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## Review

# Homework and students' achievement in math and science: A 30-year meta-analysis, 1986–2015



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## ABSTRACT

In the current investigation, research conducted since 1986 were synthesized to examine the homework – achievement relationship in math/science, and to examine a range of factors that could have moderated this relationship. Our investigation revealed that there was an overall small and positive relationship between homework and academic achievement in math/science. Our investigation further revealed that the homework – achievement relationship in math/science was stronger for elementary and high school students than for middle school students. In addition, the homework – achievement relationship in math/science was shown to be the strongest in the studies involving US students, whereas it was the weakest in the studies involving Asian students. We discussed possible explanations for these and other findings, and the implications for future research directions.

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## 1. Introduction

Most typically defined as “tasks assigned to students by school teachers that are meant to be carried out during non-school hours” (Cooper, 1989, p. 7), homework is a common and widespread educational activity of everyday importance for many students, parents, and teachers across countries (Chen & Stevenson, 1989; Cooper, 1989; Dettmers et al., 2011; Núñez, Suárez, Cerezo, et al., 2015; Núñez, Suárez, Rosário, et al., 2015; Warton, 2001; Xu & Corno, 1998). It is thus not surprising that homework is frequently considered as an important instructional strategy to improve students' academic achievement (Cooper, Robinson, & Patall, 2006; Corno & Xu, 2004).

Yet, homework is a “complicated thing” (Corno, 1996), affected by more factors than any other instructional activities (Cooper, 2007). In addition, public attitudes toward homework have periodically shifted back and forth over the last century; news media and policy makers have a tendency to make generalized (and often polemical, anecdotal, and passionate) statements concerning homework (Gill & Schlossman, 2000, 2004; Warton, 2001). Not surprisingly, homework has become a perennial topic of public interest and debate, and an active area of investigation among researchers (Cooper, 1989; Cooper et al., 2006; Gill & Schlossman, 2004; Xu, 2012).

With two rare exceptions (i.e., Austin, 1979; Marshall, 1983), previous syntheses of homework research (e.g., Cooper, 1989; Cooper et al., 2006; Goldstein, 1960; Harding, 1979; Keith, 1986) have largely focused on homework in general (i.e., homework across different school subjects), without tapping into the influence of homework in specific subject matters (e.g., math and science). Yet, subject matter may influence homework's effect (Cooper, 1989; Goldstein, 1960; Harding, 1979; Paschal, Weinstein, & Walberg, 1984). Indeed, in their last synthesis concerning homework, Cooper et al. (2006) observed:

“The ranges of estimated regression coefficients appear quite similar across the subject areas. However, we would caution against drawing any conclusions regarding the mediating role of subject matter on the homework – achievement relationship from these data, because the number and type of predictors in each model are confounded with subject matter. It should also be kept in mind that these estimates refer to high school students only.” (p. 28)

Concerning its limitations of generalizability, Cooper et al. (2006; p.53) added that their meta-analysis did not have sufficient number of studies for some subject areas, such as science. As a result, their conclusion about the small effect of subject matter on the homework – achievement relationship was tentative, and future studies on such subject matters would be needed.

Thus, it would be highly desirable to conduct a meta-analysis on the homework – achievement relationship in math/science for several additional reasons. First, some recent studies have called for and tapped into domain-specific aspects of homework (e.g., interest, effort, and self-regulation; Hong, Peng, & Rowell, 2009; Trautwein, Ludtke, Schnyder, & Niggli, 2006; Xu, Yuan, Xu, & Xu, 2014). Second, regardless of whether or not to pursue a postsecondary STEM field of study, math and

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