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# Head Start and Pre-K Students Using My Math Academy and My Reading Academy Experience Significant Gains in Math and Reading Skills

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## Key Findings

- In a district where more than 63% of students were identified as being at risk, 96% of Head Start and pre-K students who used *My Math Academy* for at least 30 minutes a week ended the school year “On Track” in math on the state-administered standardized assessment.
- Eighty-six percent of Head Start and pre-K students who used *My Reading Academy* for at least 30 minutes a week ended the school year “On Track” on the critical skill of Phonological Awareness on the state-administered standardized assessment.
- Teachers indicated that *My Math Academy* and *My Reading Academy* helped their students become more engaged and confident about learning. They also found the programs to be valuable resources that empowered them to provide personalized learning opportunities for students with diverse needs.

## Overview

The latest scores from the National Assessment of Educational Progress (NAEP) serve as a harsh reminder of the negative impact the pandemic has had on student learning. A special administration of the NAEP long-term trend reading and mathematics assessments in 2022 for 9-year-old students showed that the average scores declined 5 points in reading and 7 points in mathematics, in comparison to 2020.<sup>1</sup> Lower-performing students experienced the largest declines, and Black and Hispanic students’ decline in performance was significantly greater than that experienced by their White counterparts. In this context, teachers need high-quality early reading and math instruction to support children who enter school with various levels of readiness and learning needs. Adaptive educational technology can support teachers in providing personalized learning experiences for their students, and game-based digital curricula that involve play can increase students’ engagement in learning.

Leading up to the 2021–2022 school year, many educators and administrators searched for effective, easy-to-use educational technology solutions to support post-pandemic teaching and learning. One such educator was the director of Head Start at Tyler Independent School District in Texas. Tyler is a city

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<sup>1</sup> National Center for Education Statistics (2022). The Nation’s Report Card. NAEP Long-Term Trend Assessment Results: Reading and Mathematics. <https://www.nationsreportcard.gov/highlights/ltr/2022/>

in northeast Texas (population of approximately 131,196), located in Smith County, where 26% of the population is identified as Hispanic or Latino; the median household income is \$54,430; and 19% of families have incomes below the poverty level (NCES, 2020).<sup>2</sup>

About 85% of the students in the district are eligible for free and reduced-price meal programs, and in fall 2021, 40%, 46%, and 67% of Head Start and pre-K students in Tyler were classified as being “On Track” in Rapid Letter Naming, Rapid Vocabulary, and Phonological Awareness, respectively. Considering the critical role that early math and reading skills have for success in school and beyond, the Head Start director at Tyler sought resources with demonstrated evidence of effectiveness in helping young children learn while also developing a love of learning. She also sought resources that teachers could easily integrate into their instruction to help students with diverse learning needs, while receiving support with implementation as needed. She identified Age of Learning’s *My Math Academy* and *My Reading Academy* as resources that could address these needs, given prior studies indicating their effectiveness in helping young learners in high-need districts, and she piloted one or both programs, not only in all 10 Head Start classrooms, but also in 28 regular pre-K classrooms across the district.

## My Math Academy and My Reading Academy Programs

*My Math Academy* and *My Reading Academy* are built on a patented Personalized Mastery Learning System™ (PMLS™), designed to individualize instruction for learners. Efficacy research conducted on *My Math Academy* and *My Reading Academy* has been reviewed by LearnPlatform as meeting ESSA Level I standards for “Strong Evidence” and ESSA Level II standards for “Moderate Evidence,” respectively. Both programs use the PMLS to help young children build a solid foundation of numeracy and literacy skills. The PMLS used in

*My Math Academy* and *My Reading Academy* enables a Personalized Mastery Learning Ecosystem™ (PMLE™), which consists of three components that work together to increase children’s math and reading skills and knowledge, as well as their motivation, confidence, and persistence in learning math and reading. The three components are the child-facing Learning Games, the parent-facing At-Home Resources, and the educator-facing Educator’s Center (for a detailed overview of the Educator’s Center, see Thai & Bang, 2022).<sup>3</sup> The parent and educator resources provide real-time insights based on student performance data collected from the Learning Games.

The child-facing *My Math Academy* program features 98 games consisting of more than 300 activities, while the *My Reading Academy* program includes 25 games with over 600 activities, along with more than 300 books and videos. *My Math Academy* aims to help children build a strong understanding of fundamental number sense concepts and operations, from recognizing numbers and basic counting up through adding and subtracting three-digit numbers. *My Reading Academy* aims to help children build essential skills in reading: phonemic awareness, phonics, vocabulary, fluency, and comprehension. The programs are grounded in research on cognitive development and how children learn. The patented PMLS underlying the programs uses initial diagnostic assessments to measure each child’s prior knowledge and determine where they are placed within the program, based on what they know and are ready to learn next.

Evidence of learning on each granular Learning Objective is collected as the student plays, and as they progress in *My Math Academy* and *My Reading Academy*, the adaptive system uses the student’s performance to recommend Learning Games at a specific level of difficulty, based on a knowledge map of Learning Objectives and their

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<sup>2</sup> National Center for Education Statistics (2020). ACS-ED District Demographic Dashboard 2016–20 Tyler Independent School District, Texas. <https://nces.ed.gov/Programs/Edge/ACSDashboard/4843470>

<sup>3</sup> Thai, K.P. & Bang, H.J. (2022). *My Math Academy Empowers Pre-K and Kindergarten Teachers to Provide Personalized, Equitable Instruction to Accelerate Learning*. Research Brief Age of Learning, Inc. [https://www.ageoflearning.com/case\\_studies/HARLINGEN\\_MM\\_ResrchBrf\\_RGB\\_FINAL4.pdf](https://www.ageoflearning.com/case_studies/HARLINGEN_MM_ResrchBrf_RGB_FINAL4.pdf)

prerequisite relationships. Within each activity, performance data is used to provide appropriate scaffolding, adjust difficulty, and give formative feedback. Each game includes Learning Activities at varying difficulty levels, including an in-game mastery check called the “boss” level.

Students master the boss levels to demonstrate their skills and understanding, indicating that they are ready to move on to the next game. **Figures 1** and **2** below show examples of child-facing games in *My Math Academy* and *My Reading Academy*, respectively.

## Participants

All 16 public elementary schools in the Tyler Independent School District were offered the opportunity to use *My Math Academy* and *My Reading Academy* in the 2021–2022 school year.

A total of 592 Head Start and pre-K students in 33 classrooms across 14 schools used *My Math Academy*, while a total of 479 Head Start and pre-K students in 29 classrooms across 13 schools used *My Reading Academy*.

## Procedures

Prior to implementation, all Head Start and pre-K teachers were invited to participate in a one-

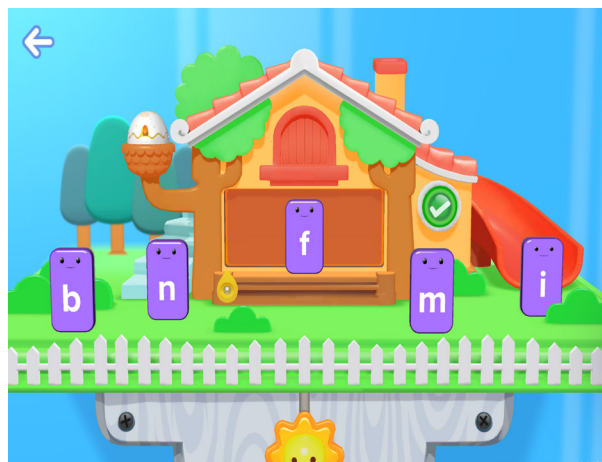
hour virtual training on *My Math Academy* and *My Reading Academy*, which included video introductions of how *My Math Academy* and *My Reading Academy* works, the students’ first-time user experience, and an overview of the Educator’s Center (student account management, exploring features of the Dashboard, and how to get started).

Educators and students began using *My Math Academy* and *My Reading Academy* in mid-to-late October 2021, after the fall administration of CIRCLE (Center for Improving the Readiness of Children for Learning and Education) Progress Monitoring System assessment.

Teachers were asked to have all students use *My Math Academy* for at least 45 minutes a week and *My Reading Academy* for at least 60 minutes a week. Head Start teachers and their principals further received bi-weekly/monthly reminders from their director about the importance of maintaining program usage, which included suggestions about how teachers could implement the program in their classrooms (e.g., all children using the program at the same time, *My Math Academy* twice a week for about 25 minutes each day, and *My Reading Academy* three times a week for about 20–30 minutes each day). In these emails, they also received a summary of their student and class data for both programs, which was also accessible via the Educator’s Center.



**Figure 1.** In the Prize Store game, learners explore counting. They choose boxes from a shelf and count the items in them. Every time the learner taps a toy from the boxes, the Shapey clerk counts along, reinforcing 1-to-1 correspondence and the count sequence.



**Figure 2.** In the Word Bird game, learners hear a VC word (i.e., a two-letter short vowel word) or a CVC word (i.e., a three-letter short vowel word) that the Chickadee bird announces. Learners drag the letter tiles into a box to build the spoken word.

During the implementation period in November, teachers participated in another one-hour virtual training to further develop their skills in making effective use of the Educator's Center, including interpreting the Student Progress Monitoring features.

At the end of the school year, teachers were asked to complete a survey and were invited to participate in a 45- to 60-minute Zoom interview. The survey and interview questions elicited data on teachers' experiences using *My Math Academy* and *My Reading Academy* over the 2021–2022 school year, as well as their observations of the programs' impact on student learning, engagement, and attitudes.

Additionally, the state of Texas administers the CIRCLE Progress Monitoring Assessment three times a year for Head Start and pre-K students. The CIRCLE is a screening and progress-monitoring tool with well-established reliability and validity when used with 3- and 4-year-olds, in that it relates to other tests and predicts child outcomes.<sup>4</sup>

Early math subskills assessed included rote counting (count to the highest number in consecutive order), set counting (count a specified number of items and verbally express the total), number naming (name pictures of numbers), number discrimination (identify a number among pictures of numbers and non-numbers), shape naming (name pictures of shapes), shape discrimination (identify pictures of specific shapes among other shapes), and operations (use addition and subtraction to respond to a question while referring to pictures on the screen). Early reading skills assessed included rapid letter naming (identify as many letters as possible in one minute), rapid vocabulary naming (identify as many pictures as possible in one minute), and phonological awareness (*syllabication*: say/clap the number of syllables in a word; *onset-rime*: repeat parts of

a word broken into sounds; *alliteration*: identify whether pairs of words start with the same sound; and *rhyming*: identify whether two words rhyme).

The CIRCLE Progress Monitoring System provides three benchmarks: “On Track,” “Needs Support/Monitor,” and “Out of Range.” “On Track” indicates that a child has developed understanding and that the child will benefit from continued targeted instruction. “Needs Support/Monitor” indicates an underdeveloped understanding. “Out of Range” indicates that the child is not within the specified age range or that there are no established thresholds. These data were collected from the district when they became available in fall 2022.

## Analyses

Students were excluded from the analytic sample if they were in a special education classroom or had an IEP status ( $n = 69$ ). Students missing math or reading assessment outcomes were also removed from the sample ( $n = 92$  and  $n = 181$  for math and reading, respectively). Finally, students were removed from the sample if they did not have usage in *My Math Academy* and *My Reading Academy* ( $n = 87$  and  $n = 70$ , respectively), leaving 414 students in the *My Math Academy* analytic sample and 342 students in the *My Reading Academy* analytic sample. Separate multiple regression models were used to estimate the effect of *My Math Academy* for each of the eight math outcomes and the effect of *My Reading Academy* for each of the seven literacy outcomes. All models controlled for student characteristics, including the relevant pretest score for each test outcome, as well as pre-K type, gender, age, race/ethnicity, free or reduced-price lunch status, English language learner status, disability status, and teacher.

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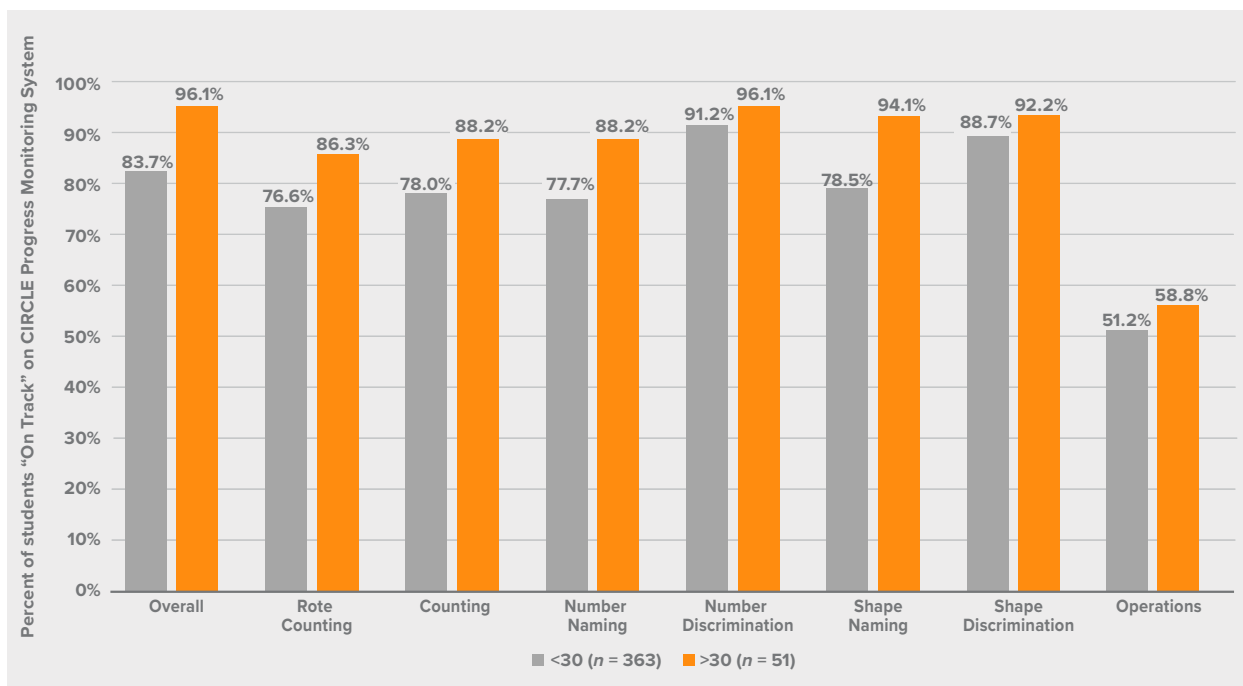
<sup>4</sup> Assel, M. A., Montroy, J. J., Williams, J. M., Foster, M., Landry, S. H., Zucker, T., ... & Bhavsar, V. (2020). Initial Validation of a Math Progress Monitoring Measure for Pre-Kindergarten Students. *Journal of Psychoeducational Assessment, 38*(8), 1014–1032; Landry, S. H., Assel, M., Williams, J., Zucker, T. A., Swank, P. R., & Gunnewig, S. (2014). CIRCLE (formerly C-PALLS+STEM): The CIRCLE phonological awareness language and literacy system + science, technology, engineering and math. Children's Learning Institute: University of Texas Health Science Center.

## Results

**Finding 1.** Ninety-six percent of Head Start and pre-K students who used *My Math Academy* for at least 30 minutes a week ended the school year “On Track” in math on the state-administered standardized assessment.

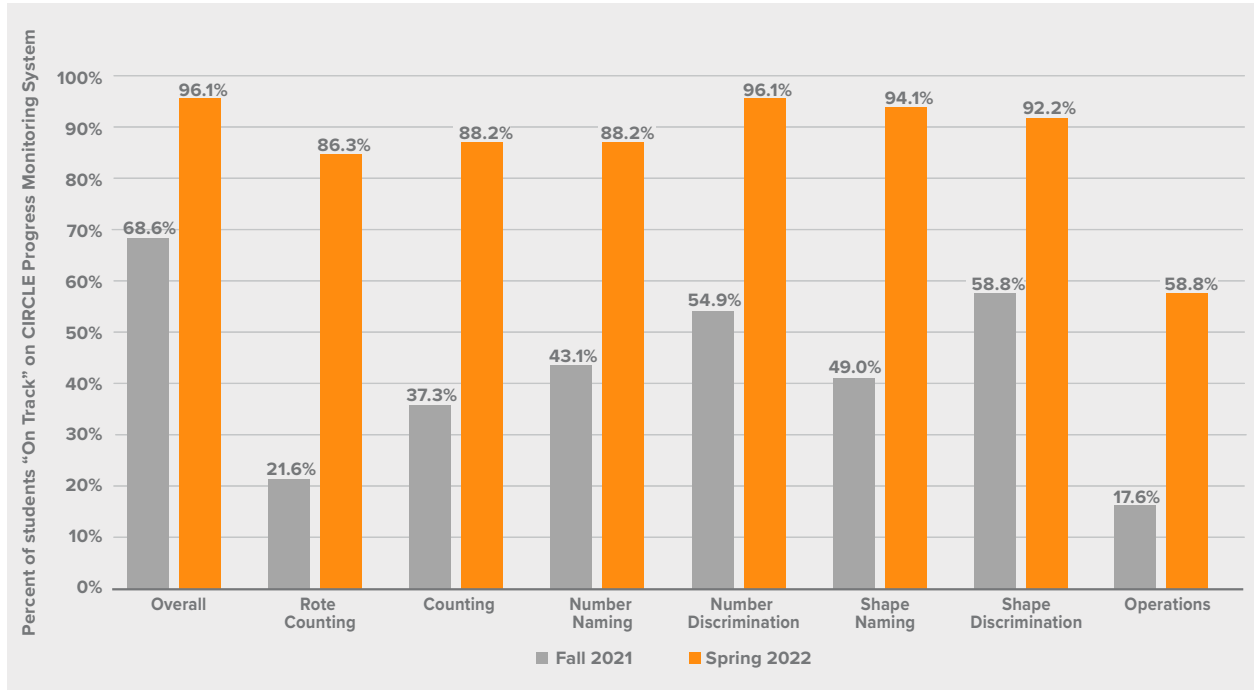
The recommended weekly usage for *My Math Academy* was a minimum of 45 minutes. Over the course of the 2021–2022 school year, Head Start and pre-K students in Tyler ISD used *My Math Academy* ( $n = 414$ ) on average for 18.54 minutes per active week ( $SD = 9.45$ ), over an average of 13.09 active weeks ( $SD = 5.29$ ). They spent, on average, 5.37 hours ( $SD = 3.63$ ) using *My Math Academy*, completing an average of 10.05 ( $SD = 10.05$ ) Learning Activities in math.

Analyses showed that those who used *My Math Academy* more experienced greater growth than their peers who used it less. **Figure 3** below compares students who used *My Math Academy* for more than 30 minutes a week versus those who used it for less than 30 minutes a week. On average, students who spent more than 30 minutes a week per active week on *My Math Academy* spent a total of 10.72 hours ( $SD = 4.83$ ) in the program over 15.27 weeks ( $SD = 6.54$ ). **Figure 3** shows that a greater proportion of students who used the program for more than 30 minutes a week ended the school year “On Track” across all the skills assessed on CIRCLE Progress Monitoring System.



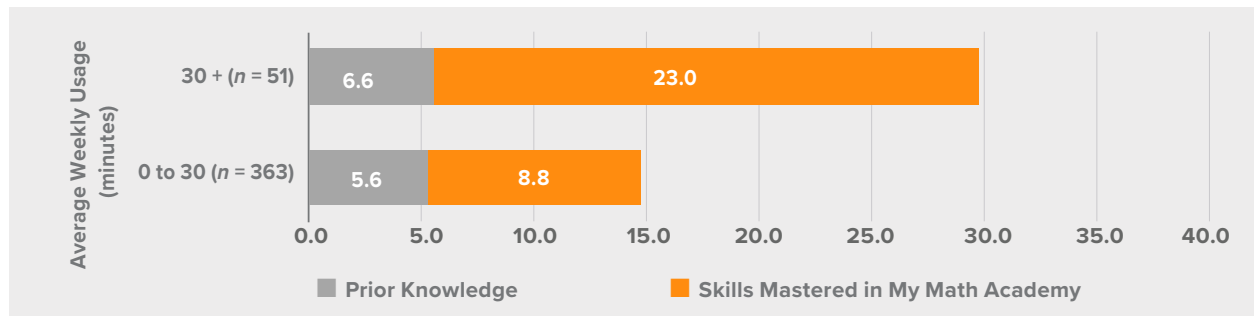
**Figure 3.** Percent of students who scored “On Track” in math CIRCLE Progress Monitoring System that used *My Math Academy* for more than 30 minutes ( $n = 51$ ) compared with students that used less than 30 minutes per active week ( $n = 363$ ).

**Figure 4** below focuses on students who used *My Math Academy* for at least 30 minutes a week throughout the school year ( $n = 51$ ). The bars represent the percentage of these students who were “On Track” in math in fall 2021, and in spring 2022. As can be seen on the graph, the majority of students who used the program for at least 30 minutes a week ended the school year “On Track” on the various subskills assessed in math.



**Figure 4.** Percent of students who used *My Math Academy* for at least 30 minutes a week and scored “On Track” in math CIRCLE Progress Monitoring System ( $n = 51$ ).

Among students who used the program for at least 30 minutes a week throughout the school year ( $n = 51$ ), 96.1% of them ended the school year “On Track” on Overall Math. **Figure 5** shows the number of math skills students knew at the start of the school year and the number of math skills they learned through *My Math Academy*. As can be seen in the graph, those who had more usage of *My Math Academy* demonstrated mastery of substantially many more skills.



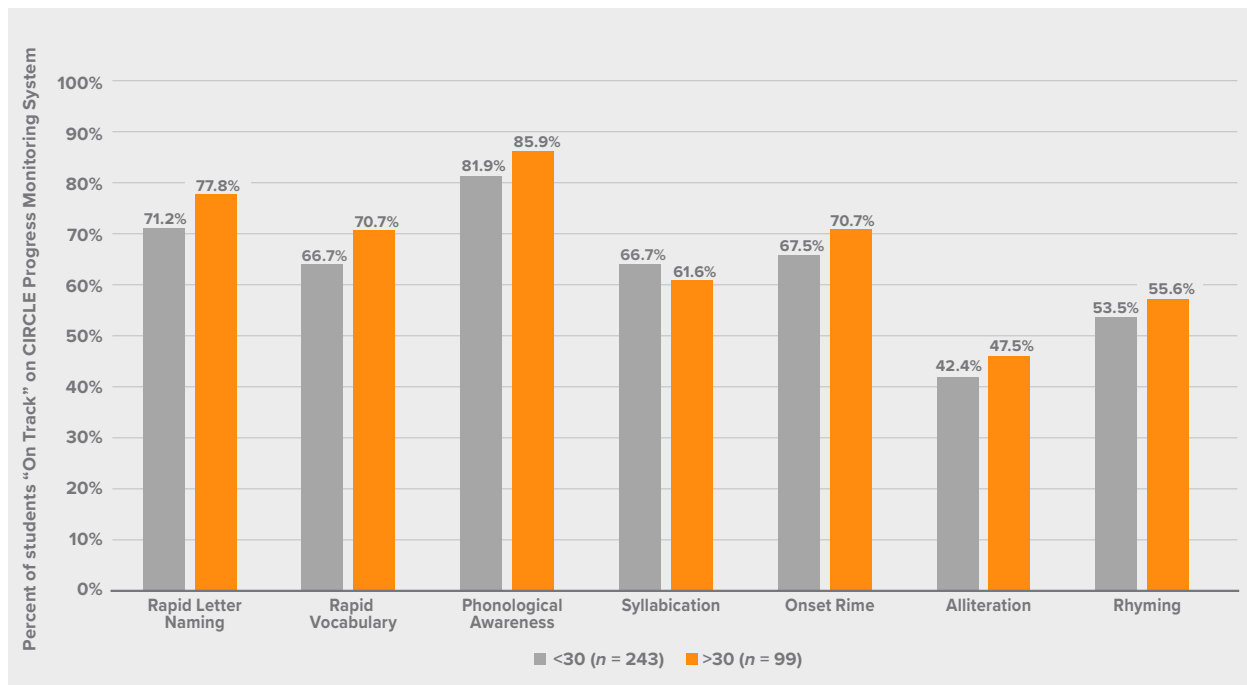
**Figure 5.** Number of math skills students knew before using *My Math Academy* (gray) and the number of math skills they learned through the program (orange).

In analyses examining the relationship between *My Math Academy* usage and CIRCLE Math scores, the following factors were controlled for: relevant pretest score, pre-K type, gender, age, race/ethnicity, free or reduced-price lunch status, English language learner status, disability status, and teacher. Controlling for these factors, mastering an additional skill in *My Math Academy* was associated with a significant positive effect on Overall Math Score,<sup>\*\*\*</sup> as well as on various subskill scores: Rote Counting,<sup>\*\*</sup> Counting Sets,<sup>\*\*</sup> Number Naming,<sup>\*\*\*</sup> Number Discrimination,<sup>\*</sup> Shape Naming,<sup>\*\*\*</sup> Shape Discrimination,<sup>\*</sup> and Operations<sup>\*\*\*</sup> (the number of asterisks indicates the degree of significance of *My Math Academy* usage on each of the subskill scores, with more asterisks indicating greater significance, <sup>\*</sup> $p < .05$ , <sup>\*\*</sup> $p < .01$ , <sup>\*\*\*</sup> $p < .001$ ).

**Finding 2.** Eighty-six percent of Head Start and pre-K students who used *My Reading Academy* for at least 30 minutes a week ended the school year “On Track” on the critical skill of Phonological Awareness on the state-administered standardized assessment.

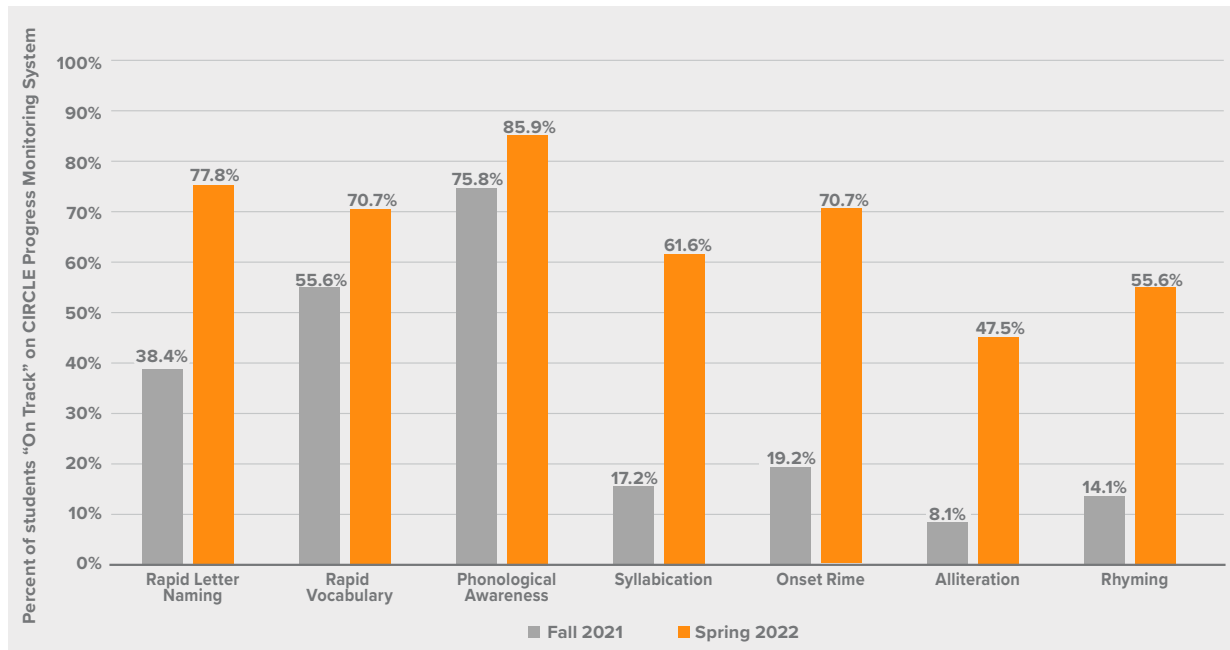
The recommended weekly usage for *My Reading Academy* was a minimum of 60 minutes. Over the course of the 2021–2022 school year, Head Start and pre-K students in Tyler ISD used *My Reading Academy* ( $n = 342$ ) on average for 25.51 minutes per active week ( $SD = 12.61$ ), over an average of 15.95 active weeks ( $SD = 6.32$ ). They spent, on average, 8.04 hours ( $SD = 5.18$ ) using *My Reading Academy*, completing an average of 42.21 ( $SD = 24.96$ ) Learning Activities in reading.

Analyses showed that those who used *My Reading Academy* more experienced greater growth than their peers who used it less. **Figure 6** below compares students who used *My Reading Academy* for more than 30 minutes a week versus those who used it for less than 30 minutes a week. On average, students who spent more than 30 minutes per active week on *My Reading Academy* spent a total of 13.27 hours ( $SD = 5.01$ ) over 18.81 weeks ( $SD = 5.84$ ). **Figure 6** shows that a greater proportion of students who used the program for more than 30 minutes a week ended the school year “On Track” across nearly all the skills assessed on CIRCLE Progress Monitoring System.



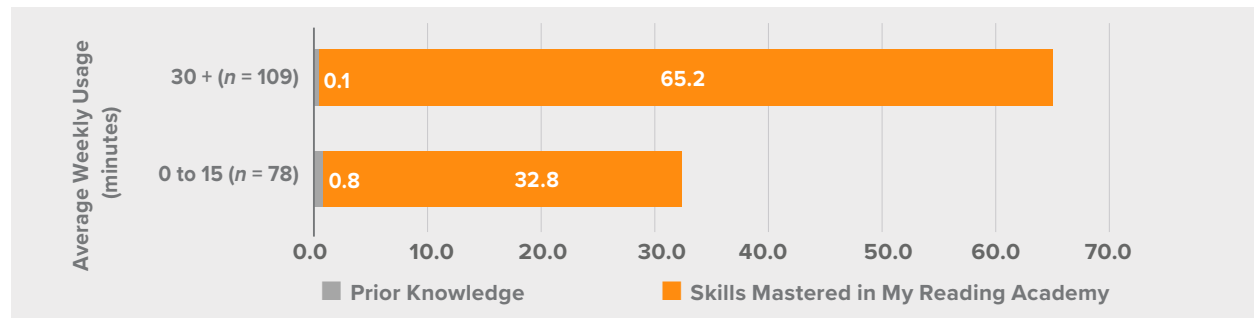
**Figure 6.** Percent of students who scored “On Track” in math CIRCLE Progress Monitoring System who used *My Reading Academy* for more than 30 minutes ( $n = 99$ ) compared with students who used less than 30 minutes per active week ( $n = 243$ ).

**Figure 7** below focuses on students who used *My Reading Academy* for at least 30 minutes a week throughout the school year ( $n = 99$ ). The bars represent the percent of these students who were “On Track” in Literacy in fall 2021, and in spring 2022. Except for alliteration, which is a skill typically targeted in 1st grade, the majority of students who used *My Reading Academy* ended the school year “On Track” on the various subskills assessed in Reading. The fact that 86% of students ended the school year “On Track” in Phonological Awareness is noteworthy, given its critical foundational role in understanding the alphabetic principle and reading success.<sup>5</sup>



**Figure 7.** Percent of students who used *My Reading Academy* for at least 30 minutes a week and scored “On Track” in reading CIRCLE Progress Monitoring System ( $n = 99$ )

**Figure 8** focuses on the students who used the program for at least 30 minutes a week throughout the school year ( $n = 99$ ). It shows the number of reading skills students knew at the start of the school year and the number of reading skills they learned through *My Reading Academy*. As can be seen in the graph, those who had more usage of *My Reading Academy* demonstrated mastery of substantially many more skills.



**Figure 8.** Number of reading skills students knew before using *My Reading Academy* (gray) and the number of reading skills they learned through the program (orange).

<sup>5</sup> Baker, S. K., Beattie, T., Nelson, N. J., & Turtura, J. (2018). *How we learn to read: The critical role of phonological awareness*. Washington, DC: U.S. Department of Education. Retrieved from <http://improvingliteracy.org>



In analyses examining the relationship between *My Reading Academy* usage and CIRCLE Literacy scores, the following factors were controlled for: the relevant pretest score, pre-K type, gender, age, race/ethnicity, free or reduced-price lunch status, English language learner status, disability status, and teacher. Controlling for these factors, mastering an additional skill in *My Reading Academy* was associated with a significantly positive effect on Rapid Letter Naming,<sup>\*\*\*</sup> Rapid Vocabulary,<sup>\*\*\*</sup> Phonological Awareness,<sup>\*\*\*</sup> Syllabication,<sup>\*\*\*</sup> Alliteration,<sup>\*\*</sup> and Rhyming<sup>\*</sup> (the number of asterisks indicates the degree of significance of *My Reading Academy* usage on each of the subskill scores, with more asterisks indicating greater significance, \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ ).

**Finding 3.** Teachers indicated that *My Math Academy* and *My Reading Academy* helped their students become more engaged and confident about learning and found the programs to be valuable resources that empowered them to provide personalized learning opportunities for students with diverse needs.

On the end-of-study survey, a total of 24 (73% of 33) and 20 (69% of 29) teachers responded to questions about *My Math Academy* and *My Reading Academy*, respectively.

When asked about the impact of *My Math Academy* on student outcomes, 100% of the teachers indicated that *My Math Academy* had a “positive” or “very positive” impact on

- students’ enjoyment in learning math,
- students’ interest in learning math, and
- students’ self-confidence in learning math.

Moreover, 96% of teachers either “agreed” or “strongly agreed” that

- their students enjoyed using *My Math Academy*, and
- they found *My Math Academy* to be a valuable math learning resource.

In response to questions about the impact of *My Reading Academy*, 90% of the teachers indicated that *My Reading Academy* had a “positive” or “very positive” impact on

- students’ phonological awareness, and
- students’ literacy knowledge.

Additionally, 90% of the teachers “agreed” or “strongly agreed” that

- they want to continue using *My Reading Academy* in their classes,
- they found *My Reading Academy* to be a valuable learning resource, and
- their students enjoyed using *My Reading Academy*.

During interviews, teachers provided additional insight into how *My Math Academy* and *My Reading Academy* were effective, engaging learning resources that they wanted to continue using in their classrooms.

## Effectiveness

*“Both My Math Academy and My Reading Academy were effective. When I started working with them, we measured at the beginning of the year with CIRCLE, and [in] reading, 25% of my students were “On Track”. And then we started using My Math Academy and My Reading Academy. At the end of the year, 95% of my students were “On Track” in reading, and I am really excited. Last year it was 20% or 30 percent at the start and 75 or 80% at the end.”*

## Engagement

*“They would get excited when they were doing a letter activity in My Reading Academy. They would show me what they were working on because they were so proud of themselves for knowing those letters. And they would love reading the stories because they could point out words that they already knew, and they just loved the Shapeys [characters/manipulatives in My Math Academy]. They would show each other too, ‘Look what I’m doing. Look at this.’ It was just a really great experience for them overall.”*

## Empowerment

*“It helped me in forming my station groups, which are ability-based. I was able to move around some students so that they could work with other students on their level and then tailor their activities and differentiate based on what they’ve mastered in My Math Academy and what they were struggling on. It was really cool to see the things that they were able to do. You can see that I have students that are going into 2nd grade but they’re in pre-K.”*

## Equity

*“I feel like they just all advanced. My high students advanced higher. My middle students advanced higher. They all stayed in the same kind of groups, but they did advance. What is interesting is that I noticed that this year students have more of a grasp of letter recognition and letter sounds than my last-year students. Half of my class knows all their letters. I had one student that came in at the beginning of the year knowing zero uppercase and one lowercase letter. Now he knows 24 uppercase letters and 23 lowercase letters. And it has been mind-blowing.”*

## Ease of Use

*“I would want to continue using the programs next year because they’re engaged with them. I feel like they are really great programs, and it’s easy for me to put them into my schedule on a daily basis. Next year, I would like to adapt my schedule to fit them in more frequently, but it is just really easy to add them in. Also because of how engaged the students are and how they’re excited about it, and they’re proud of themselves when they accomplish something and finish a game and move on. They want to show their work, and they’re just so proud of themselves.”*

## Conclusion

This is the first study in which *My Math Academy* and *My Reading Academy* have been implemented simultaneously. The results of this study corroborate findings from earlier studies, which have shown that using *My Math Academy* and *My Reading Academy* accelerates learning while increasing students' engagement in math and reading. The study findings also confirm the results of previous studies that have shown *My Math Academy* and *My Reading Academy's* positive impact on students' interest, enjoyment, and confidence in learning math and reading.

## About Age of Learning School Solutions

At Age of Learning School Solutions, we aim to reimagine education, joining educators to deliver equitable solutions that accelerate learning for all students. Our student-first, standards-aligned digital education programs are proven to support students in achieving mastery and collectively accelerate learning gains. By providing personalized, easy-to-implement solutions, we support educators in delivering targeted instruction to address individual student needs, giving each child an engaging, customized path to learning success.

For more information on Age of Learning School Solutions, [www.AgeofLearning.com/schools](http://www.AgeofLearning.com/schools)