

## Individual findings of the meta-analysis at a glance

According to Graham et al. (2020): The effects of writing on learning in science, social studies, and mathematics: A meta-analysis.

Moderator variable	Moderator levels	Effect size $g$	Number of studies ( $k$ )	Confidence Interval (95% CI)
<b>Category 1: Pre-Post Comparison</b>				
<b>Content area</b>	Science	0.31	26	[ 0.16– 0.48 ]
	Social Studies	0.31	8	[ 0.10– 0.52 ]
	Mathematics	0.32	21	[ 0.16– 0.48 ]
<b>Grade level</b>	Elementary level	0.29	19	[ 0.18– 0.40 ]
	Middle School	0.30	18	[ 0.07– 0.53 ]
	High school	0.30	18	[ 0.06– 0.54 ]
<b>Features of writing activities</b>	Informational text	0.34	18	[ 0.09– 0.60 ]
	Argumentative text	0.42	7	[ 0.17– 0.67 ]
	Journal Writing	0.33	18	[ 0.17– 0.49 ]
	Graphical representation	0.19	8	[ -0.03– 0.41 ]
	Analysis and interpretation	0.36	38	[ 0.22– 0.50 ]
	Recording of information	0.18	17	[ 0.03– 0.33 ]
	Metacognitive prompting	0.40	30	[ 0.26– 0.55 ]
	No etacognitive prompting	0.15	25	[ -0.01– 0.31 ]
	Promote knowledge/comprehension	0.16	18	[ 0.02– 0.31 ]
	Promote analysis/synthesis	0.32	15	[ 0.04– 0.59 ]
	Promote evaluation	0.44	17	[ 0.21– 0.68 ]
<b>Features of instruction</b>	Writing taught to participants	0.29	31	[ 0.15– 0.43 ]
	Writing not taught to participants	0.32	25	[ 0.15– 0.49 ]
	PD provided to teachers	0.30	21	[ 0.15– 0.45 ]
	PD not provided to teachers	0.31	35	[ 0.16– 0.49 ]
	Teacher Implementation	0.28	44	[ 0.16– 0.40 ]
	Researcher Implementation	0.40	12	[ 0.15– 0.65 ]
<b>Features of assessment</b>	Assessed knowledge	0.24	7	[ -0.02– 0.50 ]
	Assessed comprehension	0.30	24	[ 0.14– 0.47 ]
	Assessed application	0.45	17	[ 0.29– 0.61 ]
	Norm-referenced test	0.31	9	[ 0.17– 0.45 ]
	Criterion-referenced test	0.39	8	[ 0.07– 0.70 ]
	Open-ended response test	0.38	13	[ 0.16– 0.59 ]
	Multiple-choice test	0.10	15	[ -0.16– 0.35 ]
	Mixed-assessment test	0.18	10	[ -0.07– 0.44 ]
	Researcher-designed assessment	0.30	39	[ 0.15– 0.46 ]
	Commercial assessment	0.24	12	[ 0.02– 0.47 ]
	Standardized assessment	0.31	11	[ 0.19– 0.43 ]
	Proximal alignment	0.29	41	[ 0.16– 0.42 ]
	Distal alignment	0.31	11	[ 0.19– 0.43 ]
	Knowledge match assessment/writing activity	0.32	17	[ 0.21– 0.44 ]
	Knowledge match assessment lower than writing activity	0.34	32	[ 0.18– 0.49 ]
<b>Treatment vs. control comparison</b>	Writing vs. not writing	0.25	41	[ 0.12– 0.37 ]
	More writing vs. less writing	0.49	15	[ 0.27– 0.71 ]

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Quality of study	Peer reviewed	0.34	24	[ 0.17– 0.52 ]
	Not peer reviewed	0.27	32	[ 0.14– 0.41 ]
	True-experimental design	0.21	31	[ 0.08– 0.33 ]
	Quasi-experimental design	0.42	25	[ 0.24– 0.59 ]
	Test reliability adequate (>0.70)	0.26	29	[ 0.11– 0.40 ]
	Test reliability not adequate/not reliable	0.36	27	[ 0.20– 0.52 ]
	No ceiling/floor effects (<1 SD)	0.23	30	[ 0.08– 0.38 ]
	Ceiling/floor effects (>1 SD)	0.39	26	[ 0.23– 0.54 ]
	Pretest equivalence	0.27	45	[ 0.16– 0.39 ]
	No pretest equivalence	0.42	11	[ 0.15– 0.70 ]
	Not N-of-1 study	0.41	30	[ 0.22– 0.60 ]
	N-of-1 study	0.22	26	[ 0.10– 0.34 ]
	Teacher effects controlled	0.25	29	[ 0.13– 0.36 ]
	Teacher effects not controlled	0.40	27	[ 0.19– 0.60 ]
	Attrition (< 10%)	0.36	47	[ 0.24– 0.48 ]
	Attrition (>10%)	0.05	9	[ -0.14– 0.25 ]
	No differential attrition	0.38	42	[ 0.25– 0.51 ]
	Differential attrition	0.11	14	[ -0.05– 0.27 ]