Smarty Ants Reading World

Controlled Experimental Trial Initial Report

SMARTY ANTS READING WORLD CONTROLLED EXPERIMENTAL TRIAL INITIAL REPORT

Introduction

In this report, we present early findings from our analysis of data from the Smarty Ants Reading World Pilot study that took place during the 2011-2012 school year in Prairie School District (PSD) 1 on the outskirts of a major Midwestern city. This report provides an initial introduction to the work we have done and a preview of future analyses. An additional report with further details will be provided in the 2012-2013 school year.

The quantitative data presented here come from 450 students in PSD who were assessed on the CORE Phonics Survey both at the beginning of the pilot study (Pretest) and at the end of the pilot study (Posttest). Of these 450 students, 130 were enrolled in PSD pre-kindergarten classrooms in 2011-2012. Forty-three of the pre-k students were housed in 6 control group classrooms, representing 3 PSD schools. The remaining 87 pre-k students made up the Smarty Ants pilot group. These students were educated in 10 pre-k classrooms that used the Smarty Ants curriculum, housed in 5 PSD schools.

Of the 450 students with both Pretest and Posttest data, 320 were enrolled in kindergarten classrooms in PSD. The kindergarten control group was made up of 151 students in 7 classrooms across 3 PSD schools. The pilot group of kindergarten students who used the Smarty Ants curriculum comprised 169 students in 8 classrooms across 3 PSD schools.

The qualitative data consist of two interviews with each of the 17 teachers in the study, one at the beginning of implementation and one at the end, for a total of 33 interviews. One teacher did not finish the school year so could not be interviewed a second time. Each interview lasted approximately 20 minutes, and data from these interviews were used to answer questions regarding the implementation of the Smarty Ants program and teachers' general impressions of their students' engagement with the program.

Research Questions

We provide in this report our preliminary exploration of a series of three research questions, which will be the guiding questions for our final report later in the summer. First we asked, did pre-kindergarten and kindergarten students who used Smarty Ants exhibit higher literacy gains than their control group counterparts, as measured by the CORE Phonics Survey. By examining children's gains between Pretest and Posttest, we get an early picture of the relative effectiveness of Smarty Ants on children's emerging literacy skills compared with the standard literacy practices already in place at PSD. Second, we asked teachers about their experiences using the Smarty Ants program in their classrooms. Third, we asked these same teachers about their impressions of their students' interactions with Smarty Ants.

1 Pseudonyms for district, teachers and students used throughout this report2

Research Question 1: Differences in Literacy Gains between Smarty Ants and Control Group Students

As in any examination of an intervention's effects on students' learning, we began by comparing students in the treatment (Smarty Ants pilot) and control groups at the beginning of the study, prior to the implementation of the intervention.

Typically, there would be no differences in Pretest scores between students in the two groups – this scenario would set the stage for any Posttest differences to be attributable only to the impact of the Smarty Ants intervention. In the pre-kindergarten sample, there were small differences between students' Pretest scores in the pilot and control groups, however, these differences were not statistically significant. The table below presents these data.

Pretest Scores for Pre-Kindergarten Students: Average pretest scores and (standard deviations) on the CORE Phonics Survey for Smarty Ants Pilot students (n=87) and Control Group students (n=43) in the Prairie School District.

Part 1 – Capital Letters (out of 26)	*Pretest*	*Difference*	*Statistical Significance*
Smarty Ants Pre-K	12.34 (10.26)	**Smarty Ants** students identified, on average, 0.20 more capital letters.	*p*=0.91 **Non-significant**
Control Pre-K	12.14 (10.11)		

Part 2 – Lowercase Letters (out of 26)	*Pretest*	*Difference*	*Statistical Significance*
Smarty Ants Pre-K	9.68 (9.26)	**Smarty Ants** students identified, on average, 0.19 more lowercase letters.	*p*=0.91 **Non-significant**
Control Pre-K	9.49 (9.11)		

Part 3 – Consonant Sounds (out of 20)	*Pretest*	*Difference*	*Statistical Significance*
Smarty Ants Pre-K	3.33 (5.57)	**Smarty Ants** students identified, on average, 0.54 more consonant sounds.	*p*=0.58 **Non-significant**
Control Pre-K	2.79 (4.27)		

Part 4 – Vowel Sounds (out of 10)	*Pretest*	*Difference*	*Statistical Significance*
Smarty Ants Pre-K	0.80 (1.56)	**Smarty Ants** students identified, on average, 0.15 more vowel sounds.	*p*=0.56 **Non-significant**
Control Pre-K	0.65 (1.00)		

In the kindergarten sample, the Pretest findings are different. In this case, the differences between students' Pretest scores in the pilot and control groups were substantial and statistically significant in three of the first four sections of the CORE Phonics Survey. Of particular interest here is that the differences favored the control group, indicating that there was a performance 'gap' of sorts whereby students in pilot classrooms had significantly lower literacy scores than their control group counterparts prior to Smarty Ants implementation. Ultimately, these Pretest differences were found to be important, because this achievement gap was eliminated after students used Smarty Ants Reading World. These findings are discussed in the conclusion of this report. The table below presents the data illustrating the differences found between the two kindergarten groups on the pretest.

Pretest Scores for Kindergarten Students: Average pretest scores and (standard deviations) on the CORE Phonics Survey for Smarty Ants Pilot students (n=169) and Control Group students (n=151) in the Prairie School District.

Part 1 – Capital Letters (out of 26)	*Pretest*	*Difference*	*Statistical Significance*
Smarty Ants Kindergarten	20.27 (8.88)	**Control** students identified, on average, 1.83 more capital letters.	*p*=0.04 **Statistically significant**
Control Kindergarten	22.09 (6.25)		

Part 2 – Lowercase Letters (out of 26)	*Pretest*	*Difference*	*Statistical Significance*
Smarty Ants Kindergarten	19.12 (8.81)	**Control** students identified, on average, 1.82 more lowercase letters.	*p*=0.04 **Statistically significant**
Control Kindergarten	20.93 (6.53)		

Part 3 – Consonant Sounds (out of 20)	*Pretest*	*Difference*	*Statistical Significance*
Smarty Ants Kindergarten	12.15 (7.33)	**Control** students identified, on average, 1.64 more consonant sounds.	*p*=0.03 **Statistically significant**
Control Kindergarten	13.79 (5.56)		

Part 4 – Vowel Sounds (out of 10)	*Pretest*	*Difference*	*Statistical Significance*
Smarty Ants Kindergarten	3.90 (2.67)	**Control** students identified, on average, 0.13 more vowel sounds.	*p*=0.66 **Non-significant**
Control Kindergarten	4.03 (2.69)		

Gain Scores Across Smarty Ants and Control Groups

In order to account for Pretest differences in our preliminary assessment of the effectiveness of the Smarty Ants program on children's literacy learning, we compared children's growth over the course of the study instead of simply comparing the Posttest scores of children in the Smarty Ants pilot versus control group students. For each part of the CORE Phonics Survey for each child in the study, we created a gain score, which was equal to the difference between that child's Pretest and Posttest scores. By using gain scores, we were able to evaluate whether the literacy scores of students in the Smarty Ants pilot improved more than the scores of their control group counterparts. **The tables below show that indeed, adjusting for Pretest differences, students in the Smarty Ants pilot group tended to exhibit larger gains on the CORE Phonics Survey than students in the control groups.**

Preliminary Results for Pre-Kindergarten: Average scores and (standard deviations) on the CORE Phonics Survey for Smarty Ants Pilot students (n=87) and Control Group students (n=43) in the Prairie School District.

Part 1 – Capital Letters	*Pretest*	*Posttest*	*Gains*	*Difference*	*Statistical Significance*
Smarty Ants Pre-K	12.34 (10.26)	17.73 (9.08)	5.39 (7.17)	**Control** students improved by, on average, 0.42 more capital letters.	p=0.75 **Non-significant**
Control Pre-K	12.14 (10.11)	17.95 (8.03)	5.81 (7.76)		

Part 2 – Lowercase Letters	*Pretest*	*Posttest*	*Gains*	*Difference*	*Statistical Significance*
Smarty Ants Pre-K	9.68 (9.26)	15.15 (8.87)	5.47 (6.71)	**Smarty Ants** students improved by, on average, 0.10 more lowercase letters.	p=0.94 **Non-significant**
Control Pre-K	9.49 (9.11)	14.86 (8.94)	5.37 (7.52)		

Part 3 – Consonant Sounds	*Pretest*	*Posttest*	*Gains*	*Difference*	*Statistical Significance*
Smarty Ants Pre-K	3.33 (5.57)	7.61 (6.64)	4.28 (5.94)	**Smarty Ants** students improved by, on average, 0.55 more consonant sounds.	p=0.59 **Non-significant**
Control Pre-K	2.79 (4.27)	6.51 (6.35)	3.72 (4.58)		

Part 4 – Vowel Sounds	*Pretest*	*Posttest*	*Gains*	*Difference*	*Statistical Significance*
Smarty Ants Pre-K	0.80 (1.56)	1.95 (2.18)	1.15 (1.90)	**Smarty Ants** students improved by, on average, 0.15 more vowel sounds.	p=0.67 **Non-significant**
Control Pre-K	0.65 (1.00)	1.65 (2.10)	1.00 (1.84)		

For pre-kindergarten students, these findings were inconsistent and not statistically significant. For kindergarten students, the findings were substantially more convincing.

In both cases, however, these findings should be taken as preliminary only. We will be enhancing the quality of the data before our final report by merging in demographic information from PSD as well as user data from the Smarty Ants database. At that point, we will re-analyze the data using more sophisticated methods, and our results at that point will be more accurate and complete.

Preliminary Results for Kindergarten: Average scores and (standard deviations) on the CORE Phonics Survey for Smarty Ants Pilot students (n=169) and Control Group students (n=151) in the Prairie School District.

Part 1 – Capital Letters	*Pretest*	*Posttest*	*Gains*	*Difference*	*Statistical Significance*
SmartyAnts Kindergarten	20.27 (8.88)	24.91 (3.84)	4.64 (7.93)	**SmartyAnts** students improved by, on average, 1.62 more capital letters.	*p*=0.04 **Statistically significant**
Control Kindergarten	22.09 (6.25)	25.11 (3.57)	3.02 (5.61)		

Part 2 – Lowercase Letters	*Pretest*	*Posttest*	*Gains*	*Difference*	*Statistical Significance*
SmartyAnts Kindergarten	19.12 (8.81)	24.47 (4.05)	5.35 (7.91)	**SmartyAnts** students improved by, on average, 1.46 more lowercase letters.	*p*=0.06 **Significant at the trend level**
Control Kindergarten	20.93 (6.53)	24.82 (3.78)	3.89 (5.55)		

Part 3 – Consonant Sounds	*Pretest*	*Posttest*	*Gains*	*Difference*	*Statistical Significance*
SmartyAnts Kindergarten	12.15 (7.33)	18.28 (3.68)	6.12 (6.49)	**SmartyAnts** students improved by, on average, 1.51 more consonant sounds.	*p*=0.02 **Statistically significant**
Control Kindergarten	13.79 (5.56)	18.40 (3.20)	4.61 (4.69)		

Part 4 – Vowel Sounds	*Pretest*	*Posttest*	*Gains*	*Difference*	*Statistical Significance*
SmartyAnts Kindergarten	3.90 (2.67)	7.25 (2.83)	3.36 (3.04)	**SmartyAnts** students improved by, on average, 0.55 more vowel sounds.	*p*=0.10 **Significant at the trend level**
Control Kindergarten	4.03 (2.69)	6.83 (2.80)	2.80 (2.95)		

Pre-Kindergarten

In Parts 2, 3, and 4 of the CORE phonics survey, pre-kindergarten students in the Smarty Ants pilot demonstrated higher gains than their control group counterparts, while in Part 1, control students showed higher gains. In all four cases, however, these differences were substantively small and did not achieve statistical significance meaning that there is no identified difference between pre-kindergarten students' scores.

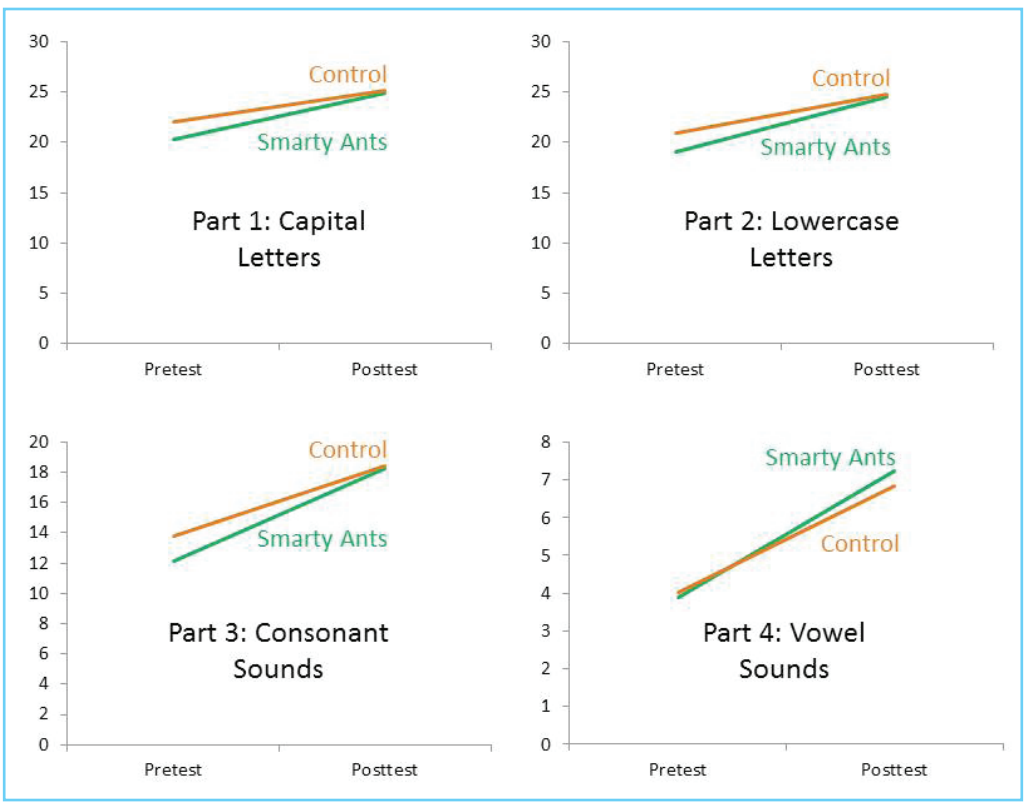
Kindergarten

The table below presents preliminary results for kindergarten students. **The results indicate that kindergarten students' gain scores in the Smarty Ants pilot classrooms were substantially and**

convincingly higher than the gain scores of students in control classrooms. Notice that the Posttest scores of Smarty Ants students were only slightly lower than control Posttest scores in three of the four sections, when they had been significantly lower on the Pretest – essentially, what these findings suggest, preliminarily, is that the use of the Smarty Ants program successfully closed the performance 'gap' between pilot and control classrooms that was evident at Pretest. Moreover, kindergarten students using Smarty Ants actually scored higher in recognizing vowel sounds on the Posttest than their control group peers.

In all four parts of the CORE phonics survey, kindergarten students in the Smarty Ants pilot group exhibited higher gains than their control group counterparts. In Parts 1 and 3, these differences were statistically significant at the traditional 0.05 level. In Parts 2 and 4, these differences were statistically significant only at the trend (0.10) level.

The figure below presents these findings graphically, highlighting the effects of the Smarty Ants program on helping the pilot group of kindergarten students to catch up to their control group peers.



Research Question 2: Program Implementation, Promises and Concerns

To address our second research question, we read and performed preliminary analysis on all teacher interviews. Overall, teachers reported feeling that the implementation of Smarty Ants in their classrooms was successful. Our initial review of the 33 teacher interviews showed a number of emerging themes regarding the ways that Smarty Ants was implemented in their classroom. These themes included differentiation for students at different levels, parent-school partnerships, and technical concerns and adaptations.

First among these themes is customization. Smarty Ants adapts instruction to the specific needs of students, and teachers used this capability to provide additional support to students who they identified as potentially difficult to reach using more traditional literacy instruction. Stacey2, a pre-kindergarten teacher, reflected: "I think it's been very successful. Like I said before, I have a few preschoolers that got that personalized attention which I wouldn't have been able to give them in the classroom." She continued by providing a specific example from her practice, "I have one little boy… that was really struggling. He was way behind all my others with this letter recognition and I think Smarty Ants really helped him because he's gotten that one on one. . . He's pretty much now caught up too, maybe not quite but he's pretty close to being." Stacey attributed this child's success to the capacity of the program to provide differentiated virtual experiences for students with different learning needs. This theme appeared again when teachers mentioned working with students who were at a higher level than their peers and could proceed at their own pace in the program.

Parent-school partnerships also emerged as a theme among the teacher interviews. Teachers reported that they were generally interested in sharing the student reports and student books from Smarty Ants with their students' parents. The reports were be used to update the parents on their children's progress in the program, while the books, created inside the program through students' mastery of certain letters and words, could be taken home and read with the parents.

Teachers also shared a number of technical concerns regarding their experiences in the implementation of Smarty Ants. These concerns included placing students in the correct level within the Smarty Ants environment, lack of access to a dedicated computer lab, and the need to teach children basic mouse skills in order for them to access the program. Despite these potential pitfalls, many teachers described how by the end of the year their comfort with the program had increased, and Smarty Ants had been tailored to meet the needs of the students in their classrooms. For teachers who lacked access to dedicated computer labs, they reported using the one or two computers they had in their classroom like a learning center. Still, our initial reading of the interviews suggested that pre-kindergarten children's access to time in the Smarty Ants game may have been dramatically uneven across classrooms, depending on whether their class had access to a computer lab or not. This lack of computer lab access could account for the lack of statistically significant differences in

pre-kindergarten test scores and will be examined in the final data analysis.

In terms of broader concerns related to teachers implementing Smarty Ants in their classrooms, a few teachers also expressed deep concern about the possibility that the district might abandon the program stressing, "How can you just use this for one year and take it away from the kids. It's not fair." Another group of teachers appreciated that for the first time, "young kids got access to a program as well." In the end, teachers expressed interest in continuing the program because they believe that it works for young children.

Research Question 3: Teacher Reports of Student Engagement

Teachers reported that students found Smarty Ants Reading World engaging and motivating. When teachers talked about which students enjoy the program, they typically referred to students by demographic categories. For example, one pre-kindergarten teacher, Lisa, reported:

> *Some of my bilingual kids love it. They love the sense of the story and the game shows. My quieter kids [are] mostly there playing and are interested and cheer for themselves. For the special-needs kids [the program] has been really big. . . For what I've noticed and the time we can use it, they're social. Like the older ones sitting with the younger ones and helping them or hey, can I sit with you and taking turns, so that's been beneficial for us, really.*

Lisa described how this program affected her classroom beyond just phonics and phonemic awareness. In Lisa's classroom, Smarty Ants transformed lessons on turn-taking and encouraged a diverse set of students, bilingual and across pre-school age bands, to come together and learn.

When it comes to specific elements of the program that teachers referenced in the interviews, having a virtual pet dog that reinforces skills in the program and playing the story game show appear to motivate students. The virtual pet dog, designed to be an in-game companion that can be customized, provoked the most interest as students looked forward to spending more time with the dog. The dog often repeats the letter names and sounds in the program when the student gets the answers correct. On the other hand, the story game show played like a multiple-choice version of a quiz-based game show focuses on reading comprehension, modeled fluency and metacognition, and some word identification. In the game show, the presence of other virtual ant friends creates a sense of competition and companionship as well.

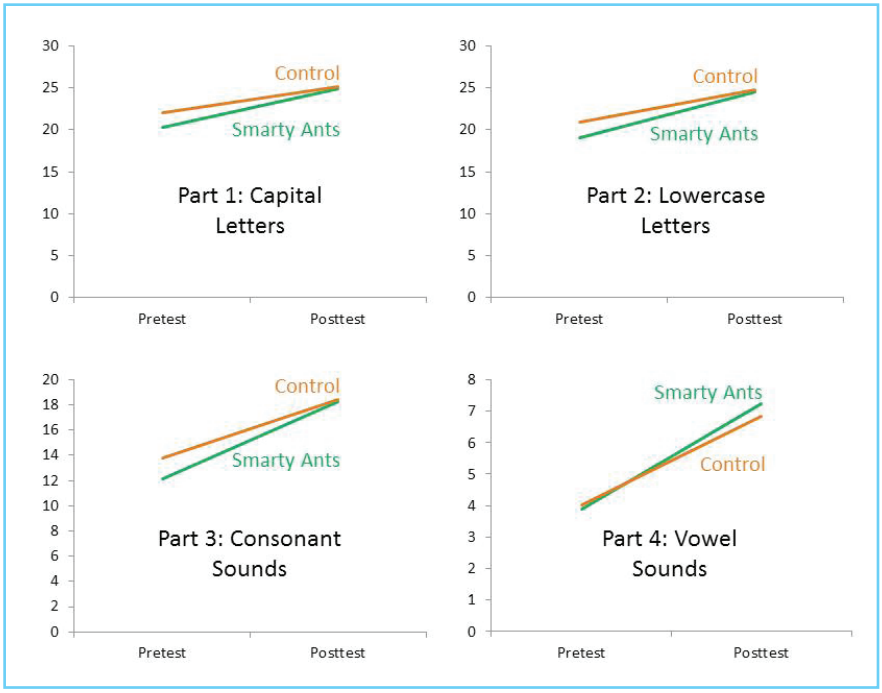
In conclusion, we need to conduct more thematic analysis to unpack whether the emerging themes of Smarty Ants, as a program that brings students together and as a program that addresses desires for competition and companionship occur in just a few interviews or if they are part of the broader experience of using Smarty Ants.

Initial Conclusions

Our initial findings are promising, especially in regard to the gain scores of kindergarten students and teachers' reports of Smarty Ants implementation and their students' engagement with the game. However, the findings in this report are preliminary, and our analysis is not yet complete. By the time we produce our final report, we will have merged the data we used here with information from PSD as well as information about the amount of time students spent using Smarty Ants. Once we have our enhanced dataset, we will re-analyze the data using multilevel regression modeling, which will both control for student and classroom-level factors that may impact students' literacy scores (i.e. access to a dedicated computer lab) as well as adjust for potential similarities among students within classrooms and differences between schools. Similarly, we will delve more deeply into the teacher interviews and utilize methods that will track the prevalence of thematic findings including efforts to document the drawbacks of the program, the relative prevalence of different uses of the program and its ability to engage with a range of students.

Highlights

- **Pre-Test Achievement Gap Existed in Kindergarten, but was Eliminated After Smarty Ants Use:** Kindergarten students in the pilot group scored significantly lower than their control group peers on the Pre-test, yet they made significantly greater growth than these students on the Post-test.



- **Kindergarten Pilot Group Students Exceeded Control Group in Vowel Sound Identification After Smarty Ants Use:** Kindergarten students in the pilot group underperformed exceeded students in the control group on the post-test in identification of vowel sounds.

- **Varying Access in Pre-K:** Pre-kindergarten students in the pilot group had widely varying exposure to Smarty Ants Reading World due to lack of access to a computer lab in some schools. No significant differences were found between Pre-kindergarten students' scores on the CORE Phonics Survey. Final analysis will examine whether a connection between student exposure and their performance exists.

- **Teachers Appreciate the Individualized Instruction Smarty Ants Reading World Provides.**

- **Student Engagement is High, Especially for Subgroups such as ELLs and Students with Special Needs.**

- **Teachers Use Smarty Ants Stories and Data to Build Parent-School Partnerships.**

- **Lack of Computer Lab Access Reported as a Barrier to Usage in Pre-K.**

- **Teachers Are Concerned that Smarty Ants Won't Be Available Next School Year.**

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