

The Use of Handheld Learning Systems in Chicago Public Schools First-Grade Classrooms: Patterns of Beginning Reading Achievement in Area 18

Report to the Finnegan Family Foundation, the OSA Foundation,
and Chicago Public Schools

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Background

In September, 2008, handheld computers were supplied to 176 first-grade classrooms in the Chicago Public Schools, courtesy of a grant from the JPMorgan Chase Foundation. One handheld was provided to every student in these classrooms as part of the TeacherMate handheld learning system that provides supplemental beginning literacy and math instruction aligned to the teacher's core curriculum.

The TeacherMate handheld learning system was developed by Innovations for Learning (IFL), a nonprofit that has served the Chicago Public Schools for fifteen years and recently expanded nationally and internationally to serve students in low-income urban and rural communities. The reading and math activities provided in the handhelds used in Chicago cover the following areas of beginning reading and math instruction for first grade: phonics, sight words, guided reading, fluency, comprehension, math facts and math concepts.

The activities are aligned to the classroom instruction by means of a learning management system installed on the teacher's personal computer. The teacher indicates on the management system the Reading and Math core (basal) programs being used in the classroom. Throughout the year the teacher indicates which unit of these programs the class (or a subset of the class) is working on. This information is synched to the handheld computers to align instruction. In this manner, a sight word game on the handheld focuses on the words introduced that week in the particular unit the student is studying in Reading. Phonogram families are implemented in the reading games on the handheld at the same time they are introduced by the teacher in accordance with the basal in the classroom.

Teachers designate in the management system the instructional reading level for each student. Students listen to stories at their designated level and record their voices while orally reading the stories. The students then compare their recorded reading with the computer's recorded reading. These recordings are stored on the device and synched back to the teacher's personal computer so that the teacher can review the recordings for fluency and conduct an assessment for accuracy, such as running records.

All activities are available in Spanish as well as English, and the teacher can determine how much Spanish support to provide to each student. Students can hear stories first in Spanish and then read the stories in English.

Teachers are encouraged to use the handheld computers for twenty minutes each day as part of students' learning centers activities. Teachers also typically allow students to use the handhelds at additional times during the day when they have finished their other assignments. Certain teachers will use the handheld computers to engage the entire class when they are administering an assessment to one student in the class.

All student scores from the activities on the handheld are synched to the teacher's personal computer so that the teacher can review student performance and inform instruction, including changing reading groups and instructional reading levels for students.

Research Design

A previous study (Teale, 2008) focused on teacher implementation of this new technology in the classroom. This preliminary, three-month study during the spring of the 2007-2008 school year in which TeacherMates were first introduced examined the extent to which the handhelds would be used by teachers as an everyday part of their instruction and to assess students' engagement with the devices. Results showed that the handheld devices were readily used by teachers and first-grade children as an everyday part of instruction in the literacy block, indicating the practicality of this intervention for immediate and widespread use in first-grade classrooms. Overall, teacher enthusiasm for the use of TeacherMate as an instructional part of the literacy block and the children's engagement with the devices was substantial throughout the project. In addition, teachers expressed a strong belief that the handheld learning system had a positive impact on the growth of their students' early reading abilities. However, because the study focused on practicality of implementation rather than achievement effects on students, no formal assessment of student reading scores was conducted.

The current analysis, conducted during the 2008-2009 school year, examined student achievement patterns by utilizing beginning-, middle-, and end-of-year reading tests administered by the Chicago Public Schools. CPS utilizes Dynamic Indicators of Basic Early Literacy Skills (DIBELS) to assess student growth in reading in the primary grades. The assessments are administered by classroom teachers to each student individually.

Seventeen first-grade classrooms in CPS Area 18 that used the TeacherMate system during the entire school year were selected as program classrooms for the research. Schools in other areas of the district were implemented and the teachers in those classrooms trained after Area 18 was started and therefore did not have the benefit of a full school year of use. The 17 participating schools were all of the schools in Area 18 that used the TeacherMates during the year, as indicated by usage data captured by the TeacherMate handhelds and synched to the teachers' personal computers.

The classrooms that participated in the implementation of the handheld computers were selected by the Area 18 principals. No guidelines were given to the principals as to which teachers should be selected. Teachers were trained through a two-hour class conducted by TeacherMate staff. Certain teachers who extensively used whole class instruction for literacy (and whose principals were receptive to the teacher receiving additional professional development) received two additional hours of professional development related to differentiated instruction over the course of the school year.

Analysis. The analysis conducted relied on existing DIBELS data collected by the classroom teachers and reported to the Center on Teaching and Learning (the parent company of DIBELS) through handheld devices the teachers were given to record child results of the assessments. Scores from the following subtests of the DIBELS were available for analysis:

Subtest	Measures	Administered		
		B-O-Y	M-O-Y	E-O-Y
PSF	Fluency segmenting words into phonemes	X	X	X
NWF	Fluency reading nonsense words	X	X	X
ORF	Oral reading fluency rate		X	X

Table 1. DIBELS Subtests Used for Analyses

Scores for all children in the 17 Project classrooms (n = 347) were compared to all other children in Area 18 (n = 868). Analyses of variance (ANOVA) were run to make the comparisons using project status (children using the Handheld Learning Systems in the classrooms versus those who were not) as the main independent variable and DIBELS subtest score at each of the time points as the dependent variable.

Findings

Data related to students' Phonemic Segmentation Fluency (PSF) and findings for the ANOVA examining it are summarized in Tables 2 and 3.

Project Status	n	B-O-Y		M-O-Y		E-O-Y	
		Mean	SD	Mean	SD	Mean	SD
Handheld	347	31.3	18.6	47.0	17.3	48.9	14.4
Non-Handheld	868	28.2	17.6	43.4	17.5	46.7	14.7

Table 2. Means and SDs for PSF Scores

Source	df	F	Sig.
Project Status	1	9.70	.002

Table 3. Test of Between Subjects Effects for PSF

The results for Phonemic Segmentation Fluency show that HLS Project students scored significantly higher on PSF at the end of the year than did students who did not have access to the handheld devices in their classrooms.

Findings for the ANOVA examining Nonsense Word Reading Fluency (NWF) are summarized in Tables 4 and 5.

Project Status	n	B-O-Y		M-O-Y		E-O-Y	
		Mean	SD	Mean	SD	Mean	SD
Handheld	347	26.8	18.2	56.7	24.8	67.6	28.4
Non-Handheld	867	24.4	17.0	50.4	22.9	61.0	29.3

Table 4. Means and SDs for NWF Scores

Source	df	F	Sig.
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Project Status	1	14.7	.000
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Table 5. Test of Between Subjects Effects for NWF

As was the case for PSF, there was a significant effect for Project Status related to scores on Nonsense Word Fluency. HLS Project students scored significantly higher at the end of the year than did students who were not in the project.

The results for Oral Reading Fluency (ORF) involved running an Analysis of Covariance (ANCOVA) because there was a pre-existing difference between the two groups on M-O-Y scores. ORF results are summarized in Tables 6 and 7. (The ORF test is only administered twice per year [M-O-Y and E-O-Y] to first grade students.)

Project Status	n	M-O-Y		E-O-Y	
		Mean	SD	Mean	SD
Handheld	375	29.4	23.6	49.4	27.0
Non-Handheld	941	26.5	24.5	43.6	28.7

Table 6. Means and SDs for ORF Scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	832050.325(b)	2	416025.163	2467.383	.000
M-O-Y ORF SCORE	822373.871	1	822373.871	4877.376	.000
PROJECT_STATUS	2622.301	1	2622.301	15.552	.000
Error	221384.811	1313	168.610		
Total	3830736.000	1316			
Corrected Total	1053435.137	1315			

Dependent Variable: E-O-Y ORF SCORE

Table 7. ANCOVA Tests of Between-Subjects Effects for ORF Scores

Once again, HLS Project students scored significantly higher at the end of the year than did students who were not in the project.

Thus, results show that there was a main effect for Project Status in each of the areas of achievement: phonemic segmentation fluency, nonsense word reading fluency, and oral reading fluency. Students in HLS classrooms significantly outscored their Area 18 peers who were not in classrooms that used the handheld devices on all three of these aspects of reading.

Conclusions

Data indicate that the use of Handheld Learning Devices was associated with significantly higher end-of-year scores on three aspects of early reading achievement measured by the DIBELS: phonemic segmentation fluency, nonsense word reading fluency, and oral reading fluency. All three of these aspects of early reading have significant correlations with reading achievement in Grade 3, the end of the primary grades. Thus, the results suggest that engagement with the learning activities contained on the handheld devices promotes greater reading achievement in grade 1.

These quantitative results reinforce the conclusions of our 2007-2008 qualitative study that handheld computers may have a significant positive impact on beginning literacy instruction in the first grade classroom.

Future Research

Because of its design, this study does not speak to the issue of a causal connection between the use of the handheld learning systems from IFL and enhanced early reading achievement. But the findings do strongly support further research with a design that would directly investigate this issue. Specifically, a quasi-experimental design with sufficient numbers of students that randomly assigned classrooms to treatment or control status and directly examined fidelity of instruction as well as conditions of implementation would provide needed data to assess the impact of this promising innovation in the primary grades.

References

Teale, W. H. (2008). *Evaluating the literacy teaching and learning effects of the use of innovative handheld technologies in first grade classrooms*. Final report to the Spencer Foundation. Chicago: University of Illinois at Chicago.

William Teale is Professor of Education at the University of Illinois at Chicago. He has published widely on numerous aspects of literacy development and education and is internationally known for his research on emergent literacy. Professor Teale was elected to the Reading Hall of Fame in 2003.