Efficacy Study on the Impact of Handwriting Without Tears

Michael A. Cook, PhD
Jane Eisinger, MS
Steven M. Ross, PhD

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EXECUTIVE SUMMARY
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In May 2021, The Center for Research and Reform in Education (CRRE) at Johns Hopkins University contracted with Learning Without Tears (LWT) to conduct a mixed-methods evaluation study of the impact of LWT's Handwriting Without Tears (HWT) program on student handwriting skills in the Groveport Madison and Perrysburg School Districts in Ohio. The study compared the handwriting of Grades K-2 students, based on scores from the Screener of Handwriting Proficiency, of students assigned to use Handwriting Without Tears, in relation to a control group that continued with business-as-usual instruction.

Learning Without Tears has developed educational products designed to build handwriting skills and fluency that solidify the foundation to build strong literacy success. The focus of the present research is *Handwriting Without Tears Integrated Print and Digital Solution*, which includes physical student editions, teacher's guides, manipulatives, an Interactive Digital Teaching Tool (IDTT), and a student app. The program utilizes multisensory learning that engages visual, audio and kinesthetic learners. Instruction is delivered through the use of intuitive, child-friendly language and imagery in students' lessons and practice, all of which can be directly accessed online from school or home. The program also employs hands-on tools which are particularly important in the younger grades to build gross and fine motor skills. Using the new Digital Student App, students can complete lessons, have additional practice, and be sent music, videos, and messages from their teacher.

The present quasi-experimental evaluation was designed to address the following research questions:

1. How does student growth on handwriting compare to that of comparison students?
2. Do program outcomes vary based on:
   a. District?
   b. School?
3. What implementation practices are used overall and by higher-performing schools?
4. What are the perceptions of participants regarding program implementation, activities, benefits, and challenges?

Study Sample

The study sample consisted of 804 Grades K-2 students across 10 elementary schools in two districts. Teacher survey data were collected from 22 teachers who participated in the HWT program. Interestingly, most teachers (92%) reported having

six or more years of experience, indicating that the teacher sample for this study was generally very experienced.

Program Impact on Student Achievement

Handwriting Without Tears had a significant positive impact on student handwriting, as measured by the Screener of Handwriting Proficiency, in spring 2022, controlling for student handwriting in winter 2022, limited demographic variables, and teacher, school, and district effects. Students who participated in HWT averaged slightly more than three-points larger winter to spring gains than did comparison students who did not participate in HWT. Subgroup analyses showed that HWT had significant effects across all Grade 1 students, as well as for IEP students.

Teacher Perceptions of HWT

Teacher perceptions of HWT were generally positive, with more than 80% of teachers agreeing that they would like to use the program again next year. Relatedly, nearly all (95%) of teachers agreed that HWT enhanced their abilities to teach handwriting skills, and 77% of teachers agreed that HWT improved student learning. A total of 91% of teachers agreed that their students were very engaged during HWT lessons, while 77% of teachers agreed that students gave their best effort when using HWT. In terms of recommendations, only 54% of teachers agreed that HWT professional development prepared them to effectively teach HWT in their classrooms. This was further evidenced in open-ended responses, in which teachers reported that they would like more HWT training, as well as more HWT resources to use in their classrooms. Some teachers also noted that they would like to be able to either dedicate more time each week to HWT, or be able to carve out a consistent, dedicated time each week in which to use HWT with their students. Overall, though, teacher perceptions were positive, and teachers expressed high levels of satisfaction with HWT materials, especially the student edition, IDTT, and manipulatives.

Conclusions

The key results and conclusions of this evaluation are as follows:

- HWT students scored significantly higher on the spring 2022 assessment of handwriting performance than did comparison students, controlling for winter 2022 Screener scores and demographic variables. The effect size was +0.19, indicating a moderately strong impact.
- Subgroup analyses showed that HWT had significant positive impacts for Grade 1 students and students with reported IEPs. No other grade-level comparisons were statistically significant.

- HWT effects were most pronounced on the assessments of Upper-Case and Sentence skills.
- Overall teacher perceptions of the HWT program were positive, with more than 80% of teachers agreeing they would like to use HWT again next year.
- HWT usage generally averaged 20-60 minutes per week, with HWT most often being incorporated into whole-class and individual instruction.
- Teachers most recommended more professional development, as well as more dedicated time during the school day to focus on HWT implementation.

Efficacy Study on the Impact of Handwriting Without Tears

In May 2021, The Center for Research and Reform in Education (CRRE) at Johns Hopkins University contracted with Learning Without Tears (LWT) to conduct a mixed-methods evaluation study of the impact of LWT's Handwriting Without Tears (HWT) program on student handwriting skills, in the Groveport Madison and Perrysburg School Districts in Ohio. Specifically, in this study, we compared the handwriting scores on the Screener of Handwriting Proficiency, of Grades K-2 students who used Handwriting Without Tears to a control group that continued with business-as-usual instruction.

Learning Without Tears has developed educational products designed to build handwriting skills and fluency that solidify the foundation to build strong literacy success. The focus of the present research is Handwriting Without Tears Integrated Print and Digital Solution, which includes physical student editions, teacher's guides, manipulatives, an Interactive Digital Teaching Tool (IDTT), and a student app. The program utilizes multisensory learning that engages visual, audio and kinesthetic learners. Instruction is delivered through the use of intuitive, child-friendly language and imagery in students' lessons and practice, all of which can be directly accessed online from school or home. The program also employs hands-on tools which are particularly important in the younger grades to build gross and fine motor skills. Using the new Digital Student App, students can complete lessons, have additional practice, and be sent music, videos, and messages from their teacher.

The present quasi-experimental evaluation was designed to address the following research questions:

1. How does student growth on handwriting compare to that of comparison students?
2. Do program outcomes vary based on:
   a. Grade?
   b. School?
   c. Demographic subgroup?
3. What implementation practices are used overall and by higher-performing schools?
4. What are the perceptions of participants regarding program implementation, activities, benefits, and challenges?

Method

Research Design

This evaluation consisted of a quasi-experimental design (QED) in which handwriting screener scores for Grades K-2 students who used the Handwriting Without Tears program were compared with handwriting screener scores from comparison students in Grades K-2 who did not use the Handwriting Without Tears program. Overall and subscale handwriting screener scores were analyzed for all students with non-missing pretest, posttest, and demographic data. In addition, responses to a teacher questionnaire were analyzed descriptively and qualitatively to examine teacher perceptions of the HWT program.

Participants

Participants were drawn from the Groveport Madison Local School District (GMLSD) and Perrysburg Exempted Village School District (PEVSD) located in central and northwestern Ohio respectively. Both districts are small in size and are located in large suburban areas. In GMLSD, roughly 5,680 students are enrolled in 11 schools including one pre-school, six elementary schools, three middle schools, and one high school. In PEVSD, roughly 5,160 students are enrolled in five elementary schools, one intermediate school, one junior high school and one high school. Demographic data for the two school districts appears in Table 1.

Table 1
District Demographic Data: Ohio Department of Education (2021)

	GMLSD	PEVSD
% White	34.26	80.5
% Hispanic	9.23	7.67
% Black	45.28	2.09
% Native American/Alaskan Native	0.11	0.15
% Two+ races	8.89	4.40
% Asian	2.21	5.15
% Pacific Islander	0.14	0.02
% SPED	18.08	10.56
% ELL	6.00	1.29

Participants in this evaluation included Grades K-2 students in the 2021-22 school year that were administered the Screener of Handwriting Proficiency, as well as the teachers of these students. Student and teacher data from 10 schools in the two districts were used in this evaluation. Screeners were sent to teachers, who supplied student ID numbers, as well as RTI (Response to Intervention) and IEP data, before

administering the screeners to students. Thus, we only had access to limited demographic data. However, the classes used in this evaluation were generally representative of their respective districts, and there is no reason to expect variation between district-wide demographics and those of study students.

A classroom-level QED was used in this study, meaning that certain classrooms across Grades K-2 in both school districts used HWT, while other classrooms, across the same grade levels and schools in both districts, did not use HWT. Comparison classrooms engaged in business as usual, meaning they taught handwriting by whatever preexisting methods were being used in those classrooms.

Pretest screener data were received from 938 students, while posttest screener data were received from 905 students. Most of the attrition was due to student absences from pretest to posttest screener administrations. When factoring in missing demographic data as well, a final analytic sample of 804 students was used. In this sample, 31% of students were kindergarten students, while 46% of students were in Grade 1 and 23% of students were in Grade 2. A total of 92% of students were identified as RTI students, while 9% of students were identified as having IEPs. Student and cluster attrition tables can be found in Appendix A.

Table 2 shows the unadjusted mean pretest Screener scores for treatment students who participated in the HWT program, and comparison students.

Table 2
Baseline equivalence, pretest Screener (n = 804)

	Overall Mean	HWT Mean (SD)	Control Mean (SD)	Adjusted T v C Difference	Pooled Unadjusted SD	Stan. Mean Diff.
Analytic Sample	52.80	53.66	51.48	1.25	23.38	0.05

Baseline equivalence was met for the analytic sample, as evidenced by the standardized mean difference of +0.05, well under the WWC threshold of 0.25 SDs (WWC, 2020). Thus, the originally planned analyses could be carried out without the use of any sort of weighting procedures or other types of analytic modifications to the sample.

Qualitative data were collected through an online teacher questionnaire that was administered to all 27 intervention teachers. A total of 22 HWT teachers participated in the questionnaire, resulting in an 81.5% response rate. Responding teachers were evenly spread out across each of the three grades, with 32% each teaching kindergarten and Grade 2, and 36% teaching Grade 1.

Measures

Data sources for the current study include pretest and posttest Screener of Handwriting Proficiency scores, as well as limited demographic data that include student grade, along with RTI and special education indicator variables. Teacher data sources included the questionnaire responses.

Screener of Handwriting Proficiency. The Screener of Handwriting Proficiency is a free and practical whole-class assessment tool developed by LWT that provides formative and summative data on students' handwriting skills and areas in need of remediation. Educators can use the Screener to identify and measure specific skill areas for which students need print or cursive instruction and intervention throughout the year. The Screener can be used independently or as part of an RTI framework. It can be administered to entire classes in about 10-15 minutes.

Although the Screener was developed by LWT, we selected it for use in this study given that the participating schools viewed it as being aligned with their knowledge and skills objectives for handwriting in Grades K-2 and having administrative procedures that appeared minimally disruptive to class instruction with regard to completion time and demands on students. To ensure that the Screener would not be over aligned with the intervention condition and therefore present an unfair advantage to those students, we conducted a review of other handwriting measures that have been used in research (Reid, Ross, & Morrison, 2021), and concluded that it was highly similar in content and format to these others, which were longer and more burdensome to administer. According to the What Works Clearinghouse's guidelines, the measurement "overalignment rule does not apply when material covered by an outcome measure must be taught." That condition applied to the participating schools in this study. As an additional precaution, we reviewed this rationale and the Reid et al. (2021) analysis with Evidence for ESSA prior to the study and received a favorable perspective on the Screener being a fair measure of fundamental handwriting performance.

Grades K and 1 screeners included eight each of Upper-Case, Numbers, and Lower-Case characters for students to complete, as well as a sentence that is scored on the basis of five characteristics. The Grade 2 Screener is similar but includes 13 Upper-Case and Lower-Case characters for students to complete. Each of the Upper-Case, Numbers, and Lower-Case items are scored on the basis of Memory, Orientation, and Placement, while the sentence is scored on the basis of: Using a capital to start the sentence, mixing capital and lowercase letters, putting too much space between letters in a word, putting words too close together, and forgetting punctuation (a period) at the end of a sentence. Teachers can use an online scoring tool to quickly and efficiently score Screeners but, for the purpose of this evaluation, this was not a viable strategy, so CRRE trained two staff members to score both pretest and posttest Screeners. Scorers trained individually on random subsets of Grades K and 1 pretest screeners,

with percent agreement being calculated and disagreements resolved through discussion. This process was repeated several times until percent agreement reached the 90% threshold.

The scoring procedure used for this evaluation differed somewhat from that typically used by the automated online HWT scoring system. Each item (except the sentence) was scored on the basis of each of Memory, Orientation, and Placement. Thus, each item was scored three times. Importantly, if a Memory error was detected (i.e., the wrong character was supplied by the student), then the item was not further scored for Orientation or Placement. This is consistent with the online HWT scoring system. Once each item was scored for each characteristic, the number of errors of each type (Memory, Orientation, and Placement) was summed for each student across each of Upper-Case Letters, Numbers, and Lower-Case Letters. To avoid counts of errors being the outcome variable in analyses, we subtracted these counts of errors from the total number of each type of item to derive counts of items that were answered "correctly" for each of Memory, Orientation and Placement. These counts were then summed together to calculate a "total" score of correct responses for each student. These total scores, along with totals for each subscale of Upper-Case Letters, Numbers, and Lower-Case Letters, were used as outcome variables in all analyses. This contrasts significantly with LWT's online scoring feature, which produces counts of each type of error (both across the entire screener and on sub scores).

Teacher questionnaire. The questionnaire included a series of Likert-scale and open-ended items that asked teachers about their perceptions of the HWT program (see copy in Appendix B). In addition to demographics such as years of experience and approximate classroom size, teachers were asked about their initial HWT training, program use, and perceived quality, benefits, and satisfaction with the HWT program. Teachers were asked open-ended questions about perceived strengths and weaknesses of HWT, as well as recommendations or suggestions to improve HWT for teachers and for students.

Analytical Approach

Hierarchical linear modeling (HLM) was used to analyze Screener of Handwriting Proficiency gains from winter to spring of the 2021-22 school year, with students clustered within teachers. Overall Screener scores, which are defined as the total number of correct items across all subscales, were used as the main outcome variable in these analyses, although we also compare patterns of gains on subscales (Upper Case Letters, Numbers, Lower Case Letters, and Sentences) in supplemental analyses. These models controlled for demographic variables including district, school, and student grade level, as well as RTI and IEP indicator variables. Descriptive statistics such as means and standard deviations were also computed for Screener scores, where appropriate. Likert-scale teacher questionnaire items were analyzed descriptively, while open-ended items were analyzed using a grounded theory approach (Glaser & Strauss,

1967). The qualitative findings reported on in the current report are themes that emerged prominently from our analysis.

Results

We begin by descriptively analyzing Screener scores from the winter and spring of the 2021-22 school year, by grade. Next, we present the results of HLMs that examined the impact of the Handwriting Without Tears program on winter to spring Screener score gains. Finally, we discuss the results of descriptive quantitative analyses of Likert-scale teacher questionnaire responses, along with the qualitative analysis of open-ended teacher questionnaire responses.

Screener of Handwriting Proficiency Results

Table 3 shows the unadjusted mean total pretest and posttest Screener scores for all students included in the current analytic sample. Scores are disaggregated by condition (treatment or comparison) and grade level.

Table 3
Unadjusted average total Screener scores

Grade	Treatment			Comparison		
	Pre	Post	*N*	Pre	Post	*N*
Grade K	31.59 (16.82)	58.03 (11.73)	142	31.82 (16.65)	58.40 (13.52)	109
Grade 1	49.79 (14.47)	65.53 (7.37)	210	54.94 (10.92)	61.17 (9.50)	161
Grade 2	83.58 (14.56)	93.28 (13.31)	122	77.90 (15.25)	89.90 (9.34)	60

Note. SDs are in parentheses

Pretest to posttest gains were greatest for kindergarten students, with both treatment and comparison kindergarten students gaining nearly 27 points. Patterns of gains favored treatment students in Grade 1, as treatment students averaged nearly 16-point gains, as compared to only 6-point average gains for comparison students. Unadjusted pretest to posttest gains were again similar for Grade 2 students, with comparison students averaging 12-point gains, as compared to 10-point average gains for treatment students.

We also descriptively examine patterns of score gains for each of the Upper-Case, Numbers, Lower-Case, and Sentence subscales of the Screeners. Results of these analyses are presented in Table 4.

Table 4
Unadjusted average subscale Screener scores

Grade	Treatment			Comparison		
	Pre	Post	*N*	Pre	Post	*N*
Upper-Case						
Grade K	11.40 (6.80)	19.27 (4.30)	142	11.98 (7.02)	19.20 (4.91)	109
Grade 1	16.54 (5.23)	21.31 (2.82)	210	18.29 (4.22)	19.52 (4.10)	161
Grade 2	30.87 (7.08)	34.31 (5.69)	122	29.67 (6.19)	33.67 (4.02)	60
Numbers						
Grade K	13.11 (7.02)	19.73 (3.42)	142	13.00 (6.73)	20.14 (3.54)	109
Grade 1	17.16 (4.39)	20.68 (2.35)	210	17.99 (3.81)	19.73 (3.20)	161
Grade 2	19.82 (4.32)	21.31 (3.62)	122	18.32 (4.75)	20.90 (2.45	60
Lower-Case						
Grade K	6.44 (5.80)	15.93 (5.12)	142	6.37 (6.05)	16.40 (5.90)	109
Grade 1	13.92 (6.09)	19.68 (3.10)	210	16.31 (4.72)	18.43 (3.48)	161
Grade 2	30.03 (5.37)	33.72 (4.63)	122	27.72 (6.69)	31.88 (4.49)	60
Sentence						
Grade K	0.65 (1.00)	3.11 (1.41)	142	0.47 (0.83)	2.66 (1.48)	109
Grade 1	2.17 (1.38)	3.86 (1.16)	210	2.34 (1.10)	3.48 (1.20)	161
Grade 2	2.86 (1.36)	3.93 (1.23)	122	2.20 (1.42)	3.45 (1.08)	60

Note. SDs in parentheses

Grade 1 treatment students outgained comparison students on the Upper-Case Screener items, while similar patterns of gains were observed on the Upper-Case items for Grades K and 2 students. Grade 1 treatment students similarly outgained students on Number items in relation to comparison students. In general, Grade 1 treatment students outgained comparison students, on average, on all the Screener subscales, while Grades K and 2 students generally experienced very similar patterns of gains from pretest to posttest Screener administrations.

Regression analyses. Next, we examine the results of hierarchical linear models (HLMs) that examine the impact of HWT on Screener total score gains for all grades combined. These models controlled for students' teacher and school, as well as the limited demographic data we obtained. We examine impacts on overall Screener scores, followed by subscale scores. Relevant model statistics and coefficients for the HLM examining the impact of HWT on Screener score gains are displayed in Table 5.

Table 5
Impact of HWT of overall Screener scores

Variable	Estimate	Standard Error	*p* value	Effect Size
HWT	3.256	1.483	.028*	0.194
Constant	66.760	1.104	<.001	
Variance of constant	14.040			
Residual	66.934			
Student *N*	804			
Class *N*	39			

Note. *$p < .05$

Students who participated in HWT averaged significantly larger Screener gains than did comparison students who did not use HWT. The regression coefficient can be interpreted as the difference in Screener gains for students who used HWT, in relation to comparison students. Thus, HWT students averaged approximately 3.25-point larger gains from pretest-to-posttest Screener administrations than did comparison students. This impact results in a standardized effect size of just under 0.20, indicating that HWT students outgained comparison students by an average of nearly one-fifth of a standard deviation, a moderately strong advantage.

Next, we move on to a series of analyses that are similar to the original HLM discussed above, but use subscale scores as outcomes, as opposed to total subscale scores. The results of these analyses are summarized in Table 6.

Table 6
Impact of HWT on Screener subscale gains

Variable	Estimate	Standard Error	*p* value	Effect Size
Upper-case	1.339	0.442	.002**	0.185
Numbers	0.358	0.363	.324	0.113
Lower-case	0.827	0.611	.176	0.106
Sentence	0.398	0.203	.050^	0.296

Note. ** $p < .01$; ^ $p < .10$

A significant positive impact of HWT was observed on Upper-Case score gains ($p = .002$), and the impact of HWT on Sentence score gains approached statistical significance ($p = .050$). As before, regression coefficients can be interpreted as the average increase in pretest-to-posttest gains for HWT students, in relation to comparison students. HWT students averaged nearly 1.5-point larger gains on Upper-

Case items from pretest to posttest than did comparison students. Similarly, HWT students averaged nearly 0.40 points larger gains on sentence items from pretest to posttest than did comparison students. It is important to note that there are only five Sentence features scored, so the range of Sentence scores is much smaller than for the other three subscales. The effect size for Upper-Case was a small to moderately strong +.185, and for the Sentence item a strong +.296.

Subgroup analyses. Next, we performed a set of subgroup analyses to examine potential differential impacts of HWT across different student populations. Specifically, we examined whether the impacts of HWT differed across grade levels and for special education (IEP) students. We only examined IEP students in subgroup analyses because nearly all students were identified as being RTI students.

First, we conducted subgroup analyses examining potential differential effects of HWT across different grade levels. Then, we conducted a separate subgroup analysis examining potential differential effects of HWT for IEP and non-IEP students. Table 7 displays impact estimates of HWT across each grade level, and for IEP students.

Table 7
Impact of HWT on spring 2022 Screener scores by grade level and IEP status

	Estimate	*p* value
Grade level		
K (*n* = 251)	-0.588	.801
1st (*n* = 271)	6.248	.001**
2nd (*n* = 182)	1.593	.645
IEP Status		
IEP students (*n* = 78)	5.693	.026*

Notes. 1. *p <.05; ** p < .01. 2. The treatment effect for each subgroup was calculated by adding the overall treatment effect and the treatment interaction terms for the subgroup. The *p* values reported in this table show whether HWT had a positive effect for the subgroup relative to similar comparison students.

Significant positive impacts of HWT were observed for Grade 1 students, with HWT students in Grade 1 outscoring comparison students by more than six points. No significant HWT impacts were observed for Grades K or 2 students. A significant positive impact was also observed for IEP students, with treatment IEP students outscoring comparison IEP students by more than 5.5 points. This latter finding gives evidence of increased program efficacy for lower-achieving students or students who otherwise need additional intervention.

Teacher perceptions of HWT

Teacher characteristics. Teachers were generally very experienced, with 92% of teachers reporting six or more years of experience, and 73% of teachers reporting

11 or more years of teaching experience. Table 8 shows teacher-reported classroom sizes for classrooms that used HWT.

Table 8
Teacher-reported HWT classroom sizes, by percentage (n = 22)

Classroom Size	Percentage
Less than 10	4.55%
11-15 students	4.55%
16-20 students	9.09%
21-25 students	45.45%
26-30 students	36.36%

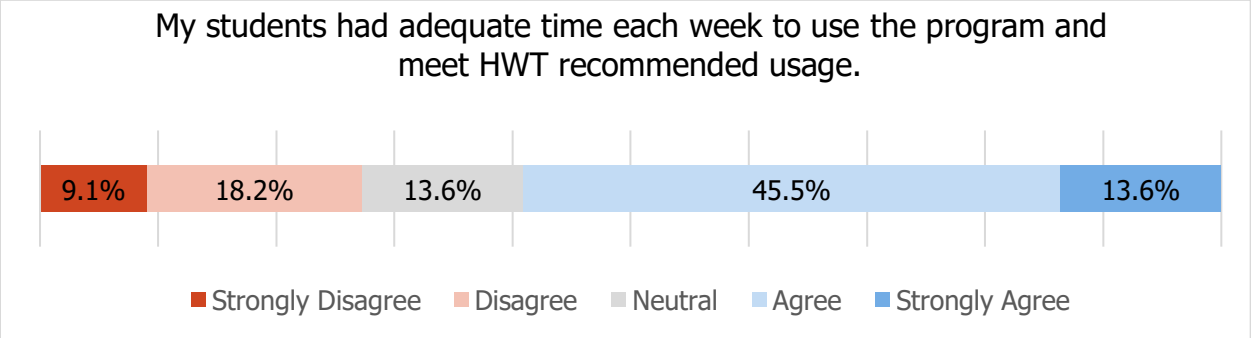
A vast majority of teachers (82%) reported having classroom sizes of between 21-30 students. Notably, no teachers reported having classroom sizes of greater than 30 students.

Training. Almost three-fourths (73%) of teachers agreed or strongly agreed that the training they received prepared them to implement HWT, while 27% of teachers disagreed. Teachers who provided a response of "strongly disagree" or "disagree" were asked to provide additional feedback and were specifically asked if anything was missing from the training they received and how the training could be improved. Five of the six teachers provided further explanation for their responses. Four commented that they either did not receive enough training or that the training was not thorough enough. Teacher comments included, "It was a great overview but it was not thorough enough to prepare me for whole class teaching," and, "Not enough training on how to form a lesson, time needed, etc." Additionally, two teachers indicated that the virtual nature of the training negatively impacted their response to the original question, with one stating, "I should have gone to the in-person training."

Program usage. Nearly all teachers reported that they were at least somewhat aware of HWT's recommendations for student program usage, with 82% of teachers responding that were definitely aware of these recommendations, and 14% of teachers reporting they were somewhat aware of these recommendations. In addition, teachers were asked in a questionnaire item to rate the degree to which they agreed their students had adequate time to use HWT and meet recommended usage levels. Responses to this item are summarized in Figure 1.

Figure 1

Teacher perceptions of students meeting recommended HWT usage



A majority of teachers (59%) agreed that their students had adequate time each week to use the program and meet HWT's recommended usage guidelines (see Figure 1). About one-fourth (27%), however, disagreed, suggesting that some teachers encountered some difficulty fitting HWT into their classroom schedules, along with all other regularly scheduled activities. Teachers who indicated that they "strongly disagreed" or "disagreed" were asked to provide additional feedback on their responses. Six teachers did so, and they were unanimous in stating that a lack of time was the limiting factor for program usage. Three of the six teachers specified that their building schedule requirements hampered usage. One teacher stated that, "Many children needed time to work in small groups and do the boards more, but I didn't have time to implement that in my schedule" and another commented:

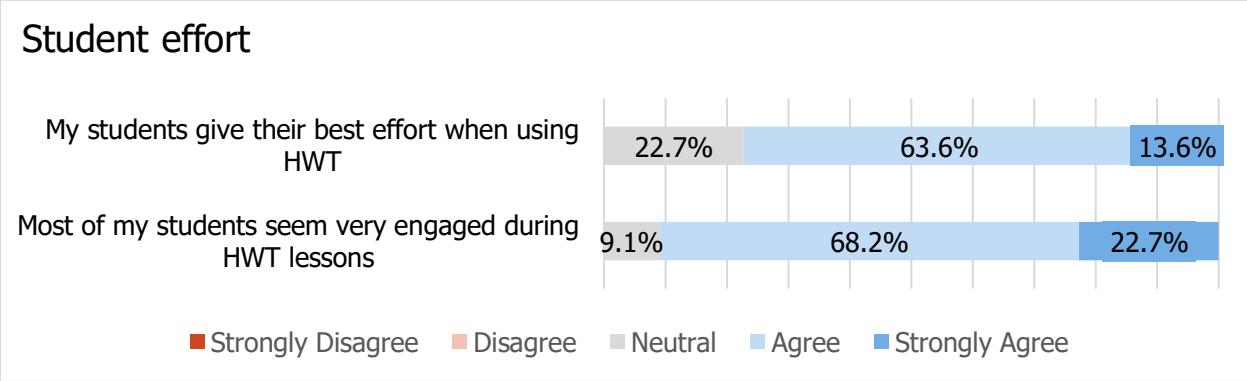
> *I started out with the whole class but due to our building schedule requirements, I had to shift to a greatest need model using the program in small group intervention less time than recommended. I wish I would have had more time to devote to the program.*

One teacher also observed that several COVID-19-related factors also played a role in student usage time with one stating,

> *Coming back from COVID, students took more time to get into a routine. We were still required for part of the year to stay 6 feet apart so doing small groups and one to one was not easy. I often felt rushed. I am sure after having it for a year it will be smoother next time.*

Student effort and engagement. Figure 2 shows teacher perceptions of student effort and engagement with HWT.

Figure 2
Teacher perceptions of student effort and engagement.



Teacher perceptions of student effort and engagement were very positive, with 76% of teachers agreeing that students gave their best effort when using HWT, and 91% of teachers agreeing that most of their students seemed very engaged during HWT lessons. No teachers indicated that they disagreed with either of these statements.

HWT implementation. Teachers were asked several questions regarding usage and implementation of HWT in their classrooms. Table 9 shows percentages of teachers who implemented HWT in different classroom activities.

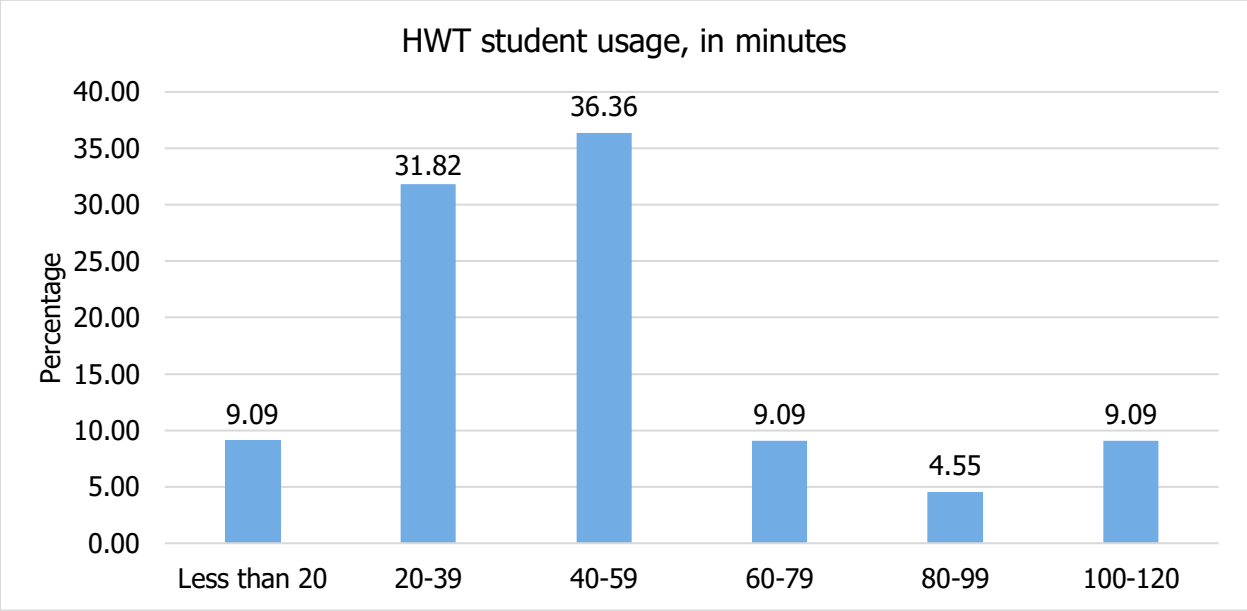
Table 9
HWT Implementation, by classroom activity (n = 22).

Activity	Percentage
Whole-group instruction	90.9%
Independent work	45.5%
Center-based work	13.6%
Other	9.1%
Homework	0.0%

Nearly all teachers reported using HWT during whole-group instruction in their classrooms, while just under half of teachers reporting using HWT during independent work periods. Small numbers of teachers reported using HWT during center-based work and other activities, while no teachers reported using HWT in homework assignments.

Program Usage. Figure 3 displays teacher-estimated program usage by their students in a given week.

Figure 3
Student HWT usage, in minutes

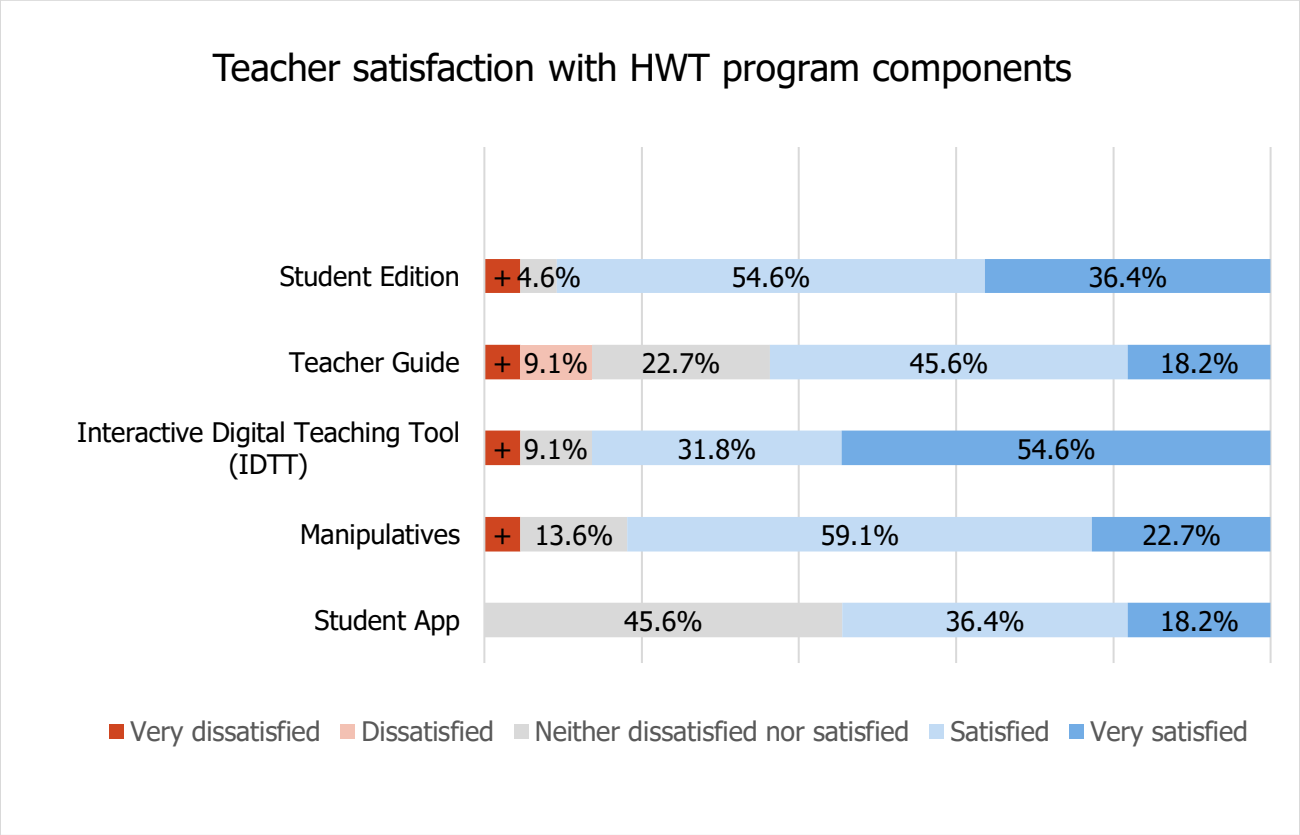


Most teachers estimated that students used HWT between 20-59 minutes each week, with 36% of teachers reporting 40-59 minutes of HWT usage per week and 32% of teachers reporting 20-39 minutes of usage per week. In addition, 23% of teachers reported an hour or more of usage per week. On a separate questionnaire item, nearly all (95%) teachers reported that students typically spent 20 minutes or less using HWT during a typical session. Most teachers (86%) also indicated that they implemented HWT in their classrooms three or more times per week, with 45% of teachers reporting implementing five days per week. Taken together, these responses indicate that teachers generally used HWT multiple times per week, but for short durations of time, typically no more than 20 minutes each session.

Program components. Teachers were asked to rate their perceived levels of satisfaction in relation to five components of the HWT program. Figure 4 displays these responses, by HWT component.

Figure 4

Teacher perceptions of satisfaction with HWT program components



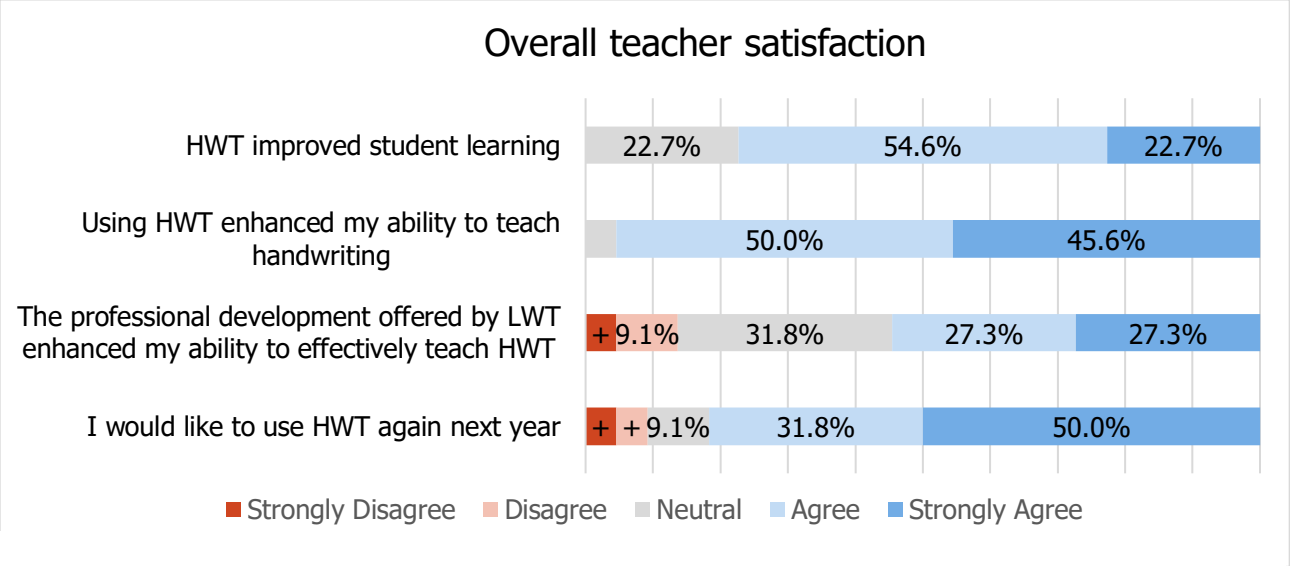
Note. + < 5%

Teachers were generally satisfied with each of the HWT program components. Teachers expressed the highest levels of satisfaction for the Student Edition, with 95% responding they were "Satisfied" or "Very Satisfied." The next most positively rated components were the Interactive Digital Teaching Tool (91% satisfaction) and Manipulatives (86%). Relatedly, 17 of 19 teachers (89%) reported that they "always" or "often" used the IDTT. The student app had the lowest level of teacher satisfaction, with only 54% of teachers reporting being satisfied. Two open-ended responses were provided by teachers who disagreed or strongly disagreed with any of the statements. One was "N/A" but the other stated that, "The teacher's guide was not near as helpful as the lesson planner within the digital teaching tool (IDTT)."

Teacher perceptions of HWT. Teachers were asked four questionnaire items relating to their perceptions of the effectiveness of HWT. Responses to these items are displayed in Figure 5.

Figure 5

Teachers' perceived quality, benefits, and satisfaction with HWT



Note. + < 5%

Teacher perceptions of HWT were generally positive. Notably, nearly all teachers agreed that using HWT enhanced their ability to teach handwriting, and 82% of teachers agreed that they would like to use HWT again next year. One interesting finding was that only 54% of teachers agreed that the professional development offered by LWT enhanced their ability to effectively teach HWT. One teacher who disagreed or strongly disagreed with this statement remarked that, "We put most emphasis on lowercase letters in kindergarten because that is the majority of what students need in writing. The Handwriting Without Tears teaches all capitals first and that does not align with our current teaching." A second teacher's entry reinforced previous feedback suggesting that lack of time and limited flexibility in scheduling impacted her responses saying,

> *Unfortunately, our building schedule is planned to the minute and there is not time available to teach this program with fidelity. I really tried, but in the end I had to focus on a small group of beginning writers as more of a tier 2 intervention.*

Teachers were asked an open-ended question prompting them to list the strengths of HWT, with 19 teachers providing responses. They identified four main areas of program strength:

1. Program features
2. Simplification of letter formation
3. Ease of use for teachers
4. Student engagement

Eleven of these teachers (57.9%) named one or more of the following program features as program strengths:

- **Hands-on learning/Manipulatives.** Six teachers stated that they liked the hands-on manipulatives provided by the program, singling out the chalkboards and the Magic C Bunny.
- **Videos.** Five teachers commented favorably on the program videos. One commented that, "The videos were very engaging."
- **Student workbook.** Four teachers liked the student workbook. One noted that it was "easy to follow for kids."
- **Songs.** Three teachers enjoyed the inclusion of songs within the program with one adding that they increased student engagement.
- **Online practice.** Two teachers appreciated the opportunity for students to do online practice with one saying, "[I] LOVE the online component."

Six teachers (31.6%) named each of the remaining three areas of program strength.

- **Simplicity of Letter Formation.** Teachers' comments included, "[The] simplicity of the formation of letters and numbers with only 4 shapes makes it so easy," and "It helps the kids break down how to make the letters. I love how it then gets them used to writing on different types of lines."
- **Ease of use for teachers.** Teachers spoke of how easy it was to implement the program in their classrooms. One said, "Can be done quickly yet effectively when used on a consistent basis," and another added, "We teach the capital and lowercase letters together, by letter. I like this method better."
- **Student Engagement.** Teachers indicated that multiple aspects of the program such as the online practice, the manipulatives, and the songs and videos kept their students engaged with one exclaiming, "It really kept the kids on their toes!"

Finally, a smaller group of four teachers (21.1%) stated that they liked the program's language/vocabulary, with one saying, "Vocabulary for letter formations is easy to learn." Other program strengths that were mentioned by one or two teachers included the program being interactive and research based.

The next questionnaire item asked teachers to comment on perceived program weaknesses. Three teachers (15.8%) wrote that they did not have any program weaknesses to list. Among the 19 responses provided, the most common weakness of the program identified was the time required to implement the program. This was observed by four teachers (21.1%) and their comments included, "Working to find time to fit it into schedule can be difficult," and "It is very tricky to try and get everything

done in the 10 minutes given for lessons. It got better as time went on and the students grasped the concepts." Another teacher described not always having time to use HWT during the class small group time.

The remaining responses to this question focused on items primarily related to either program materials or content. Responses regarding materials fell into the following categories:

- **Student workbook.** Three teachers disliked aspects of the student workbook. One said that it "jumps around," making it hard for students to find their place. The other explained, "Some picture examples in student books did not follow phonics rules (ex: owl on O page...we had not introduced ow sound." Finally, one teacher noted that the workbooks' pages began falling out at mid-year and had to be taped back in place.
- **Teacher Manual.** Two teachers noted weaknesses within the manual. One said that it did not follow sequence initially and the other stated that it was hard to follow.
- **Shortage of materials.** Two teachers found the quantity of program manipulatives lacking, with one commenting that, "With a class of 30 there needs to be enough manipulatives for each student."
- **Lack of alignment.** Two teachers noted that the program did not align with their scope and/or sequence for phonics. Their comments were, "[It] would be nice to align with phonics scope and sequence," and "[D]oes not go along with our phonics program."

Regarding content, individual teachers commented on the following:

- The two-line system of HWT does not prepare students for the single or triple lines that are more commonly encountered.
- The program does not focus on uppercase letters first.
- The Magic C Bunny is less appropriate for students above Grade 1.
- The chalkboards could be difficult to erase without using water.

Individual teachers also commented that more training was needed "to see and correctly use everything," that they had been unsuccessful in creating worksheets from the teacher tools, and no PIN number had been provided to enable access to some online program features.

Teachers were asked what recommendations or suggestions they had to improve HWT for teachers (e.g., teacher preparation, program components, implementation, etc.). Almost half of the 19 teachers (42.1%) who responded had no recommendations

for improvement. Another teacher responded by saying "I like all of it." The remaining teachers' recommendations were as follows:

- **Improve teacher manual.** Four teachers stated that the teacher manual could be improved. Feedback included ideas for formatting the manual so that the lessons would be in order from Day 1 and aligning the order of the teacher manual with that of the student handbook.
- **Increase/provide more instructional time.** Three teachers recommended that the program be allocated more instructional time, perhaps through a dedicated block of time each day.
- **Provide more training.** Two more teachers suggested that additional teacher training be provided.

A final suggestion, made by an individual teacher was for providing smaller, less cumbersome chalkboards, along with spill-proof water containers for cleaning.

The final open-ended question posed to teachers asked them for recommendations or suggestions to improve HWT for students, based on their experience during the current year (student engagement, focus, etc.). Twelve of the 19 teachers who responded (63.2%) indicated that they had no recommendations for improving the program for students, with one stating, "None, my students really enjoyed it," and another reiterating that their students had enjoyed the program's songs. The remaining teachers' recommendations largely mirrored ones that had been suggested in answers to previous questionnaire items. Recommendations were as follows:

- **Provide more materials.** Two teachers recommended that materials be provided for each individual student in the classroom.
- **Improve student workbooks.** Two teachers suggested that the workbooks be improved, either by being made sturdier/less likely to lose pages or by updating the student workbook to correspond to the order of the lessons.

Finally, individual teachers made the following suggestions: 1) differentiate the lessons "for students who are slower in their [letter] formation, but gradually blend into work for faster finishers (on the same page)," 2) allow for more time to complete initial lessons, and 3) increase the number of songs because "that really got [students'] attention."

Summary & Discussion

The purpose of this study was to evaluate the efficacy of the Handwriting Without Tears handwriting instruction program. The main focus of this evaluation was comparing handwriting improvement for Grades K-2 students who participated in HWT to that of otherwise similar Grades K-2 students who did not participate in the program but taught handwriting using other strategies and resources. This report presented findings from an assessment of varied handwriting skills and a teacher questionnaire administered to all HWT teachers.

Results showed that students who participated in Handwriting Without Tears scored significantly higher on posttest handwriting skills performance in spring 2022 than did comparison students who did not participate in the program. HWT students outscored comparison students by over three points, on average, after controlling for pretest performance from winter 2022 and available demographic variables. Subgroup analyses showed that Grade 1 HWT students significantly outgained Grade 1 comparison students. Similarly, IEP students who participated in HWT significantly outgained IEP comparison students.

Teachers reported HWT usage in the classroom averaged 20-60 minutes per week. Nearly all teachers used HWT as part of whole-class instruction, while just under half of all teachers reported using HWT for independent instruction. Teachers generally expressed high levels of satisfaction with each of the HWT program components, with the highest levels of satisfaction expressed for the Teacher Guide, the IDTT, and manipulatives.

Teacher perceptions of Handwriting Without Tears were generally very positive, with over 80% of teachers agreeing that they would like to use HWT again next year. The ability of HWT to assist teachers with teaching handwriting was the most commonly cited feature, with nearly all teachers agreeing that HWT enhanced their ability to teach handwriting. Open-ended questionnaire responses supported this assertion, with many teachers reporting how they enjoyed and appreciated having a dedicated curriculum to follow for handwriting instruction. Nearly 80% of teachers agreed that HWT improved student learning outcomes, with teachers specifically observing that students' handwriting technique improved this year using HWT than in previous years. Weaknesses and recommendations identified by teachers in both quantitative and qualitative questionnaire responses mostly focused on a desire for more training, as well as for more classroom materials to facilitate HWT implementation.

Conclusions

The key results and conclusions of this evaluation are as follows:

- HWT students scored significantly higher on the spring 2022 assessment of handwriting performance than did comparison students, controlling for winter 2022 Screener scores and demographic variables. The effect size was 0.19, indicating a moderately strong impact.
- Subgroup analyses showed that HWT had significant positive impacts for Grade 1 students and students with reported IEPs. No other grade-level comparisons were statistically significant.
- HWT effects were most pronounced on the assessments of Upper-Case and Sentence skills.
- Overall teacher perceptions of the HWT program were positive, with more than 80% of teachers agreeing they would like to use HWT again next year.
- HWT usage generally averaged 20-60 minutes per week, with HWT most often being incorporated into whole-class and individual instruction.
- Teachers most recommended more professional development, as well as more dedicated time during the school day to focus on HWT implementation.

References

Reid, A., Ross, S., & Morrison, J. (2022). *A Description of Handwriting Evaluation Measures.* Towson, MD: Center for Research and Reform in Education (CRRE), Johns Hopkins University.

Appendix A: ESSA Attrition Tables

Table A1

Summary of cluster attrition

C Cluster *N*	T Cluster *N*	*N* Randomized to C	*N* Randomized to T	Attrited C Clusters	Attrited T Clusters	Overall Cluster Attrition Rate (%)	Differential Cluster Attrition Rate (%)
16	25	16	25	0	0	0.00	0.00

Table A2

Summary of student attrition, Math

C Student *N*	T Student *N*	*N* Randomized to C	*N* Randomized to T	Attrited C Students	Attrited T Students	Overall Student Attrition Rate (%)	Differential Student Attrition Rate (%)
330	474	575	363	33	101	14.29	8.48

Appendix B: Teacher Questionnaire

Learning Without Tears - Teacher Questionnaire

Teacher Information

Please indicate your school.

- Asbury Elementary
- Dunloe Elementary
- Fort Meigs Elementary
- Frank Elementary
- Glendening Elementary
- Groveport Elementary
- Madison Elementary
- Sedalia Elementary
- Toth Elementary
- Woodland Elementary

In which grade do you teach?

- K
- 1st
- 2nd
- 3rd
- 4th
- 5th

How many years have you been a teacher?

- >1
- 1-2
- 3-5
- 6-10
- 11+

Approximately how many students are in your HWT classroom?

- Less than 10
- 11-15
- 16-20

21-25
26-30
31+

Teacher Preparation/Training

The initial training I received prepared me to teach HWT in my classroom.

Strongly disagree
Disagree
Neither disagree nor agree
Agree
Strongly agree

Why did you disagree that the initial training you received prepared you to teach HWT? How can the HWT training be improved? Was anything missing? (Displayed only to participants who responded strongly disagree/disagree to the previous questionnaire item.)

I am aware of HWT's recommendations for the amount of time that students use the program (daily, weekly, other).

Yes
Somewhat
No

Program Use

My students had adequate time each week to use the program and meet HWT recommended usage.

Strongly disagree
Disagree
Neither disagree nor agree
Agree
Strongly agree

Why did you disagree that your students had adequate time each week to use the program and meet HWT recommended usage? Do you have suggestions for how this could be improved? (Displayed only to participants who responded strongly disagree/disagree to the previous questionnaire item.)

My students give their best effort when using HWT.

Strongly disagree
Disagree
Neither disagree nor agree
Agree
Strongly agree

Why did you disagree that your students give their best effort when using HWT? Do you have suggestions for how this could be improved? (Displayed only to participants who responded strongly disagree/disagree to the previous questionnaire item.)

Most of my students seem very engaged during HWT lessons.

Strongly disagree
Disagree
Neither disagree nor agree
Agree
Strongly agree

Why did you disagree that your students seem very engaged during HWT lessons? Do you have suggestions for how this could be improved? (Displayed only to participants who responded strongly disagree/disagree to the previous questionnaire item.)

How did you use HWT in your classroom? (Check all that apply)

Whole group instruction
Independent work
Center based work
Homework
Other

How much time was the program used by students on average each week? Please give your best estimate in minutes.

Less than 20 minutes
20-39 minutes
40-59 minutes
60-79 minutes
80-99 minutes
100-120 minutes

How many minutes did a student typically spend in HWT within a single session?

10 minutes

20 minutes
30 minutes
40 minutes
50 minutes
60 minutes

Typically, how many days per week did you implement HWT in your classroom? (Drop down menu)

1
2
3
4
5

How easy was it to implement the Screener of Handwriting Proficiency assessment?

Very easy
Easy
Neither difficult nor easy
Difficult
Very difficult

Do you have any suggestions for improving the implementation of the Screener of Handwriting Proficiency assessment?

Yes
No

(If yes – text box provided for response)

Teachers Perceived Quality, Benefits, and Satisfaction with Program

(Matrix table) Please indicate your level of agreement with each of the following statements:

1. HWT improved student learning
2. Using HWT enhanced my ability to teach handwriting
3. The professional development offered by LWT enhanced my ability to effectively teach HWT
4. I would like to use HWT again next year

Strongly disagree
Disagree
Neither disagree nor agree
Agree
Strongly agree

Please provide additional feedback on why you disagreed with one or more of the previous statements; 1) HWT improved student learning, 2) Using HWT enhanced my ability to teach handwriting, 3) The professional development offered by LWT enhanced my ability to effectively teach HWT, and/or 4) I would like to use HWT again next year.) Please reference which statement you are commenting on so we can record your response accurately. (Displayed only to participants who responded strongly disagree/disagree to one or more of the statements in the previous questionnaire item.)

(Matrix table) Please rate your level of satisfaction with each of the following HWT program components:

1. Student Edition
2. Teacher Guide
3. Interactive Digital Teaching Tool (IDTT)
4. Manipulatives

Very Dissatisfied
Dissatisfied
Neither dissatisfied nor satisfied
Satisfied
Very satisfied

Please provide additional feedback on why you were dissatisfied with one or more of the HWT program components; 1) Student Edition, 2) Teacher Guide, 3) Interactive Digital Teaching Tool (IDTT), 4) Manipulatives, and/or 5) Student App. Please reference which statement you are commenting on so we can record your response accurately. (Displayed only to participants who responded strongly disagree/disagree to one or more of the statements in the previous questionnaire item.)

How often did you use the Interactive Digital Teaching Tool (IDTT)?

Never
Rarely
Sometimes
Often
Always

Open-Ended

1. What are the strengths of HWT?
2. What are the weaknesses of HWT?
3. What recommendations or suggestions do you have to improve HWT for teachers (e.g., teacher preparation, program components, implementation, etc.)?
4. What recommendations or suggestions do you have to improve HWT for students based on their experience during the current year (student engagement, focus, etc.)?

Appendix C: Questionnaire Descriptive Statistics

Table C1

Item-level descriptive statistics, Likert-scale items

Rate your level of agreement with the following statements.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	*N*	*M*	*SD*
The initial training I received prepared me to teach HWT	0.0%	27.3%	0.0%	45.5%	27.3%	22	3.73	1.14
My students had adequate time each to week to use the program and meet HWT recommended usage	9.1%	18.2%	13.6%	45.5%	13.6%	22	3.36	1.22
My students give their best effort when using HWT	0.0%	0.0%	22.7%	63.6%	13.6%	22	3.91	0.60
Most of my students seem very engaged during HWT lessons	0.0%	0.0%	9.1%	68.2%	22.7%	22	4.14	0.55
HWT improved student learning	0.0%	0.0%	22.7%	54.6%	22.7%	22	4.00	0.67
Using HWT enhanced my ability to teach handwriting	0.0%	0.0%	4.6%	50.0%	45.6%	22	4.41	0.58
The PD offered by LWT enhanced my ability to effectively teach HWT	4.6%	9.1%	31.8%	27.3%	27.3%	22	3.64	1.11
I would like to use HWT again next year	4.6%	4.6%	9.1%	31.8%	50.0%	22	4.17	1.07

Table C2
Item-level descriptive statistics, teacher satisfaction items

Rate your level of satisfaction with each of the following HWT program components:

	Very dissatisfied	Dissatisfied	Neither dissatisfied nor satisfied	Satisfied	Very satisfied	*N*	*M*	*SD*
Student Edition	4.6%	0.0%	4.6%	54.6%	36.4%	22	4.18	0.89
Teacher Guide	4.6%	9.1%	22.7%	45.6%	18.2%	22	3.64	1.02
IDDT	4.6%	0.0%	9.1%	31.8%	54.6%	22	4.32	0.97
Manipulatives	4.6%	0.0%	13.6%	59.1%	22.7%	22	3.95	0.88
Student App	0.0%	0.0%	45.6%	36.4%	18.2%	22	3.73	0.75