EFFECTIVENESS REPORT

Research Foundation & Evidence of Effectiveness for WiggleWorks®

Executive Summary

WiggleWorks is an interactive, leveled reading program that has been proven to increase reading scores. Designed by Scholastic in collaboration with academic researchers, WiggleWorks is a media-rich program for students in PreK through Grade 3 that blends technology with literature and teacher support. This paper presents the foundational research base of WiggleWorks and the results of a validation study that demonstrates evidence of the effectiveness of the WiggleWorks program in increasing literacy skills in primary-grade students.

This study was conducted by Lynn Hickey Shultz, Ed.D., of Harvard University, in the 1994–1995 school year. The purpose of the study was to determine if WiggleWorks enhances first graders' growth in literacy in comparison to the learning produced by their usual language arts program. The results of the study show that WiggleWorks is a highly effective solution for promoting significant growth in reading and writing scores for children in the primary grades.

WiggleWorks provides leveled reading practice, built-in instruction, and motivation to engage students in reading and writing. To promote reading, WiggleWorks includes books and software including instruction in the five key areas of Reading First: Phonemic Awareness, Phonics, Fluency, Vocabulary, and Comprehension. WiggleWorks also has a strong focus on writing, both on the software and offline. And, WiggleWorks reinforces print concepts in multiple forms so students can internalize those concepts, building language skills for all learners. WiggleWorks is the perfect solution for engaging beginning readers and improving student achievement.

WiggleWorks®

Research Foundation & Evidence of Effectiveness for WiggleWorks®

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Introduction

In order for all children to become proficient readers by the end of third grade, teachers must focus on reading achievement throughout the primary school grades. From a classroom teacher's perspective, ensuring that every child in a classroom reaches proficiency is highly challenging.

A major challenge for primary-grade teachers is to meet the needs of an increasingly diverse student population, including:

- **Beginning Readers –** Many young students have not previously been exposed to books. The primary-grade classroom is the first opportunity for these students to learn to read.

- **Struggling Readers –** As measured by the 2007 National Assessment of Educational Progress (NAEP), 34% of fourth-grade students in the U.S. perform at a below-basic level in reading. The typical primary-grade classroom contains children with a broad range of reading levels, including many children who enter school with a vocabulary disadvantage. For these students, a limited vocabulary presents a major hurdle toward becoming a proficient reader by the end of third grade.

- **English Language Learners –** According to the Office of English Language Acquisition, there are over three million children with limited English language skills in U.S. schools nationwide. These children are highly concentrated at the primary-grade level.

- **Special Needs Students –** The number of students qualifying for special education services in the U.S. has almost doubled over the past twenty-five years. With inclusion practices becoming more common, these children represent a substantial and rising percentage of the population in primary-grade classrooms.

- **Gifted and Talented Students –** Primary-grade classrooms also include students who are reading above grade level and have abilities and needs that are different from those of other students. Students with above-grade-level reading skills must be adequately challenged in the primary grades in order to stay motivated and increase their reading skills in the classroom.

To help every child learn to read and write successfully in a typical primary-grade classroom, teachers turn to small-group instruction where they can focus on children's specific needs. Delivering differentiated instruction that meets each child's unique needs is challenging, as is figuring out how to keep the rest of the children in the classroom engaged during small-group time.

Furthermore, all teachers want not only to help children master the skill of reading with comprehension, but also to help all children grow to enjoy reading. Finding materials that motivate children and keep them engaged in reading is essential, but also a great challenge. Researchers have found that children have a great interest in using computers and engage with them for long periods of time (Liu, 1996). Thus, primary-grade teachers can turn to interactive multimedia to address this challenge and increase children's motivation to read with interactive, educational technology programs.

To address these needs, Scholastic developed WiggleWorks, the supplemental beginning reading and writing technology program that blends literature with interactive software and instructional support. WiggleWorks combines today's best thinking about how children learn to read and write with the power of software to create an innovative model for instruction – a model designed to support all young learners in their reading, writing, listening, and speaking development.

Helping all children become successful readers and writers requires talented teachers using carefully selected materials in thoughtful ways. This Effectiveness Report provides a detailed analysis of how WiggleWorks meets the needs of all beginning readers and writers, and includes research evidence that demonstrates the program's effectiveness with young children.

How WiggleWorks Supports Young Learners

WiggleWorks combines today's best thinking about how children learn to read and write with the power of software to create an innovative model for instruction — a model designed to support young learners in their reading, writing, and language skills. Through the combination of leveled books, interactive software, and instructional materials, WiggleWorks provides purposeful practice and reinforcement in the key areas of research-based reading instruction.

Research-Based Reading Instruction

Research shows that effective reading instruction should include the five key areas: Phonemic Awareness, Phonics, Fluency, Vocabulary, and Comprehension.

Research reveals that children need to master skills in these five interrelated areas in order to be proficient, successful readers. WiggleWorks helps teachers provide instruction and independent practice in the key areas of research-based reading instruction:

Instructional Area	WiggleWorks Application
Phonemic Awareness Before children can use the knowledge of sound-spelling relationships to decode words, they must understand that words are made up of sounds (Adams, 1990).	Using the software's Magnet Board helps children break words into their component sounds. With the Teaching Plans, teachers encourage oral practice with sounds.
Phonics Systematic and explicit phonics instruction significantly improves early-grade children's word recognition and spelling. Phonics instruction is particularly beneficial for children who are having difficulty learning to read and who are at risk for developing further reading problems (Put Reading First, 2001).	Teaching Plans offer a full sequence of phonics skills, helping teachers reinforce the letter-sound connection on and off the software.
Fluency Developing reading fluency requires accuracy and automaticity, and their integration in single-word and connected text. Decoding becomes relatively effortless, oral reading is smooth with correct prosody, and attention can be allotted to comprehension (Wolf and Katzir-Cohen, 2001).	By reading the right level of book on and off the computer, children build fluency. Audio recordings on CD and on the computer provide models of fluent reading.

Instructional Area	WiggleWorks Application
Vocabulary Classroom instruction can have a significant positive impact on children's vocabulary (Duke, 2003). Vocabulary can be developed through listening to read-alouds and explicit vocabulary instruction (Beck and McKeown, 2001).	Teaching Plans include teacher-led instruction in content-related words and vocabulary strategies. On the computer, My Words and Story Words reinforce learning.
Comprehension Brain research shows that teachers can help children become strategic readers who know what to look for in a text and how to do it. Understanding text requires both strategies and motivation (Rose, 2005).	Teaching Plans include instruction in critical comprehension strategies and oral practice in skills. By writing on and off the computer, children reinforce their textual understanding.

Leveled Reading

Just-Right Leveled Books

Research shows that the "just-right" level of book is essential in building reading skills and motivating students to read more books.

WiggleWorks includes 84 high-quality trade books, representing the wide range of reading levels that are typical in today's diverse classrooms. WiggleWorks books are grouped by Guided Reading and DRA levels to ensure that every child will be challenged at his or her precise level, as research suggests is critical for developing early readers (e.g., Fountas & Pinnell, 1996).

Each leveled WiggleWorks book is accessible in multiple media, including on the computer, in printed format, and as an audio recording, to provide beginning readers with the right amount of work and support exactly when they need it.

Fiction & Nonfiction Books

Children benefit from reading a mix of both fiction and nonfiction texts in the primary grades.

Research and classroom practice show that it takes all kinds of text, both fiction and nonfiction, to engage children and build their reading skills. According to researcher Nell Duke, "children should have a great deal of exposure to fictional stories, but they should also be exposed to nonfiction stories and to texts that are not in story form" (Duke, Bennett-Armistead, & Roberts, 2002).

This is why WiggleWorks includes 30% nonfiction books. The library is a rich collection that introduces children to a range of genres, including realistic fiction, nonfiction, and folktales.

"One of the best things about [WiggleWorks] is that it uses authentic texts that give students the chance to read diverse stories either on the computer or with a hard copy that is also provided, and to do activities on the computer as well…!"

—Dr. Mary McVee and Kindergarten Teacher Ben Dickson, The Reading Teacher, *April 2002*

Spanish-Language Books

Spanish speakers comprise 79% of the total English language learner population in the United States (OELA, 2002).

Based on Department of Education data, English language learners whose native language is Spanish comprise the majority of the total ELL population. WiggleWorks provides leveled books for this group of children, including:

- 24 interactive Spanish books included in the software.
- Titles that include authentic Spanish-language literature and books by Latino authors such as Alma Flor Ada, Ximena de la Piedra, and Margarita Gonzales-Jensen.

Using the software, English language learners can hear stories and unfamiliar words read aloud repeatedly, generate individual word lists, see text highlighted word-by-word or line-by-line, and get support for writing. In addition, Spanish paperbacks, audiobook CD's, and Teaching Plans are available to supplement instruction.

Interactive Software

Designed for All Learners

Young readers, regardless of ability, are more engaged in and successful at learning to read if the literacy curriculum includes flexible, universally designed tools and inclusion strategies.

Scholastic is proud that WiggleWorks was the first major example of Universal Design in educational software. WiggleWorks was designed in consultation with the Center for Applied Special Technology (CAST). Founded and led by Dr. David Rose, CAST aims to expand opportunities for students through the innovative development and application of technology. CAST specializes in Universal Design for Learning, which has as its objective to make learning accessible to all children. For educational software used in classrooms, universal design anticipates the need for alternatives, options, and adaptations to meet the challenge of individual differences.

Because of CAST's involvement with the design of WiggleWorks, all children can be successful with the program. Dr. Rose counsels, "Multimedia programs like WiggleWorks are designed to accommodate a broad range of students. Such programs are able to provide the alternatives that are needed to achieve success for each and every child." Whether a child has difficulty seeing or recognizing letters, is unable to turn the pages of a printed book, or has had little exposure to English at home, universal design features ensure that each child benefits from the WiggleWorks program.

Technology Differentiates Support

Customizing the learning environment ensures that every child is being appropriately challenged to maximize learning, engagement, and motivation.

As Dr. David Rose explains, "A 'one size fits all' experience is far from optimal in today's classrooms where students are wildly different in their backgrounds and skills. To support optimal learning, classrooms must provide opportunities for learning that are matched to students' needs and capacities." This differentiation ensures, as Vygotsky points out, that every child is consistently in their "zone of proximal development" (Vygotsky, 1978).

A teacher using WiggleWorks can customize the program in many different ways, for example:

1. Selecting the kinds of activities and content presented to students (recorded audio Teacher Messages, etc.).
2. Differentiating the kinds of support that each student will get (word-by-word vs. line-by-line read-aloud options, etc.).
3. Adapting the way that information appears on-screen (text color, background color, etc.).
4. Accommodating the ways in which students can navigate or respond within the software (talking buttons, assistive technology input devices, etc.).

All of these options and many others are available in the management section of the WiggleWorks software. Teachers may select options for whole classes or for individual students. The ability to customize the WiggleWorks software ensures that ALL children, including struggling readers, English language learners, and students with special needs, achieve positive results.

Software Scaffolds Learning

Well-constructed software can provide the scaffolding to support learning, gradually releasing support as students' reading skills develop.

A good teacher, when working with a beginning reader, provides the bridging support that a child needs — a word here and there to maintain the flow, prompting the use of an emerging strategy, and providing background knowledge to bridge a gap. Research shows that software can provide that scaffolding to beginning readers to effectively extend the reach of the teacher (Kamil, Intrator, & Kim, 2000).

The five areas of the WiggleWorks software follow through on the promise of technology by providing the "just-right" scaffolding that beginning readers need to advance their learning and enjoy the process. Each area of the WiggleWorks software provides unique scaffolding for beginning readers:

Read Aloud:

Children read along as skillful narrators model fluent reading of each book. As children gain skills, they can click to hear individual words or the entire page.

Read:

The support in the Read area includes clickable words so children retain the meaning of the text as they read independently. Children can collect My Words to scaffold their follow-up writing activities and record their oral readings.

Write:

WiggleWorks software supports children in writing, illustrating, and recording audio about what they've read. My Words help children use story words in their writing, and a Story Starter provides a scaffolded start to the writing process.

My Book:

In My Book, children can modify the text of a story and add to the illustrations. This scaffolding supports children's creative efforts and builds their fluency with language.

Magnet Board:

Exploring sound-letter relationships is enhanced by the visual and auditory combination of support features on the WiggleWorks Magnet Board.

Technology-Supported Writing

Research shows there are strong advantages to using technology as a support for authentic writing (Riel, 1989; 1990).

WiggleWorks brings the advantages of technology to young writers in primary-grade classrooms. For one thing, students who are in elementary schools today often find that technology allows them to express themselves in ways that are more contemporary and current than print. And, technology allows students to communicate and share what they create with a larger audience than print had previously allowed.

> *"We felt very strongly about finding a program that used authentic texts and a variety of writing, reading, and oral and auditory skills. WiggleWorks was the only program we reviewed that received high marks in this category."*
>
> *—Dr. Mary McVee and Kindergarten Teacher Ben Dickson,* The Reading Teacher, *April 2002*

WiggleWorks supports early writers through a range of scaffolds. A student may begin by "dictating" a story into the embedded microphone rather than typing. Another student may begin with illustrations. The overall effect is that a student can construct a real book or written essay using many different paths, and that writing can be printed or shared electronically with peers.

Motivation and Engagement

Experiencing success with text enables beginning readers and writers to build confidence and a sense of accomplishment.

> *"This technology captivates children. Then it motivates them to listen, speak, read, and write.…In Read, they can record and then listen to themselves reading the book. What a motivator for encouraging children to read with expression!"*
>
> *—Marie Scigliano, Technology Coordinator, Sunnyvale, California*

WiggleWorks builds student motivation and engages children in experiences where they are successful with text. Much research has been devoted to this psychological element in reading instruction (Guthrie & Wigfield, 1997). WiggleWorks's combination of books and innovative technology immerses children in a world of books and gives them the support they need to become engaged and stay motivated to read more and have deeper experiences with books.

Classroom Management Tools

Assessment for Learning

Beginning readers and writers need timely and appropriate feedback on performance—and so do their teachers.

Technology can provide new avenues for feedback from independent reading and writing that are effective for students and teachers, more effective than printed books can provide. By embedding speech recording right within the reading program, a complete record of a student's actual oral reading can be saved and reviewed. This is an example of how WiggleWorks provides feedback both to students, who can listen to themselves and compare to a model reading, and to teachers, who can listen either informally or formally by doing a reading record.

WiggleWorks includes many software features that help students begin self-assessment and check their own work. For example, the computer will read aloud everything the student has written. This simple feedback is both empowering and entertaining, as many students realize that their writing "doesn't sound right" and they then revise.

> *"WiggleWorks has excellent assessment options. For example, teachers can choose which student work will be saved and track how much time students spend working on different activities. Teachers can also create portfolios of student work and record written comments about a child's progress."*
>
> *—Dr. Mary McVee and Kindergarten Teacher Ben Dickson,* The Reading Teacher, *April 2002*

For assessment, WiggleWorks offers a teacher management system to monitor students' progress on the software. In addition, the Teacher's Guide contains a variety of assessment tools and strategies including diagnostic assessments, informal assessments, observation, survey, and conferencing tools.

Instructional Support for Teachers

WiggleWorks provides teachers with tools to effectively manage their classrooms.

In small-group instruction, a critical challenge for teachers is how to optimize the time when students are not working with the teacher. WiggleWorks technology extends the reach of the teacher, ensuring that children who are working independently are engaged in meaningful practice that maximizes their development as confident, skilled, and motivated readers.

To ensure that all children are engaged in learning, WiggleWorks includes instructional materials for teachers to effectively manage their classroom. These materials include the WiggleWorks Manager, a management systems that allows teachers to coordinate student rosters, monitor student progress, modify activities and program options for individuals or groups of students, and review and print data-driven reports.

Also included is a Teacher's Guide that offers a comprehensive program overview, detailed management instructions, and assessment tools, as well as Teaching Plans for each leveled book. The Teaching Plans include not only lessons for small-group instruction, but also support for engaging the "other children" in technology to continue to develop their reading and writing skills.

Proven Results

When the original WiggleWorks program launched in 1994, it was one of the first programs to be published with an independent study demonstrating positive results with students. Scholastic continues its commitment to scientifically based reading research by sharing the results of that original validation study here.

Validation Study

Conducted by Lynn Hickey Schultz, Ed.D., of Harvard University, the validation study examined the efficacy of WiggleWorks in promoting first-grade literacy in 29 classrooms during the 1994–1995 school year. The purpose of the study was to answer the research question: *Does WiggleWorks enhance first graders' growth in literacy over and above the learning produced by their usual language arts program?*

Method

Schools in three sites participated in the study, including two suburban school systems (Hamilton-Wenham, Massachusetts, and Sunnyvale, California) and one urban school (Boston, Massachusetts). A total of fourteen classrooms (283 students) used the WiggleWorks program and fifteen classrooms (368 students) served as comparison classrooms. Students in comparison classrooms represented similar demographics to students in the WiggleWorks experimental classrooms. The student sample represented a range of socioeconomic backgrounds, including students from middle- and lower-income families. Although the experimental group represented an overall higher socioeconomic background, this initial difference was offset by statistical controls in data analysis.

In the yearlong study, the WiggleWorks classrooms implemented the program using a combination of the printed books and the software, with students working individually, in pairs or in groups at a single computer. Teachers received initial implementation training and support at ongoing meetings. Data were collected on students in both the WiggleWorks and comparison classrooms at three testing points during the school year: in November, March, and June.

Students were given subtests of the Iowa Test of Basic Skills (ITBS) to assess their language arts skills. Researchers gave ITBS subtests in Vocabulary, Word Analysis, and Language, with Reading given at the latter testing points only. In addition, writing samples were collected based on prompts reflecting WiggleWorks story themes and were scored on Content, Style, and Mechanics.

Regression analyses were used to assess the amount of change across the year on the ITBS tests and writing scores in the WiggleWorks group relative to the comparison group. For the ITBS, analyses were run on the four subtests separately as well as on a composite language arts score representing the average of the subtests. Similarly, for the writing scores, analyses were run on the three writing scales separately and on a composite score computed as the average of the three scales. Each analysis controlled for any initial differences between experimental and comparison groups.

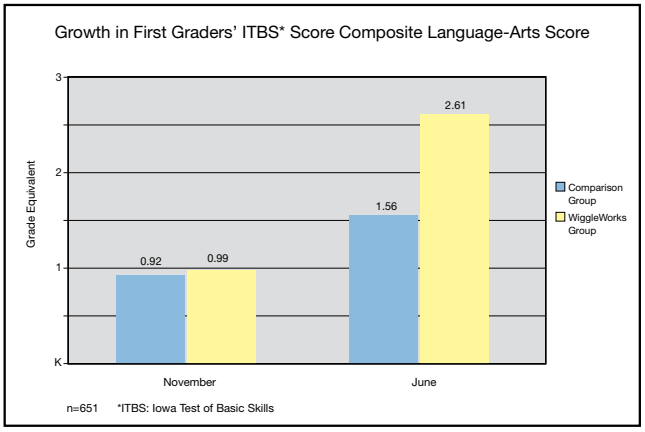
Results

In Reading, WiggleWorks students showed significant gains over comparison students on the composite ITBS language arts score. After controlling for differences in students' initial scores, regression analyses showed highly significant differences ($p < .0001$) between students who used the WiggleWorks program and students in control classrooms.

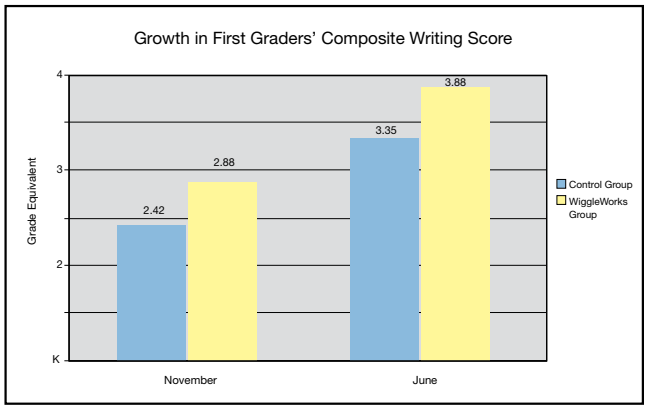
In Writing, WiggleWorks students showed significant gains ($p < .001$) over students in the control group on the composite writing score and on all three subtests: Content, Style, and Mechanics. The regression analyses controlled for the differences between the groups' initial writing scores.

Separate analyses were run on both reading and writing scores to determine the impact of WiggleWorks on poorer versus advanced readers. This distinction was defined as students scoring below and above the median of the baseline composite scores in reading and writing. These analyses showed that the program produced powerful effects on the reading skills of both poorer and more advanced readers, and promoted writing skills in both groups as well.

Composite Language Arts



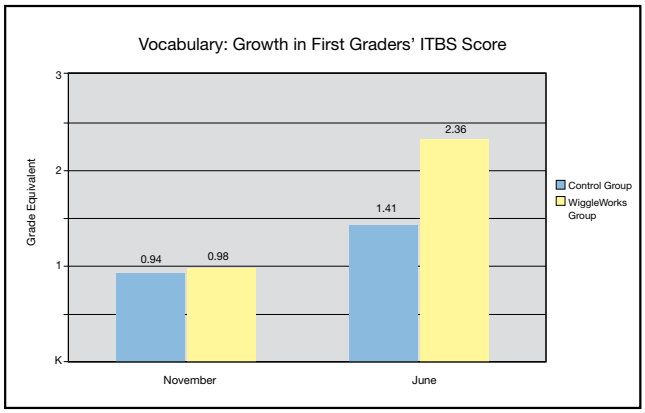
Composite Writing



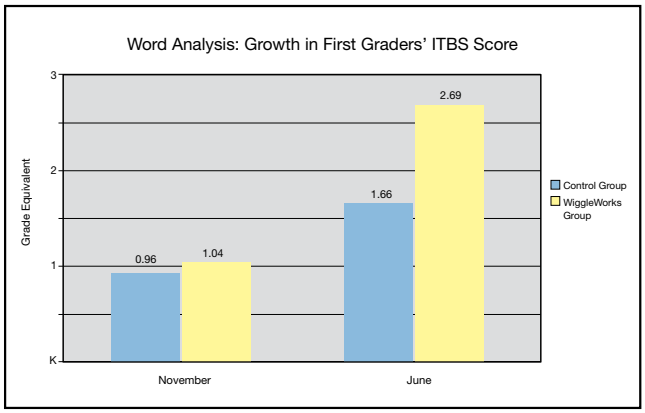
On all four ITBS subtests, students in the WiggleWorks classrooms made significantly greater gains ($p < .0001$) than comparison students during the yearlong intervention. For the Vocabulary (listening and reading), Word Analysis (letter recognition and letter-sound relationships), and Language (oral language usage, word classification, writing conventions) subtests, students showed statistically significant gains over comparison students between pre- and post-testing. The Reading (comprehension) subtest was given only in March and June, and during this time period gains by the WiggleWorks students were significantly higher than students in the control group.

Growth in First Graders' ITBS* Subtest Scores

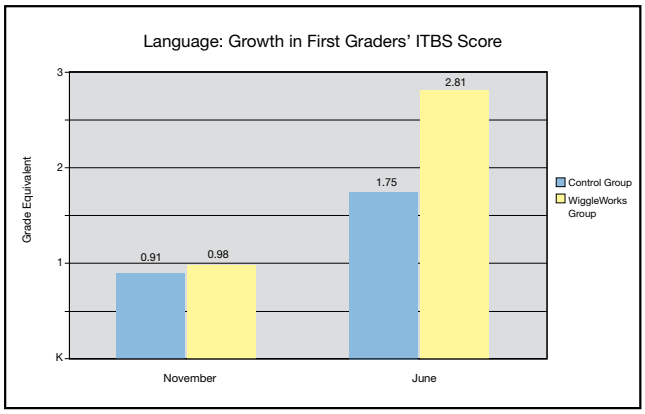
Vocabulary



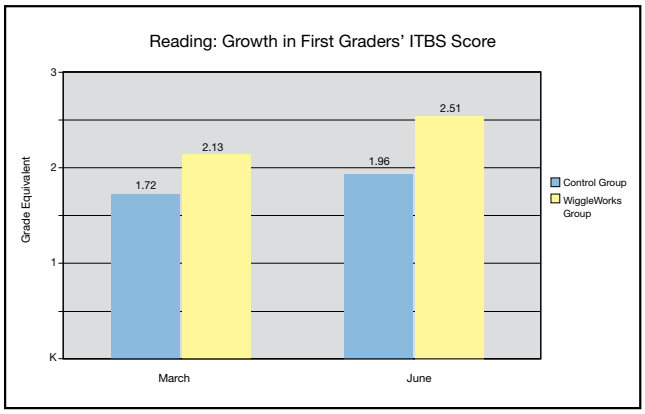
Word Analysis



Language



Reading



*ITBS= Iowa Test of Basic Skills

Discussion

The results of this validation study quite dramatically demonstrate the effectiveness of the WiggleWorks program in promoting first-grade reading and writing skills. First graders using the WiggleWorks program made significantly greater gains on standardized reading tests and writing samples than comparison students. These results are particularly large, given that students started using the program in December and that each classroom contained only one computer to run the software. This study provides evidence of the effectiveness of WiggleWorks, a program that offers a powerful combination of effective trade-book literature incorporated with state-of-the-art, equal-access, interactive technology that entices and educates beginning readers at all skill levels.

Summary

As demonstrated by the validation study completed by Lynn Hickey Schultz, WiggleWorks proves to be a highly effective solution for delivering significant growth in reading and writing scores for children in the primary grades. Beginning readers benefit from the leveled books in print format and on the computer, and gain through independent practice using technology that scaffolds learning. Since its creation, WiggleWorks has demonstrated its ability to engage and motivate beginning readers and writers, and proved its usefulness as a trusted classroom tool for teachers.

With WiggleWorks, teachers who would otherwise struggle to meet the unique needs of all children in today's diverse classroom populations are now achieving positive results in reading and writing. Teachers are seeing the results in improved test scores, in increased reading frequency, and in the level of engagement by their students. Through powerful technology, leveled books, and teaching materials, each child receives differentiated instruction to become a successful reader and writer.

Children will continue to enter schools with limited experience in the English language, with engagement levels below those of other children, and with unique needs to be met by their classroom teachers. Fortunately, with WiggleWorks, Scholastic can provide schools with a tool proven to increase student achievement in reading and writing.

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Item # 155561
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