational Evaluation and Policy Analysis*	13	802	54	*Journal of School Psychology*	9	732	54
18	*The Achievement Gap in Reading: Complex Causes, Persistent Issues, Possible Solutions*[1]	13	32	11	*Urban Education*	19	718	51
19	*Children and Youth Services Review*	12	302	18	*Teachers College Record*	30	697	61
20	*Closing The Achievement Gap from An International Perspective: Transforming Stem for Effective Education*[1]	12	70	3	*Journal of Negro Education*	19	573	39

Note. Citations as of December 25, 2023

Table 7

Top 155 Keywords in Achievement Gap Articles by Category

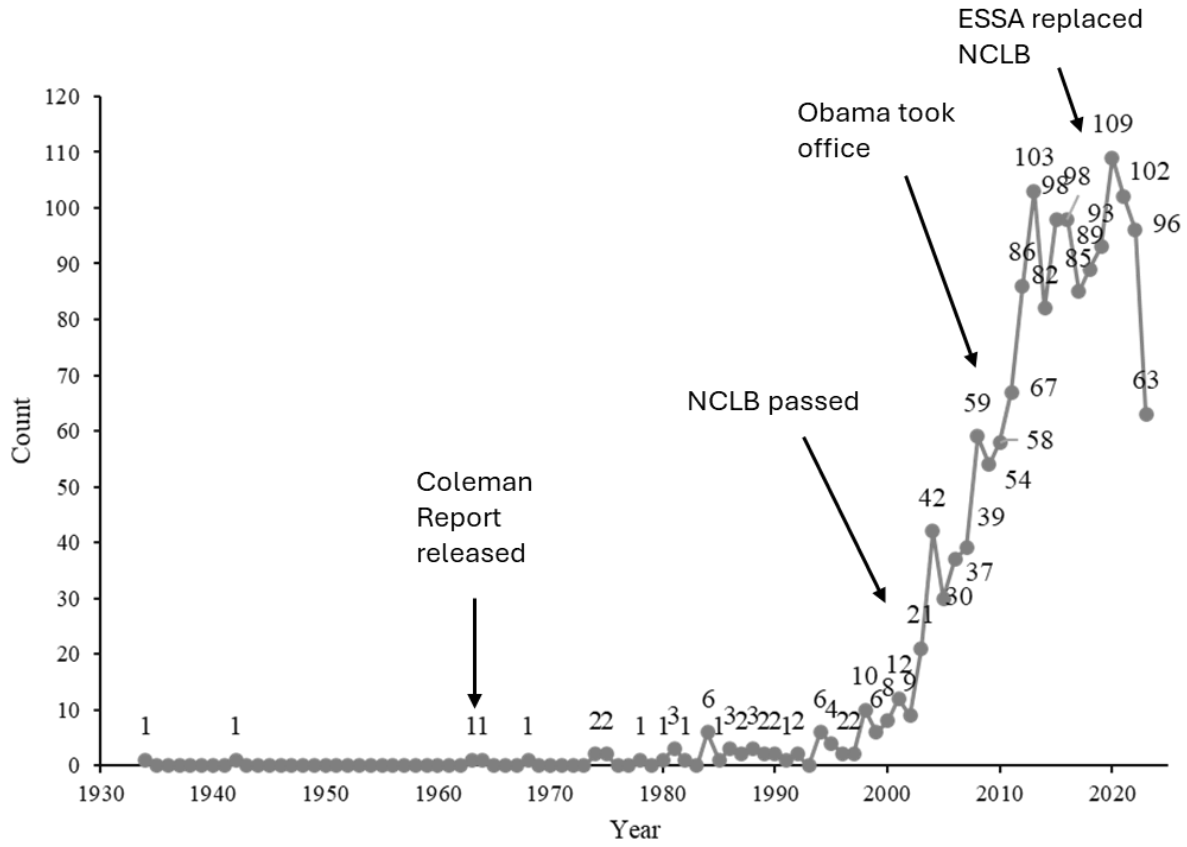
Category	Keywords opportunity gap
Achievement gaps and educational equity (15 words, 573 times)	achievement gaps 357, equity 45, educational inequality 39, inequality 21, diversity 18, attainment gap 17, social justice 12, disparities 11, disproportionality 9, educational equity 9, test score gap 9, achievement inequality 8, opportunity gap 8, academic achievement gap 5, educational disparities 5
Academic achievement (11 words, 245 times)	**General:** academic achievement 79, achievement 61, student achievement 20, educational achievement 19, test scores 14, educational attainment 13, academic performance 12, academic attainment 6, school readiness 9, attainment 7, school achievement 5 **Subject (10 words, 126 times):** reading achievement 20, mathematics 29, STEM 18, literacy 15, mathematics achievement 11, science education 9, science achievement 7, mathematics education 6, science 6, reading comprehension 5
Social identities (35 words, 487 times)	**Race (170 times):** race 64, ethnicity 29, African American 14, race/ethnicity 12, black-white test score gap 9, racial achievement gap 9, ethnic minorities 7, racial disparities 7, minorities 6, minority students 6, Asian American 5, racism 5 **Class (158 times):** socioeconomic status 55, poverty 26, social class 19, human capital 14, SES 8, income inequality 7, social 7, social inequality 6, social stratification 6, income 5, socioeconomic achievement gap 5 **Gender (87 times):** gender 46, gender gap 15, gender differences 19, sex differences 7 **Immigration and language:** immigrant students 12, immigrants 11, English language learners 9, immigration 6 **Other:** identity 12, intersectionality 8, at-risk students 9, social identity 5
Education (25 words, 251 times)	**Education system and process:** education 61, urban education 21, assessment 17, schools 14, teacher expectations 11, school choice 9, school climate 9, parental involvement 8, parenting 8, leadership 7, school effects 7, urban 6, active learning 6, learning 6, charter schools 5, special education 5, summer setback 5, school quality 5, teacher effectiveness 5, tracking 5 **Education policy and reform**: educational policy 24, No Child Left Behind 14, accountability 13, segregation 13, policy 12, education policy 9, educational reform 8, school reform 8, school segregation 5, school improvement 5 **Education level:** higher education 16, early childhood 15, preschool 8, elementary schools 7, middle school 7, secondary school 6, childhood 5, high school 5, kindergarten 5, adolescents 15, child development 8 **School discipline:** school discipline 16, discipline gap 15, suspension 9, discipline 7, exclusionary discipline 5

Theories and factors	**Social cultural factors:** critical race theory 8, culture 8, cultural capital 5, cultural responsiveness 5, oppositional culture 5, Covid-19 5 **Psychological factors:** stereotype threat 36, self-efficacy 9, self-regulation 8, self-affirmation 6, cognitive development 5, executive function 5, resilience 5, social psychology 5, working memory 5
Methodology	**Research methods:** intervention 13, longitudinal studies 13, regression analyses 13, descriptive analysis 10, hierarchical linear modeling 10, meta-analysis 10, econometric analysis 7, longitudinal 7, decomposition 6, secondary data analysis 6, correlational analysis 5, multilevel 5, quantile regression 5, quasi-experimental analysis 5, mediation 5, survey research 5 **Data and sample:** Australia 6, United States 6, international comparison 6, China 5, PISA 34, TIMSS 11, NAEP 9

Note. Numbers displayed after keywords are frequencies of co-occurrence.

Figure 1

Temporal Trends of AG Articles in the Past 90 years



Note. The publication data for 2023 is up to September.

Figure 2

The Geographical Distribution of Achievement Gap Literature

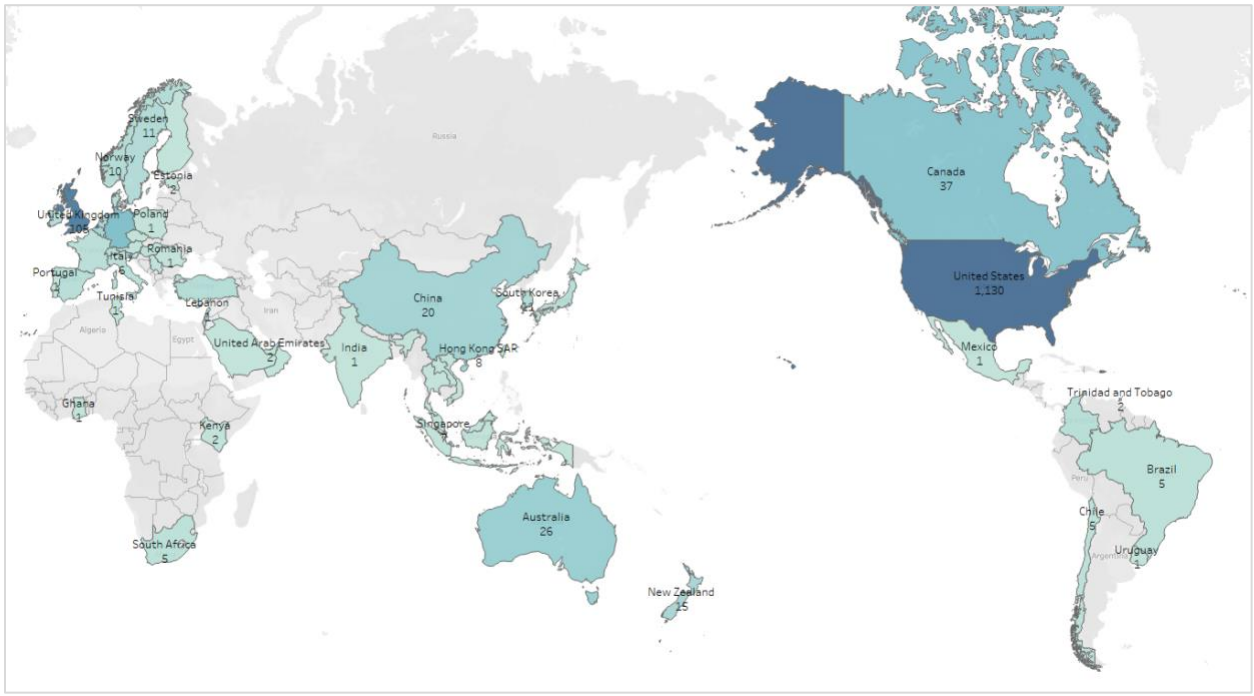
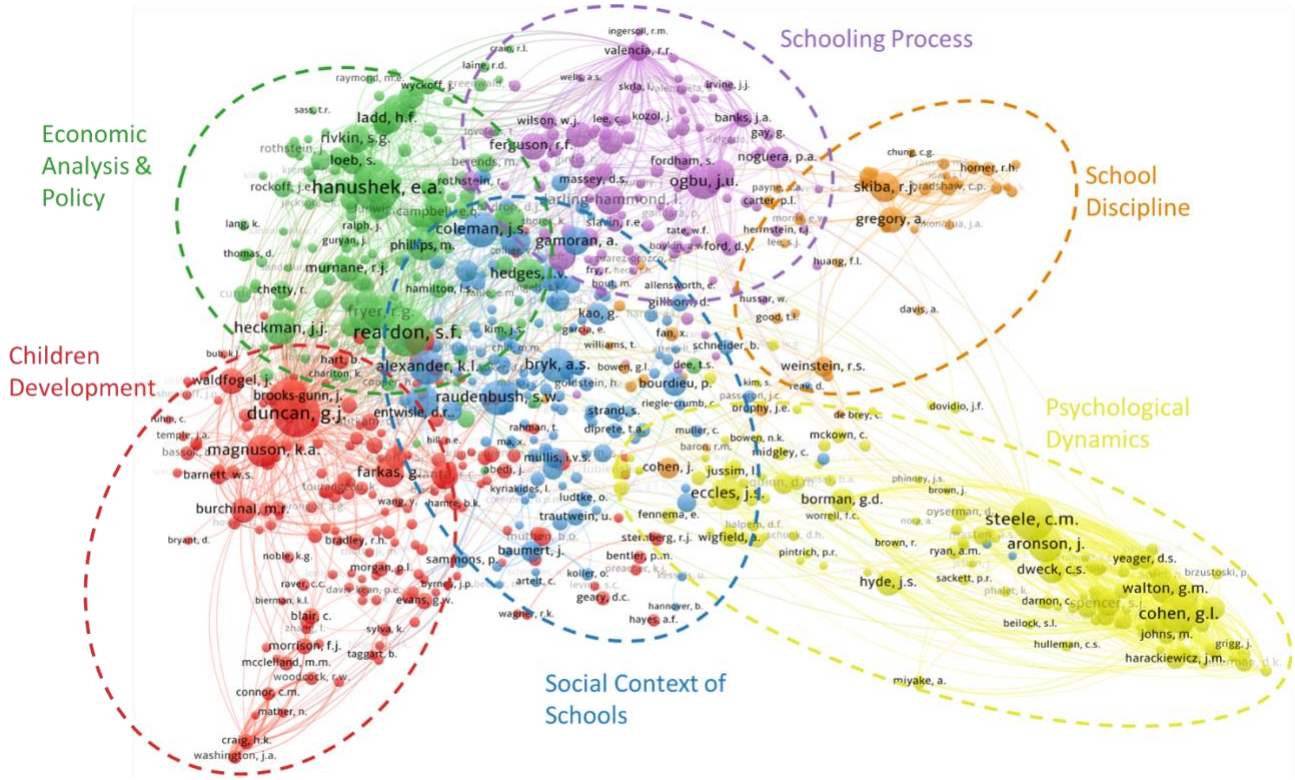


Figure 3

Author Co-Citation Map of The Achievement Gap Scholarship



Note. This map displays 786 authors who have received at least 25 citations.

Figure 4

Temporal Keyword Co-occurrence Analysis