“Breaking Barriers for Academic Achievement through Artificial Intelligence”

SC Research Districts (21)	Schools and organizations (63)
Cherokee County	BD Lee Elementary
Laurens 57	Eastside Elementary
Lee County	Lower Lee, West Lee Elementary
Florence 1	Wallace Gregg Elementary
Florence 5	Johnsonville Elementary
Lexington/Richland 5	H.E. Corley Magnet Elementary
Lancaster	Buford Elementary
Williamsburg	Summer School, Kenneth Gardner, Hemingway
Kershaw	Blaney, Camden, Wateree, Doby’s Mill, and Jackson Elementary
Barnwell 45	Barnwell Elementary, Barnwell Primary
Sumter	Crosswell Elementary, RE Davis College Prep Alice Drive, Cherryvale, High Hills, Kingsbury, Lemira, Manchester, Millwood, Oakland, Pocalla Springs, Rafting Creek, Shaw Heights, Wilder, Willow
Beaufort	Whale Branch Middle, Boys and Girls Club of the Lowcountry
Allendale	Allendale Elementary
Pickens	Pickens, Six Mile Elementary
Richland 2	Windsor Elementary, Jackson Creek Elementary
Lexington 4	Frances Mack Intermediate School
Charleston	St. James Santee Elementary School
York 3 (Rock Hill)	Oakdale Elementary, Ebinport, Sunset Park, Cherry Park, Ebenezer Avenue, Independence, India Hook, Lesslie, Mount Gallant, Mount Holly, Northside, Old Pointe, Richmond Drive, York Road
Lexington 2	Saluda River Academy of the Arts, Springdale
SC Public Charter	Pee Dee Math, Science Technology Academy, East Point Academy, Bridges Prepatory Academy
Charter Institute at Erskine	Royal Live Oaks Academy

I. Overview of Progress

a. Activities students and teachers participated in over the reporting period.

Year 1. In the 2019-20 school year, we conducted a randomized control study to evaluate math proficiency gains achieved by adding ABii to Independent Learning Time (ILT). Approximately 500 3rd-5th grade students in 30 schools and 16 school districts were enrolled. Three cohorts of participants were recruited to begin the study at different times throughout the school year. Onboarding was scheduled for each cohort around school holidays so as to allot an uninterrupted 10 weeks of study time.

Year 2. In the 2020-21 school year, we launched a continuing, randomized control group study to evaluate reading proficiency gains achieved by adding ABii to ILT. About 281 enrolled 2nd grade students from high poverty, low-performing or rural districts, who were at high risk for school disengagement and reading delay were enrolled. Each teacher who participated in the study, was teaching full-time in the classroom with at least 10 students enrolled in their classroom. The total duration of study activities for this project was approximately 10 weeks.

Year 3. In the 2021-22 school year, we expanded the randomized control study and enrolled 1,200 K-5th grade students across 20 Title 1 elementary schools, to study the learning impact of a social robot with Social Emotional Learning (SEL) lessons on social intelligence. The duration of the study is approximately 32 weeks during the 2021-22 school year.

Ongoing Study Protocol (Year 3)

Week 1: Each participating teacher received 1-2 robots for their classroom, a packet of consent forms for parents and one for themselves, as well as assent forms for their students. Teachers and technology staff or administrators from the school, attended a brief 30-45 minute Zoom set up call to acquaint teachers and staff with how ABii works, answer any questions and introduce their dedicated project manager.

Week 2: Student consent forms were received and students were randomly assigned to either the Study Group or the Control Group (receiving whole group SEL only).

Weeks 3-31: All students receive whole-group SEL instruction 15 minutes each morning. Students in the Study Group also complete 2 weekly, 15-minute SEL lessons with ABii during Independent Learning Time. Students in the Control Group complete online SEL lessons or activities they normally use (typically online apps).

Week 32: Both Study Group and Control Group take another online, SC standards-aligned SEL posttest to measure learning gains achieved during the study.

End of study: Data is organized for empirical analysis to evaluate additional learning impact realized through the ABii technology added to regular classroom instruction.

b. Major milestones accomplished

We completed studies during Year 1 and 2 as designed, with good protocol fidelity. Our Year 1 study met all criteria for an ESSA Tier 1 research study, with a statistically significant positive effect, at least 350 students enrolled, and at least 2 educational sites participating. Although the 2020-21 study fell short of the 350 student criterion (due to budget cuts and subsequently fewer robots deployed) all other criteria were met for ESSA Tier 1 in Year 2. The Year 3 study is currently ongoing with the largest study cohort.

II. Summary of Results

a. Summary of Math Intervention Results (2019-20)

At the completion of the 4-week randomized control study, data for all cohorts was compiled and analyzed to compare learning gains observed across study groups and control groups. Both groups were given paper-and-pencil, standards-aligned, pre tests and post tests.

**14% *more* students in the STUDY Group showed scores improvement on the post test, compared to students in the CONTROL Group.

In summary, the number of students in the STUDY Group who demonstrated any improvement from the pre test to the post test exceeded the number of students who showed any improvement from the CONTROL Group. The next analysis was designed to evaluate how much improvement was observed from those students who did show improvement overall.

**Students from the STUDY Group who showed improvement achieved learning gains which averaged 15% compared to 3% for students from the CONTROL Group.

Additional statistical correlations conducted between pretest scores and learning gains reveal that students with the lowest initial pretest scores showed the most significant improvement.

b. Summary of Reading Intervention Results (2020-21)

After four weeks, greater learning gains were observed among Study Group students who completed lessons with ABii compared to Control Group participants who engaged in other Independent Learning Time activities.

STUDY Group Learning Gains Overall: **18% | CONTROL Group Learning Gains Overall: **13%**

The Year 2 Study Group students with the lowest pretest scores (<50%) tend to achieve significantly greater learning gains after working with ABii, compared to learning gains observed in the lowest-scoring students from the Control Group.

STUDY Group Learning Gains (Lowest): **24% | CONTROL Group Learning Gains (Lowest): **13%**

Significant Statistical Results. An independent-samples t-test was conducted to compare learning gains observed with ABii tutoring and other Independent Learning Time activities without ABii tutoring. There was a strong significant difference in the lowest pretest scorers' learning gains in the ABii Study Group (M=23.91, SD=5.66) and the lowest pretest scorers learning gains in the Control Group (M=13, SD=8.68) conditions; t (40)=2.88, p = 0.006 at p<0.01. These results suggest that ABii has a significant and positive effect on learning gains observed in second graders testing below proficient in reading. Specifically, our results suggest that when second graders who test below proficient in reading use ABii during independent learning time, their learning gains increase more than their peers who do not use ABii.

c. Summary of SEL Intervention Results (2021-22)

Results will be forthcoming in Summer 2022.