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# Educational strategies to reduce the achievement gap: a systematic review

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Despite continuous efforts, the educational achievement gap is still, in most societies, a significant obstacle to ensuring more equity and social justice. Much of this inequality derives from belonging to historically discriminated groups. Indeed, coming from a lower socioeconomic status (SES), of an immigrant, or descendant situation, being Black, Hispanic, Gypsy, or any other racialized condition, still strongly influences academic attainment, school dropout and career choices. However, many innovative strategies and policies have been implemented to minimize this bias. This investigation proposes to gather, assess, and analyze these most recent interventions and perceive which of these present a better level of efficacy. Using the PRISMA guidelines, this Systematic Review of Literature yielded 27 studies that fit the inclusion criteria. The analysis considered the level of efficacy, intervention method and scope. Results show that targeted strategies, such as working on reading abilities and school subjects' focused interventions are more effective in improving minorities' and lower SES students' attainment. Other beneficial initiatives include whole-school, state and community-based projects, innovative pedagogies, and, finally, programs that deal with the psycho-social consequences of racism and discrimination, e.g., the internalization of negative perceptions and expectations. Overall, there is a strong need to develop mixed-method and longitudinal designs that will further our knowledge about what type of measure works, while considering a situated and contextual perspective, instead of a one-size-fits-all approach.

## KEYWORDS

systematic review, educational gap, intervention, socioeconomic, minorities, immigrants

## 1. Introduction

Extensive research has, time and again, confirmed the existence of continuous and widespread school achievement gaps between groups (Dietrichson et al., 2017; Furgione et al., 2018; OECD, 2020). Since the Coleman Report (Coleman et al., 1966), there has been critical awareness that schools, despite attempting to promote equality, partially replicate many inequalities arising in societies. Currently, however, social and economic placement in the social structure cannot be considered the only variable that conditions access to and performance in education. In some cases, the racialized condition, for instance, can be a more powerful disadvantage, toward the struggle for equity, within the same economic and social strata. Indeed, belonging to a low socioeconomic level, just like being born to a minority group, being an immigrant or of immigrant descent, may, among other factors, become a predictor of lower educational achievement and higher school dropout (Sirin, 2005; Gonçalves and França, 2008; Coimbra and Fontaine, 2015; García and Weiss, 2017; Burger, 2019). These intricate roots make it more challenging to evaluate the foundations of inequalities and generate a sustainable change to this phenomenon.

## 2. The socioeconomic achievement gap

Historically, groups in disadvantaged economic layers tend to display, on average, a lower academic achievement than their upper level counterparts. “In both the United States and England, for example, it is estimated that the attainment of high-school students from low-income households lags behind that of their counterparts from higher-income households by the equivalent of more than two and a half years of schooling” (Easterbrook and Hadden, 2021, p. 181). Some even contend that the gap has been increasing (Michelmores and Dynarski, 2017). These authors analyzed children and youngsters living in a permanent poverty situation, i.e., students continuously on subsidized school meals, from kindergarten to the 8th grade. They concluded that “These persistently disadvantaged children score nearly one standard deviation below students who were never disadvantaged” (p. 10). Also, these children achieved lower than those in intermittent poverty. In other words, even accounting for other variables, poverty (measured by this proxy of free meals) has an almost direct, negative effect on scores. Unsurprisingly, those who were never eligible for free school meals scored the highest in the 8th-grade exams.

Even at such a precocious age as beginning kindergarten, García and Weiss (2017) have demonstrated notable differences in children’s cognitive and non-cognitive skills, between the lowest and highest SES groups, a lag that remained stable from 1998 to 2010.

There is more evidence of this connection. Hung et al. (2020), for instance, retrieved information from the Stanford Education Archive across five school years (2008–2013), six grade levels (grades third to eighth) and two test subjects (Math and English language). Academic performance was analyzed with an array of sociodemographic and school variables: students receiving free lunch and other SES indicators, students considered English language learners, students receiving special education services, but also the Gini index, and city/urban school district zip code. The results indicated that economic inequality, racial inequality, and household adult education attainment are strongly associated with student achievement gaps.

## 3. The racial gap

Another long-standing imbalance is the Black/White academic performance gap—similar to the gaps found with other cultural minorities, such as the Roma population, especially in Europe. In recent decades, this situation has become more complex, by accounting for the achievement inequalities between foreigners and the majority population, with a new phenomenon: the increase in immigration movements to Europe and North America. From 2000 to 2020, the United States received 21 640 238 immigrants ([https://www.dhs.gov/sites/default/files/2023-03/2022\\_1114\\_plcy\\_yearbook\\_immigration\\_statistics\\_fy2021\\_v2\\_1.pdf](https://www.dhs.gov/sites/default/files/2023-03/2022_1114_plcy_yearbook_immigration_statistics_fy2021_v2_1.pdf)). In Europe, “The number of people residing in an EU Member State with citizenship of a non-member country on the 1st of January 2020 was of 23 million, representing 5.1 % of the EU population”

(<https://ec.europa.eu/eurostat/web/education-and-training/overview>). The growth in migration demands adjustments in educational systems to improve integration, language learning, multicultural respect and attention for all these different groups with diverse needs, characteristics and strengths.

Let us begin with the structural, deep-rooted gap between people of color/white persons. For example, despite the many measures and policies implemented in the United States, racial-ethnic differences on tests of school motivation and academic achievement persist (Mckown, 2013; Merolla and Jackson, 2019). Also, Hung et al. (2020) identified various indicators that significantly correlated with the achievement gaps between White and African American students across school districts. These included analysis of the percentage of special education students, total expenditure per pupil, average enrolment per grade, city/urban setting, economic inequality between the White and Black, the degree of racial segregation in schools, household unemployment status, and household adult educational attainment. The persistent inequalities may best be explained by these differences in socioeconomic status, family cultural accessibility and opportunities, school type, segregated residential areas, prejudiced academic environments and expectations. Structural racism, therefore, still holds back Americans of color (Merolla and Jackson, 2019).

Some studies support the notion that these gaps have been declining in the last three decades (Kao and Thompson, 2003), not only regarding academic results but also in vocational options (as well as tracking). Nevertheless, gaps remain visible in school accomplishment, graduate studies admission, and completion. These remain higher in African American, Hispanic, and Native American groups than in White and Asian American counterparts (Kao and Thompson, 2003). Part of the racial and ethnic patterns still remain evident, especially in the highest achievement levels. As an example, although Black and Hispanic students are more present in college nowadays, they tend to apply to community college, rather than a 4-year graduation, when compared to their white and Asian colleagues.

Gillborn et al. (2017) also refutes the official positions issued by governmental institutions, which state that the Black Caribbean/White gap is “being eroded” in the United Kingdom. Gillborn contests that, instead, “the odds of greater success for White students remain significant throughout the 25 years we have reviewed, fluctuating between one-and-a-half and more than twice the chance of their Black Caribbean peers” (p. 866) in the UK. Compared to their White peers, the chances for Black Caribbean students to succeed have never improved, considering the level achieved at the end of the last century. The proposed explanation is that those policy interventions intended to set higher standards by increasing the benchmark, have, consequently, actively widened achievement inequities and served to maintain Black Caribbean disadvantage.

In Europe, there has been a wide variability in progress amidst different foreign or cultural minorities and the majority population: “(...) between 1992 and 2004, all racial/ethnic groups experienced an increase in the proportion of pupils obtaining at least five General Certificate of Secondary Education (GCSE) grades of A\* to C grades, the national benchmark of achievement in

England at the end of compulsory schooling” (Stevens, 2007, p. 155). Even more remarkable is that some groups, including the Chinese, Irish, and Indian pupils, now outperform the dominant White group. On the other hand, on average, Bangladeshi, Pakistani and Black pupils still present lower outcomes than the dominant White group. Furthermore, only Indian, and White pupils accomplish continuous year-to-year improvements, whereas other racial/ethnic minority groups show periods during which their success rates fall back (Stevens, 2007).

In the Netherlands, the Dutch government has evaluated its educational policies’ intent to integrate immigrant and ethnic minorities, in order to, progressively, level them with the majority population. During the last few decades, the rapid growth in foreign arrivals created new challenges to which the political approaches varied, starting with a multicultural perspective, which guaranteed the preservation of the minorities’ culture and language, to a recent, more assimilationist perspective (Rijkschroeff et al., 2005). Findings from this study demonstrate that, although policy and programmatic efforts aim at equalizing educational opportunities, the investments have not yet reduced the disparity.

Another study comparing first and second-immigrant students with national ones in Spain and Italy revealed that the immigrant counterparts underperformed, compared to native students in both countries. Even though socioeconomic level and language skills partly contributed to explaining these achievement gaps, there were still significant differences, after controlling for these variables and family and school characteristics (Azzolini et al., 2012).

Bécares and Priest (2015) analyzed the intersectional contributions of race, ethnicity, gender and class on several features of school attainment, including emotional ones. They concluded that awareness of social stereotypes could often negatively impact one’s social group. Considering that, generally, within the same SES group, the gender and race experience entails different socialization processes and unequal access to resources, none of these variables alone can be held accountable for the origin and persistence of the achievement gap. “In general, the largest inequalities in academic outcomes across racial/ethnic and gender groups appeared in the most privileged classes” (Bécares and Priest, 2015, p. 8). We might infer, therefore, that the interaction of group characteristics can yield different outcomes for individuals placed at different crossroads, not only in terms of academic performance but also in terms of emotional features.

Educators and politicians trying to deal with these inequalities face a difficult task: how can the performance of low SES groups or minorities improve when the leading cause of their low achievement is the ingrained, prolonged inequality and disadvantage they are embedded in? (Elias et al., 2013). These researchers proved that SES and race still have more influence on school results than other, more mutable variables, like teacher mobility, school, and class size. Moreover, “it is important to note that race/ethnicity, without SES interaction, did not become significant until middle school” (Elias et al., 2013, p. 4). The effect of ethnic composition on test scores was higher in schools with a larger reduced or free lunch population. In high school, having a more significant portion of Black or Latino students impacted the educational climate. In sum, in schools with high poverty and high minority it is more challenging to improve test score performance.

As such, different types of inequalities may entwine, reinforce, and sometimes contradict themselves (Martins et al., 2016). Nevertheless, the predominant trend is the systematic accumulation of multiple dimensions of imbalance (Stiglitz, 2014).

Another form of disadvantage lies in access to better professional careers. Increasingly, access to more qualified professions demands a higher level of education. The educational level achieved still strongly affects social mobility regarding professional placement and resource distribution in all European countries (Martins et al., 2016). There is a strong relationship between social class and test scores, educational attainment, and graduate studies attendance and completion (see Lee and Burkam, 2002; Duncan et al., 2011; Mishel et al., 2012; Snellman et al., 2015; García and Weiss, 2017).

García and Weiss (2017), comparing data from cohorts in 1998 and 2010, concluded that considerable SES-based gaps in academic performance exist and have persisted at the beginning of kindergarten. SES-based gaps across skills among the 2010 kindergartners have remained the same, compared with the prior academic generation of students (García and Weiss, 2017). Parental activities, parental expectations for their children’s attainment, and pre-K participation reduce the gaps between high-SES and low-SES children. However, they are not enough to eliminate these gaps, even considering children’s individual and family characteristics. Another crucial finding is that those school districts adopting “whole child” approaches to education are seeing better outcomes for students, from improved readiness for kindergarten to higher test scores and graduation rates, and narrower achievement gaps.

## 4. Previous systematic reviews on inequality and school achievement

So far, there have been few systematic reviews produced, on the subject of strategies and measures used for equalizing academic results. Sirin (2005) presents one of these most comprehensive reviews, focusing on the relationship between SES and academic achievement. Seeking to replicate (White, 1982) study on “the relation between socioeconomic status and academic achievement”, Sirin intended first to evaluate the strength of the relation between SES and achievement; next, to uncover possible moderating factors; finally, to bring to light the changes that have been occurring since 1982. The results confirmed that there was a moderate effect size between SES and achievement and a strong effect between school area and achievement, and that this connection has been weakening since White’s study. The findings could be a good indicator of the effect of compensatory measures in education or, we add, of improving living conditions.

Berkowitz et al. (2017) produced a critical literature review, integrating a comprehensive collection of studies dating back to 2000, examining whether a positive school and class climate can successfully interfere with the association between low SES and poor academic achievement. “In conclusion, findings from the current study demonstrate the overall positive contribution of positive climate to academic achievement among all students but especially those from lower SES backgrounds” (Berkowitz et al., 2017, p. 459).

A more comprehensive systematic review and meta-analysis, closer to our goals in this paper, is the work by [Dietrichson et al. \(2017\)](#), which focused on “effective academic interventions for elementary and middle school students with low socioeconomic status” (p. 1). They suggest an array of possibilities, from parent training programs to health interventions, role model interventions, and early childhood intervention programs, as possible means to increase the academic achievement of children with low SES. Such interventions may act on primary areas of development such as cognitive development, social adjustment, family support, motivational support, increased expectations, and pedagogical support ([Reynolds et al., 2010](#)). Dietrichson’s team gathered interventions implemented by schools, researchers, and local stakeholders and studies that used a treatment-control design. They concluded that there is a positive impact for low SES students, in elementary and middle education, with interventions such as tutoring, feedback and progress monitoring, and cooperative learning.

A very recent review by [Ashraf et al. \(2021\)](#) evaluated how interventions targeted at Free Meal student beneficiaries have contributed to improving their attainment. Through a meta-analysis of existing trials, they analyzed several interventions with similar pedagogical characteristics, like, for example, one-to-one tuition, compared to whole-class teaching methods. The analysis shows mixed results: the interventions had, indeed, positive effects on the literacy outcomes of the participating children; however, none of the 48 experiments had the same impact on mathematics. Despite the evidence of improvements, these were equivalent in both Free Meal and Non-Free Meal students, meaning the gap between them remained.

Nevertheless, our goals in the current paper go a step further in the revision of studies implicating this relationship between SES and school achievement. Considering the ever-mutating flow of newcomers to western (and other) countries, it seems crucial to pay special attention to the case of cultural minorities and foreigners, *via* immigration or refugee status.

As such, the main objectives of the current study are: (a) to gather, in a systematic manner, recent literature on the impact of educational interventions designed to reduce achievement inequalities; (b) to organize and categorize the most relevant studies concerning SES and immigrant/minority condition as baseline variables; c) to integrate and summarize the differential effects of these interventions on the targeted populations.

## 5. Methodology

This systematic search and analysis of the literature used the Preferred Reporting Items for Systematic Review and meta-analysis protocols PRISMA-P ([Moher et al., 2015](#)). The PRISMA Guidelines assert that a clear and detailed protocol of the procedures should be the starting point from which to assemble and organize the relevant studies that match previously established criteria.

The reason for the choice of a Systematic Review instead of a Meta Analysis, which was a relevant alternative possibility, relies on the vast array of interventions and programs we encountered in our initial search. It would be a limitation to consider all these

actions as single, comparable variables. We decided not to restrain the interventions and the methodology and allow this study to uncover all the variability of interventions, in all forms.

By adopting the PRISMA protocol, we defined the following criteria for including studies. First, the studies should define the level of the school population. We decided to concentrate specifically on elementary, middle, and secondary school levels, on the grounds of having some form of academic evaluation available in these segments. Second, interventions should aim at reducing inequalities in academic outcomes based on social, economic, or cultural features. Third, studies must include some level of efficacy measure. In the case of qualitative studies, the analysis must confirm whether there are any noticeable changes, as stated by the participants; for quantitative studies, quasi-experimental or experimental studies should have academic performance as the dependent variable.

In this review, it is essential to consider what kind of interventions, projects, and even political measures are effective in transforming educational outcomes, to what extent and in which groups are affected, and which ones are not. It is also important to consider why some function better than others, if this reflection is available. The time frame considered here was between 2000 and 2021.

In sum, the research questions we explore in this review are the following:

- 1) What kind of interventions or projects aimed at reducing the SES and minorities achievement gap can be found in studies from 2000 until 2021?
- 2) What is the measured and/or perceived efficacy of each of these interventions?

The search for our review involved the following databases: Academic Search Ultimate, ERIC, Education Source, APA PsycINFO, Psychology and Behavioral Sciences Collection, Sociology Source Ultimate, and PsychArticles. Later, a second search was directed to the Journal of Research on Education Effectiveness.

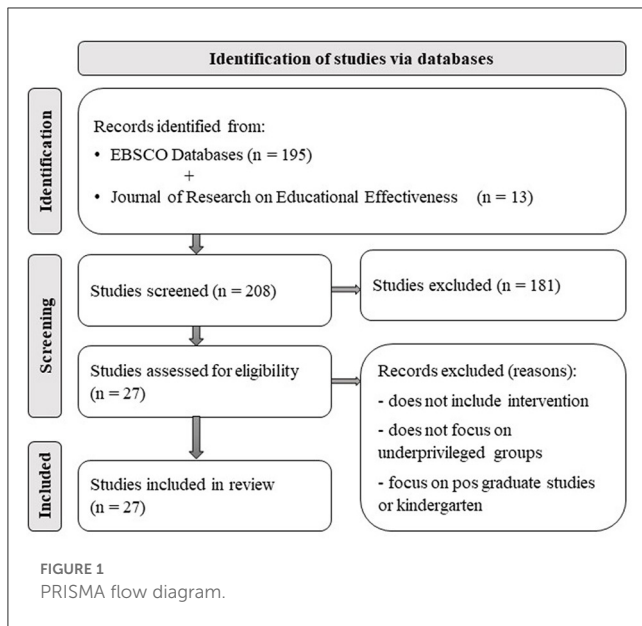
The keywords used were the following: educational achievement or academic achievement AND program or intervention assessment AND racial or minority AND socioeconomic status or socioeconomic status. The restrictions for the search included peer-reviewed, full text and academic journals only.

This search was conducted in English, Spanish and Portuguese using the exact keywords in the same EBSCO databases, and also Scielo.

### 5.1. Exclusion criteria

- Studies on the origins of inequalities, without any intervention to reduce them.
- Studies that do not include underprivileged, minority or immigrant groups.
- Studies on intervention in the kindergarten/ higher education levels





- Studies on gender differences
- Studies on special education
- Studies on health inequalities in the student population
- Studies that do not describe the strategies or measures implemented.
- Studies that do not evaluate the efficacy of the intervention, whether by quantitative or qualitative methods.

The search yielded 195 results, and, in a first phase, the articles' abstracts and keywords were carefully analyzed. After this initial screening, 118 articles were excluded for not fitting the inclusion criteria (see Figure 1). Posterior closer and thorough reading reduced these studies to 20. Afterwards, we added a tailored search to our systematic revision, focusing on the Journal of Research on Educational Effectiveness. The keywords for this specific search were: *educational achievement or academic achievement AND intervention AND minorities AND socioeconomic*.

Therefore, 13 articles from the *Journal of Research on Educational Effectiveness* were selected by screening the journal's titles and abstracts. The following analysis brought to light another 7 relevant articles portraying studies of measurement of interventions on school inequalities. These underwent the same procedure of analysis and classification as the previous articles in the EBSCO database.

The data retrieved from the Journal of Research on Educational Effectiveness were not obtainable from the EBSCO databases, and since this particular journal focuses on the evaluation of educational strategies, it was considered an additional value to the work, making the revision more complete and widespread.

The reason why some many articles did not fit the inclusion criteria stem from the fact that most of the studies retrieved showed an emphasis only around the causes and origins of achievement inequalities, such as the negative impact of belonging to a low SES or to a minority. Besides these factors, many articles highlighted gender differences in academic outcomes, which is not our focus here. In other cases, studies described

other possible causal explanations for the differences in the students' performance, such as teachers' training and attitudes, school climate (without reference to any measure to transform it), violence in the school context, and resilience factors for at-risk or minority students. Moreover, some articles explored gifted students' programs, differential vocational choices for low SES, minorities, and gender groups, and tracking methodologies and, finally, many studies performed in the higher education system. Another exclusion criteria that surfaced often was not including any intervention.

Finally, the remaining articles were read thoroughly. As above mentioned, only 27 in total corresponded to the inclusion criteria at the end of this detailed reading.

## 6. Results

The organization of the studies in a PICO framework (Population, Intervention, Comparators, Outcomes) allows for an overview of the diversity of measures and interventions collected (Table 1).

The analysis was conducted according to several categories which were previously created, considering the studies' aims.

In the first place, we classified the articles into Strong, Weak or Mixed efficacy categories, according to the efficacy of the intervention, based on the impact described in the articles' results section (Table 2). As it is of general knowledge, often the impact is not totally positive or negative. Often, the results are intricate and complex and need a thorough breakdown. In many cases, they indicate some measures of improvement in some respects, for some specific groups and show a decrease or maintenance in the outcomes in other groups or measures. Most studies analyzed in this revision of intervention strategies revealed such complexity.

Another category we were initially interested in, was the type of intervention in terms of focus and scope. Since the objective is to increase performance in underachieving groups, many types and scopes of interventions have been put into practice in the last two decades. From the most specific, tailored action designed for difficulties in learning how to read, how to write, and how to develop a better understanding of mathematics or sciences, for example, to the more general national policies in education, there has been a wide range of practices. Subsequently, a more detailed analysis shows that the measures and strategies shown to have a more substantial impact, are very diverse and challenging to organize into categories. Our organizational choices were one in many possibilities, given the array of strategies. It was a categorization suggested by the material itself. The studies analyzed assembled in either a more pinpoint strategy, or a more holistic, integrated action, or even widespread national or state policy changes. Therefore, a definition of underlying themes was created as follows: Intervention focused in a learning basic ability/subject (mainly in the areas of reading, writing, and mathematics); Participation in state or community programs (after-school or summer compensation programs, state policies); Support to Families; Pedagogical interventions; Psychosocial Strategies; Whole school approaches (Table 2).

TABLE 1 PICO analysis.

Included articles' PICO analysis	Population	Intervention	Methods	Comparators	Outcomes
Changing Context. Do Magnet Schools Improve Student Achievement in a Modern Setting	400 000 students in over 400 Magnet schools. Majority non-white.	Magnet Program Types Vanguard STEM Language Fine and Performing Arts College Preparation Career Academy	Quantitative	Students not in Magnet Program/TPS Schools (Traditional Public Schools)	Most of the results show that magnet schools had an effect that is negative or statistically indistinguishable from zero.
Closing the achievement gap means transformation	Illinois high school students- those who did and did not participate in Advanced Placement, or AP, courses	Advanced Placement, or AP, courses (Accelerated courses to offer college-level curriculum and examinations to high school students.)	Quantitative	Non-Participants in AP courses	Students of color and low socioeconomic status benefit from participation in Advanced Placement courses.
Dutch policies on socio-economic and ethnic inequality in education	Dutch policy aimed at the reduction of educational disadvantage. Ethnic minorities and working-class children.	Educational stimulation policy. Intercultural education. Municipal educational disadvantages policy. Preschool and early school education	Quantitative	Not disadvantaged and non minority Dutch children	The Dutch working-class children performed considerably lower than the group without disadvantages and the ethnic minority children scored the lowest.
Educational choice and marketization in Hong Kong the case of direct subsidy scheme schools	A sample of government aided and private schools Hong Kong Schools. Retrieved from PISA	Direct subsidy scheme (DSS) schools	Quantitative	Traditional Public Schools	Direct Subsidy Students performed significantly worse than their peers in Traditional Public Schools in all three subjects.
Effects of a Theoretically Based Large-Scale Reading Intervention in a Multicultural Urban School District	Grades 3–5 during the years 1998–2003. Colorado USA- Pueblo School District 60 (PSD60) Title 1 schools	Lindamood- Bell Learning Processes Considers both verbal and nonverbal cognition -with both codes involving various sensory modalities (e.g., visual, auditory, and haptic).	Quantitative	Title 1 non intervention Schools statewide	The treatment main effect was statistically significant.
Evaluating Mathematics Achievement of Middle School Students in a Looping Environment	Student scores on the Mississippi Curriculum Test (MCT). Between sixth and eighth grade years. Treatment: 69 students who looped.	Looping, a school structure where students remain with one group of teachers for two or more school years,	Quantitative	A group of 137 students who did not loop	In seventh and eighth grades, students in the looping classes had higher results on the mathematics portion of the Mississippi Curriculum Test.
Evaluating the effects of programs for reducing achievement gaps - a case study in Taiwan	Junior high school graduates in Taiwan. High school entrance examination scores between 2004 and 2010	The Program of Educational Priority Area- to balance the discrepancy between urban and rural education. After-School Academic Support Program-recruiting college students and retired teachers to provide psychological counseling and schoolwork tutoring for disadvantaged and underachieving students in secondary schools.	Quantitative	Different SES and Non-Ethnic population	Current educational policies have not reduced the problem of achievement gaps among students from different SESs and school districts. They have, however, exerted a positive reducing the gaps among students from different ethnic groups.

(Continued)

TABLE 1 (Continued)

Included articles' PICO analysis	Population	Intervention	Methods	Comparators	Outcomes
Expanding opportunities for high academic achievement- An International Baccalaureate Diploma program in an urban high school.	Students in Jefferson High School-Portville school district. National Coordinators of the International Baccalaureate Diploma	International Baccalaureate Diploma, which includes providing students with academic and social scaffolds (e.g., academic enrichment courses, and social supports) Counseling	Mixed methods transcriptions of 63 interviews with school personnel, parents, and IB administrators. Exams scores between 2001 and 2005	% of exams passed in US (VS IB students) Participants positive discourse	Exams scores (with a high score) increased from 76 to 175 students between 2001 and 2005.
Helping or Hurting. Are Adolescent Intervention Programs Minimizing Racial Inequality.	A baseline sample of eighth-grade students in 1988 (...) with four follow-up surveys. $n = 10,204$ ; A nationally representative sample with 358 students participating in either Talent Search or Upward Bound.	Talent Search and Upward Bound Upward Bound provides instruction in mathematics, laboratory sciences, foreign languages, composition, and literature as well as social and cultural capital consistent with parental college attendance	Quantitative	Program not attending students	The total effect of program participation by race significantly increases the probability that an African American or Hispanic student will attend a postsecondary institution for all SES sections.
High School Curriculum- Three Phases of Contemporary Research and Reform	A college-preparation curriculum for all students, expanded AP offerings, support courses in ninth grade; the suspension of remedial courses	Influences of the high school curriculum on student learning	Quantitative	Cohort-comparison evaluation design and longitudinal data archive	Early findings regarding the new curriculum policy are mixed. About 30 percent lower-ability students have earned credit for survey literature, but on the other hand, a negative finding is that lower-ability students were more likely to fail these classes in 2004 than in 1994.
Improving reading achievements of struggling learners	567 pupils Struggling readers. The Netherlands	Reading Acceleration Program. Based on: The core instruction program. Broadening instruction for struggling readers Specialized instruction	Quantitative	Non program participants control group	The program reduced the rate of struggling readers in the experimental group from over 28% to less than 6%.
Passport Reading Journeys	The program targets students in grades 6–12 who are reading one to three years below grade level, including students with varied needs such as English language learners.	Passport Reading Journeys is a supplemental literacy curriculum designed to help improve reading comprehension, vocabulary, word study, and writing skills of struggling readers in grades 6–12. Instruction includes a combination of whole-class instruction, small-group instruction, independent reading, video segments, and individualized computer-based practice.	Quantitative Evaluated by What works clearinghouse	Control group	The evidence indicates that implementing Passport Reading Journeys has inconsistent effects on reading comprehension
Practical Effects of Classwide Mathematics Intervention	All fourth-grade students participating in mathematics instruction in general Education classrooms in the participating district in the fall of 2009	Classwide intervention designed to build fluency in mathematics computations and operations	Quantitative	Control group	The intervention showed stronger effects in this sample for students of minority ethnicity, students receiving special education services, and students considered at risk based on the prior year's state test score in mathematics.

(Continued)

TABLE 1 (Continued)

Included articles' PICO analysis	Population	Intervention	Methods	Comparators	Outcomes
Pronouncing new words aloud during the silent reading of text enhances fifth graders' memory for vocabulary words and their spellings	socioeconomic status, language minority fifth graders (M = 10 years, 7 months; n = 62)	Silently read eight passages each focused on an unknown multi-syllabic word that was underlined, embedded in a meaningful context, defined, depicted, and repeated three times.	Quantitative	In the control condition, students penciled a check if they had seen the underlined word	Lower-level word readers who read words orally revealed better memory for pronunciation-meaning associations when compared to lower word readers who read words silently.
Purpose plus- Supporting youth purpose, control, and academic achievement	High school students from a low-socioeconomic status community. participants in Pennsylvania	Intervention program aimed to enhance perceptions of control and youth purpose. Bimonthly small group sessions at the high school	Quantitative	Matched peer group designed (based on the demographic variables, internal control, purpose scores)	Results show that the intervention was effective.
Reducing Achievement Gaps in Academic Writing for Latinos and English Learners in Grades 7 – 12	Final sample for the AWA in Year 2 consisted of 40 control classrooms and 41 Pathway classrooms	Pathway Project- uses a cognitive strategies approach to text-based analytical writing. Secondary teachers learn how to integrate cognitive strategy instruction into process writing to improve students', specifically Latinos' and mainstreamed ELs', interpretive reading and text-based analytical writing	Quantitative	Control classrooms	Pathway students gained 0.99 points more than control students, and it was highly statistically significant. Across race/ethnic groups, the largest positive effects are for Hispanics and Blacks
A eficácia dos programas de educação compensatória nos resultados escolares	TEIP Priority Intervention Schools. Based on criteria for achievement and dropout in Portugal	To work against school and social exclusion by promoting the role of local community elements, providing more autonomy, and increasing human resources	Quantitative	Non TEIP	Schools in all four stages of Priority Intervention (TEIP) maintain an average score of around 13. Non TEIP schools start at 13,11 and increased up to 13, 54 at the end of the 15-year range.
The Mnemonic Value of Orthography for Vocabulary Learning	Lower socioeconomic status minority 2nd graders and 5th graders	Learning sets of unfamiliar nouns and their meanings over several learning trials, by making these words defined, depicted, and embedded in sentences.	Quantitative	One set to be taught with spellings, the other set to be taught without spellings	Spelling aids proved advantageous for learning most, if not all, of the individual vocabulary words' pronunciations and meanings.
The Reversed Role of Magnets in St. Louis Implications for Black Student Outcomes	Black students who attend 23 magnet schools in St. Louis	Magnets aim at encouraging White, suburban students to attend city schools as a means of integrating schools.	Quantitative	Between above and below Median Income of Black Families	Magnet schools in St. Louis maintain racial segregation (15 of 18 schools have Black student enrollments more than 50%) and are located in poorer Black neighborhoods. As the magnet schools enroll more Black students, Black student achievement reduces.
Impacting 9th Grade Educational Outcomes: Results from a Multisite Randomized Controlled Trial of the BARR Model	More than 4,000 9th graders across 11 high schools	Whole student focusProfessional development for teachers, counselors, and administrators "I-time" social-emotional lessonsRegular block/team meetings among core subject teachers to collaboratively problems...	Quantitative	Two conditions, a treatment group (teachers participated in BARR) control group, whose core subject teachers did not participate in BARR.	BARR significantly increased core credits earned and mathematics achievement.
Social Identity and Achievement Gaps: Evidence From an Affirmation Intervention	2,500 7th and 8th graders from six Philadelphia-area middle schools.	Intervention in which students complete a self-directed "self-affirmation" exercise. In order to help them to identify and reflect upon their core personal values	Quantitative	Control group completes other written tasks	The treatment showed no statistically significant effects across different types of students.

(Continued)



TABLE 1 (Continued)

Included articles' PICO analysis	Population	Intervention	Methods	Comparators	Outcomes
The Effects of the Louisiana Scholarship Program on Student Achievement and College Entrance	Moderate- to low-income students attending low-performing public schools in Louisiana. Up to 2,348 vouchers' students.	Offers publicly funded vouchers to moderate- and low-income students in low-performing public schools to enroll in participating private schools	Quantitative	Control groups	Results from the primary sample indicate substantial negative achievement impacts.
Replicating a Scalable Intervention That Helps Students Reappraise Academic and Social Adversity During the Transition to Middle School	Randomized controlled trial at scale among students transitioning to middle school in seventh grade (N = 2,171)	Promoting students reappraise common social and academic worries during the difficult transition to middle school.	Quantitative	Control groups	The impact of the exercises is positive for intervention group students. However, none of the intervention-by-race interactions are statistically significant. Differences in effects between white students other racial/ethnic groups were not statistically significant.
Helping ELLs Meet the Common Core State Standards for Literacy in Science: The Impact of an Instructional Intervention Focused	Participants included 1,309 students, of whom 353 were English language learners (ELLs).	To implement Quality English and Science Teaching —designed to help English language learners (ELLs) and their English proficient classmates to develop academic language in science.	Quantitative	Control groups	For the whole group, results indicated that posttest differences in favor of the treatment group sections were statistically significant for academic language and science. For ELLs (English Learners) however, posttest differences favored the treatment group for academic language only.
Distributional analysis in Educational Evaluation: A Case Study from the New York City Voucher Program	The study matches over 88,000 school-age voucher recipients. Public-school records to estimate the impact of vouchers on academic performance.	The Housing Choice Voucher is a federally funded housing assistance program. The goal is to ascertain whether housing vouchers improve educational outcomes for students whose families receive them.	Quantitative	Comparison of students' performance before and after voucher receipt.	Students in voucher households perform better in both English Language Arts and Mathematics. Small or no gains for black students were found, but still significant gains for Hispanic, Asian, and white students.
The Effects of Within-Class Ability Grouping on Academic Achievement in Early Elementary Years	21,260 children in about 1,200 kindergarten programs Sample: 17,487 children	Within-class ability grouping involves teachers organizing students into small reading groups by their literacy skill levels	Quantitative	Ungrouped classes	Schools using ability grouping had, in general, more disadvantageous characteristics than schools without ability grouping.
Delayed Effects of a Low-Cost and Large-Scale Summer Reading Intervention on Elementary School Children's Reading Comprehension	59 elementary schools, 463 classrooms, and 6,383 second and third graders North Carolina -USA	A large-scale summer reading intervention to provide comprehension lessons at the end of the school year and stimulate home-based summer reading routines	Quantitative	Control Group	The treatment had a statistically significant impact on children's reading comprehension, improving performance by 0.04 SD (standard deviation) overall and 0.05 SD in high-poverty schools.

(Continued)

TABLE 1 (Continued)

Included articles' PICO analysis	Population	Intervention	Methods	Comparators	Outcomes
Academic Attitudes and Achievement in Students of Urban Public Single-Sex and Mixed-Sex High Schools	11th-grade low-income students of color enrolled in nonselective, urban neighborhood public single-sex and mixed-sex high schools	Publicly funded single-sex schooling (SSS)	Quantitative	Control group from mixed sex schools	In general, Single Sex Schools attendance was linked to negative effects for boys and positive effects for girls. In particular, while girls in SSS outperformed girls in Mixed Sex Schools in math, science, reading, and writing, boys in SSS scored lower than boys in MSS on the PSSA tests of math and writing.
The Impact of a Holistic Conditional Cash Transfer Program in New York City on Parental Financial Investment, Student Time Use, and Educational Processes and Outcomes	511 students in six low-income urban communities in the Bronx, Manhattan, and Brooklyn in New York City	Family Rewards offers cash assistance to low-income families on the condition that the family invests in three areas: children's education, family preventive health care, and parents' employment	Quantitative	Control group	The percentage of students who took at least one Regents exam across treatment and control increased for Latino students and was lower for Black students. These impacts were statistically significantly different.

To broaden the analysis and better organize these categories more concretely and perceptibly, we should look at some examples of the measures that have proven to be most effective (Table 3).

### 6.1. Reading/writing/subject focused strategies

What emerged more frequently in this revision were approaches that focused on compensation strategies in reading/writing abilities, especially in the early years of schooling. These interventions are also frequently developed to address non-native-speaking learners' difficulties. Therefore, compensation techniques in Reading, Writing, and Comprehension comprise many of the studies reviewed as having a very good impact on learning skills. Here is a more descriptive presentation of some of the initiatives:

The Lindamood-Bell Learning Processes implemented a reading enhancement program in Colorado, in a minority urban district, with Title I Schools (with at least 40% Free Meal Students) to improve the reading scores, which were below average (Sadoski and Willson, 2006). The Lindamood-Bell Method uses different senses to help students make connections between sounds, letters, and words. It also applies imagery to improve understanding of contents (<https://www.understood.org/articles/en/lindamood-bell-program-what-you-need-to-know>). There was an overall improvement in schools where the project was implemented compared to other schools in the control group, and it increased over the years. Variables like school size, minority students and FSM students' percentage variation were controlled to guarantee the effects are attributable only to the implementation.

In order to improve the reading comprehension outcomes of children in high-poverty schools, a large-scale comprehension intervention summer school was implemented, with lessons at the end of the school year. It stimulated home-based reading routines with narrative and informational books alongside regular assistance from the children's parents. The READS intervention (Reading Enhances Achievement During Summer) showed improved reading comprehension scores by 4% of a standard deviation (Kim et al., 2016). Descriptively, the results suggest that the effect size in high-poverty schools (75–100% free lunch) was larger than the effect size in moderate-poverty schools.

A project designed to increase text-based analytical writing, called the Pathway Project, which uses a cognitive promotion approach, was also successful. It includes tools such as explicit instruction, “notational systems, think sheets, graphic organizers, prompts, planning strategies”, and learning communities (Olson et al., 2017, p. 3). The project target was secondary school students, specifically Latinos and mainstreamed English Learners from a large, urban, low-SES district, to develop academic writing skills. Analyses revealed significant effects on student writing outcomes in both years of the intervention. Moreover, Pathway students had higher odds than control students of passing the California High School Exit Exam in both years.

To evaluate the mnemonic effect of orthography on learning new vocabulary, Rosenthal and Ehri (2008) examined whether spelling could improve students' memory for pronunciations and

TABLE 2 Categories of efficacy level and object of intervention.

Categories of analysis	Subcategories	Description	No. of studies
Level of efficacy of interventions	Strong efficacy level	Most results yielded present a positive change for all subjects involved.	11
	Medium or mixed level	Some groups of subjects improved performance, others have not. Or, there was a positive change in some parameters, but not in others.	9
	Weak effect or null	Most of the sample or participants has not revealed achievement improvement.	7
Object of intervention	Focused on subject or ability	Aimed at one subject or learning process (reading, mathematics, science, etc.).	7
	Pedagogical	Teacher's class methodology, school pedagogical approach.	5
	Psychosocial	Intervention on basic emotional, (efficacy, self-regulation) motivational, or relational skills (inclusion, conflict resolution, minority pride promotion).	3
	Whole School Approach	Whole school/systemic- all of school elements are involved in the process.	4
	Family Intervention	Family support, e.g., vouchers, parental practices training, family increased involvement.	1
	Participation in communitarian or state programs	Compensation classes, Summer Courses, Tutoring, State Policies.	7

meanings of new vocabulary words. Lower socioeconomic status minority 2nd and 5th graders were taught two sets of unfamiliar nouns and their meanings over several learning trials. Results show that orthographic knowledge benefited vocabulary learning and diminished dependence on phonological memory.

## 6.2. Whole school model

The “Building Assets, Reducing Risks” (BARR) program has presented a considerable positive impact in this category of interventions, as described by [Borman et al. \(2021\)](#).

The BARR model is a comprehensive approach that uses eight interlinked strategies to build intentional staff and students' relationships. For instance, the core teams of teachers have scheduled time to meet and discuss students' strengths and challenges. “During these block/team meetings, teachers share with each other their individual experiences of students and collectively review real-time student data to identify interventions that may be helpful.” (p. 816). Seventy-five per cent of students were racial/ethnic minorities in this study. Results demonstrate that reductions in gaps in attainment and course passing for some subgroups were notorious (e.g., minority status and English Learners status, especially for the credits earned outcome). Also, English Language Arts scores significantly impacted minority students and those eligible for free or reduced-price lunches.

## 6.3. Pedagogical approaches

The International Baccalaureate (IB) program is an international initiative that promotes students' autonomy, learning and research abilities. The IB challenges learners to think

critically and to learn in a flexible environment (<https://www.ibo.org/programmes/diploma-programme/>). [Mayer \(2008\)](#) wanted to discover whether this highly demanding curriculum worked in urban, low-achieving schools. The main question placed here was if an efficiently structured academic program could increase the possibility for low-income students and students of color to achieve university admission.

Mayer used mixed methods to analyze the relationship between implementing a structured graduate studies preparatory program (IB) in a difficult school district, and academic achievement, in low-income Latino and African American students. The school where this intervention took place, Jefferson High School, is situated in an urban context, that serves mainly Latino, Black, and Southeast Asian students. Several learning scaffolds were included in this particular Title 1 school, such as counseling, academic enrichment courses, and social support. Examples of academic enrichment experiences were algebra or biology tutoring or community service. Social scaffolding included student retreats to develop leadership activities and prompt teacher-student positive relationships. Social support could also involve regular club attendance to improve motivation and establish mutual peer support.

Jefferson's students appeared to succeed, working with this demanding academic curriculum, alongside these scaffolding measures, motivational retreats, university preparation clubs, and tutoring. In 2006, 48 of the 55 diploma candidates achieved university admission. On the whole, the author concluded that the IB program effectively attracted and retained African American, Latino, and Native-American students, from lower SES levels.

[Walsh \(2011\)](#) studied two programs, explicitly designed to reduce racial disparity in university admission—Upward Bound and Talent Search—focusing on race/ethnicity and socioeconomic status, at a secondary level. “Upward Bound provides instruction in mathematics, laboratory sciences, foreign languages, composition,

and literature as well as social and cultural capital” (p. 372). Participant students must, among other conditions, present a need for academic support if they are to attend graduate studies, be of a lower SES, and be the child of parents who have not completed postsecondary programs. Talent Search aims to help low-SES students in the graduate studies application process, giving them several measures of support through financial, career and academic counseling. Program participation significantly promotes low-SES African American and Hispanic students’ graduate studies attendance.

Thompson et al. (2008) analyzed the effects of mathematics learning in a looping environment. In this school mechanism, students remain with one group of teachers for two or more years. This showed positive results on test scores for looping classes compared to their counterparts. Considering ethnicity, African American and Caucasian looping students achieved higher scores over the two-year looping period than did their non-looping peers.

### 6.4. Psychosocial interventions

An example of a psychosocial intervention targeted feelings of control over academic achievement in youngsters. Pizzolato et al. (2011) evaluated the effectiveness of a program based on Control Theory. More specifically, youngsters’ perceptions of control over their academic achievement, while being able to envision themselves as successful adults, and correlate these expectations to current school behavior. The intervention focused on small group sessions, in a high school context, with students from a low-socioeconomic status community, with the goal of debating and planning strategies to enhance perceptions of control and purpose. The evidence showed a significant positive effect on GPA scores, through the coupled effect of internal control and a sense of enhancement.

The other two types of efficacy level interventions are listed in Table 4.

## 7. Discussion

This literature review aimed at collecting and analyzing current educational strategies to oppose achievement inequalities in minority and/or lower socioeconomic status students. Our approach was systematic and broad, in order to include an array of studies that could demonstrate current trends and models set in elementary and secondary schools. It was our goal, from the beginning, to reach and integrate as many interventions and measures as possible, hence our choice for a systematic revision instead of a meta-analysis methodology. The qualitative aspects of studies were equally included, considering the perspective of participants as a reliable source about the phenomenon and its effects. This option maintains its consistency, even though the data obtained, and the treatments used differ. This decision was based on the premise that different (qualitative or quantitative) methodological choices, and their results are equally reliable.

Our findings exposed a diversity of interventions, from the most topic-specific, focusing on fundamental learning competencies, such as reading, writing, and comprehension,

TABLE 3 Categories of educational intervention in the strong efficacy level.

Strong efficacy levels article title	Intervention category
Walsh, R. (2011). Helping or Hurting – Are Adolescent Intervention Programs Minimizing Racial Inequa	Focused intervention in learning skills or school subject
Thompson, N. L., Fuller, B., Hare, R. D., and Miller, N. C. (2008). Evaluating Mathematics Achievement of Middle School Students in a Looping Environment	
(Rosenthal and Ehri, 2011) Pronouncing new words aloud during the silent reading of text enhances fifth graders’ memory for vocabulary words and their spellings	
Olson, C. B., Matuchniak, T., Chung, H. Q., Stumpf, R., and Farkas, G. (2017). Reducing Achievement Gaps in Academic Writing for Latinos and English Learners in Grades 7 – 12	
Sadoski, M., and Willson, V. L. (2006). Effects of a Theoretically Based Large-Scale Reading Intervention in a Multicultural Urban School District	State or community intervention
Kim, J. S., Guryan, J., White, T. G., Quinn, D. M., Capotosto, L. and Kingston, H. C. (2016). Delayed-effects-of-a-low-cost-and-summer reading	
Rosenthal, J., and Ehri, L. C. (2008). The Mnemonic Value of Orthography for Vocabulary Learning	
Houtveen, T. and van de Grift, W. (2012). Improving reading achievements of struggling learners.	Pedagogical
Mayer, A. P. (2008). Expanding opportunities for high academic achievement—An International Baccalaureate Diploma program in an urban high school.	
Pizzolato, J. E., Brown, E. L., and Kanny, M. A. (2011). Purpose plus – Supporting youth purpose, control, and academic achievement	Psychosocial
Borman, T. H., Bos, H., Park, S. J. and Auchstetter, A. (2021). Borman-2021-Impacting-9th-grade-educational-outcomes (Building Assets, Reducing Risks model)	Whole school

to the broadest organizational and political changes in the educational system.

The objective was to compile all studies that evaluated these strategies, allowing for evidence-based analysis. Many of these showed mixed results, that is, the efficacy was proven in some of the treatment groups, but not all. Nevertheless, some success was achieved in reducing these gaps. In these mixed-results interventions, we can consider that each subgroup’s cultural or historical idiosyncrasies function and result in different outcomes. One approach may have a strong impact on Hispanic students, for instance, and not on Black students, while other methods may be more effective with other minorities. Overall, these findings emphasize the need for a situated and contextual perspective to evidence-based approaches. Interventions that are tailored to local and group characteristics show more efficacy. Strategies intended to be universal and replicable, without careful adaptation to, knowledge of or active involvement from the target population, may fail for lack of adequacy to existing needs, particular problems and constraints, but also lack of recognition of existing resources and facilitators.

TABLE 4 Mixed or weak efficacy categories.

Medium or mixed effects efficacy
(August et al., 2014) Helping ELLs Meet the Common Core State Standards for Literacy in Science: The Impact of an Instructional Intervention Focused on Academic Language.
(Bitler et al., 2015) Distributional analysis in Educational Evaluation: A Case Study from the New York City Voucher Program.
(What Works Clearinghouse, 2019) Passport Reading Journeys. Institute of Education Science.
(Colgren and Sappington, 2015) Closing the Achievement Gap Means Transformation.
(Sung et al., 2014) Evaluating the effects of programs for reducing achievement gaps: a case study in Taiwan.
(Lee and Ready, 2009) High School Curriculum: Three Phases of Contemporary Research and Reform.
Pyne, J., and Borman, G. D. (2020). Replicating a Scalable Intervention That Helps Students Reappraise Academic and Social Adversity During the Transition to Middle School.
(VanDerHeyden and Coddling, 2015) Practical Effects of Classwide Mathematics Intervention.
(Zhou, 2015) Educational choice and marketization in Hong Kong: the case of direct subsidy scheme schools.
Weak efficacy
(Driessen and Dekkers, 2008) Dutch policies on socio-economic and ethnic inequality in education.
(Ferraz et al., 2018) A eficácia dos programas de educação compensatória nos resultados escolares: análise do programa nacional português de educação compensatória ao longo de 13 anos.
(Grooms and Williams, 2015) The Reversed Role of Magnets in St. Louis: Implications for Black Student Outcomes.
(Harris, 2019) Changing Context: Do Magnet Schools Improve Student Achievement in a Modern Setting?
(Erickson et al., 2021) The Effects of the Louisiana Scholarship Program on Student Achievement and College Entrance.
(Nomi, 2009) The Effects of Within-Class Ability Grouping on Academic Achievement in Early Elementary Years.
(Dec, 2015) Social Identity and Achievement Gaps: Evidence From an Affirmation Intervention.

Looking at those actions that achieved stronger transformations, altogether, it was also notorious that the most specific interventions designed to address a particular impairment, usually an essential cornerstone for learning, like reading skills, and early mathematical comprehension, have been proven more effective. In terms of research, especially of quantitative nature, having fewer independent and dependent variables may increase the odds of showing clearer results. The broader the scope of intervention, the more complex and entangled the results become. As such, there is a clear need for more robust methodological designs, including mixed-methods and longitudinal approaches, in more holistic interventions.

Nevertheless, some family- and community-based initiatives have been proven effective, such as summer programs with active parental involvement, whole-school approaches or projects targeting group discrimination prevention.

There were fewer interventions, in our revision, that presented very low or null positive impacts. These presented a very varied nature, but it's noteworthy that several attempts to achieve better results for disadvantaged population *via* vouchers or lottery selection, to access private schooling, for example, have not been fruitful. We may discuss this outcome from many perspectives, but, perhaps, looking at the discrepancy of curricula demand, coming from low achieving public schools and entering high achieving private schools, where most population have a normative, strong middle class cultural and social background, may constitute an

obstacle for achievement. This contrast may arise for academic reasons (lack of previous knowledge, different pedagogies) or for psychological and social limitations, such as poor social integration, competitive peer environment, high pressure for excellent results.

## 8. Limitations and future research possibilities

An attempt to gather, organize and make coherent analysis of such a vast range of educational strategies and measures is full of obstacles. How to group different studies, with some consistency, how to create a categorization that would reveal some worthy results, is a challenging decision. A striking finding is the predominance of the United States in this area, with poor representation from other countries, especially in the African and South American regions. Even in Europe, where this revision took place, the amount of investigation measuring, whether by qualitative, quantitative, ethnographic, or other methods, educational strategies' impact, is scarce.

On the whole, there is a clear need for more systematic knowledge in this field. The evaluation of strategies, projects, and measures in education, designed to improve performance and reduce drop-out, in these historically excluded, disadvantaged social groups, is still scarce. Without rigorous and continuous research, decision-making in this area could fail: How to improve



what already is being implemented and how to start something else anew, without guidelines and references from other empirically proven strategies? The need for regular, well-tailored, consistent research is huge, for we are aware that many schools, institutions, education cabinets, and many other organisms have been creating and implementing educational projects, without any mechanism to monitor and control their outputs. To learn more about educational intervention in this area, we must do better in terms of program evaluation.

## 9. Conclusion

These findings emphasize the need to envision the ecological nature of social transformations, where all pertaining elements should be considered in the process of constructing a more equalitarian society. Schools cannot entail this mission alone, for it derives from deep seeded roots of oppression and discrimination, which demands time, a collective effort and will to confront.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

## Author contributions

CC-G, TN, and IM contributed to conception and design of the study. CC-G did the systematic search, retrieval of articles, analyzed and organized the data, and performed the content analysis. TN and IM reviewed every step of the process. All authors contributed to manuscript revision, read, and approved the submitted version.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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