Effects of a Computerized STOP & LIST Intervention to Foster Text Production Skills in Students Who Struggle With Composition Writing

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Most students who struggle with writing have particular trouble with planning a text. They do not find themselves sufficiently able to generate content and organize the ideas they wish to address into a coherent order. STOP & LIST is a well-proven strategy that has the potential to help students mold an internal representation of the text in their minds before composing it. However, teaching such a technique in diverse classroom environments is challenging. We thus developed a computerized version of a STOP & LIST intervention geared toward providing each student with sufficient practice opportunities and individualized feedback to acquire ample text-planning skills. In our randomized experiment, we involved 30 fourth graders with severe difficulties in expressive writing. We provided 15 students with seven 90-minute training sessions using our software, and the other 15 continued to participate in regular classroom activities. Our results speak to the high effectiveness of the intervention. The children obviously benefitted greatly from the treatment. Our program produced an effect size of about one and three quarters standard deviations. We end the paper with a critical discussion of the results and some practical implications of the findings.

Keywords: **Writing Instruction, Learning Disabilities in Written Expression, Strategy Instruction, STOP & LIST**

Introduction

Being able to form words and sentences to produce texts that are comprehensible to their readers is indispensable in today's society. As MacArthur et al. (2006) put it, "writing is one of humankind's most powerful tools" (p. 1). It is often viewed as equivalent to thinking (Foerster et al., 2000) and a key way in which people reveal their skill levels and their knowledge (Day, 2018).

The significance that text production holds for daily functioning in educational, work-related, and personal life contexts makes it problematic if learners fail to reach at least a minimum competency level in writing. Unfortunately, difficulties in this area are one of the most common obstacles for elemen-

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tary and secondary students on their way to reaching their full potential. In fact, only a little over 40% of all high school graduates in the United States meet the basic requirements for most career fields in this respect (College Board, 2014). Because written language disorders are among the most prevalent learning disabilities (LDs) worldwide (Grünke & Leonard Zabel, 2015), it is assumed that problems in producing texts of sufficient quality are widespread all around the globe (not just in America).

In their influential theory, Hayes and Flower (1980) described the composition process as an activity that consists of three recursive stages: planning, translating, and revising. Skilled writers often spend more than a third of the time of the whole procedure thinking of ideas and organizing information (Gillespie-Rouse & Graham, 2016). In contrast, students who are academically challenged in literary language, such as those with specific LDs in writing, often invest less than one minute in planning (MacArthur & Graham, 1987).

Luckily, there are several meta-analyses that give evidence about different ways to support children and youth who struggle with text composition (e.g., Cook & Bennett, 2014; Datchuk & Kubina, 2012; Gillespie & Graham, 2014; Gillespie et al., 2018; Rogers & Graham, 2008). The underlying thrust of these systematic aggregations of available effectiveness studies indicates that strategy instruction, goal setting, word processing, summarization, positive reinforcement, and sentence construction are very useful in helping children and adolescents improve their text production skills.

An especially promising approach in assisting students with severe problems in planning is called STOP & LIST (Graham & Harris, 2005). The name stands as acronym for the four steps that should be taken during the prewriting phase: (a) ***S***top, (b) ***T***hink ***O***f ***P***urpose, (c) ***L***ist ***I***deas, and (d) ***S***equence ***T***hem (Graham & Harris, 2005). Like many other efficient learning techniques, STOP & LIST usually gets taught by way of the self-regulated strategy development (SRSD) model by Graham and Harris (1995). SRSD is an empirically validated framework for explicitly guiding struggling writers through the different activities that need to be undertaken before arriving at an admissible text product. The What Works Clearinghouse recognizes it as an evidence-based practice that involves six stages: (a) develop and activate background knowledge in the students, (b) discuss the strategy with them, (c) model the way to apply the different steps involved while thinking aloud, (d) assist the students to memorize the steps necessary to successfully execute the strategy, (e) scaffold the process as they try to use it on their own, and (f) help the students to master the transition from "overt" to "covert" writing (Gillespie Rouse & Graham, 2016).

Up to now, five published studies have evaluated the effects of STOP & LIST in struggling writers (including those with specific LDs; Graham et al., 1998; Grünke & Hatton, 2017; Grünke et al., 2019; Özbek et al., 2019; Troia

& Graham, 2002). In all experiments, the students were able to improve their performance in a meaningful way by applying the strategy. After they had been taught STOP & LIST, they unanimously wrote more extensive and more elaborate texts than before the treatment.

Despite these promising findings, offering struggling children and youth interventions such as the one just described remains difficult in a classroom setting with a large group of students who all need different amounts of support. It is virtually impossible for teachers to sufficiently attend to the individual needs of academically challenged learners while providing them with enough opportunities to practice various skills until they reach a mastery level. Thus, educational strategies are warranted that carry the potential of being responsive to the specific strengths and weaknesses of every student, especially to those of weak performers.

Computer-assisted instruction (CAI) is a method of programmed learning that seems to meet these requirements. It is a teaching process in which a PC, a laptop, or a tablet is used to enhance the acquisition of different skills. There is a broad research base on the effects of CAI, supporting the notion that this model is especially beneficial for struggling children and adolescents. In their meta-analysis, Gersten and Baker (2001) stated that using CAI in story writing instruction yields high effect sizes of $d > 1.00$ for students with LDs. Kellog and Whiteford (2009) added that automated feedback can boost such positive outcomes.

The purpose of this study was to evaluate the effects of a computerized STOP & LIST intervention on the story writing performance of struggling fourth graders. We chose this particular target group because children that age should have already mastered the skill of producing simple narratives (Decker et al., 2016; Kellog, 2008). The first author designed the software and aimed at scaffolding the crucial planning process of the participants while applying STOP & LIST. We expected that in comparison to students who would not receive the intervention, children who took part in the training would demonstrate a significantly greater increase in text length from pre- to post-testing.

Method

Participants and Settings

The participants were 17 male and 13 female fourth graders between the ages of 8 and 9 years. We chose them through a screening process across four classrooms in two elementary schools in North Rhine Westphalia (Germany). All students were asked to compose a narrative on a computer in response to a simple writing prompt (no time limits were given). They were able to pick one of three options ("It is all your fault," "A bicycle accident," or "Lost keys") about which to write their text. A median split was performed based on the length of

the stories. Students whose narratives contained fewer words than the median were considered potential candidates for our study. In addition to having been able to only produce a rather small number of words, they had to meet the following criteria:

1. Their teachers deemed them skillful in using a computer keyboard (based on the experiences they had instructing them in the school's computer lab).
2. Their teachers considered them comparatively weak writers.
3. The students did not have any kind of intellectual disability (IQ not lower than 85).
4. The students did not score in the last quarter of a standardized spelling test.

By considering these prerequisites, we tried to make sure that the participants possessed all the necessary requirements to benefit from our intervention. It would not have been reasonable to choose children who were not even able to engage in the writing intervention because they lacked the necessary keyboard skills, intellectual capabilities, or orthographic competence.

To capture intelligence and spelling, we applied the Number Combination Test by Oswald (2016) and the Hamburg Writing Samples by May (2018). The eventual group of 17 boys and 13 girls demonstrated an IQ between 85 and 112 ($M = 96.07$; $SD = 8.21$). According to their teachers, about half of them did not grow up with German as their first language. However, all of them spoke and wrote the language fluently.

Despite their sufficient intellectual and spelling abilities, their composition skills were below expectations (according to our screening and their teachers' estimations). An LD is characterized by low achievement in one or more academic areas (reading, mathematics, and/or written language; Fletcher, Llyon et al., 2018). Even though there is no standardized test in German aimed at capturing compositions skills, all of our participants did obviously demonstrate insufficient performance in this academic area and thus conformed with the general description of what constitutes an LD.

Design and Measures

We employed a pre-posttest control group design, which is the strongest type of plan for the collection and analysis of data and should be used whenever possible (Mertens & McLaughlin, 2003). Participants were randomly assigned to either the treatment or the control group. Fifteen children received the intervention, and the other 15 continued to take part in regular classroom activities. We conducted the measurements one day before the first intervention session and the day after the last one.

The pretest and the posttest each consisted of another writing task. Students were asked to produce a story in response to a prompt similar to the

one we used during the screening assessment. From those writing examples, the number of total words written (TWW) was determined by two graduate university students (interrater reliability equaled 100%). According to Grünke et al. (2015), at the age of our participants and in the phase of the writing development in which they were operating, the number of TWW is the most common way of capturing productivity and text quality. If experts evaluate writing examples from children on that level, longer texts usually get better ratings. When students acquire more experience in writing, the correlation is lower (MacArthur et al., 2006).

Intervention

Our computerized version of the STOP & LIST intervention was designed as a method that guides learners through the planning and transcribing part of the writing process in five steps:

1. Get ready for the task: Students are led through three questions that revolve around setting appropriate writing conditions and preparing emotionally for the assignment ("Is it quiet enough to start working?" "Am I sitting comfortably?" "Am I ready to begin?"). Subsequently, the software lets the students select a writing prompt. The aim is to apply rituals for structured work that the learners can transfer into their self-regulated workflow.
2. Set goals and focuse on purpose: With their writing prompt in mind, a digital clock set to one minute helps students to focus on setting appropriate writing goals and thinking about the purpose of the writing task.
3. Brainstorm ideas: During the next step, students have to list at least three thoughts in the form of keywords on what they want to include in their story.
4. Sequence thoughts: After jotting down some notes, the aim of the next step is to sequence the listed ideas. The interface lets students pull every keyword up and down until they build an order that should help them write down their story during the last step of the strategy.
5. Compose the text: The software provides a blank form for students to write down their story. The sequenced keywords are displayed on the right side of the screen to aid during the transcribing and reviewing part of the writing process.

After all steps are completed, the story can be printed or saved as a pdf document. To benefit from the positive effects of automated feedback on writing (Kellog & Whiteford, 2009), a word-counting tool was included. Thus, the participants always received instant feedback on the length of their texts.

The intervention consisted of seven 90-minute sessions spread over 2 weeks. Two graduate college students of special education conducted the treatment. They were both experienced in working with children, due to several internships they had completed in different elementary schools during the course of their university training. To enhance the internal validity and guide the interventionists through the process, we prepared a written manual (available upon request). It contained information about technical and formal questions regarding the procedures. In addition, it provided a guideline on how to conduct each lesson during the intervention. It entailed sentence-by-sentence instruction for the implementation of the software.

For the sessions, the children met up with the interventionists in two empty classrooms that were equipped with computers for each child. The first lesson focused on familiarizing the students with the software and on demonstrating its use. After recalling basic knowledge about the writing process (Step 1 of SRSD), the interventionists explained that learning about and applying the STOP & LIST strategy would help them to write better stories (Step 2 of SRSD). They modeled the use of the software by displaying a computer screen on a whiteboard and demonstrating how to use it while commenting on each activity. The interventionists started by going through the three questions aimed at preparing learners for the writing process ("Is it quiet enough to start working?" "Am I sitting comfortably?" "Am I ready to begin?") and by clicking "yes" on the dialogue window on the screen. Subsequently, a selection of different writing prompts appeared.

After choosing one, the interventionists typed in 10 ideas that came to their mind while contemplating the chosen topic. Next, they sequenced their thoughts in order to reflect the course of action in the story to be created. As a last step, they transcribed a short story of about 60 words while referring to the sequenced list of ideas (Step 3 of SRSD).

During the whole time, the university graduate students thought aloud and commented on their actions. Furthermore, they involved the children in the process by asking them guided questions about the purpose of each activity they were demonstrating. Next, they asked participants to go through the process and use the software themselves, while the interventionists provided help and corrective feedback (Step 4 of SRSD).

All remaining sessions were structured in the same way: (a) The interventionists praised the children for their previous achievements, based on positive aspects about the stories they had written in the last lesson (because every text was saved on the hard drive of the computers, the university students were always able to analyze and evaluate each story after a session); (b) the children worked independently with the software, while the interventionists monitored the process and provided help whenever it was needed; and (c) the participants

filled out a three-category questionnaire about how they liked the day's session (Step 5 of SRSD). Over time, the university students gradually faded out their support and put the children in the place of applying the software bit by bit more independently (Step 6 of SRSD).

Results

Figure 1 presents the results for the number of TWW in both groups in the form of a boxplot. As can be easily recognized, the treatment group improved remarkably, whereas the control group did not show any noteworthy enhancements.

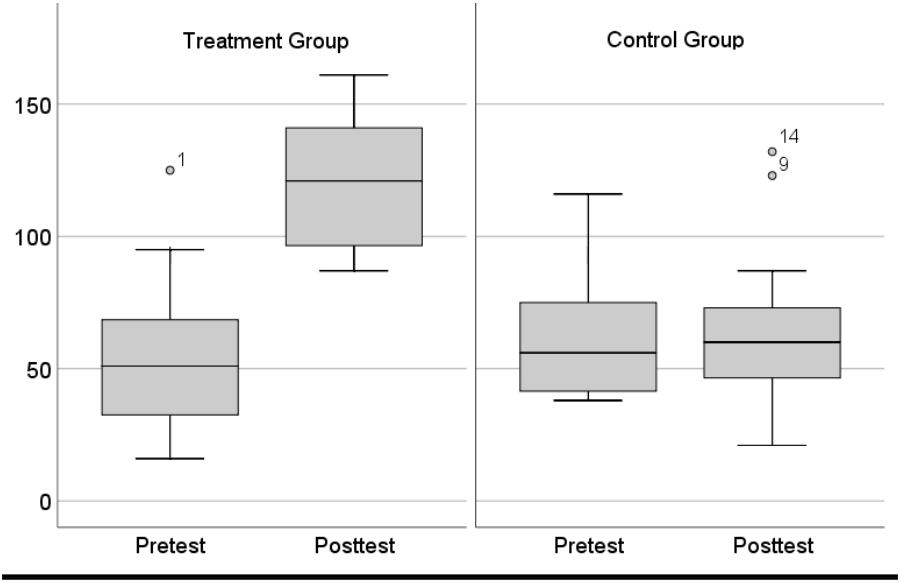

Figure 1. **Boxplots for the number of total words written in both groups.**

Descriptive data concerning the number of TWW of the students who received the intervention and of those who did not are presented in Table 1.

Table 1. ***Means of Performance on Pretest and Posttest Measures for Both Groups***

	Pretest		Posttest	
Group	Mean	*SD*	Mean	*SD*
Treatment Group ($N = 15$)	54.33	29.66	130.13	55.58
Control Group ($N = 15$)	61.93	26.89	65.33	30.54

The pretest scores did not significantly differ between both conditions, $t(28) = -.73$, $p = .468$ (two-tailed). However, the average number of TWW of the students in the control group exceeded that of the students in the treatment group by 13.99%. Taking this nonsignificant yet notable difference into account, we conducted an analysis of covariance (ANCOVA) with the pretest as the covariate and the posttest as the dependent variable. This approach is often recommended in the literature for the analysis of data from pre-post control group designs when there are at least marginal discrepancies in pretest scores between conditions (see Dugard & Todman, 1995). Before running the ANCOVA, we performed a test for homogeneity of regression to determine whether the within-group regression coefficients were equivalent. The results indicated that the regression coefficients were essentially homogeneous. As can be seen in Table 2, the main effect of the treatment condition proved to be statistically significant, $F(1,27) = 20.08$, $p < .001$.

Table 2. ***The Results of the ANCOVA***

Source	*df*	Mean Square	*F*	Sig.	eta^2
Pretest	2	8528.75	4.82	.037	.15
Group	1	20825.32	20.08	<.001	.43
Error	27	1769.57			
Total	30				

That means that group membership did have a significant effect on the posttest scores when controlling for pretest differences. To quantify the magnitude of change, we used a corrected effect size for repeated measures designs (see Lenhard & Lenhard, 2016), which is an adaption of Cohen's *d* (Cohen, 1988).

The formula accounts for any differences between groups that might have existed before a treatment was implemented. Our calculation yielded a remarkably high index of $d = 1.77$. According to common conventions for small ($d = 0.20$), medium ($d = 0.50$), and large effects ($d = 0.80$; Chen et al., 2010), our results can be considered very positive.

The data from the aforementioned questionnaire about how the students liked the day's lesson revealed that the acceptance rate of the intervention was very high. All 15 participants in the experimental group indicated at least four out of five times that they enjoyed the particular session very much. None of them ever expressed disapproval. In 92.00% of all cases, the students rated the lesson most favorably on our three-category questionnaire.

Discussion

Basic Findings

The aim of this randomized control trial was to evaluate whether a computerized STOP & LIST intervention would improve the writing performance of struggling fourth graders. Our training consisted of just seven 90-minute sessions. The results indicated that students who received the treatment produced significantly longer texts upon termination of the instruction than those who continued to participate in regular classroom activities. In fact, the improvements were so strong that they yielded an unusually high corrected effect size of $d = 1.77$. Thus, our approach can be seen as very helpful and beneficial.

These findings correspond with the results of previous studies on the potency of STOP & LIST interventions as described above. What is novel about our approach is the implementation of this very effective planning strategy within a CAI framework. Hence, we were able to demonstrate that helping struggling writers to improve their ability to generate content and to organize ideas does not have to be done by teachers to be effective. It seems that our software can also facilitate the process of acquiring application knowledge in using the STOP & LIST strategy in a very feasible way. Furthermore, the participants seemed to like the intervention very much and gave markedly positive feedback.

Limitations

Notwithstanding the positive results, our study is subject to several caveats. First and most obvious, it was conducted with only 30 children. Furthermore, all of them were of a similar age and educational background. This makes generalizations to the population from which we selected our sample difficult, let alone to groups of students that differ in relevant attributes from our participants. The study needs be replicated with more and more diverse learners to be able to draw broader conclusions about the effects of our STOP & LIST intervention. Due to the fact that there are no standardized writing tests in German (like the Test of Written Language by Hammill and Larsen [2009] in English),

the objectivity in defining and selecting our sample was certainly not beyond reproach. The choice of our participants rested, among other factors, on the appraisals of the teachers concerning students' writing performance and ability to use a computer keyboard. Subjective evaluations such as these lack the precision that would be necessary to properly replicate our experiment. Furthermore, classifying our participants as having an LD in written expression remains questionable. However, given the lack of a suitable instrument to capture writing performance objectively, this shortcoming could not be avoided.

Another limitation pertains to the question of which factors were responsible for the outcomes and to what extent. Research shows that both the use of a computer (e.g., Peterson-Karlan, 2011) and of strategy instruction (Graham et al., 2018) usually leads to significantly better writing performance in students with LDs. However, it is impossible to determine based on our findings whether the positive outcomes can be explained by the fact that we used a computerized version of STOP & LIST instead of any other approach to enhance planning skills. Prospective studies should investigate the effects of different techniques in this respect and should alternate between CAI and non-CAI.

We used no other measure of writing performance besides the number of TWW, and we did not include a follow-up test. This limits the validity of the claim that the intervention had a deep and lasting impact. As mentioned above, text length correlates very highly with text quality when appraising stories written by elementary school children (Grünke et al., 2015). However, both aspects are not synonymous. It would have been helpful to include some expert judgements on how well the narratives were written. In addition, integrating follow-up measures into our study design would have enabled us to make statements about whether the effects were still traceable after certain periods of time. Unfortunately, restricted resources prevented us from conducting a study that would have been more elaborate, rich, and complex.

Finally, the software that the interventionists worked with was a beta version with some features not yet finished, such as the option to reassess and finish a story. The university students had to work around some bugs that might have had a negative influence on the writing outcomes and motivation. In future studies on our computerized STOP & LIST intervention, these shortcomings will have certainly been eliminated.

Implications for Practice and Outlook

In almost every part of the world, classrooms are becoming more and more diversified as students who were once pulled out for special programs are now included within regular instruction (Rapp & Arndt, 2012). This places increasingly high demands on teachers to transform their approaches to instruction to meet the needs of very heterogeneous groups of children and youth. Incorporating CAI into the curriculum can be a crucial step in making learning

more tailored for individual students. By applying such interactive instructional techniques, everyone can work on a skill that matches their needs. Even though a computer cannot replace a human when it comes to the "I do it!" part of the common sequence of the three steps in explicit teaching ("I do it!" "We do it!" "You do it!"; Goeke, 2008), it can certainly help with prompted and unprompted practice. Software like the one we used in this study is definitely suitable for intense drills while providing immediate feedback. In addition, the observation that students are generally very motivated to engage in CAI has been repeatedly documented for several decades now (e.g., Kulik et al., 1983; Lepper, 1985; Seymour et al., 1987). Hence, an intervention such as ours meets several requirements that are essential for providing individuals with learning problems a custom-fit range of academic activities from which they can actually benefit (Mitchell, 2014).

The beta version of the software certainly had some flaws and caused extra work on the side of the interventionists and students because they were not able to use all features. Without a doubt, our intervention needs some optimizing and fine-tuning. We have to make sure that it functions well and is user-friendly with low maintenance. However, regardless of any possible shortcomings in conjunction with the software, we were definitely able to demonstrate that delivering the well-proven STOP & LIST strategy through a CAI model can help struggling students to write longer stories while enjoying the activity. When dealing with such an aversive and arduous task as text production, such a finding cannot be valued enough. Engaging young learners at risk for failure in activities that help them improve their composition performance is extraordinarily valuable. We hope that instructional approaches such as ours will receive wide attention in research as well as in practice to enhance the often dire situation of children and youth in school systems that all too often fail to meet the needs of their struggling students.

References

Chen, H., Cohen, P.,& Chen, S.(2010) How big is a big odds ratio? Interpreting the magnitudes of odds ratios in epidemiological studies. *Communications in Statistics: Simulation and Computation, 39*, 860-864. doi: 10.1080/03610911003650383

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences.* Hillsdale, NJ: Erlbaum.

College Board (2014). *Test specifications for the redesigned SAT*. New York, NY: The College Board.

Cook, K. B. & Bennett, K. E. (2014). Writing interventions for high school students with disabilities: A review of single-case design studies. *Remedial and Special Education, 35*, 344–355.

Datchuk, S. M. & Kubina, R. M. (2012). A review of teaching sentence-level writing skills to students with writing difficulties and learning disabilities. *Remedial and Special Education, 34*, 180–192.

Day, T. (2018). *Success in academic writing*. London, UK: Red Globe Press.

Decker, S. L., Roberts, A. M., Roberts, K. L., Stafford, A. L., & Eckert, M. A. (2016). Cognitive components of developmental writing skill. *Psychology in the Schools, 53*, 617–625.

Dugard, P., & Todman, J. (1995) Analysis of pre-test-post-test control group designs in educational research. *Educational Psychology: An International Journal of Experimental Educational Psychology, 15*, 181–198, http://dx.doi.org/10.1080/0144341950150207

Fletcher, J. M., Lyon, G. R., Fuchs, L. S., & Barnes, M. A. (2018). *Learning disabilities: From identification to intervention*. New York, NY. Guilford.

Foerster, N., Steadman, J. M., Moroney, J. F. (2000). *Writing and thinking: A handbook of composition and revision*. Boston, MA: Houghton Mifflin.

Gersten, R. & Baker, S. (2001). Teaching expressive writing to students with learning disabilities: A meta-analysis. *The Elementary School Journal, 101*, 251–272.

Gillespie, A. & Graham, S. (2014). A meta-analysis of writing interventions for students with learning disabilities. *Exceptional Children, 80*, 454–473.

Gillespie Rouse, A., & Graham, S. (2016). Best practices in writing instruction for students with learning disabilities. In R. Schiff, & R. Joshi (Eds.), *Interventions in learning disabilities: A handbook on systematic training programs for individuals with learning disabilities* (pp. 175–190). Cham, Switzerland: Springer.

Gillespie-Rouse, A., & Sandoval, A. (2018). Writing interventions for students with learning disabilities: Characteristics of recent research. *Learning Disabilities: A Multidisciplinary Journal, 23*, 1–17.

Goeke, J. L. (2008). *Explicit instruction: Strategies for meaningful direct teaching*. London, UK: Pearson.

Graham, S., & Harris, K. R. (1993). Self-regulated strategy development: Helping students with learning problems develop as writers. *The Elementary School Journal, 94*, 169–181. https://doi.org/10.1086/461758

Graham, S., Harris, K. R., & Troia, G. A. (1998). Writing and self-regulation: Cases from the self-regulated strategy development model. In D. H. Schunk & B. J. Zimmerman (Eds.), *Self-regulated learning: From teaching to self-reflective practice* (pp. 20–41). New York, NY: Guilford.

Graham, S., & Harris, K. R. (2005). *Writing better. Effective strategies for teaching students with learning difficulties*. Baltimore, MD: Paul H. Brookes.

Graham, S., Lui, X., Aitken, A., Ng, C., Barlett, B., Harris, K. R., & Holzapfel, J. (2018). Effectiveness of literacy programs balancing reading and writing instruction: A meta-analysis. *Reading Research Quarterly, 53*, 279–304.

Grünke, M., Büyüknarci, Ö., Wilbert, J., & Breuer, E. (2015). To what extent do certain characteristics of a child's written story influence the way it is rated? *Insights into Learning Disabilities, 12*, 163–177.

Grünke, M., & Hatton, H. (2017). Effects of the STOP and LIST strategy on the writing performance of a sixth grader with learning disabilities. *Insights into Learning Disabilities, 14*, 155–165.

Grünke, M. & Leonard Zabel, A. M. (2015). How to support struggling writers. *International Journal of Special Education, 30*, 137–150.

Grünke, M., Nobel, K., & Bracht, J. (2019). Effects of the STOP and LIST strategy on the writing performance of struggling fourth graders. *Journal of Education and Learning, 8*, 1-13.

Hammill, D. D., & Larsen, S. C. (2009). *Test of written language – fourth edition* (TOWL-4). Austin, TX: PRO-ED.

Hayes, J. R. & Flower, L.S. (1980). Identifying the organisation of writing processes. In L. W. Gregg & E. R. Steinberg (Eds.), *Cognitive processes in writing* (pp. 3–30). Hillsdale, NY: Lawrence Erlbaum.

Kellog, R. T. (2008). Training writing skills: A cognitive development perspective. *Journal of Writing Research, 1*, 1–26.

Kellog, R. T. & Whiteford, A. P. (2009). Training advanced writing skills: The case for deliberate practice. *Educational Psychologist, 44*, 250–266.

Kulik, J. A., Bangert, R. L., & Williams, G. W. (1983). Effects of computer-based teaching on secondary school students. *Journal of Educational Psychology, 75*, 19–26.

Lenhard, W. & Lenhard, A. (2016). *Calculation of effect sizes*. Retrieved from: https://www.psychometrica.de/effect_size.html. Dettelbach (Germany): Psychometrica. DOI: 10.13140/RG.2.2.17823.92329

Lepper, M. (1985). Microcomputers in education: Motivational and social issues. *American Psychologist, 40*, 1–18.

MacArthur, C. A., & Graham, S. (1987). Learning disabled students' composing under three methods of text production: Handwriting, word processing, and dictation. *Journal of Special Education, 21*, 22–42. https://doi.org/10.1177/002246698702100304

MacArthur, C. A, Graham, S. & Fitzgerald, J. (2006). *Handbook of writing research*. New York, NY: Guilford.

May, P. (2018). *Hamburger Schreibprobe* [Hamburg Writing Samples]. Göttingen, Germany: Hogrefe.

Mertens, D. M., & McLaughlin, J. A. (2003). *Research and evaluation methods in special education*. Thousand Oaks, CA: Corwin.

Mitchell, D. (2014). *What really works in special and inclusive education: Using evidence-based teaching strategies*. London, UK. Routledge.

Oswald, W. D. (2016). *Der Zahlenverbindungstest* [Number Combination Test]. Göttingen, Germany: Hogrefe.

Özbek, A. B., Tülü, B. K., & Ergül, C. (2019). An intervention to improve the writing skills of students with learning disabilities: Stop & List strategy. *Insights into Learning Disabilities, 16*, 155–171.

Peterson-Karlan, G. R. (2011). Technology to support writing by students with learning and academic disabilities: recent research trends and findings. *Assistive Technology Outcomes and Benefits, 7*, 39–62.

Rapp, W. H., & Arndt, K. L. (2012). *Teaching everyone: An introduction to inclusive education*. Baltimore, MA: Brookes.

Rogers, L. A. & Graham, S. (2008). A meta-analysis of single-subject design writing intervention research. *Journal of Educational Psychology, 100*, 879–906.

Seymour, S.L., Sullivan, H.J., Story, N.O. et al. Microcomputers and continuing motivation. ECTJ 35, 18–23 (1987). https://doi.org/10.1007/BF02769449

Troia, G.A. & Graham, S. (2002). The effectiveness of a highly explicit, teacher-directed strategy instruction routine: Changing the writing performance of students with learning disabilities. *Journal of Learning Disabilities, 35*, 290–305.

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