

Learning through writing: How effective is writing as a learning activity in different subjects?

Teaching and learning research assumes that students dig into learning content and understand it better when they write about it. With little effort, teachers can integrate various types of writing activities into their lessons, which promote learning. Graham and colleagues' (2020) meta-analysis »The effects of writing on learning in science, social studies, and mathematics«, investigated whether writing activities, aimed toward the promotion of learning, actually lead to deeper understanding of learning content. They came to a clear conclusion.

INTRODUCTION. Writing is a cross-cultural technique. In the school context, writing can be used to promote learning about subject-matter content. From a learning theory point of view, writing about learning content (also called writing-to-learn) helps to strengthen, expand, or deepen knowledge. Formulating content in writing sets various cognitive processes in motion, which activate existing knowledge, contribute to better processing, and support storage of learning content. Teachers can integrate writing activities into their lessons in a variety of ways. Activities range from creating simple notes to composing complex argumentations. Graham and colleagues' meta-analysis provides an up-to-date and nuanced examination of 'writing to promote learning' effectiveness in the classroom.

META-ANALYSIS AT A GLANCE

Focus of the study	Writing activities to promote learning in the classroom
Target group	Primary and secondary school students
Average effect size	Positive overall effect of $g = 0.3$ in favor of instruction with integrated writing activities to promote learning
Further findings	The finding is stable across different school subjects, grades, and modes of implementation

WHAT IS THIS STUDY ABOUT? In this meta-analysis, the authors examine whether writing activities to promote learning are effective in promoting student learning in different subjects. Students' writing assignments across the included studies were quite different. They ranged in activities that involved, for example, taking brief notes, summarizing information, describing procedures, explaining facts, or developing written arguments for complex sub-

ject matter. However, what all writing activities had in common, was that they were assigned with the aim of enhancing learning. Moreover, the students had to write texts digitally or by hand, rather than, for example, create diagrams or do math problems.

Since different writing activities - such as summarizing or comparing content - initiate different learning processes, the authors assumed that these differences would also be reflected in learning outcomes. They also argued that the effectiveness of writing to promote learning might depend on many other factors. As a result, they analyzed various moderators, to determine whether effectiveness differed by school subject, age, type of writing activity, or how learning outcomes were measured. The authors also paid attention to the quality of the studies that they included. For example, they selected studies that only used scientifically based performance testing procedures rather than school grades. Then, they examined whether differences in quality were associated with differences in outcomes.

Their search included studies from 1998 to 2017, and yielded 56 experimental and quasi-experimental studies involving a total of 6,235 students. Most studies determined efficacy based on comparing the learning performance of students who learned either with or without writing (73%). A small group of studies compared students with more vs. less writing activities (27%; see [primary study example](#)). Strikingly, most studies were from science (47%) and mathematics (38%), and fewer were from the social sciences (15%). Moreover, 65% of the studies included results from secondary education and 35% from primary education.

WHAT DID THIS STUDY FIND? Across all studies, the meta-analysis found a significant overall effect of $g = 0.30$ (confidence interval $g = 0.20$ to $g = 0.41$) in favor of the learning performance of students who learned with classroom writing activities. Test scores showed better performance in knowledge reproduction, comprehension, and content application. In nearly all categories studied - different school subjects, grade levels, or different writing activities - students were able to achieve significantly better learning outcomes when writing activities were part of the instruction.

Moreover, the meta-analysis documents a variety of ways in which different writing activities with various objectives can be integrated into instruction. Although the authors examined the influence on effect size for a range of differences across studies, they were unable to demonstrate any statistically significant impacts through moderator analyses. For an overview of all moderator variables examined, see the [overview of all individual findings](#).

HOW DOES THE CLEARING HOUSE UNTERRICHT EVALUATE THIS STUDY? The *Clearing House Unterricht Research Group* evaluates the meta-analysis using the following five questions, guided by the Abelson criteria (1995):

How substantial are the effects? The average effect size in this meta-analysis is $g = 0.3$. This effect size means that more than 61% of learners with writing activities performed better than the control group learners' average performance on fewer writing activities or no writing activities. This positive effect is stable across many situations and conditions. Even though some effects in individual studies were significantly above or below this average

value, it can be assumed that, overall, writing has a positive effect on learning performance under most circumstances.

Further contributing to the substance of the effects is the authors' exclusion of studies with less reliable study designs during the selection process. These exclusions comprised studies that did not ensure whether the content focus and learning durations were similar between students in the experimental and control groups. In addition, studies were excluded when school grades or non-scientific testing procedures were used to measure performance. It is known from previous research (Cheung & Slavin, 2016) that inclusion of such studies tends to overestimate effect sizes. Learn more about estimating effect sizes in our [handout](#).

How differentiated are the results? The authors estimated the differentiated nature of the reported effects based on three categories: school subject, age group, and investigated criteria for learning outcome. The meta-analysis provided differentiated values on the different subject areas of science, mathematics, and social studies, as well as for primary and secondary age groups. The criteria for learning outcome included recall, comprehension, and application of content.

Nevertheless, the differences within the three categories were not statistically significant. This finding supports the assumption that writing activities to promote learning have similar positive effects across these areas.

How generalizable are the findings? Writing activities can be integrated into subject lessons and implemented in a variety of ways to promote learning. The varied and numerous moderators demonstrate this flexibility (see [overall table of findings](#)). The moderator analyses - in which the authors considered the most important influencing variables - also showed no statistically significant differences. This suggests that the positive effect of writing activities to promote learning is broadly generalizable.

The number and size of included studies decisively influence the results of moderator analyses. Perhaps a more comprehensive set of studies than was available could allow for differentiated findings on effectiveness. Nevertheless, the current trend indicates that more frequent writing activities can lead to higher effects in contrast to less frequent activities. Stimuli that encourage students to use metacognitive strategies also seem to allow for higher efficacy.

What makes this meta-analysis scientifically relevant? The current meta-analysis is scientifically relevant because it provides a more reliable assessment of the effectiveness of writing to promote learning compared to previous meta-analyses (Bangert-Drowns et al., 2004; Graham & Perin, 2007). It includes more studies, pays attention to the quality of the studies, and takes a more nuanced approach to the analyses. As a result, it provides more trustworthy findings, which also somewhat differ from previous meta-analyses on this topic. Namely, that the effect size of writing activities to promote learning, $g = 0.3$, is higher than the average findings of previous meta-analyses.

From a scientific point of view, there is also a significant need for more research, above all, in the subject area of social studies, since relatively few experimental studies were available here, even though writing is frequently used in these classrooms.

How methodologically reliable are the findings? The transparency and justification of the methodological approach meets the standards criteria of common requirement guides (e.g. APA Meta-Analysis Reporting Standards) to a high degree. In particular, the areas of study selection and analysis of findings are very well documented. However, in the area of primary study coding more detailed information (e.g., on the coding of dependent variables) is needed. More detailed information on the methodological assessment can be found in the [rating sheet](#).

CONCLUSION FOR CLASSROOM PRACTICE. Writing is a widely used practice in the classroom. Consistent with the findings from decades of research in this field, the overall outcomes of this meta-analysis clearly indicate that writing about learning content is an effective way to promote student learning.

While writing as a learning support activity is often used in social studies subject areas, this meta-analysis shows that the effectiveness of this method was also at least as effective for science and math subjects. The meta-analysis also documents a variety of uses for this method across subjects. Writing activities to promote learning can consist of students summarizing information, presenting facts, analyzing and interpreting connections or differences, or developing arguments in writing.

Moreover, the authors strived to identify particularly effective uses of writing activities. However, based on the current findings, no further concrete recommendations could be derived.

EXAMPLE STUDY

In their writing-to-learn study, Hand, Hohenshell & Prain (2004) investigated the effectiveness of innovative writing tasks in biology classes. They wanted to test whether two writing tasks (textbook article and newspaper article) had a better effect on learning performance than only one writing task (textbook article).

Seventy-three 10th grade students from four classes participated in the study. The students were divided into two groups (two classes per group), with no differences between groups on students' performance the previous year. Both groups of students were first given the task of writing a textbook article (500 words) explaining a topic in biotechnology to younger students. Then, the experimental group was given the additional task of writing a short newspaper article in which they should expand and elaborate on their ideas from the first task. In contrast, the control group completed other typical learning activities, such as copying from the board or working on worksheets for the same amount of time. In total, the students were engaged in this lesson for six weeks. During this time, both groups also received feedback on the writing activities and were able to incorporate it.

To determine the effectiveness of the different measures, students were required to complete three tests consisting of closed and open-ended questions: The first test took place after writing the textbook article, the second test after writing the newspaper article, and the third test eight weeks later. While there were no differences in test performance between the experimental and control groups after the first task (test 1), there were significant differences in favor of the experimental group after task 2 ($ES = 0.70$) and 8 weeks later ($ES = 1.09$). The results show that working on several innovative writing tasks can be worthwhile for science learning.

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LINKS.

To the meta-analysis of [Graham et al, 2020](#)

To the study example of [Hand et al., 2004](#)

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