

Using peer assisted strategies to teach early writing: results of a pilot study to examine feasibility and promise

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Abstract Despite the poor outcomes for U.S. students on national writing tests, overall research on how to teach writing is sparse, and this scarcity is more pronounced in the early years of beginning to write. In this study 81,200 we present preliminary findings from Year 1 of a 3-year Institute of Education Sciences-funded Goal 2 project aimed at improving the writing performance of kindergarten children. We designed peer assisted writing strategies (PAWS) and tested its feasibility and promise. Participants for this study were 86 kindergartners ranging in age from 62 to 76 months, recruited from five classes in two different schools. It was feasible for research staff to deliver PAWS, which combined the need to focus early writing instruction on critical transcription skills with an effective learning pedagogy (i.e., peer-assisted learning). Lessons that targeted writing letters focused on formation and fluency, and lessons that targeted spelling focused on teaching letter sound correspondence for spelling decodable words and recognition and spelling practice for sight words. Results indicated that there were statistically significant differences between the PAWS participants and the control children on the alphabet fluency and essay post-test measures. Thus preliminary results indicate that PAWS instruction helped children, on average, improve early writing skills. Directions for future research are discussed.

Keywords Early writing · Kindergarten · Literacy · Peer-assisted learning · Transcription · Writing instruction

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Introduction

In the past three decades, educational efforts to improve literacy have concentrated on improving our understanding of reading difficulties, the causes of these difficulties, and how to assess and teach reading, especially in the primary grades. This effort to prevent reading problems has materialized because educators and policy makers are cognizant of the grim short and long term consequences related to poor reading skills. Children who enter school with limited reading-related skills are not only at a high risk for later reading difficulties but also for other academic difficulties (Scarborough, 1998; Share, Jorm, MacLean, & Mathews, 1984) such as increased referral for special education services and social and behavioral problems (Lonigan et al., 1999; Spira, Bracken, & Fischel, 2005). Similar consequences have been noted for writing. Children who are poor writers in first grade are highly likely to remain poor writers at the end of fourth grade (Juel, 1988). Thus, as with reading, future success in writing depends upon early educational experiences.

Reading, writing, and arithmetic (the three “Rs”) have historically been considered the cornerstone of our educational policy. Of the three “Rs”, writing is truly the neglected “R” (National Commission on Writing, 2003), so it is not surprising that a majority of students in US schools do not write well enough to meet grade-level expectations (National Center for Education Statistics, 2012; Salahu-Din, Persky, & Miller, 2008). Despite this poor performance, research on how to teach writing is sparse, particularly for the early years of beginning to write. The handful of empirical studies that have been conducted with kindergarten children has focused on teaching spelling to improve reading skills (Ehri & Wilce, 1987; O’Connor & Jenkins, 1995; Ouellette & Sénéchal, 2008; Vandervelden & Siegel, 1997). In all four of these studies, children in the experimental condition outperformed the children in the control condition not only on spelling but also on word reading. Whereas some research on teaching writing (beyond teaching spelling) to beginning writers exists, they are primarily descriptive or based on individual case studies (e.g., Behymer, 2003; Hall, 1987; Lysaker, Wheat, & Benson, 2010).

Furthermore although writing researchers emphasize that beginning writers should write every day for at least 30 min a day, in a recent study we observed writing instruction and found that kindergarten students participated in writing for an average of only 6.1 min of instruction in fall and only about 10 min in the winter (Puranik, Al Otaiba, Folsom, & Greulich, 2014). Most of this time was independent writing with little instruction (e.g., less than 2 min of spelling instruction was observed). Perhaps not surprisingly, at the end of kindergarten, there was large individual variability in the number of letters a student could write in a minute, the number of words written, and the number of words spelled correctly. Across classrooms, between 5 and 20 % of kindergarteners did not write any letters or wrote only random strings in answer to a prompt that asked them about what they had learned in kindergarten. This is problematic in light of increasing expectations for beginning writers. Specifically, the Common Core State Standards for English Language Arts & Literacy for kindergarten include: (a) print many upper- and

lowercase letters, (b) write a letter or letters for most consonant and short-vowel sounds (phonemes), (c) spell simple words phonetically, drawing on knowledge of sound-letter relationships, (d) produce and expand complete sentences in shared language activities, and (e) use a combination of drawing, dictating, and writing to write about experiences, stories, people, objects, or events.

The purpose of this study is to present preliminary findings of a pilot study of a supplemental peer mediated writing instruction. This study is part of a 3-year IES funded Goal 2 project. The purpose of a Goal 2 project is to demonstrate the feasibility and the promise of an intervention that can later be evaluated through an efficacy study with a tightly controlled experimental design. We followed principals of design-based research studies (e.g., Anderson & Shattuck, 2012; Bowen et al., 2009; Dykstra Steinbrenner et al., 2015; Penuel, Fishman, Cheng, & Sabelli, 2011). Ultimately the instruction will be tested with classroom teachers as end-users, but initially we wanted to test the feasibility, usability, fidelity, and dosage in a more controlled condition using project staff as implementers. To enhance usability, our research staff included former teachers, former speech-language pathologists, and a coauthor and a trainer of the K-PALS (Fuchs et al., 2001) curriculum. During this small-scale underpowered quasi-experimental pre- post-test pilot, research staff delivered PAWS in a small group pull-out fashion. In line with IES Goal 2 design guidelines (IES, National Center for Education Research, 84-305A2012-2; 2011), we focused our efforts in Year 1 on demonstrating the feasibility and promise for improving writing performance of kindergarten children.

Peer assisted writing strategies (PAWS)

To guide the development of PAWS, not only did we consider the CCSS, but we also used to two theoretical and empirical frameworks for beginning writing—one focused on cognitive processes and the other connected with socio-cultural theory; both have dominated much of the discussion about writing and writing development. One theoretical view has focused on the individual writer and emphasizes the importance of cognitive processes involved in writing, linguistic knowledge required to produce written text, and affective and motivational factors in writing (Flower & Hayes, 1981; Hayes, 1996; Hayes & Berninger, 2009). From a cognitive perspective, in the early stages of writing, teaching transcription skills (transcription refers to the actual mechanics of converting ideas into written symbols and includes primarily spelling and handwriting) is critical. Thus, the “what” of our PAWS instruction focused primarily on teaching transcription skills: handwriting and spelling.

The focus on transcription skills is important because of empirical findings showing that in the beginning stages of writing, transcription skills exact considerable amounts of cognitive energy, interfering with other higher-order writing processes required for writing. Research indicates that in the primary grades, transcription skills of handwriting and spelling account for 66 % of the variance in compositional fluency and 25 % of the variance in compositional quality (Graham, 1999). Most recently, Alves, Limpo, Fidalgo, Carvalhais, and Pereira (2015) reported on a study in which they randomly assigned second graders to a

handwriting condition and a keyboarding condition. Robust differences were noted between the two groups; the students in the handwriting group outperformed the students in the keyboarding group on handwriting fluency as expected but these children also wrote longer and better stories than students in the keyboarding condition. More importantly, they need to be fluent at various language levels: sub-word, word, and sentence levels (Whitaker, Berninger, Johnston, & Swanson, 1994). The importance of transcription skills has been noted as early as kindergarten. Puranik and Al Otaiba (2012) found that even after controlling for important demographic variables, kindergartners' handwriting and spelling predicted their performance on a writing prompt. Before children can compose text, they need to be fluent in lower-order transcription skills.

The second theory that guided PAWS development has its roots in socio-cultural theory (see Prior, 2006) and focuses on writing as a mode of social action that allows a child to learn from interaction with a more knowledgeable other (Vygotsky, 1978). In PAWS, the lessons always began with the teacher, "the knowledgeable other" modeling the lessons and the feedback process. Socio-cultural theories also concentrate on how writing development is influenced by the social and contextual interactions that occur within the classroom and includes interactions among students and interactions between students and teacher, which led us to consider peer-assisted learning strategies as "how" we delivered the intervention. In PAWS, all learning occurred during interactions among students and teacher and between students acting as coaches and writers.

The primary empirical rationale for creating an intervention focused on peer interaction is the strong evidence base supporting Peer-Assisted Learning Strategies (PALS) developed by Fuchs, Fuchs, and colleagues (Fuchs & Fuchs, 2005; Fuchs, Fuchs, Mathes, & Simmons, 1997; Fuchs et al., 2001a, b, c). PALS was primarily based upon the foundational principles of Classwide Peer Tutoring (CWPT; Delquadri, Greenwood, Whorton, Carta, & Hall, 1986): active engagement in instruction, pairing children to work together on a highly structured sequence of activities aimed at enhancing reading or mathematic skills. PALS has been shown to be effective in improving student outcomes in reading and mathematics (Fuchs & Fuchs, 2005; Fuchs, Fuchs, Kazdan, & Allen, 1999; Fuchs et al., 1997; Fuchs, Fuchs, Thompson, Svenson, et al., 2001). Further, improvements have been demonstrated across various ability levels of students (i.e., low, average, and high readers), across differing types of schools (i.e., Title I, non-Title I), and across grade level (i.e., kindergarten through high school). What is most important is that beyond the demonstrated academic benefits, teachers and students report enjoying the activities, teachers are able to implement the procedures with high fidelity, and the intervention results in an increased social acceptance of students with disabilities (Fuchs et al., 1997; Fuchs et al., 2001c; Mathes, Grek, Howard, Babyak, & Allen, 1999; Mathes, Howard, Allen, & Fuchs, 1998).

In addition to the documented evidence of PALS, there is evidence indicating that children learn to write by imitating the actions of adults and by observing their peers, that their attention is sustained and engagement increases when working with peers, and that their motivation and enjoyment of writing increases when sharing their written product with peers (Roberts & Wibbens, 2010; Trioia, Shankland, &

Heintz, 2010). The power of peer involvement is seen as a teaching–learning opportunity for all students involved; where students are viewed as participants in the teaching and learning process (Graham & Perin, 2007; Rijlaarsdam et al., 2008). One of the goals of PAWS was to extend the work of Fuchs, Fuchs, and colleagues by developing a peer-assisted intervention that capitalizes on the strengths of CWPT and PALS yet focuses on the underemphasized yet critical early writing skills of kindergarten students.

The specific research aims were (1) to demonstrate the feasibility of implementing the planned components with kindergarteners (i.e., fidelity, dosage, and usability), (2) to determine whether the PAWS intervention would demonstrate promise for increasing writing performance (i.e., alphabet fluency, spelling, sentence-writing, and essay-writing) for kindergarten children when implemented by research assistants in a pull-out small group format and (3) to determine whether the PAWS intervention focused on writing would result in improvements in reading for kindergarten children. Since students were taught writing during the language arts instruction and missed out on the reading instruction taking place in the classroom, we wanted to examine if this had any effect on their reading skills. Based on prior research showing that teaching writing has positive effects on children's reading skills (see Graham & Hebert, 2010 for a review), we anticipated that children in the PAWS group would perform just as well if not better than children in the control condition. We anticipated that students receiving PAWS instruction would outperform children in the control condition on post-test writing measures.

Method

Participants and setting

To address the specific research aims, we conducted a small-scale, pre- post-test quasi-experiment. Participants for this study included 86 kindergartners ranging in age from 62 to 76 months ($M = 68.2$, $SD = 3.7$) with 56 % of the children being male. The majority of the participants were from minority ethnic backgrounds (African American = 57 %, Caucasian = 33 %, Other = 6 %, Hispanic = 3 %, Asian = 1 %). Participants were recruited from five classes in two different schools (see Table 1 for demographic information).

School 1 was a low-SES, high performing (i.e., met the Adequate Yearly Progress measures as reported by the Pennsylvania Department of Education for all three of the preceding years) charter school that had two kindergarten classes with a total of 40 students. Six children were randomly pulled from each class to receive the PAWS instruction, while the remaining 28 children received typical writing instruction (i.e., no core writing program; used Fountas & Pinnell's *Treasures* reading program). Several children missed at least one task during the assessment periods, so their scores were not included in the corresponding analyses (see Table 1 for breakdown of attrition rates by task). In school 1, no data was missing from the PAWS participants whereas the attrition rate for the control participants ranged from 4 to 11 %.

Table 1 Participant demographic information by condition and school

	PAWS group		Controls	
	School 1	School 2	School 1	School 2
n	12	10	27	37
<i>M</i> age (in months)	67.0	67.3	68.8	68.4
<i>SD</i> age (in months)	3.3	3.6	4.0	3.6
% female	42 %	52 %	60 %	35 %
<i>Ethnicity</i>				
African American	33 %	30 %	80 %	78 %
Asian	0 %	4 %	0 %	0 %
Caucasian	58 %	56 %	10 %	14 %
Hispanic	0 %	0 %	10 %	5 %
Other	8 %	11 %	0 %	3 %
<i>Attrition rates</i>				
Alphabet writing fluency	0 %	17 %	11 %	30 %
Spelling	0 %	17 %	11 %	30 %
Sentence writing	0 %	17 %	4 %	32 %
Essay	0 %	50 %	7 %	36 %

School 1 had two classes participating; School 2 had three classes participating

School 2 was a low-SES, low performing (i.e., did not meet the Adequate Yearly Progress measures as reported by the Pennsylvania Department of Education for any of the three preceding years), public school that had three kindergarten classes with a total of 65 students. Six children were randomly pulled from two of the classes to receive the PAWS instruction, while the remaining 53 children received typical writing instruction (i.e., the writing component of Harcourt's *StoryTown* reading/language arts program). Again, several children missed at least one task during the assessment periods. For most tasks, there was a greater attrition rate for control participants than for the PAWS participants (e.g., 17 vs. 30 %) except for the essay task; the attrition rate for the PAWS participants (50 %) was greater than the attrition rate for the control participants (36 %). These greater attrition rates, in comparison to school 1, likely reflect the low performing versus high performing differences between the two contexts. However, it is also likely that students were simply absent on the day when the essay task was administered.

PAWS intervention

PAWS incorporated several important features of peer-assisted tutoring. First, it involved pairing students to work together as partners. To create the pairs, children were first ranked based on their DIBELS letter naming fluency scores. Then, the class was divided in half, and the children at the top of each list were paired together. Finally, teachers reviewed the list to ensure that there were no potential

personality conflicts. Second, students were trained to use specific prompts, corrections, and feedback. Instructors used a set of brief scripted lessons to train all students. Third, roles were reciprocal; students switched roles and took turns being coaches & writers. Fourth, students were provided highly structured content material (see description of activities below) and trained to use them independently. Finally, there was active engagement in frequent writing.

The PAWS curriculum combined the need to focus early writing instruction on critical transcription skills with an effective learning pedagogy (i.e., peer-assisted learning). This instruction targeted both writing letters and spelling. Earlier lessons that targeted writing letters focused on formation and fluency, and later lessons that targeted spelling focused on teaching encoding using decodable words and spelling using sight words. Each lesson involved completing one activity (e.g., Letter Learning, What Comes After/Before?, Missing Letters, Cover-Copy-Check). In addition to the main lessons, students completed weekly reviews of the prior lessons, and when time permitted, they spent the remainder of the lesson on supplemental activities that focused on letter formation, letter fluency, and spelling.

In the *Letter Learning* lessons, students were introduced to the name, sound, and formation of three letters. Then students practiced writing each letter three times. This practice not only included scaffolding for earlier attempts, but students also received peer feedback after each attempt. Students were trained to provide specific feedback to their partner about the shape, size, and placement of each letter. During these lessons, students learned 18 of the 26 letters of the alphabet. The sequence of letters was closely aligned to the reading curriculum across the participating schools.

Students worked on their letter writing fluency during the *What Comes After/Before?* lessons. First, students were given a letter that came before one of the week's target letters, and they were instructed to write what letter comes after the letter. Then, students were given a letter that came after each of the week's target letters, and they needed to write what letter comes before the letter. After each attempt, the student received feedback from their coach about the correctness of their response. In order to provide specific feedback, students were trained to use alphabet checkers to determine whether their partner wrote the correct letter.

In the *Missing Letters* lessons, students practiced spelling decodable words. Students completed several words that were missing a letter. Letters were strategically removed from CVC words to help students focus on different sounds of the word (i.e., initial, final, middle). The final word on the worksheet was blank, allowing students to practice spelling the whole word for themselves. For each word, students wrote the missing letter(s). After each attempt, students received peer feedback about the correctness of their response. As coaches, students were trained to first listen for the initial sound, then listen for the final sound, and lastly listen for the middle vowel sound. Instructors provided additional support for coaches to check whether their partner wrote the correct letter.

Finally, in the *Cover-Copy-Check* lessons, students practiced writing sight words. Students were introduced to two sight words per lesson. With their partner, students 'took a mental picture of the word'. Then the coach would cover the word while the student tried to write the word from memory. For the second attempt, coaches would

count to five after covering the target word so that there was a longer delay between the writer seeing the word and writing the word. After each attempt, the student would receive feedback from the coach on the correctness of their attempt. Students were trained to compare the writer's attempt with the model provided.

Procedures and design

The PAWS instruction was provided in the spring of the school year by two project staff. Students were pulled from their language arts instruction three times a week for 30 min each session. The first staff member taught the PAWS participants from school 1. She was a master's student in Special Education with experience teaching students with disabilities. She completed 35 sessions—20 sessions focused on letters and 15 sessions focused on spelling. Students were taught 18 letters and nine high frequency words (i.e., is, of, and, to, in, you, it, he, she). The second staff member taught the PAWS participants from school 2. She was a doctoral student in Special Education with experience teaching kindergarten and first grade special education. Because school 2 started 3 weeks later and ended 2 weeks earlier than school 1, she only completed 23 sessions that focused primarily on 12 letters and two high frequency words (i.e., you, here).

Both staff members received training on the PAWS lessons. Prior to beginning training, both staff member had read the K-PALS and the PAWS manual. Next, they engaged in role-playing for each activity in the PAWS program. The staff members took turns being students and teacher until all questions were answered and they felt comfortable with the program. For the first four PAWS lessons delivered, the staff members were accompanied by the first author, who was present to ensure fidelity and provide support as needed.

Project staff met weekly for discussions with senior members of the research team. During meetings, there were discussions about the feasibility, including usability, of the lessons and about students' engagement. As in any research project, there were also conversations about challenges to implementation. Because fidelity of the intervention is one of the outcome variables supporting our first aim (i.e., demonstrate feasibility), specific details will be discussed in a later section.

Measures

Prior to and after the instruction period, all participants completed a battery of curriculum-based writing measures (CBM-W) that were administered to the whole class, including an alphabet fluency task, a spelling task, a sentence-writing task, and an essay task. All writing measures were exhaustively, double-coded with high reliability (i.e., percent agreement ranged from 82 to 90 %).

Alphabet writing fluency

To measure alphabet writing fluency, children were asked to print the entire lowercase alphabet in manuscript as quickly and as accurately as possible in 1 min. This handwriting automaticity task has been widely used by writing researchers

(e.g., Graham, Berninger, Abbott, Abbott, & Whitaker, 1997; Hudson, Lane, & Mercer, 2005; Jones & Christensen, 1999). One point was awarded for each correctly written letter. Partial credit (i.e., $\frac{1}{2}$ point) was awarded to letters that were uppercase, reversed, or recognizable but contained formation or control errors. The alphabet writing fluency score was the number of points earned in 1 min.

Spelling

A researcher-generated task was used to examine spelling. The task involved spelling five CVC words with each of the vowels represented, two grade-appropriate sight words, and three CVC nonsense words. The words were scored using a 9-point phonological, rating scale that was adapted from Tangel and Blachman's (1992) scoring procedure (see Appendix for coding rules and examples). To account for the developmental level of the kindergarten students, students also received credit for demonstrating prewriting skills. For example, a child would get one point for producing a scribble and two points for producing a single good form or writing that demonstrated knowledge of writing features such as linearity and discreteness. The spelling score was the number of points earned on the task.

Sentence-writing

To measure students' ability to write sentences, students were given picture-prompts and asked to write a sentence describing the picture. They had 3 min to complete as many sentences as possible. Coker and Ritchey (2010) used a similar task to assess sentence writing in kindergarten and first grade children and reported good reliability and validity. The sentences were coded for the number of correct word sequences (CWS). A CWS was two adjacent words that were correctly spelled and grammatically (e.g., capitalized and punctuated) and semantically acceptable within the context of the sentence. This measure has been widely used in previous studies (e.g., Coker & Ritchey, 2010; McMaster, Du, & Petursdottir, 2009) with good reliability and validity. The sentence-writing score was the number of CWS written in 3 min.

Essay

Finally, students' ability to write longer texts was assessed with an essay task used in previous studies (e.g., Puranik & Al Otaiba, 2012). Participants were instructed to write an essay that completes the prompt "I like kindergarten because..." After introducing the task, the assessor helped the students brainstorm ideas. Then the students had 5 min to complete their essay. The essays were also coded for the number of CWS. The essay score was the number of CWS written in 5 min.

Letter naming fluency (LNF)

The LNF task assessed students' ability to name letters. Students had 1 min to name randomly presented uppercase and lowercase letters. The LNF score was the number of correctly named letters.

Phonemic segmentation fluency (PSF)

The PSF task assessed students' ability to segment three- and four-phoneme words into their individual phonemes. Students had 1 min to produce the individual phonemes for each word presented verbally by the assessor. The PSF score was the number of correctly produced phonemes.

Nonsense word fluency (NWF)

The NWF task assessed students' ability to read nonsense words. Students had 1 min to either produce the whole nonsense word or produce the individual letter sounds for each VC and CVC nonsense word. Two scores resulted from the NWF task. The *correct letter sounds (NWF-CLS)* score was the number of correctly produced letter sounds that were either read in isolation or as part of the whole word. The *whole words read (NWF-WWR)* score was the number of whole nonsense words read correctly the first time.

Questionnaire

To address the social validity of PAWS and levels of satisfaction with the program, we administered a simple 4-item questionnaire to the students at the end of the PAWS program. The instructor read a scripted introduction and provided instruction to ensure student understanding. The four items were read aloud to the students and they were required to respond with a *yes*, *no*, and *sometimes*. Emoticons for each response was included to help students.

Fidelity of instruction

All of the instruction sessions were videotaped, and a sample of 34 lessons was randomly selected for fidelity purposes—one lesson per week for each instructor. Two research assistants with experience teaching elementary students coded the fidelity of instruction. The fidelity measure comprised five general observations (e.g., Does the interventionist exhibit enthusiasm and warmth? Does the interventionist ensure understanding?) and nine observations specific to the intervention (e.g., Does the interventionist follow the script? Does the interventionist ensure that the writer and coach are working together?). These fourteen observations were coded on a three-point scale with 1 indicating never, 2 indicating sometimes, and 3 indicating most of the time. The fidelity score is the proportion of the total possible points (i.e., sum of points earned divided by 42 possible points). Fidelity was measured with high inter-rater reliability ($ICC = 0.92$).

Analysis

Qualitative and quantitative data analyses were used to address three aims. Our first research aim was to demonstrate the feasibility of implementing the PAWS intervention. We considered three aspects of feasibility. First, we reported the level of fidelity with which the instructors provided the instruction. Second, we described how the dosage varied across the two schools. Third, we demonstrated the usability by summarizing

Table 2 Descriptive statistics for pre- and post-test CBM-W and CBM-R by group

Measure	PAWS group				Controls			
	<i>n</i>	<i>M</i>	<i>SD</i>	Range	<i>n</i>	<i>M</i>	<i>SD</i>	Range
<i>Pretest</i>								
Alphabet writing fluency	22	4.5	3.7	0–13	62	3.7	4.3	0–23.5
Spelling	22	59.7	14.7	20–89	62	52.8	17.4	20–89
Sentence writing	22	1.0	2.0	0–8	63	1.24	3.3	0–19
Essay	18	0.8	1.7	0–5	60	1.2	4.4	0–30
LNF	24	32.4	19.1	1–66	33	24.3	14.7	5–56
PSF	24	14.3	11.2	0–42	33	12.5	10.1	0–36
NWF-CLS	24	13.5	10.9	1–45	33	9.3	9.6	0–41
NWF-WWR	24	0.7	2.0	0–9	33	0.6	2.0	0–10
<i>Posttest</i>								
Alphabet writing fluency	22	13.7	7.4	4.5–25.5	62	9.3	6.2	0–23
Spelling	22	81.1	12.4	39–90	62	72.0	18.7	11–89
Sentence writing	22	7.6	5.4	0–20	63	5.9	5.7	0–23
Essay	18	8.4	8.9	0–32	60	4.1	5.1	0–18
LNF	24	53.0	16.1	13–78	19	49.1	11.8	28–67
PSF	24	44.2	15.6	4–63	19	41.6	18.3	4–66
NWF-CLS	24	33.3	21.2	3–84	19	26.0	10.2	16–47
NWF-WWR	24	5.2	7.8	0–28	19	1.5	2.1	0–7

LNF Letter naming fluency, *PSF* phonemic segmentation slucency, *NWF-CLS* nonsense word fluency-correct letter sounds, *NWF-WWR* nonsense word fluency-whole words read

students' responses regarding their engagement and enjoyment with the PAWS intervention.

Our second research aim was to learn about the promise of PAWS for improving kindergartners' writing performance. Descriptive statistics for pre- and post-test writing measures are included in Table 2 (in Table 3 descriptive statistics are separated by school). Since there were fewer PAWS participants than control participants, the Welch statistic was used to determine if there were differences between the groups at pretest; there were no significant differences. Each measure at posttest was analyzed using an ANCOVA comparing PAWS participants to control participants with the measure at pretest as a covariate. Similar analysis was used to address our third aim of examining improvement on reading-related measures.

Results

Feasibility of PAWS

Fidelity

The staff members provided the instruction with high fidelity. The fidelity ratings for Instructor 1 ranged from 91 to 100 % ($M = 98\%$, $SD = 3\%$). The fidelity

Table 3 Descriptive statistics for pre- and post-test CBM-W and CBM-R by school

Measure	PAWS group						Controls										
	School 1			School 2			School 1			School 2							
	<i>n</i>	<i>M</i>	<i>SD</i>	Range	<i>n</i>	<i>M</i>	<i>SD</i>	Range	<i>n</i>	<i>M</i>	<i>SD</i>	Range	<i>n</i>	<i>M</i>	<i>SD</i>	Range	
<i>Pretest</i>																	
CBM-W																	
AWF	12	4.5	1.8	1.5–7.5	10	4.4	5.3	0–13	25	2.8	2.1	0–6.5	37	4.3	5.2	0–23.5	
Spelling	12	61.9	7.2	49–74	10	57.0	20.6	20–89	25	56.8	12.1	29–81	37	50.1	19.9	4–89	
SW	12	1.1	1.7	0–4	10	0.9	2.5	0–8	27	1.0	2.2	0–8	36	1.4	4.0	0–19	
Essay	12	1.3	2.0	0–5	6	0.0	0.0	0–0	26	0.8	1.9	0–8	34	1.5	5.6	0–30	
CBM-R																	
LNF	12	39.5	16.4	10–66	12	25.3	19.7	1–54	14	28.3	13.2	8–56	19	21.4	15.3	5–49	
PSF	12	17.7	11.5	6–42	12	10.8	10.2	0–31	14	17.1	9.5	3–34	19	9.2	9.4	0–36	
NWF-CLS	12	16.2	8.2	2–29	12	10.8	12.8	1–45	14	12.2	10.6	1–41	19	7.1	8.5	0–32	
NWF-WWR	12	0.3	0.9	0–3	12	1.1	2.6	0–9	14	0.0	0.0	0–0	19	1.0	2.5	0–10	
<i>Posttest</i>																	
CBM-W																	
AWF	12	18.0	6.2	7–25.5	10	8.7	5.2	4.5–17.5	25	12.1	6.2	1–23	37	7.4	5.4	0–20	
Spelling	12	85.6	3.2	80–90	10	75.7	16.9	39–90	25	77.0	20.9	11–89	37	68.6	16.6	21–89	
SW	12	9.9	4.6	6–20	10	4.9	5.2	0–10	27	7.2	4.7	0–19	36	4.8	6.1	0–23	
Essay	12	11.3	9.3	0–32	6	2.7	4.2	0–9	26	5.5	5.4	0–18	34	2.9	4.6	0–15	
CBM-R																	
LNF	12	57.6	13.4	40–78	12	48.4	17.9	13–70	14	49.6	12.2	28–67	5	47.6	11.6	35–65	
PSF	12	53.9	8.0	37–63	12	34.4	15.3	4–51	14	48.9	11.9	17–66	5	21.2	18.6	4–48	
NWF-CLS	12	38.4	20.1	17–80	12	28.2	21.8	3–84	14	27.3	11.3	16–47	5	22.4	5.7	18–32	

Table 3 continued

Measure	PAWS group						Controls									
	School 1			School 2			School 1			School 2						
	<i>n</i>	<i>M</i>	<i>SD</i>	Range	<i>n</i>	<i>M</i>	<i>SD</i>	Range	<i>n</i>	<i>M</i>	<i>SD</i>	Range				
NWF-WWR	12	5.5	7.8	0-22	12	4.9	8.1	0-28	14	1.9	2.2	0-7	5	0.4	0.9	0-2

School 1 is a high performing school with two classes; School 2 is a low performing school with three classes; AWF alphabet writing fluency; SW sentence writing, LNF letter naming fluency, PSF phonemic segmentation fluency, NWF-CLS nonsense word fluency-Correct letter sounds, NWF-WWR nonsense word fluency-whole words read

ratings for Instructor 2 ranged from 75 to 100 % ($M = 97$ %, $SD = 7$ %). In the lesson with the lowest fidelity, Instructor 2 was introducing the spelling task for the first time. Many of the students struggled with this new task. As indicated by the instructor, several students were more distracted than usual, and one child had an unusually difficult time when learning the sight words. With the exception of that one lesson, all other lessons were completed with high fidelity (i.e., 96 % or above).

Dosage

The dosage of PAWS varied across the two schools. As mentioned previously, given different start and end dates, the two schools differed in how many lessons were completed: school 1 completed 35 lesson and school 2 completed 23 lessons. Both schools completed approximately the same number of lessons that focused on writing lowercase letters (i.e., 20 lessons). However, the students in school 1 learned six more letters than the students in school 2. This difference resulted from School 2 getting a later start and the slower pace needed in the low performing school. School 1 also spent more time on spelling—that is, school 1 completed 15 lessons compared to only one and a half lessons at school 2.

It was feasible to provide approximately three sessions per week in both schools. Lessons were allotted 30 min, and both instructors limited their instruction time to approximately 30 min. On average, lessons in school 1 lasted 29 min ($SD = 2.4$). The shortest lesson was 23 min, and the longest lesson was 34 min. Similarly, lessons in school 2 lasted 33 min ($SD = 4.6$). For school 2, the shortest lesson was 24 min, and the longest lesson was 40 min.

Despite lessons being approximately the same length, some adjustments to the lessons were necessary to meet the level of students in school 2. While attempting the fluency tasks, students struggled with using the alphabet checker. Most students did not even know whether a given letter would appear in the beginning, middle, or end of the alphabet. Therefore, alternative activities or downward extensions to provide greater scaffolding were developed. For example, in the *Letter Matching* lesson, students first practiced writing the target letters, and then they connected that letter to the corresponding letter on the alphabet chart located above writing practice area.

Even with these adaptations, the pace needed to be slower for school 2. For each set of target letters, four lessons were required to cover the material at school 2 compared to three lessons at school 1. Moreover, all of the specific feedback lessons needed to be repeated at school 2, which extended the four lessons to eight lessons. These adjustments limited the amount of material that was able to be covered at the low performing school.

Usability

In this study, we defined usability as the level of engagement and enjoyment as reported by the instructors and students. Both instructors reported that students were engaged and enjoyed PAWS. They also reported that the PAWS components functioned as intended.

In general, the students responded positively to PAWS and working with a partner. One student did not complete the end-of-year questionnaire. Sixteen of the remaining 21 PAWS participants responded “yes” to the statement “I liked the activities I played in PAWS!”, and four students responded “sometimes”. Only one student responded “no”, and when asked what was liked least about PAWS, she said “Pencils. I wanted markers”. Nineteen of the 21 PAWS participants responded “yes” to the statement “I liked working with a classmate!”, and one student responded “sometimes”. Again, only one student responded “no”.

Effectiveness of PAWS-writing

Overall, PAWS participants outperformed the control participants on the alphabet fluency and essay writing task, and there were no significant differences between the conditions on the reading measures (see Fig. 1). Similar patterns were found when ANCOVAs were conducted split by school, but the sample size was not large enough to detect statistically significant differences. As an indicator of effect size, Cohen’s d (i.e., mean difference divided by average standard deviation; Cohen, 1977) was provided for all posttest analyses. More detailed findings for each measure follow.

Alphabet writing fluency

At pretest, participants correctly wrote an average of 3.9 letters ($SD = 4.1$) in 60 s (range 0–23.5). There was not a significant difference between PAWS participants and control participants, *Welch’s* $F(1, 42.35) < 1$, $p = 0.41$. At posttest, participants correctly wrote an average of 10.5 letters ($SD = 6.7$) in 60 s (range 0–25.5). The PAWS participants wrote significantly more letters than the control participants, $F(1, 81) = 7.03$, $p = 0.01$, $d = 0.68$ (see Fig. 1a).

To illustrate the differential growth on the alphabet writing fluency task, we selected two students from the same class who performed equally at pretest (see

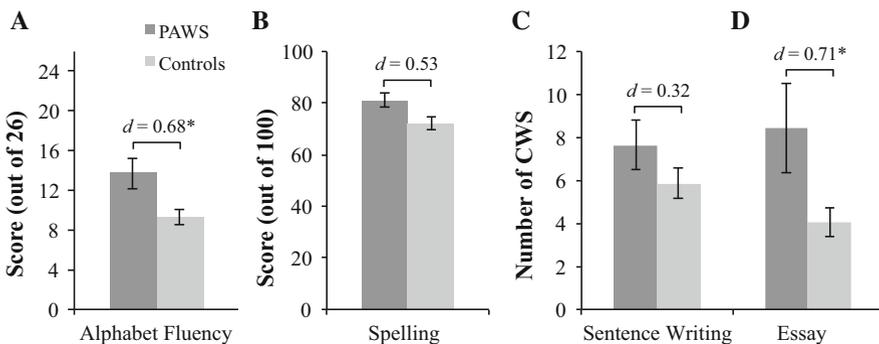


Fig. 1 Comparison of PAWS and control participants’ performance at posttest on CBM-W. * $p < 0.01$

Fig. 2). The students were approximately the same age (PAWS = 69 months; control = 68 months), and they were both Caucasian. The PAWS participant was female, and the control participant was male. At the beginning of kindergarten, both students were able to write several letters, some of the letters were formed correctly and some of the letters had formation issues. By the end of kindergarten, the PAWS participant was able to write all of the letters of the alphabet within 60 s, and most of the letters were formed correctly. The control participant did not show much improvement—he was still only able to write several letters and seemed to get confused with the order and shape of the letters after the letter f.

Spelling

At pretest, participants scored an average of 54.6 points ($SD = 16.9$) on the spelling test (range 4–89). There was not a statistically significant difference between PAWS participants and control participants, *Welch's F*(1, 43.35) = 3.26, $p = 0.08$. At posttest, participants scored an average of 74.4 points ($SD = 17.7$) on the spelling test (range 21–90). There was not a statistically significant difference between the groups, $F(1, 81) = 1.83$, $p = 0.18$, $d = 0.53$ (see Fig. 1b).

Sentence-writing

At pretest, participants correctly wrote an average of 1.2 correct word sequences ($SD = 3.0$) in 3 min (range 0–19). There was not a significant difference between PAWS participants and control participants, *Welch's F*(1, 60.39) < 1, $p = 0.70$. At posttest, participants wrote an average of 6.3 correct word sequences ($SD = 5.6$) in 3 min (range 0–23). Again, there was not a statistically significant difference between the groups, $F(1, 82) = 2.86$, $p = 0.10$, $d = 0.32$ (see Fig. 1c).

Essay

At pretest, participants correctly wrote an average of 1.1 correct word sequences ($SD = 3.9$) in 5 min (range 0–30). There was not a significant difference between PAWS participants and control participants, *Welch's F*(1, 71.17) < 1, $p = 0.60$. At

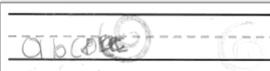
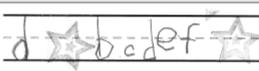
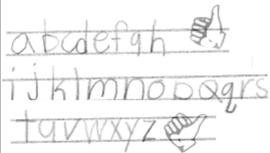
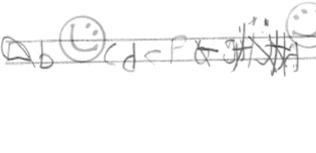
	PAWS	Control
pretest		
posttest		

Fig. 2 Example of alphabet fluency task at pretest and posttest for a PAWS participant and a control participant

posttest, participants wrote an average of 5.1 correct word sequences ($SD = 6.4$) in 5 min (range 0–32). The PAWS participants wrote significantly more CWS than the control participants, $F(1, 75) = 7.46, p = 0.01, d = 0.71$ (see Fig. 1d).

Again, to illustrate the differential growth on the essay task between a PAWS participant and a control participant, two students from the same class who performed equally at pretest were selected (see Fig. 3). The students were the same age (63 months), and they were both African American males. At the beginning of kindergarten, both students filled the page with random letters, which represented a text that they dictated to the assessors. By the end of kindergarten both students were able to represent complete thoughts about why they like kindergarten using full sentences and some correctly spelled words. The PAWS participant was able to write significantly more text than the control participant, which extended onto a second page (not shown in example).

Effectiveness of PAWS-reading

Letter naming fluency

At pretest, participants correctly named an average of 27.7 letters ($SD = 17.0$) in 1 min on the LNF task (range 1–66). There were no significant differences between PAWS participants and control participants, *Welch's* $F(1, 41.4) = 2.99, p = 0.09$. At posttest, participants named an average of 51.3 letters ($SD = 14.3$) in 1 min

	PAWS	Control
pretest		
posttest		

Fig. 3 Examples of essay task at pretest and posttest for a PAWS participant and a control participant

(range 13–78). There was not a statistically significant difference between the groups, $F(1, 40) < 1$, $p = 0.82$, $d = 0.27$.

Phonemic segmentation fluency

On the PSF task, participants correctly produced an average of 13.3 phonemes ($SD = 10.5$) in 1 min at pre-test (range 0–42). The difference between PAWS participants and control participants was not statistically significant, *Welch's* $F(1, 46.7) < 1$, $p = 0.55$. At posttest, participants produced an average of 43.0 phonemes ($SD = 16.7$) in 1 min (range 4–66). There was not a statistically significant difference between the groups, $F(1, 40) < 1$, $p = 0.58$, $d = 0.15$.

Nonsense word fluency

At pretest, participants correctly produced an average of 11.1 letter sounds ($SD = 10.3$) in 1 min in the NWF-CLS task (range 0–45). There was not a significant difference between PAWS participants and control participants, *Welch's* $F(1, 46.0) = 2.31$, $p = 0.14$. At posttest, participants produced an average of 30.1 letter sounds ($SD = 17.4$) in 1 min (range 3–84). There was not a statistically significant difference between the groups, $F(1, 40) < 1$, $p = 0.34$, $d = 0.42$.

Finally, on the NWF-WWR task, participants correctly read an average of 0.63 nonsense words ($SD = 1.95$) in 1 min at pre-test (range 0–10). There was not a significant difference between PAWS participants and control participants, *Welch's* $F(1, 49.8) < 1$, $p = 0.80$. At posttest, participants read an average of 3.6 nonsense words ($SD = 6.2$) in 1 min (range 0–28). There was not a statistically significant difference between the groups, $F(1, 40) = 1.68$, $p = 0.20$, $d = 0.62$.

Discussion

There is consensus among researchers that getting an early start in reading leads to future success in reading. Similarly, future success in writing depends upon early educational experiences. Despite the importance of early instruction, research on writing with young, beginning writers in kindergarten is sparse. In light of the relatively new CCSS, there is greater need for children to receive empirical based instruction to learn the fundamentals of beginning writing. The goal of this study was to examine the feasibility and promise of using a peer-assisted strategies framework to teach writing to kindergarten children in two schools which served similarly low-SES students, but one school was high-performing and one was low-performing. This project was supported through funding from the Institute of Education Sciences Goal 2 Research to develop and pilot a new program to teach early writing skills. Three research questions were addressed in the present study. The first question focused on the overall feasibility of implementing the planned components with kindergarteners (i.e., fidelity, dosage, and usability). The second question was to determine whether the PAWS intervention would demonstrate promise for increasing writing performance (i.e., alphabet fluency, spelling,

sentence-writing, and essay-writing) for kindergarten children and the third question was to examine whether the PAWS intervention would increase beginning reading performance (letter-naming, phoneme segmentation, nonsense word reading, and letter-sound naming).

Evidence of feasibility: fidelity, dosage, and usability

In the first year, PAWS was delivered in a small group format of six children (3 pairs) by research staff. The staff members who served as teachers reported that the lessons were generally feasible to implement within the time frame and that the PAWS components functioned as intended. The issue of instructor fidelity was confirmed by video observations. As with any feasibility study, there were lessons that needed tweaking—this included the teacher instructions, student materials, and number and type of activities. The staff members provided the instruction with a high degree of fidelity suggesting that PAWS can be implemented effectively as intended at least in a small group setting.

As far as dosage is concerned, two issues became important. One, how many sessions would be required? Would the number of sessions vary depending on the type of school and students? On the one hand, in the higher performing school, it was clear that 35 sessions (in School 1) were not adequate to address writing beyond the sub-word and word level. Clearly it is important to address writing beyond the word level to be compliant not only with Common Core Standards but also research indicating the importance of fluency at various language levels (e.g., Whitaker et al., 1994). We have addressed this issue in our studies in year 1 and 2. Regarding the issue of the number of sessions varying by the type of school, the answer was an obvious yes. The lower performing school (School 2) required more repetition of lessons and more scaffolding to get through some of the lessons. As mentioned previously, for each set of target letters, four lessons were required to cover the material at school 2 compared to three lessons at school 1. Moreover, all of the specific feedback lessons needed to be repeated at school 2, which extended the four lessons to eight lessons which resulted in less material being covered at the low performing school.

In terms of usability, a positive outcome for PAWS was that the students enjoyed it. This enjoyment was expressed during the instruction and also noted on feedback obtained from the students at the end of the instruction. Motivation and enjoyment are important factors in writing (Flower & Hayes, 1981; Hayes, 1996; Hayes & Berninger, 2009) and should be considered important ingredients of any instructional program.

However, we learned in conducting this pilot study, that teaching students to coach each other in writing is so much more difficult than teaching reading. In K-PALS (Fuchs et al., 2001a), during the decoding lessons, the coach points to a letter and says, “what sound?” and the reader provides the answer. If the reader does not know the answer, the coach helps by saying the sound. The script is simple. In writing however, giving feedback is not so simple or straightforward. For

example in the *Letter Learning* task, the writer writes a letter. However, there could be several errors—it could be the wrong letter, or it could be the right letter but written incorrectly (e.g., too high or too low on the lines, the wrong size, uppercase instead of a lower case). Addressing this complexity required more nuanced feedback on the coach's part. Therefore, extra time had to be spent teaching the students how to provide feedback. Another observation was that because writing can vary so much from student to student, feedback can vary accordingly as well. We had to train students on how to be nice to their partners or how to be less nit-picky as sometimes, partners disagreed as to what was “good enough.” A final observation was that in K-PALS the focus is on practicing as much as possible in the allotted time—reading as many sounds in the decoding lessons or reading as many words in the sight word lessons. This is possible because the responses are verbal. By contrast, writing takes time and so less could be done in a single PAWS lesson compared to a K-PALS lesson.

Evidence on the effectiveness of PAWS in improving writing and reading-related skills

Our instruction in Year 1, focused on transcription skills (i.e., letter writing, letter writing fluency, and spelling) mainly because instruction was carried out over 16 weeks in one school and 8 weeks in the second school. This short time-frame meant that very little time was available to address writing beyond the letter and word level, such as sentence writing. However, it is important to note that although we only addressed primarily transcription skills, transfer was noted to text generation at least as evidenced on the essay writing measure. In school 2, the abbreviated time resulted in very little word learning—only two sight words were introduced in the last three lessons. In Year 2 of this project, the duration of the instruction will be extended to allow us to include sentence level instruction.

Results indicate that there were statistically significant differences between the PAWS participants and the control children on the alphabet writing fluency and essay post-test measures with large effect sizes ($d = 0.68$ and 0.71 respectively). The non-significant differences for the spelling and sentence writing measures likely resulted from the underpowered nature of this study. However the effect sizes indicate practical and meaningful differences in favor of the PAWS intervention (i.e., for spelling, $d = 0.53$; for sentence writing, $d = 0.32$). Our results are similar to the results of Alves et al. (2015) who reported statistically nonsignificant findings for their spelling intervention with second graders but with meaningful effect sizes on the length and the quality of the text produced by the participants in their experimental condition compared to the control participants ($d = 0.63$ and $d = 0.53$ respectively).

Furthermore, teaching writing appeared to have improved children's reading-related skills. These findings appear similar to the few studies that have concentrated on teaching spelling to primarily improve word reading skills but also noted improvements in phonemic segmentation (Ehri & Wilce, 1987),

phonological awareness (Ouellette & Sénéchal, 2008) and nonsense word reading (O'Connor & Jenkins, 1995; Vandervelden & Siegel, 1997). Although improving reading-related skills was not the primary focus of this study, it was very encouraging to note that the PAWS participants performed as well as the control participants on the DIBELS measures, with effect sizes ranging from 0.27 for LNF and 0.62 for NWF to 0.15 for PSF. In one of our participating schools, the principal and teacher were very concerned that the students would fall back on their reading, because they were being pulled out for PAWS during their Language Arts Instruction time. However, our findings indicate that there was no need for concern. The results of our findings thus provide further evidence that teaching writing appears to be effective in improving not only writing but also had a positive, albeit not significant effect on beginning reading skills (Graham & Hebert, 2010).

Current educational efforts have concentrated on reading, but as the nation's report card indicates, these efforts are far from enough. It is troubling that as few as 30 % of 8th graders demonstrated proficient writing (National Center for Educational Statistics, 2012). Writing is an integral component of language and literacy, and writing instruction should be part of a comprehensive literacy program because the abilities to read and write are both important for academic success. There are other reasons to include writing instruction as part of a comprehensive early literacy program. For instance, research shows that practicing spelling a word through writing reinforces phonemic awareness and word reading (e.g., Craig, 2006) and letter writing impacts learning letter names and perhaps letter sounds (Puranik, Lonigan, & Kim, 2011). In summary, although no causal inferences can be made at this point, preliminary evidence indicates that PAWS was feasible and that it appears to show promise for improving writing in kindergarten children at least when delivered in a small group format.

Limitations and future directions

Although preliminary results for PAWS look promising, there are several limitations to this study that need to be acknowledged and which we will be addressing in future iterations. The primary limitation is that the children in our study received the instruction in small groups, whereas the control children received instruction in a whole class format. It is entirely possible that the differences in instructional format are responsible for the differences in performance. In our follow-up study, we have addressed this issue by providing the PAWS instruction in a whole group format. The small group setting format used in this study could be beneficial for working with children who struggle with writing and who need more individualized instruction (i.e., Tier 2).

A second limitation of this study was the relatively small sample and setting, which restrict the generalizability of our findings. Small sample sizes also reduce statistical power to detect significant finding which may help explain the discrepancies between the non-significant p values and effect sizes on our CBM-W and CBM-R measures (Sun, Pan, & Wang, 2010 as cited in Alves et al., 2015) and increase the likelihood of Type II errors (Abraham & Russell, 2008). Our follow up studies have been conducted with larger samples to circumvent this problem.

Perhaps another limitation of this study was our high attrition rates—especially among the students at school 2 (i.e., the low performing school). Note, these attrition rates do not reflect the number of instruction sessions attended; they reflect the number of children that missed out on the pre-test assessments mainly because the students were absent on the assessment days. In our subsequent studies, we have made every effort to make up these missed assessments. On a final note, PAWS instruction was provided by trained research staff and future research will determine whether the effects are similar when PAWS is conducted by classroom teachers, who are our intended end-user.

Conclusion

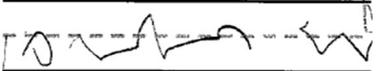
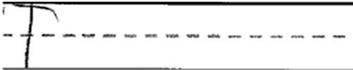
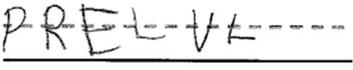
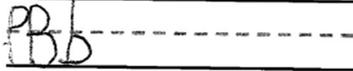
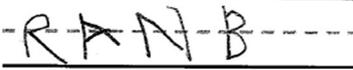
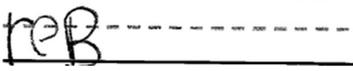
In conclusion, using a peer-assisted strategies framework to teach writing to young beginning writers appears promising. However, we also recognize the need to temper our results with caution given the pilot-study nature of the research, the small sample size, the small group format, and the study's quasi-experimental design. Yet, the results from Year 1 of this project serve as an important starting point. Efforts in our lab are underway to address some of the limitations from the pilot-study such as extending instructional time, comparing the effectiveness of PAWS in a whole classroom format, and including a more diverse and larger sample size. Future studies are needed to validate our preliminary results and refine the instruction to address writing skills at different language levels beyond the word level.

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Appendix

See Table 4.

Table 4 Spelling coding rules

Points	Rule	Response (example of 'rib')
0	No response	
1	Scribble: produced by scratching	
2	Single good form: not produced just by scratching, but in a more controlled manner	
3	Conventional letter: at least one real letter not phonetically related to the target word	
4	Random string: more than one, different random (not phonetically related) letters	
5	Early phonetic: at least one letter phonetically related to the target word in any position of the word	
6	First letter: the initial sound represented by the correct letter either by itself or with other letters	
7	Multiple phonetic: the majority of the sounds represented (i.e., initial correct letter + one phonetically related letter in any position)	
8	Invented spelling: all of the sounds represented (i.e., initial correct letter + any attempt to represent the vowel sound with a vowel letter + letter phonetically related to the last sound)	
9	Correct spelling: the word was written in its conventional form (i.e., correct letters in correct positions)	

References

- Abraham, W. T., & Russell, D. W. (2008). Statistical power analysis in psychological research. *Social and Personality Psychology Compass*, 2, 283–301. doi:10.1111/j.1751-9004.2007.00052.x.
- Alves, R. A., Limpo, T., Fidalgo, R., Carvalhais, L., Pereira, L. Á., & Castro, S. L. (2015). The Impact of promoting transcription on early text production: Effects on bursts and pauses, levels of written language, and writing performance. *Journal of Educational Psychology*. doi:10.1037/edu0000089.
- Anderson, T., & Shattuck, J. (2012). Design-based research: A decade of progress in education research? *Educational Researcher*, 41, 16–25. doi:10.3102/0013189X11428813.
- Behymer, A. (2003). Kindergarten writing workshop. *The Reading Teacher*, 57(2), 85–88.
- Bowen, D., Kreuter, M., Spring, B., Cofta-Woerpel, L., Linnan, L., Weiner, D., et al. (2009). How we design feasibility studies. *American Journal of Preventative Medicine*, 36(5), 452–457. doi:10.1016/j.amepre.2009.02.002.
- Cohen, J. (1977). *Statistical power analysis for the behavioral sciences*. New York: Academic Press.

- Coker, D. L., & Ritchey, K. D. (2010). Curriculum-based measurement of writing in kindergarten and first grade: An investigation of production and qualitative scores. *Exceptional Children, 76*(2), 175–193.
- Craig, S. A. (2006). The effects of an adapted interactive writing intervention on kindergarten children's phonological awareness, spelling, and early reading development: A contextualized approach to instruction. *Journal of Educational Psychology, 98*, 714–731.
- Delquadri, J. C., Greenwood, C. R., Whorton, D., Carta, J. J., & Hall, R. V. (1986). Classwide peer tutoring. *Exceptional Children, 52*(6), 535–542.
- Dykstra Steinbrenner, J. R., Watson, L. R., Boyd, B. A., Wilson, K. P., Crais, E. R., Baranek, G. T., et al. (2015). Developing feasible and effective school-based interventions for children with ASD: A case study of the iterative development process. *Journal of Early Intervention, 37*(1), 23–43. doi:10.1177/1053815115588827.
- Ehri, L. C., & Wilce, L. S. (1987). Does learning to spell help beginners learn to read words? *Reading Research Quarterly, 22*(1), 37–65. doi:10.2307/747720.
- Flower, L., & Hayes, J. R. (1981). A cognitive process theory of writing. *College Composition and Communication, 32*(4), 365–387. doi:10.2307/356600.
- Fuchs, D., & Fuchs, L. S. (2005). Peer-assisted learning strategies: Promoting word recognition, fluency, and reading comprehension in young children. *Journal of Special Education, 39*, 34–44. doi:10.1177/00224669050390010401.
- Fuchs, D., Fuchs, L. S., Kazdan, S., & Allen, S. (1999). Effects of peer-assisted learning strategies in reading with and without training in elaborated help giving. *Elementary School Journal, 99*, 201–219.
- Fuchs, D., Fuchs, L. S., Mathes, P. G., & Simmons, D. C. (1997). Peer-assisted learning strategies: Making classrooms more responsive to diversity. *American Education Research Journal, 34*(1), 174–206. doi:10.3102/00028312034001174.
- Fuchs, D., Fuchs, L. S., Svenson, E., Yen, L., Thompson, A., McMaster, K. L., et al. (2001a). *Peer-assisted learning strategies: First grade reading*. Nashville, TN: Vanderbilt University.
- Fuchs, D., Fuchs, L. S., Thompson, A., Al Otaiba, S., Yen, L., & McMaster, K. L. (2001b). *Peer-assisted learning strategies: Kindergarten reading*. Nashville, TN: Vanderbilt University.
- Fuchs, D., Fuchs, L. S., Thompson, A., Svenson, E., Yen, L., & Al Otaiba, S. (2001c). Peer-assisted learning strategies in reading: Extensions for kindergarten, first grade, and high school. *Remedial and Special Education, 22*(1), 15–21. doi:10.1177/074193250102200103.
- Graham, S. (1999). Handwriting and spelling instruction for students with learning disabilities: A review. *Learning Disabilities Quarterly, 22*(2), 79–98. doi:10.2307/1511268.
- Graham, S., Berninger, V. W., Abbott, R. D., Abbott, S. P., & Whitaker, D. (1997). Role of mechanics in composing of elementary school students: A new methodological approach. *Journal of Educational Psychology, 89*, 170–182. doi:10.1037/0022-0663.89.1.170.
- Graham, S., & Hebert, M. (2010). *Writing to read: Evidence for how writing can improve reading*. Washington, DC: Alliance for Excellent Education.
- Graham, S., & Perin, D. (2007). A meta-analysis of writing instruction for adolescent students. *Journal of Educational Psychology, 99*, 445–476. doi:10.1037/0022-0663.99.3.445.
- Hall, N. (1987). *The emergence of literacy*. Portsmouth, NH: Heinemann.
- Hayes, J. R. (1996). *A new framework for understanding cognition and affect in writing. The science of writing: Theories, methods, individual differences, and applications* (pp. 1–27). Mahwah, NJ: Lawrence Erlbaum.
- Hayes, J. R., & Berninger, V. W. (2009). Relationships between idea generation and transcription: How the act of writing shapes what children write. In R. K. Braverman, K. Lunsford, S. McLeod, S. Null, & A. S. P. Rogers (Eds.), *Traditions of writing research*. New York: Taylor and Francis/Routledge.
- Hudson, R. F., Lane, H. B., & Mercer, C. D. (2005). Writing prompts: The role of various priming conditions on the compositional fluency of developing writers. *Reading and Writing, 18*, 473–495. doi:10.1007/s11145-004-7042-2.
- Institute of Education Science. (2011). National Center for Education Research, RFA 84-305A2012-2.
- Jones, D., & Christensen, C. A. (1999). Relationship between automaticity in handwriting and students' ability to generate written text. *Journal of Educational Psychology, 91*, 44–49. doi:10.1037/0022-0663.91.1.44.
- Juel, C. (1988). Learning to read and write: A longitudinal study of 54 children from first through fourth grades. *Journal of Educational Psychology, 80*, 437–447. doi:10.1037/0022-0663.80.4.437.

- Lonigan, C. J., Blomfield, B. G., Anthony, J. L., Bacon, K. D., Phillips, B. M., & Samwel, C. S. (1999). Relations among emergent literacy skills, behavior problems, and social competencies in preschool children from low- and middle-income backgrounds. *Topics in Early Childhood Special Education, 19*(1), 40–54.
- Lysaker, J. T., Wheat, J., & Benson, E. (2010). Children's spontaneous play in Writer's Workshops. *Journal of Early Childhood Literacy, 10*(2), 209–229. doi:10.1177/1468798410363835.
- Mathes, P. G., Grek, M. L., Howard, J. K., Babyak, A. E., & Allen, S. H. (1999). Peer-assisted learning strategies for first-grade readers: A tool for preventing early reading failure. *Learning Disabilities Research and Practice, 14*(1), 50–60. doi:10.1207/sldrp1401_5.
- Mathes, P. G., Howard, J. K., Allen, S. H., & Fuchs, D. (1998). Peer-assisted learning strategies for first-grade readers: Responding to the needs of diverse learners. *Reading Research Quarterly, 33*(1), 62–94. doi:10.1598/RRQ.33.1.4.
- McMaster, K. L., Du, X., & Petursdottir, A. L. (2009). Technical features of curriculum-based measures for beginning writers. *Journal of Learning Disabilities, 42*, 41–60. doi:10.1177/0022219408326212.
- National Center for Education Statistics. (2012). *The nation's report card: Writing 2011*. <http://nces.ed.gov/nationsreportcard/pdf/main2011/2012470.pdf>.
- National Commission on Writing for America's Families, Schools, and Colleges. (2003). *The neglected R: The need for a writing revolution*. http://www.collegeboard.com/prod_downloads/writingcom/neglectedr.pdf.
- O'Connor, R. E., & Jenkins, J. R. (1995). Improving the generalization of sound/symbol knowledge: Teaching spelling to kindergarten children with disabilities. *The Journal of Special Education, 29*(3), 255–275. doi:10.1177/002246699502900301.
- Ouellette, G. P., & Sénéchal, M. (2008). A window into early literacy: Exploring the cognitive and linguistic underpinnings of invented spelling. *Scientific Studies of Reading, 12*, 195–219. doi:10.1080/10888430801917324.
- Penuel, W. R., Fishman, B. J., Cheng, B. H., & Sabelli, N. (2011). Organizing research and development at the intersection of learning, implementation, and design. *Educational Researcher, 40*(7), 331–337. doi:10.3102/0013189X114421826.
- Prior, P. (2006). A sociocultural theory of writing. In C. A. MacArthur, S. Graham, & J. Fitzgerald (Eds.), *Handbook of writing research*. New York: The Guilford Press.
- Puranik, C. S., & Al Otaiba, S. (2012). Examining the contribution of handwriting and spelling to written expression in kindergarten children. *Reading and Writing, 25*(7), 1523–1546. doi:10.1007/s11145-011-9331-x.
- Puranik, C. S., Al Otaiba, S., Folsom Sidler, J., & Greulich, L. (2014). Exploring the amount and type of writing instruction during language arts instruction in kindergarten classrooms. *Reading and Writing, 27*, 213–236. doi:10.1007/s11145-013-9441-8.
- Puranik, C. S., Lonigan, C. J., & Kim, Y. S. (2011). Contributions of emergent literacy skills to name writing, letter writing, and spelling in preschool children. *Early Childhood Research Quarterly, 26*(4), 465–474. doi:10.1016/j.ecresq.2011.03.002.
- Rijlaarsdam, G., Braaksmā, M., Couzijn, M., Janssen, T., Raedts, M., van Steendam, E., & van den Bergh, H. (2008). Observation of peers in learning to write: Practice and research. *Journal of Writing Research, 1*(1), 53–83. doi:10.17239/jowr-2008.01.01.3.
- Roberts, K., & Wibbens, E. (2010). Writing first: Preparing the teachers of our youngest writers. In G. Trioia, R. Shankland, & A. Heintz (Eds.), *Putting writing research into practice: Applications for teacher professional development* (pp. 179–205). New York: Guilford Press.
- Salahu-Din, D., Persky, H., & Miller, J. (2008). *The nation's report card: Writing 2007*. <http://nces.ed.gov/nationsreportcard/pdf/main2007/2008468.pdf>.
- Scarborough, H. (1998). *Early identification of children at risk for reading disabilities*. Timonium, MD: York Press.
- Share, D. L., Jorm, A. F., MacLean, R., & Mathews, R. (1984). Sources of individual differences in reading acquisition. *Journal of Educational Psychology, 76*, 1309–1324. doi:10.1037/0022-0663.76.6.1309.
- Spira, E. G., Bracken, S. S., & Fischel, J. E. (2005). Predicting improvement after first-grade reading difficulties: The effects of oral language, emergent literacy, and behavior skills. *Developmental Psychology, 41*, 225–234. doi:10.1037/0012-1649.41.1.225.
- Tangel, D. M., & Blachman, B. A. (1992). Effect of phoneme awareness instruction on kindergarten children's invented spelling. *Journal of Reading Behavior, 24*(2), 233–261. doi:10.1080/10862969209547774.

- Trioia, G., Shankland, R., & Heintz, A. (2010). *Putting writing research into practice: Applications for teacher professional development*. New York: Guilford Press.
- Vandervelden, M. C., & Siegel, L. S. (1997). Teaching phonological processing skills in early literacy: A developmental approach. *Learning Disability Quarterly*, 20(2), 63–81. doi:[10.2307/1511215](https://doi.org/10.2307/1511215).
- Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes* (trans: Cole, M., John-Steiner, V., Scribner, S., & Souberman, E.). Cambridge, MA: Harvard University Press.
- Whitaker, D., Berninger, V., Johnston, J., & Swanson, H. L. (1994). Intraindividual differences in levels of language in intermediate grade writers: Implications for the translating process. *Learning and Individual Differences*, 6(1), 107–130. doi:[10.1016/1041-6080\(94\)90016-7](https://doi.org/10.1016/1041-6080(94)90016-7).