

## SCIENCE ACHIEVEMENT GAPS BEGIN VERY EARLY, PERSIST, AND ARE LARGELY EXPLAINED BY MODIFIABLE FACTORS BY MORGAN, PAUL L., GEORGE FARKAS, MARIANNE M. HILLEMEIER, AND STEVE MACZUGA.

Discussion of possible factors affecting science achievement gaps, despite such limited studies since 1992. Many factors identified seem modifiable and recommendations to close science achievement gaps include legislative changes.

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This study sought to examine which preventable factors affect students' science achievement gaps when considering the age of onset, over-time dynamics, and mechanisms of such achievement gaps. Previous studies of science achievement gaps have been surprisingly limited, with only 12 studies being conducted since 1992. Likewise, those studies failed to command a very broad scope or analysis, as the average number of factors used as predictors averaged only 5 per study. The authors suggest that failing to consider the onset, over-time dynamics, and mechanisms of science achievement gaps is preventing practitioners from properly addressing those gaps and effectively intervening, particularly in regards to racial and ethnic minorities or low-income students.

The authors then discuss several possible factors affecting science achievement gaps, particularly noting overlaps and interrelations that other studies have suggested to be indicators of susceptibility to gaps (e.g., some studies suggest that English language learners may encounter understanding barriers to science learning, while others suggest that dual-language learners may have greater aptitude, their language needs necessitating a higher cognitive function). They conducted a longitudinal study of 7,757 students with data collected from kindergarten entry to the end of eighth grade. The study group included a broad range of students from varying racial, ethnic, and socioeconomic backgrounds. The study also incorporated science achievement scores for third, fifth and eighth grades.

The authors confirm their theory that much of the disparity between science performance is caused by modifiable factors. They concede that the necessary interventions need to take place very early in children's development, and they also note that the early-appearing gaps can be compounded by other modifiable factors. They authors also found that achievement trajectories are set in early development and are largely stable into elementary and middle school. While stability for high-achieving students is a positive trend, the stability also means that students who suffer a gap early in their education are often able to close that gap, even if they demonstrate consistent growth throughout their academic career.

However, the study is predicated on an early measure of children's reading and mathematics abilities (50/50). Even though the reading and mathematics scores effectively predicted science performance, the authors recommend a study that measures science items in kindergarteners specifically. The ECLS-K also provided limitations to the study: the data did not measure students' attitudes toward science, nor did it allow for causal inferences, only hypothesis generation. Practical recommendations based on these findings include modifying legislation and national policies to account for reading and math performance, lower behavioral self-regulation, and school racial segregation. Economic policies designed to increase opportunities for students' families are also suggested.

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This annotated bibliography was compiled by TIES for *Our Neighborhood*.