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Teaching Writing to Elementary School Learners: A Study

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Abstract:

The majority of students in the Netherlands, as well as in other countries, are unable to write at a high enough level by the end of elementary school, according to research. The time allotted to writing is extremely constrained, and only a small percentage of institutions are successful in imparting this skill effectively. There is little doubt that the way writing is taught in elementary schools has to be improved upon. In order to uncover effective techniques to teaching writing to kids in grades 4 to 6, a study of writing intervention studies was conducted. There were eleven intervention categories: strategy teaching, text structure instruction, prewriting activities, peer aid, grammar instruction; feedback; evaluation; process approach; goal setting; and revision. Each intervention category had its average impact size computed. Five of the 10 categories had statistically significant results. In a pairwise comparison of these categories, goal setting (ES = 2.03) was found to be the most effective intervention for improving students' writing performance, followed by strategy instruction (ES =.96), text structure instruction (ES =.76), peer assistance (ES =.59), and feedback (ES =.88), all of which were found to be effective. Finding out how these therapies may be applied in the classrooms of primary school students will require further research.

Keywords: Writing, meta-analysis, intervention, composition, elementary, school

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1. Introduction

The extensive use of computers, tablets, and mobile phones in Western civilization over the last two decades has resulted in a rapid rise in literacy. Increasing usage of e-mail and text messaging has resulted in a rise in the requirement for individuals to be able to communicate effectively in writing. Those who don't have a firm grasp on the principles of writing will have a hard time engaging fully in the activities of everyday living in the long run. When it comes to academic and professional success, writing skills are more vital than ever for children to develop at an early age (National Commission on Writing, 2003).

The great majority of students in the Netherlands are unable to meet the writing competency standards necessary for success in both academic and professional endeavours, according to a recent study (Henkens, 2010). For example, according to a nationwide assessment study conducted in the Netherlands, most primary school students are unable to write texts that effectively communicate one simple idea or point to a reader by the end of grade six. In addition, this study found that children's writing skills don't improve much between fourth and sixth grade. Fewer than one-third of eighth-graders in the United States scored at or above competent on a national writing assessment (Salahu-Din, Persky, & Miller, 2008). At high school and college, writing becomes an increasingly important tool for learning and communication. Inadequate writers are at a considerable disadvantage (e.g. Bangert-Drowns, Hurley, & Wilkinson, 2004).

It was observed in a research by Kühlemeier and coworkers (2013) that writing education at the primary level in the Netherlands is undervalued. According to Dutch education inspectors (Henkens, 2010), just a small percentage of schools are doing a good job of teaching students how to write well. Even in their professional training, Dutch teachers do not receive enough writing instruction, nor are they equipped to teach writing to their pupils (Leeuw, 2006; Smits, 2009). Additionally, it was found that language teaching resources (such as textbooks and teacher guides) typically lack the advice teachers need to support their students' writing processes and offer suitable feedback (Stoeldraijer, 2012). To summarise, it is evident that the Netherlands' basic writing curriculum has to be improved.

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It is essential that primary-school writing instruction be based on therapies that have been proven to improve the quality of students' written texts, rather than on experimental discoveries. Children in upper elementary school were the focus of our study, and we sought for effective methods for teaching composition to those students. Research into writing interventions continues to grow, and we now have a growing body of work that examines a wide range of approaches to writing education. We conducted a meta-analysis of writing intervention studies including experimental and quasi-experimental approaches aimed at students in grades 4–6 in order to get insight into the most effective teaching methods for this age group. Meta-analysis is the approach of choice since it allows for a systematic study of the size and direction of effects from a large number of studies.

There have already been a number of meta-analyses in the field of writing research. When it comes to writing, strategy teaching has a major impact on pupils in grades 1 through 12. Graham (2006) showed that approach education greatly enhanced students' writing ability in another research involving children in grades 1 to 12. Students in grades 1 through 12 were studied in 29 research done by Graham and Sandmel (2011), which used the process approach to writing. Students' writing quality improved statistically significant but somewhat as a result of process writing education, the researchers found. There have been three meta-analyses that looked at the impact of word processing on text quality in children in grades K to 12, all of which showed that this therapy was beneficial, especially for poorer writers (Bangert-Drowns et al., 1993; Goldberg and Russell 2003; Morphy& Graham 2012).

Hillocks (1984) was the first comprehensive meta-analysis of experimental and quasi-experimental writing intervention studies; Graham and Perin (2007) was the second; and Graham, McKeown, Kiuhara, and Harris (2012) was the third. The interventions used in the three research varied slightly due to the diversity of the groups being studied. There was still a great deal of overlap in the results. Meta-analyses found that grammar instruction had a negative influence on the quality of the text, with effect sizes [ES] of -.29 (Hillocks, 1984) to -.41 (Stanford et al, 2009). (Hillocks, 1989). (Graham and colleagues, 2012) There was an ES of.56 for the study of models and an ES of.28 for inquiry, which were all determined to have an ES of.56 and.28. Sentence combining (combine basic sentences) was found by Hillocks (1984) and Graham and Perin (2006). The process of writing (ES =.09), strategy instruction

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(ES = 1.03 and.02), prewriting activities (ES =.42 and.54) and peer assistance during writing (ES =.70 and.89) all had a significant positive effect on text quality, according to Graham and Perin (2007) and Graham and colleagues (2012). Additional effective practises for improving elementary students' writing were identified by Graham and colleagues (2012), including feedback (adult and peer), the use of creativity and imagery (ES =.70), text structure instruction (ES =.59), teaching transcription skills (ES =.55), assessing writing (ES =.42), and comprehensive writing programmes.

Meta-analysis of 88 single-subject design studies conducted by Rogers and Graham (2008) found that strategy instruction, word processing, prewriting activities, goal setting, and sentence construction were all effective in improving student writing performance in high school and college. Teaching techniques for constructing paragraphs, as well as teaching abilities for editing, were all shown to be effective by Rogers and Graham (2008) for both normal and struggling writers. It was shown that grammar training had a positive impact, contrary to previous study. Some of the authors hypothesised that poorer writers could have benefitted from specific grammar training or that the teaching style (teacher modelling) might have had a role in boosting the efficacy of grammar instruction.

Because we concentrated on successful instructional practises for beginning writers (grades 4-6) in a normal educational context rather than on writing teaching in general, our meta-analysis can be regarded an improvement on prior meta-analyses of writing instruction. A wide range of ages and grade levels were represented in past meta-analyses of several therapies, including primary school pupils, teens, and students from elementary through college (Hillocks, 1984). Even though we had projected that different sorts of treatment would be effective for different groups of children, we were shocked by the outcomes. We did this study to see if our hypothesis was valid, based on the idea that intervention types would alter amongst elementary, secondary, and college students. A distinction between students in the lower and higher elementary grades was also something we expected. Bourdin and Fayol (1994) found that students up to the fourth or fifth grade performed better orally than in writing when it came to developing tales. When there is no automated writing, they found that young pupils are forced to focus on low-level writing tasks like lexical access and sentence production instead of more advanced abilities like content development. This

interferes with their ability to think critically and plan ahead. Writing performance in the early primary grades is heavily dependent on the development of lower-level skills that are necessary for writing, according to Berninger, Yates, Cartwright, Rutberg, Remy, and Abbott (1992). Pupils in upper elementary school are expected to be able to concentrate only on the composing process by the time they reach this point in their development (Kress, 1994). Pupils are more open to teaching and have more practise with essential composition skills at this time, we feel. The outcome was that instead of focusing on students in the lower grades of primary school, we decided to only include research focusing on students in grades four through six.

In addition, prior evaluations included research that focused on specific student groups, such as struggling writers, kids with learning disabilities, bilingual students, or high achievers. We feel that it is essential to exercise care when extrapolating results from studies that have been undertaken with such narrow groups to the larger population of all youngsters in a typical school context, because the instructional demands of distinct groups are bound to differ. While struggling writers may benefit from more instruction in the principles of writing, multilingual children may require additional grammatical and linguistic help, and bright kids may demand more challenging writing assignments and strategies in order to excel in the classroom. That is why we opted to include research that aimed at a broad cross-section of students in a normal classroom setting.

No previous studies went beyond summarising effects and comparing therapy to discover whether they differed significantly in terms of efficacy, which is the most crucial thing to highlight. As a result, they may be viewed as statistical reviews rather than actual therapies, as they provided reactions to the degree of variation in efficacy across interventions. Supplementing previous meta-analyses, our study found that advantageous therapies were not only identified, but also statistically proven to be more effective than alternative treatments.

Because a quarter of the publications we uncovered were not previously included in prior meta-analyses, our study may be seen as an update to the past meta-analytical research.

"Which instructional strategies are most effective in improving the writing skills of students in the upper elementary school grades?" was the question that prompted this meta-analysis. A systematic evaluation of 32 quasi-experimental writing intervention studies involving

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children in fourth through sixth grades provided the answer to this question. The findings of this meta-analysis have significant significance for the production of instructional materials and the training of teachers in upper elementary school composition.

2. Method

2.1 Inclusion criteria and search procedure

In order to be included in the meta-analysis, studies had to meet the following five criteria. First and foremost, the research required to involve kids enrolled in a regular school environment in upper elementary school classrooms (grades 4-6). Studies done in a specific educational setting or involving only struggling authors were excluded from this analysis.. Only studies that examined at least two instructional circumstances were included, rather than studies that compared only one instructional condition, as was the case in previous research. Some studies have found that participants are better off receiving an alternative therapy as part of a control condition, while others have found that participants are better off receiving no further instructions. Correlational and qualitative studies were not included in this meta-analysis as a result of this As a last consideration, each research required to provide a final quality assessment to determine the impact of an intervention on students' writing skills following the study. Students are given a grade for text quality based on a reader's overall assessment of the student's writing, which takes into account a range of criteria such as the content, organisation, vocabulary, and tone and style. A few studies reported on other outcomes, such as the length of texts or student motivation, but they couldn't be included in the meta-analysis since they weren't provided in all trials. In order to be evaluated for inclusion in the analysis, research must supply the data required to compute a weighted effect size. Finally, only papers that were published in English were included in the meta-analytic process.

Meta-analysis includes studies that were identified through searches of the PsychINFO, ERIC and Google Scholar databases, as well as others. For our study, we used the same method of searching as Graham and colleagues (2012), but we added additional search terms to indicate the type of "intervention," such as: assessment; collaborative learning; creativity; dictation; free writing; genres; goal-setting; grammar; handwriting; imagery; inquiry and mechanics; motivation; peer collaboration and peers. planning and pre-writing. This was followed by the

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addition of editing and feedback as well as modelling and observational learning as well as outlining and revision to our search to see if there were any current studies that may help us find effective approaches. The references of previous meta-analyses, reviews, and acquired publications were also used to identify relevant studies.

Databases of theses, dissertations, and conference proceedings, among other sources, were searched for unpublished research on the subject. Additional citation searches of earlier reviews and meta-analyses were conducted in Web of Knowledge utilising citations from the preceding studies.

As a consequence of using this procedure, around 2000 results were retrieved, which were thoroughly analysed. There were no non-intervention and no study focused on pupils in grades 4 through 6 in the first step. Next, we ruled out any study that was not experimental or quasi-experimental. Our next step was to exclude studies that had adequate controls, and then we discarded any research that focused on a single subgroup, such as pupils who had difficulty writing, were learning-disabled, or were bilingual or otherwise academically successful. There were 37 studies found that met all of the criteria for inclusion. Although data from five trials was available, the necessary statistics for calculating effect sizes were missing. We tried to contact the authors of these research to get their permission to use their data, but got no answer. These studies were not able to be included, for obvious reasons. Our meta-analysis was completed after identifying 32 papers that were appropriate for inclusion in the meta-analysis method as outlined in the preceding paragraphs.

2.2 The process of encoding

The following variables were coded for each study included in the meta-analysis: grade, number of participants, description of experimental and control conditions, publication type (Journal, Dissertation, Report, Conference Presentation, Paper), and the genre of the post-test measure (Expository / Narrative / Informative / Persuasive). Coding was limited to post-test measures since we needed to know effect sizes, which is why they were the only measures included. A variety of factors were categorised for which we believed they may explain for discrepancies in effect sizes across trials, making things more challenging. Attrition (% of total sample), intervention time (in days) and intensity (in minutes) were all categorised, as were the individuals instructing (researchers, teachers, teaching assistants), and the conditions

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to which instructors were randomly assigned. It was difficult to administer a single overall reliability score across all of the studies because of the wide range of scoring procedures and the differing interpretations of dependability of scoring. As a result, we coded aspects of studies that were known to be associated with the reliability of writing quality scores, such as the type of assessment of writing quality (holistic or analytical), the number of writing tasks completed, and the number of raters who evaluated the post-test measure's quality (e.g. Rijlaarsdam et al., 2011). First author and a qualified helper coded all trials in this research. Both coders were 97 percent consistent in their coding of a random sample of 10 studies (one-third of the total sample).

2.3 Interventions are classified.

All studies were extensively analysed and then classified according to the intervention's emphasis for the purposes of the study. Categorization followed, and studies with comparable emphasis on intervention were drawn from previous meta-analyses for inspiration (e.g. Graham &Perin, 2007; Graham et al., 2012; Hillocks, 1984). There were several categories from prior meta-analyses that we preserved in our analysis: strategy teaching (text structure instruction), peer help (process method), feedback, grammar instruction, and prewriting exercises.

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Table 1. Description of intervention categories

Category	Description
Strategy instruction	Explicit and systematical teaching of writing strategies
Text structure instruction	Explicit teaching of knowledge of the structure of texts
Peer assistance	Students engage in joined activities during (parts of) the writing process
Evaluation	Teaching students to evaluate their own work with specified criteria
Goal setting	Students are assigned specific product or process goals before writing
Feedback	Students receive comments from others on their writing
Grammar instruction	Explicit teaching of grammar and/or construction of sentences
Revision	Focus on revising draft versions
Prewriting activities	Students engage in activities before writing: generating content/planning
Process approach	Focus on writing process and subprocesses: planning-writing-revising

To avoid confusion, we used the phrase 'goal setting,' rather than 'product goals,' because our sample included a study in which researchers specified process objectives along with product goals. We couldn't classify our sample's two sorts of intervention using the previous reviews' categories, so we came up with two new ones: evaluation and revision. Finally, eleven categories of interventions were found, as shown in the following table: 1. Prewriting and editing, for example, are part of both process and strategy training, therefore it is important to note that the intervention categories are not mutually exclusive. We categorised studies in accordance with the principal topic of instruction that the authors had identified. Using Bui, Schumaker and Deshler (2006) as an example, the authors characterise their intervention as a writing strategy that incorporates the process approach, which the authors define as Since this intervention's major goal is to provide children with writing methods, it was decided to classify this research under the heading of strategy training. The research by Wong, Hoskyn, Jai et al. (2008), which combines self-regulated strategy development with feedback, is one of the interventions that contains features from more than one category. The study was included in this category rather than the feedback classification system since the major intervention is strategy instruction.

The explicit teaching of planning, interpretation, translation, and editing procedures is included in strategy instruction. According to Harris and Graham (1996), the bulk of studies in this area uses the Self Regulatory Strategy Development (SRSD) model devised by them in which students are also taught self-regulation skills to manage the writing process and procedural information about writing as well. It's the instruction of a certain genre's text structure, such as the organisation of a persuasive essay, the plot sections and interconnections of narrative writings, or the framework of a compare/contrast paper. To employ peer aid, you either have students engage at various stages of the writing process (planning, formulating, and revising), or you must use some type of tutoring. An essential component of assessment is helping students learn how to analyse and reflect on their own work. In the bulk of studies in this field, the 6+1 Traits Writing Model, which was developed in the United States in the 1980s, was used (Northwest Regional Educational Library, 2013). It is suggested that students use the 6 (+1) Traits Writing Model to assess their work in terms of the following areas: ideas, organisation and voice; word choice; sentence fluency; conventions and presentation. Use of reflective questions and rubrics helps students analyse their writing. Before pupils begin writing, it is necessary to provide them with writing objectives, such as constructing paragraphs or creating a draught (e.g. acquiring a learning strategy). Feedback investigations are studies in which students receive feedback on (aspects of) their writing from a teacher or a peer. Interventions in grammar education are designed to help pupils construct correct sentences. Revision studies are those in which students are taught how to improve draughts of texts. Prewriting tasks include research on content creation and planning processes, such as brainstorming and the use of graphic organisers, as well as writing exercises. When using a process-based approach, students work through a series of planning, formulation, and editing steps, as well as writing for a variety of real-world audiences and purposes, all while honing their writing abilities. Individualized education is provided to pupils in the form of mini-lessons, writing conferences, and teachable moments. In addition, students are encouraged to take responsibility of their written work by emphasising the significance of self-reflection and assessment. Students cooperate in a supportive and non-threatening setting when they write (Graham &Sandmel, 2011).

In the three studies we chose (Arter, Spandle, Culham, and Pollard, 1993; Saddler and Graham, 2005; as well as Dejarnette, 2008), researchers compared the effects of two types of

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intervention. Each treatment was given an effect size estimate before being separated into two groups depending on size. The study by Schunk and Swartz (1993) also looked at the efficacy of identifying product objectives in addition to the success of developing process goals. We estimated unique effect sizes for each of the situations where this was the case.

Analysis of statistical data and the calculation of effect sizes

Each research included in the analysis was given an effect size for writing quality based on the findings of the posttest. As long as the overall score was known, the effect size was determined using that score. In order to get a single impact size for the full writing sample, different effect sizes were calculated for each facet of writing quality, such as organisation, ideas, or word choice. Means and standard deviations were used to compute the effect sizes. Effect sizes were calculated using Hedges' g (standardised mean difference) by subtracting the mean performance of a control group from that of a treatment group at posttest and then dividing the result by the combined standard deviation of both groups. For smaller samples, Hedges' g provides a somewhat more accurate estimate than Cohens d. (Borenstein, Hedges, Higgins, & Rothstein, 2011).

A random effects model was used for the meta-analysis since it was expected that the genuine effect would vary from study to study due to variations in participants, as well as changes in treatments and the implementation of interventions. A random effects model tries to estimate the mean of a distribution of impacts instead of trying to estimate a single impact magnitude. This makes it possible to extrapolate the findings to populations other than those involved in the original research... (Borenstein, et al., 2011). We calculated the average effect size, confidence interval, and statistical significance of the effect sizes found in each treatment category. In this way, it would be feasible to compare the results of different therapies. In addition, a homogeneity test was carried out to see if there was a bigger variation in effect sizes than predicted based on sampling error alone. To determine if identifiable variables like treatment length, publication kind or grade may account for the heterogeneity, a moderator analysis was performed when the homogeneity test was statistically significant.

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2.5 Description of studies included in the meta-analysis

Table 2. Description of included studies grouped per intervention category

Study	Publication type	Grade	N	Intervention	Genre	Effect size
				Strategy instruction (*k*=11)		
Brunstein & Glaser (2011)	J	4	115	Strategy instruction + self-regulation vs. strategy instruction	N	0.84
Glaser & Brunstein (2007) 1	J	4	72	Strategy instruction vs. didactic lessons in composition	N	0.48
Glaser & Brunstein (2007) 2	J	4	79	Strategy instruction + self-regulation vs. didactic lessons in composition	N	1.12
Mason et al. (2012) 1	J	4	47	Strategy instruction + self-regulation (TWA + PLANS) vs. no treatment	I	1.13
Bui et al. (2006)	J	5	99	Demand Writing Instruction Model vs. traditional writing instruction (+Prewriting activities)	n.s.	0.34
Barnes (2013) 1	D	5	178	WISE (Writing In School Every day) vs. no treatment	N,I,P	0.11
Barnes (2013) 2	D	5	189	WISE + professional development vs. no treatment	N,I,P	0.33
Mason et al. (2012)	J	5	48	Strategy instruction (TWA) vs. no treatment	N	0.81

Each study that was included in this analysis and its impact sizes are listed in Table 2, which is organised by the kind of intervention. There is a hierarchy of interventions based on the number of impact sizes they include, with strategy instruction having the highest (11 effect sizes). Subjects are presented in alphabetical order by grade level within each category. There is a brief discussion of each study's intervention and control conditions, as well as a brief description of how the posttest measures were conducted, as well as an explanation of how large an effect size was found.

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Study	Publication type	Grade	N	Intervention	Genre	Effect size
Fidalgo et al. (2015)		6	41	Strategy instruction vs. normal curriculum	I	2.11
Torrance et al. (2007)	J	6	95	CSRI (Cognitive Self Regulation Instruction) vs. normal curriculum	I	3.57
Wong et al. (2008)	J	6	57	SRSD strategy instruction + CHAIR + adult feedback vs. CHAIR + constant training time	P	0.64
				Text structure instruction (*k*=9)		
Fitzgerald & Teasley (1986)	J	4	49	Instruction in story constituents and interrelations vs. dictionary use and word study	N	1.07
Gordon & Braun (1986)	J	5	54	Instruction in narrative structure vs. instruction in poetry writing	N	0.32
Bean & Steenwyk (1984) 1	J	6	41	Direct instruction rule-governed vs. advice to find main ideas	I	1.07
Bean & Steenwyk (1984) 2	J	6	39	GIST: direct instruction intuitive approach vs. advice to find main ideas	I	0.84
Crowhurst (1990)	J	6	46	Instruction model for persuasion + writing practice vs. group discussion activities	I	1.11
Crowhurst (1991) 1	J	6	50	Instruction model for persuasion + writing practice vs. reading novels and writing book reports	P	1.10
Crowhurst (1991) 2	J	6	50	Instruction model for persuasion + reading practices vs. reading novels and writing book reports	P	0.78
Crowhurst (1991) 3	J	6	50	One lesson persuasion vs. reading novels and writing book reports	P	0.34
Raphael & Kirschner (1985)	C	6	45	Instruction compare-contrast text structure vs. normal curriculum	I	0.26
				Peer assistance (*k*=9)		
Paquette (2008)	J	4	50	6 + 1 Traits model with cross-age tutoring vs. no extra instruction (+ Evaluation)	n.s.	1.27

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Study	Publication type	Grade	N	Intervention	Genre	Effect size
Puma et al. (2007) 1	R	4	1249	Writing Wings (cooperative writing) vs. normal curriculum	N,I	0.07
Saddler & Graham (2005) 1	J	4	44	Sentence combining with peer assistance vs. grammar instruction	N	1.66
Puma et al. (2007) 2	R	5	347	Writing Wings (cooperative writing) vs. normal curriculum	N,I	0.03
Yarrow & Topping (2001) 1	J	5	14	Metacognitive strategy instruction with peer assistance (tutor) vs. metacognitive strategy instruction with no interaction	N	0.70
Yarrow & Topping (2001) 2	J	5	12	Metacognitive strategy instruction with peer assistance (tutee) vs. metacognitive strategy instruction with no interaction	N	0.52
Brakel Olson (1990) 2	J	6	41	Writing lessons + peer partner vs. writing lessons only	N	0.42
Hoogeveen (2013) 1	D	6	96	Specific genre knowledge + peer response vs. no extra instruction	N,E	1.11
Hoogeveen (2013) 2	D	6	93	General aspects of communicative writing + peer response vs. no extra instruction	N,E	0.30
				Evaluation (*k*=7)		
Collopy (2009)	J	4	100	6 Traits writing model vs. no extra instruction	N	0.31
Paquette (2008)	J	4	50	6 + 1 Traits model with cross-age tutoring vs. no extra instruction (+ Peer assistance)	n.s.	1.27
Tienken & Achilles (2003)	J	4	98	Skills and strategies to self-assess writing vs. no extra instruction	N	0.41
Ross et al. (1999)	J	4/5/6	296	Self-evaluation with rubrics + teacher feedback vs. normal curriculum development	N	0.74
Arter et al. (1994)1	C	5	132	6 Traits writing model vs. observation (normal curriculum) (+ Process approach)	E,N	0.20

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Study	Publication type	Grade	N	Intervention	Genre	Effect size
DeJarnette (2008)	D	5	131	6 + 1 Traits writing model vs. Writing workshop	N	0.73
Coe et al. (2011)	R	5	4134	6 Traits writing model vs. no extra instruction	E	0.01
				Goal setting (*k*=6)		
Schunk & Swartz (1993) 2	J	4	20	Process goal + progress feedback vs. general goal (+ Feedback)	E,N,I	3.03
Schunk & Swartz (1993) 2	J	4	20	Process goal vs. general goal	E,N,I	2,62
Schunk & Swartz (1993) 2	J	4	20	Product goal vs. general goal	E,N,I	1,05
Schunk & Swartz (1993) 1	J	5	30	Process goal + progress feedback vs. general goal (+ Feedback)	E,N,I	3.15
Schunk & Swartz (1993) 1	J	5	30	Process goal vs. general goal	E,N,I	2.66
Schunk & Swartz (1993) 1	J	5	30	Product goal vs. general goal	E,N,I	1.65
				Feedback (*k*=4)		
Schunk & Swartz (1993) 2	J	4	20	Process goal + progress feedback vs. general goal (+ Goal setting)	E,N,I	3.03
Schunk & Swartz (1993) 1	J	5	30	Process goal + progress feedback vs. general goal (+ Goal setting)	E,N,I	3.15
Holliway (2004) 1	J	5	55	Feedback + rating vs. one sentence	E	0.84
Holliway (2004) 1	J	5	48	Feedback + reading as the reader vs. one sentence feedback	E	0.69
				Grammar instruction (*k*=4)		
Saddler & Graham (2005) 1	J	4	44	Grammar instruction vs. sentence combining with peer assistance	N	-1.66
Gein (1991) 1	D	4	109	School grammar vs. direct writing	E,N	-0.05
Gein (1991) 2	D	4	110	Sentence construction vs. direct writing	E,N	0.06
Gein (1991) 3	D	4	111	School grammar vs. sentence construction	E,N	-0.11

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Study	Publication type	Grade	N	Intervention	Genre	Effect size
				Revision (*k*=3)		
Brakel Olson (1990) 1	J	6	40	Revision instruction vs. no extra instruction	N	0.04
Brakel Olson (1990) 3	J	6	37	Revision instruction + peer partner vs. no extra instruction (+ Peer assistance)	N	0.85
Fitzgerald & Markham (1987)	J	6	30	Revision instruction vs. reading good literature	N	0.89
				Prewriting activities (*k*=3)		
Brodney et al. (1999) 1	J	5	51	Reading combined with prewriting vs. no extra instruction	E	0.93
Brodney et al. (1999) 3	J	5	49	Prewriting only vs. no extra instruction	E	0.17
Bui et al. (2006)	J	5	99	Demand Writing Instruction Model vs. traditional instruction (+ Strategy instruction)	n.s.	0.34

A total of seven groups, with an average impact size of four, may be identified. We admit that the sample sizes employed in this study are too small to draw firm conclusions. However, for the sake of completeness, these categories were included in the study, since doing so would at the very least give a notion of the possible efficacy of these sorts of treatments. Total impact sizes were derived from 32 studies, which were divided into 10 groups according to the treatments used.

				Process approach (*k*=3)		
Arter et al. (1994)	C	5	132	Process approach vs. 6 Traits model (+ Evaluation)	E,N	-0.20
DeJarnette (2008) 2	D	5	131	Writing workshop vs. 6 + 1 Traits writing model (+Evaluation)	N	-0.73
Varble (1990)	J	6	128	Whole language group vs. traditional language instruction	I	0.16

Note: For ***study***, numbers behind the references indicate that effect sizes were calculated for multiple conditions, or groups; these effect sizes are reported separately. For ***Publication*** type, J: Journal, D: Dissertation, R: Report, C: Conference presentation, P: Paper. For ***Genre***, N: Narrative, E: Expository, I: Informative, P: Persuasive, n.s.: not specified. When a study is included in another category as well, this is mentioned in parentheses.

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3. Results

To begin, the meta-average analysis's impact size was calculated using a random effects model, which was applied to all of the included investigations. The total effect size, g =.72, was computed using a 95 percent confidence interval between [.49 and.94]. For this reason, more research was needed to evaluate whether or not a combination of effect sizes in the sample produced an appropriate assessment of an individual's overall effect size. A product homogeneity test can reveal this information. Using this test, researchers may assess if the variability in effect sizes is more than the predicted variability based only on sampling error. The homogeneity test confirmed our suspicions that there was substantial heterogeneity: Q = 51151; df = 54; p.001 was obtained. As a result of the wide range of study topics and methodologies represented in our sample, we anticipated high levels of variation. However, the results showed that it was impossible to assume a single impact size for all studies.

This meta-analysis began with an investigation of publication bias by performing a moderator analysis on each article that was a part of it. Researchers found that the effect sizes of research published in peer-reviewed journals did not differ in a systematic way from those of research published in other outlets like books or newspapers (p =.22), according to the findings of this study. By using these 10 categories as explanatory variables, we were able to estimate the success of various intervention types. Our inquiry came to an end here. It was found that the inclusion of the intervention categories considerably improved the model, with X2 = 19.69, df = 9, and p.001 for inclusion of the intervention categories in a likelihood ratio test. The sort of intervention utilised accounted for some of the variation in effect sizes, so to speak.

Table 3 lists all intervention types in the same sequence as Table 2, with data for each type provided in Table 2. Each intervention has its own effect size, standard error, 95 percent confidence interval, and heterogeneity statistics Q (test statistic for heterogeneity) and I2 (% of overall heterogeneity/variability) for each intervention. There are other statistics to examine.

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Table 3. Summary of statistics for intervention categories

Intervention	N	Average	SE	95% Confidence		Heterogeneity	
				Lower	Upper	Q	I^2
Strategy instruction	11	0.96 ***	0.19	0.59	1.33	109.99***	94.30
Text structure	9	0.76 ***	0.21	0.34	1.18	11.91	33.87
Peer assistance	9	0.59 **	0.21	0.17	1.01	56.05***	89.83
Evaluation	7	0.43	0.23	-0.01	0.87	66.56***	87.57
Goal setting	6	2.03 ***	0.33	1.37	2.68	13.47*	62.61
Feedback	4	0.88 *	0.38	0.14	1.61	25.08***	91.08
Grammar	4	-0.37	0.30	-0.97	0.22	20.16***	91.84
Revision	3	0.58	0.38	-0.17	1.33	4.14	51.59
Prewriting activities	3	0.13	0.36	-0.58	0.85	3.91	48.57
Process approach	3	-0.25	0.34	-0.92	0.41	12.78**	84.58

Note: *** $p < .001$, ** $p < .01$, * $p < .05$

Two unfavourable impacts were shown in Table 3: one for grammar teaching and one for the process technique." There was no improvement in the quality of the students' writing as a result of these exercises. As far as I can tell, everything else was okay. Among these beneficial benefits, five key impacts were determined to be significantly different from zero. In that order, goal setting, strategy teaching, feedback, text structure training, and peer support were the most effective treatments. Post-hoc analysis was carried out using contrast analysis, which compared all treatments pairwise. Following education and counselling, goal setting was found to be the most effective intervention (X2 = 36.81, df = 1, p.001) in these analyses. Although Table 2 shows that a single research comparing various circumstances and grades was used to determine the impact sizes in the category goal setting (Schunk & Swartz, 1993). Although this result is significant, it should be approached with care. A statistically significant outcome (p =.006) was found when technique teaching (2 = 26.06, df = 1, p =.001), text structure instruction (2 = 12.82, df = 1, p.001), and peer help (2 = 7.64, df = 1, p =.006) were implemented. Various studies having nine or more effect sizes resulted in the creation of three distinct classifications of research. In addition to prewriting activities, feedback was shown to be a useful intervention. However, it was not found to be more helpful than prewriting exercises alone.

A significant amount of residual heterogeneity (QE = 283.18, df = 45, P =.001) was found in the sample after the homogeneity test. As a consequence, we evaluated the funnel plot (see Figure 1) in order to detect outliers that may be a source of heterogeneity. Convergence of an intervention's influence on study size is represented by a "funnel plot." Figure 1 depicts the funnel plot of the model residuals versus the standard error of the mean after including the intervention categories as explanatory variables (right). There is no uniformity in Figure 1, thus the straight lines reflect the area where 95% of the studies were expected to take place. This illustrates that the studies were symmetrically distributed around the overall average impact size, and that the bulk of the points were located in the region between the straight lines (see figure). Our sample's lack of persistent heterogeneity was revealed by this finding. Only 6.25% of the data was affected by the two outliers that were found in the sample. These outliers were found to be studies done by Torrance et al. (2007) and Saddler et al. (2007), according to the forest plot (see Appendix) that we produced (2005). So while in Torrance et al. (2007) the observed effect size was smaller than expected, in Saddler and Graham (2005) it was larger than expected, as a result of the analysis the effect size in the first study was larger than comparable studies and in the latter study the effect size was smaller than comparable studies (see also Figure 1). According to this analysis, the results did not indicate a statistically significant difference if the studies were excluded (p = 0.16 for differences between 2 and 3 and df for the difference between 2). As a consequence, it was decided to continue these research and to employ the previously calculated model for future inquiry.

After that, moderator data was analysed to see whether the discrepancy between studies could be attributed to any one or more unique causes. If there were systematic variations in effect sizes between trials using an adequate control condition and those comparing multiple intervention conditions, we wanted to look for them. No research included a control group that received no additional training in any of the six intervention categories. Relative heterogeneity (QE = 220.37, df = 37, p.001) was not reduced significantly by the addition of control condition in the moderating variable (p-values ranging from .29 to .90). After that, the following variables were analysed as moderating factors: grade, intervention duration, technique for measuring writing quality (holistic versus analytical), number of writing assignments in posttest, and number of raters who rated the quality of the posttest measure. All these factors had no statistically significant effect on the total sample heterogeneity.

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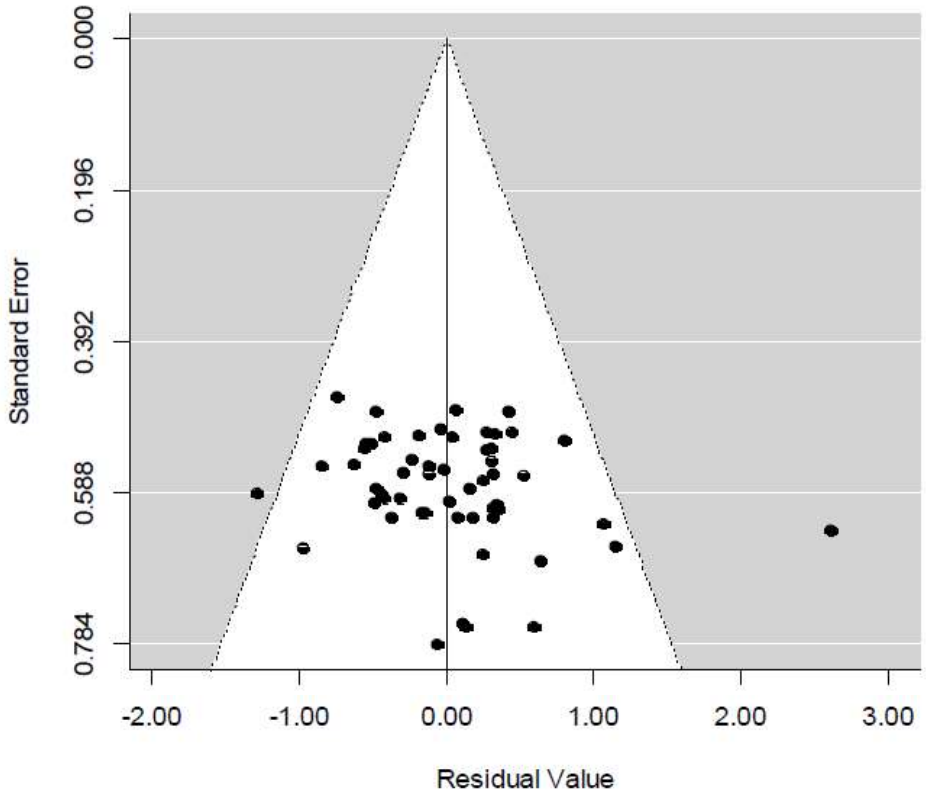

Figure 1: Funnel plot of final model.

Text structure instruction, process method, revision, and prewriting were all shown to have no significant differences in the following phase of the study (p-values ranging from .08 to .16). Remaining intervention types were compared to see how they differed. As a result, only categories with an impact size greater than five were included for this research. These categories include strategy training, peer help, assessment, and goal setting. Using a moderator analysis on the individual categories, grade, duration of intervention, type of writing quality evaluation (holistic or analytical), number of writing assignments in posttest, and number of raters rating the quality of posttest measure were considered as possible moderators.

Effect sizes in grade 6 (2.19) were consistently larger than those in grades 4 or 5, suggesting that grade may be an important mediator in strategy teaching. (0.59). Analytical text quality assessment trials were shown to have smaller impact sizes than studies that employed a holistic evaluation when compared to other types of trials (-0.86). Effect sizes were less (-0.11) for explanatory texts when genre was a significant mediator in the category evaluation.

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There is a lot of variation in peer support because of one large research with a tiny impact size. Goal-setting heterogeneity can be attributed to different situations.

The 95 percent confidence interval data in Table 3 demonstrate that even at the bottom bounds of the confidence interval, the effects of treatments that considerably enhance writing skill are remain overwhelmingly favourable.

In this section, we'll discuss the best ways to help elementary school pupils improve their writing.

According to new study, there have to be changes made to the way writing is taught in Dutch primary schools. Meta-analysis was conducted in order to identify effective instructional methods for teaching writing to students in grades 4 through 6. To arrive at this result, we computed the average impact sizes of 10 distinct types of treatments. In terms of impact sizes, the most successful interventions for increasing students' writing skills include goal setting, strategy training, text structure teaching, feedback, and peer help. These treatments were deemed to be the most effective by the post-hoc analysis. A recent review (Graham et al., 2012) found similar results to ours (Graham &Perin, 2007). This is despite the fact that we only studied kids in grades 4 to 6 who were enrolled in a typical school setting. In this example, statistical analysis supports our conclusions.

A key conclusion of our research is that establishing goals was by far the most helpful strategy. According to Schunk and Swartz (1993), all of these impact estimates stem from a single (1993) research, which compares diverse scenarios and numerous grades, as previously indicated. Thus, it is only possible to make speculative generalisations from these observations. Prior meta-analyses (Graham &Perin, 2007, Graham et al., 2012) found evidence that specifying product goals was beneficial, but these research were carried out on (partially) different populations of students (special needs learners, struggling writers, and slightly older students). Setting goals for students may help them improve their writing abilities, according to one study. Instruction in approach is the next most effective intervention. Teaching strategies is the most common type of intervention in our study, thus we can draw more reliable conclusions from it. One of the most extensively studied interventions is strategy teaching. However, Harris and Graham (1996)'s self-regulated strategy development (SRSD) approach to strategy education, or a variation of it, was the

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focus of the majority of the research in this area. The SRSD approach has evolved as the "standard" in strategy education, which is not unexpected given the consistently large impact sizes revealed in research assessing SRSD. SRD has been proven to be exceptionally beneficial for all sorts of learners (strugglers with writing; learning challenged; average; and gifted) across a wide variety of grade levels by other research (grade 2 to 10). Another moderator analysis, which we ran in all categories with more than five effect sizes from various studies, found that in our sample, the (average) effect of strategy instruction appears to be significantly stronger in grade 6 than it is in either grade 4 or 5. Another argument is that students' lower level abilities have improved to the point where they can benefit from particular training in writing methods by sixth grade. Because of this, we find that impact sizes in this category are less in research where text quality is evaluated analytically, as compared to studies that adopt a holistic approach. Analytical assessments are commonly based on scoring rubrics. Using a scoring rubric is a way of determining how well an individual does based on a set of criteria and standards. A holistic test, on the other hand, is more generalizable to writing skill than an analytical exam since it is more task-specific (Schoonen, 2005; Rijlaarsdam et al., 2011). Analytical scores tend to be lower than holistic scores when analysing texts since all the different components of a text are analysed separately and then combined into a single final total score (Schoonen, 2005).

The second most effective intervention kind is teaching in text structure. The studies in this category are all of the same type. This category investigates the impact of explicit instruction of (parts of) text structure on student accomplishment in a variety of texts, including narrative, persuasive, and compare-and-contrast texts. In all of the research included in this category, students' writing skills improved significantly when text organisation was taught explicitly.

The pupils are given guidance from their peers once they have been taught about the structure of a book. Collaboration between students at various phases of the writing process as well as various types of interventions are all part of peer help. Using peer support is most successful when it's offered in a certain way with a specific goal in mind, as indicated in Table 2.

Comparatively, studies that focus just on cooperative writing (e.g., Puma et al. 2007) had less impact than studies that combine peer help with more specialised treatments, such as the

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teaching of particular genre knowledge (Hoogeveen, 2013) or sentence combining (e.g. Puma et al. 2007). (Saddler & Graham, 2005). Students' writing skills can be improved by peer tutoring, according to the study by Yarrow and Topping (2001). This study found that instructors' writing scores improved more quickly than students'. Student learning may be enhanced when they are required to explain a topic in front of a group of others. The only way to truly grasp anything is to have first experienced it.

With just four impact sizes from two studies, feedback is one of the more restricted intervention categories. However, despite the fact that feedback tends to be effective, further study is needed to draw more definite conclusions, as feedback may be provided in a number of methods (for example, peer feedback vs teacher input) (e.g. product-focused vs. process-focused). The use of feedback in the classroom to improve students' writing abilities should be studied further.

The process approach to writing and the usage of grammar instruction have both negative impact sizes on the overall effect size of the writing process. The result that grammar instruction had a negative impact is in line with other meta-analyses that found the same thing (Graham &Perin, 2007; Graham et al., 2012; Hillocks, 1984). The quality of the material appears to be unaffected by paying attention to the correct structure of phrases. To a certain extent, this is because students may not be able to apply what they have learned in the classroom to real-world writing situations owing to a lack of transfer effects.

The procedure approach may have had a negative influence due to a variety of factors. Although it is a tiny intervention category, there are just three studies in this group, which makes it homogenous. You can compare one intervention type (in this example more effective) to the process approach as a control condition. This is the case in two of the three studies. Consequently, we anticipated that if we had used a 'pure' control group, the effect sizes would have been less than they were. A subsequent investigation employing the type of control condition as a moderator, on the other hand, was unable to support our hypothesis. There are various plausible explanations for this finding: However, it's also possible that our sample size is too tiny to identify any systematic variations, making it impossible to discover any changes at all. Beginning authors may find the process method overwhelming since it necessitates them working on too many things at the same time. Beginner writers may benefit

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more from specialised writing instruction, such as instruction in text structure or technique. A (modest) beneficial effect of the process method was shown in the Graham and Perin (2007) meta-analysis of adolescent students. Using the process technique to teach writing to more experienced authors may be successful, but it may not be optimal for teaching writing to beginning authors, as previously noted.

The study has a number of limitations.

We can only speculate about the overall success of these intervention categories because several categories had minor effect sizes (e.g., 4 impact sizes). Even though we didn't include these categories in the research because we wanted to make the most of the available data, we did include them in the analysis to see whether they had any influence.

It was more challenging to understand the results of the study because of the large degree of variability between trials that could not be explained entirely by recognised variables. As a result of the inclusion of a significant number of small studies in our sample, our sample's heterogeneity is inflated. Large studies exhibit more variability inside the study and less across studies, but several small studies in a category lead to considerably more heterogeneity between studies, as seen in the picture. Differences across individual studies are typically the cause of variability in our sample's smaller categories, which is in line with earlier findings. For example, it's possible that the operationalization of the research differed due to variations in the materials that were used and the training that was given. Assignments ranged from a single piece of writing in one genre to many pieces of writing across several different genres. Students were expected to finish all of these pieces in class. Involvement might last anything from a single day to a whole calendar year. There were a number of issues with this study's data analysis, such as the inability to code for variables that weren't clearly stated. However, despite the fact that these characteristics might contribute to heterogeneity, they cannot be addressed meaningfully in a meta-analysis unless they are reported correctly.

4.3 Proposals for more research

According to our findings, there hasn't been much study on writing interventions for elementary school pupils, which is in keeping with earlier findings. We may conclude that more study is absolutely important in this field. In our meta-analysis, we found that sample sizes for some types of interventions were too small to make firm conclusions regarding their

efficacy. In this field, further study is needed, in particular in the categories listed above. Research on the utility of goal setting, in particular, is essential because our findings imply that it may be extremely beneficial in improving writing. If Schunk and Swartz (1993)'s encouraging results can be replicated in additional studies, it would be beneficial to do so. Further research on prewriting activities such as feedback is needed here as well. Further research is needed to see if many highly effective treatments might lead to even better student performance. Does combining one highly successful strategy with another highly effective intervention result in a marginal gain in outcomes? In addition, new interventions and approaches should be created and tested.

34 percent of the studies in our sample utilise a posttest-only design, whereas 47 percent use the pretest-posttest design, in which the effect of an intervention is examined at the end of the intervention. It is, nevertheless, required to include a delayed posttest in order to verify claims regarding the effectiveness of an intervention. The posttest can be very similar to what was taught during the intervention, which might lead to an overestimation of the success of the intervention. Administering a delayed posttest might provide more information on the long-term effects of treatments on students' writing. In order to make conclusions regarding the'real' efficacy of therapy, delayed posttest data are needed. In intervention research, this isn't a common practise, which is a shame.

4.4 Instructional suggestions for use in the classroom

This meta-analysis gives useful information on what works in the teaching of writing. We were able to identify several possible tactics for teaching writing to kids in the upper elementary grades, but further research is needed to understand exactly what works and what doesn't. Because of this, we conclude that beginning writers would benefit most from a writing programme that focuses on goal-setting and strategy training as well as text structure education, feedback and peer interaction. We found that setting process goals, such as acquiring a certain skill, was really beneficial. Self-regulation skills were better taught when strategy instruction was incorporated into self-control training. Elementary students were shown to benefit most from specialised, targeted treatments, such as instruction in the application of procedures or the structure of a book. For example, we don't yet know what the optimal instructional programme for teaching composition skills is: what resources should be

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utilised, how much time students should devote to composing, how much practise students are expected to obtain, how we should assist students' writing processes, and so on. As a result, this research merely offers general concepts for teaching, rather than a prepackaged solution ready for use. You'll still need extensive classroom testing to find out what works.

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