

*Accelerate*LEARNING
THE LEADER in STEM EDUCATION



**IMPACT AND
RESEARCH
REPORT**

2023



Executive Summary

In 2023, the Accelerate Learning (ALI) research team conducted numerous research activities across all of ALI's products, demonstrating evidence of effectiveness. Activities are organized by efficacy studies (9), product use studies (3), case studies (4), customer advisory board activities and support surveys (8), dissemination (4), as well as grants and upcoming projects (13). In total, the research team executed and finalized more than 40 projects. Within each section, we describe the research activity type and why it is important. Studies are then further broken out by product.

New this year: **we are excited to announce that the ALI Research team has been busy working with numerous outside partners to provide outside evaluations of products.**

Working with an external evaluator provides additional credibility to research findings, as it delivers another layer of evidence to complement and validate ALI's own internal research. In all sections below, if ALI conducted the study, we use the term "We" to indicate who conducted the research; evaluations by external parties will note explicitly who partnered with us to conduct the study/activity.

The total number of research activities conducted/started in 2023 was 40; \$9.5 million dollars in grants was awarded to ALI for further development and research. In the following report you will see a brief overview of all activities conducted in 2023, although data for many studies were gathered across 2022 and 2023. For detailed descriptions of each study, please see <https://stemscopes.com/research/>.

Kide Science

32

COUNTRIES

30K+

REGISTERED EDUCATORS

1M+

CHILDREN REACHED

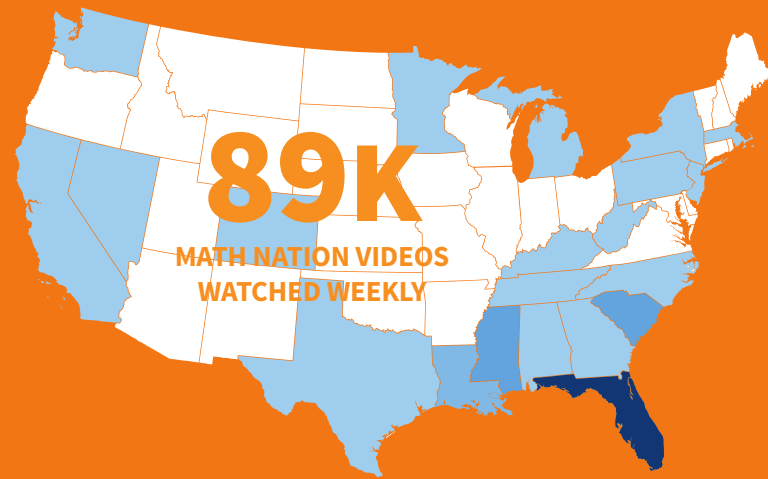
200K+

LESSON PLAN VIEWS

In 2023, Kide Science was used in 20+ states in the US, with the most prominent user bases in **California, Texas, New York, and Florida.**

Math Nation

In 2023, Math Nation was used in 26 states, with the most prominent user bases in **Florida, South Carolina, and Mississippi.**



4,020

SCHOOLS

323K

ACTIVE STUDENTS WITH
5M STUDENT LOGINS

STEMscopes (Math + Science)

**across STEMscopes Science, Math, and supplemental products (including private and international students)*

16.7K+

SCHOOLS

8.4M+

STUDENT
ACCOUNTS*

700K+

EDUCATOR/STAFF
ACCOUNTS*

700K

SCOPES ACCESSED
WEEKLY BY
TEACHERS

Based on the number of schools above, ~12.5% of the nation's schools (public or private) across all 50 states are using STEMscopes products, with the most prominent user bases in **Texas, California, Florida, and Georgia.**

NISE (National Institute for STEM Education)

25

SCHOOLS COMPLETED THE NATIONAL CERTIFICATE FOR STEM EXCELLENCE (NCSE), WHILE 55 MORE ARE IN PROGRESS.

4,200

TEACHERS/EDUCATORS ACTIVELY ENROLLED IN/ COMPLETED STEM MICRO CERTIFICATES, WITH 640 COURSES COMPLETED IN 2023.

1,620

TEACHERS/EDUCATORS EARNED THE NATIONAL CERTIFICATE FOR STEM TEACHING (NCST), WITH 1,433 MORE CURRENTLY IN PROGRESS. AMONG THE NCST-CERTIFIED EDUCATORS, 795 HAVE TRANSFERRED TO AMERICAN COLLEGE OF EDUCATION (ACE) TO RECEIVE GRADUATE CREDITS.

Since 2021, an average of 199 teachers/educators a month have enrolled in NCST certification; 3 schools per month have enrolled for NCSE across all 50 states, with the most prominent user bases in **Texas, Alabama, Georgia, and Colorado.**

Efficacy Studies

Efficacy studies in education are often defined as “the power of a product/intervention to produce the desired effect.” Put another way, ALI’s efficacy studies seek to uncover the potential effect of our products on a host of expected outcomes in real world settings. They are designed to match the Every Student Succeeds Act (ESSA) and What Works Clearinghouse (WWC) higher tiers/standards for evidence of effectiveness. With these studies, we want to make sure schools feel confident that our products are research-supported as the best products on the market.

KIDE SCIENCE

We conducted research examining how Kide Science affects teachers’ self-efficacy. Teachers in Finland and internationally (n = 116) completed the P-TABS survey, a validated measure of preschool teachers’ attitudes and beliefs toward science teaching (Maier et al., 2013), before and after using Kide Science. **The results were clear: Kide Science increases teachers’ confidence and enjoyment in teaching STEAM.** The strongest difference between Kide and non-Kide users was related to their *confidence* and *enjoyment* in teaching STEAM subjects. For example, for the question “I feel like I have sufficient knowledge to be able to help children in inquiry-based activities,” only 6% of non-Kide teachers responded that they would strongly agree.

However, in the Kide-user teacher group, 55% of teachers stated that they would strongly agree with the same statement. Likewise, 100% of Kide teachers either “agree” (11%) or “very strongly agree” (89%) with the statement, “Doing inquiry-based activities with children makes me cheerful.” Conversely, only 56% of non-Kide teachers selected that they would strongly agree.

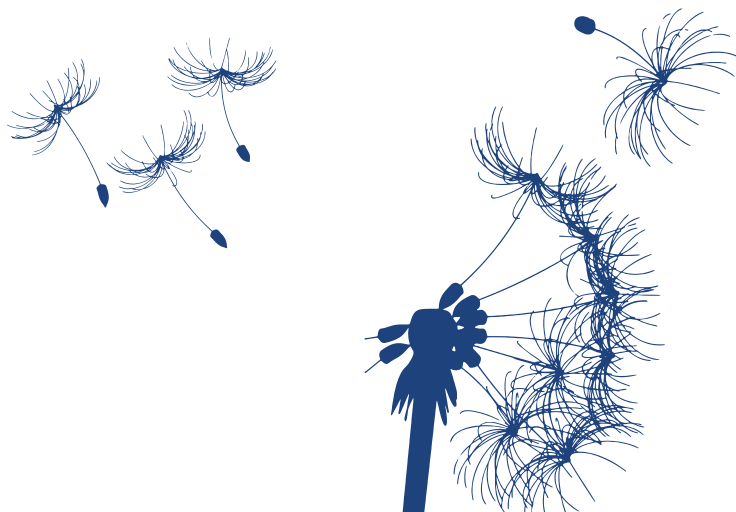
In summary, Kide Science lesson plans help teachers become more confident in their STEAM teaching skills (both content knowledge and ability to teach STEAM), and thus positively and significantly affects their enjoyment and motivation to teach STEAM in their everyday classroom practice.

MATH NATION

The [Mississippi State University Research & Curriculum Unit](#) conducted a study to determine whether Math Nation use improved Mississippi students’ math scores on the Mississippi Academic Assessment Program (MAAP) during the 2021–2022 school year. **Findings were unequivocal: Math Nation had a positive, significant impact on students’ performance on MAAP tests.**

On average, schools utilizing Math Nation demonstrated 13% higher math proficiency and math growth, compared to their non-Math Nation peers.

Math growth for students who scored in the lowest 25% on the previous year’s MAAP assessment was also significantly higher for students in Math Nation schools. Moreover, Math proficiency mean scores had higher effect sizes, that is “bigger impacts” (e.g., > 0.70) for Black or African American and White students compared to other subgroups of students. Moreover, the math proficiency mean scores were significantly higher for economically disadvantaged Black or African American and White students in urban areas with a school accountability rating of D. In some cases, the effect sizes were above 1—indicating that Math Nation usage has a substantial impact on MAAP scores. **Overall, the evaluation findings indicate that Math Nation is an effective and engaging tool for enhancing students’ math learning and performance.**



STEMSCOPES MATH

We conducted [a Texas statewide efficacy study focused on 3rd and 4th grade STAAR benchmark rates](#) in schools that used STEMscopes Math versus matched non-STEMscopes schools. **Results were excellent: In 3rd grade, schools that used STEMscopes had a 1.96-point increase in the percentage of students that met or exceeded grade level standards. In 4th grade, there was a 2.22-point increase in the percentage of students that met or exceeded grade level standards.** Follow-up analyses for both grades indicated a significant impact of STEMscopes Math on school rates for subgroups of students. Economically disadvantaged students in 3rd (1.96+) and 4th grade (2.49+) had higher rates of meeting or exceeding grade level standards in STEMscopes schools. We also saw significant differences for 3rd grade Black/African American students (3.30+) and Hispanic/Latinx students (3.25+) as well as English language learners (4.01+)

in STEMscopes schools. Additional tests indicated that African American/Black and Hispanic student 3rd graders also outperformed White/Caucasian students.

Put another way, students of color are being advantaged by STEMscopes in facilitating their learning compared to their White/Caucasian counterparts.

There were similar findings among subgroups of students in 4th grade. Specifically, there were significant point increases for females (2.07+) and Hispanic/Latinx students' rate of "met grade level or above" in STEMscopes compared to non-STEMscopes schools. **Overall, results indicate that STEMscopes Math is effective at improving student outcomes, particularly among students of color.**

STEMSCOPES SCIENCE

The following section provides a summary of research based on state standardized tests that were conducted in the spring of 2022. We present a comparison of weighted passing rates in STEMscopes and non-STEMscopes districts and schools.

One of our first studies of the year was conducted at the district level, as this was our past practice (see [Impact Report 2022](#)). However, shortly after this study, we changed to studying school level findings to get a finer grained view of the impact of STEMscopes Science on student achievement. Studies occurred across 5 states for 5th and 8th grade. Different states use highly diverse criteria and test questions to determine their state's passing rate. Despite differences, STEMscopes Science consistently increases student science achievement.

We found significant positive effects of STEMscopes Science on the percentage of students passing, with passing rate increases between 1.58 and 6.40 percentage points for STEMscopes versus non-STEMscopes districts and schools across grades and across differing units of study (e.g., in [Texas](#), we focused on a large city, Dallas; in [Georgia](#), we focused on urban districts only) as well as different usage patterns (including full-time curriculum usage versus any paid usage of the product). We also included student subpopulation analyses this year (see table), and findings indicated increases in the percentage of students passing across a variety of student subpopulations, with increases between 1.83 and 13.07 percentage points, depending on the study and

subpopulation. Across 4/5 states, we saw significant passing rate increases among economically disadvantaged students, as well as Black/African American students.

Retrospective Evaluation for Texas Elementaries: ALI recently partnered with John Hopkins University (JHU) to conduct a retrospective research study. The study sought to determine whether STEMscopes Science, when used as a core curriculum, raised school level passing rates in 5th grade for the 2018–2019 school year. This study was an outside evaluation, and is a retrospective study (that is, a study that took place only after all data had been released and made publicly available). **Overall, across 1,926 Texas schools (963 STEMscopes schools), STEMscopes schools had "Meets" STAAR Science proficiency rates that were approximately 1.41 points higher than those in comparison schools, after controlling for prior year mathematics proficiency rates and school-level demographic variables.** These findings met $p < .05$ significance. Similar magnitude impacts were observed for "Approaches" and "Masters" STAAR Science proficiency levels. This provides promising evidence for ESSA tier 3. In addition to the main finding, results also indicated positive effects for female students, in that females in STEMscopes schools outperformed their counterparts in non-STEMscopes schools. Finally, results indicated that school usage of 15 or more unique scopes was associated with significant increases in a school passing rate, confirming that STEMscopes is most effective when used as a full-time core curriculum.

STATE STUDIES STEMSCOPES SCIENCE

State	Grade Level/Locale	Difference in Passing Rate, STEMscopes vs., non-STEMscopes, 2022 (program use)	Estimated Additional Students Passing, 2022
Texas	5TH GRADE, DALLAS Economically disadvantaged English Language Learners African American students Females	6.20+ (full time) 6.32+ 8.11+ 13.07+ 7.26+	+167
California	5TH, ALL DISTRICTS Economically disadvantaged African American students	1.58+ (any use) 1.83+ 4.76+	+897
	8TH, ALL DISTRICTS	2.01+ (any use)	+2,415
Georgia	5TH, URBAN SCHOOLS Economically disadvantaged African American students Special education Females Males	6.40+ (any use) 6.34+ 4.47+ 5.69+ 6.90+ 5.93+	+2,717
Oregon	8TH, ALL SCHOOLS Hispanic/Latinx students Special education	3.98+ (any use) 3.24+ 3.02+	+409
Illinois	5TH, ALL SCHOOLS Economically disadvantaged Students with IEP	1.96+ (any use) 6.31+ 8.11+	-
	8TH, ALL SCHOOLS Economically disadvantaged English Language Learners African American students	5.97+ (any use) 6.75+ 6.71+ 8.07+	-
Total Across Studies			+6,605 within studies



Product Use Studies

Product use studies refer to smaller scale studies that are typically conducted by ALI and partners that ask qualitative and quantitative research questions but often without the rigor of a control group. They are “process” studies that help us gather research about a variety of program outcomes (e.g., what is working and what needs improvement) before we conduct a larger scale study that compares these outcomes directly to groups of non-users. In traditional research these are sometimes called pilot studies or “promising studies” to use language borrowed from ESSA.

KIDE SCIENCE

We conducted a study to examine teachers’ perceptions of Kide Science and how they interpret the impact on children. The study surveyed teachers in Finland (n=101) and had semi-structured interviews with customers outside of Finland (n = 17) that allowed us to better understand and add context to the survey results. We used a method of study called qualitative content-driven analysis to help us evaluate open-ended survey responses and interview data. This method focuses on the content of what the teachers said (instead of counting up how many different teachers said it). The emphasis of this type of analysis is on understanding the meanings, patterns, and themes present in the survey and interview responses.

The study found that teachers highly valued children’s increased engagement in STEAM learning facilitated by Kide Science.

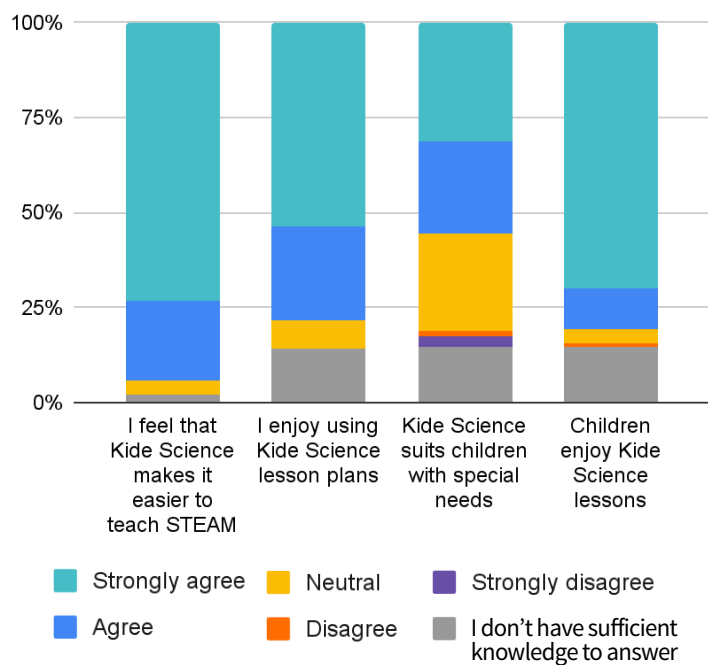
Play and stories were mentioned as essential features that captured children’s attention and amplified children’s interest in STEAM.

One of the teachers said that she appreciated the creative lessons and that children started to ask more scientific questions after starting Kide Science. Furthermore, teachers highlighted that Kide Science contributed to their professional development and expressed enjoyment in delivering STEAM education through Kide Science lessons. For example, one teacher described a shift in her perception of science: “I used to struggle with science. However, upon encountering Kide Science, I realized it wasn’t as challenging as I had initially thought.” Some teachers mentioned that the principles of Playful Inquiry extended beyond Kide Science lessons and

permeated the day. Teachers also appreciated that Kide Science reduced their workload in planning and teaching STEAM activities. Teachers found Kide Science user-friendly and appreciated its comprehensive content, indicating that everything was readily available and facilitated ease of use for educators.

The survey results (as rated on a 5-point Likert scale) show that **94% of respondents either agreed or strongly agreed that Kide Science made teaching STEAM to young children easier.** Both teachers and children found the lessons enjoyable, and over **50% of teachers believed that Kide Science also catered well to children with special needs.**

PERCENTAGE DISTRIBUTION OF TEACHER’S ANSWERS



STEMSCOPES MATH

Cleburne ISD:

Across the 2022–2023 school year, 6th–8th grade teachers and 469 students in Cleburne ISD (Texas) participated in a product effectiveness study of the STEMscopes Math curriculum.

Teachers opted into the study for the year and had autonomy to choose how much or how little of the program they used.

At the end of the year, Cleburne ISD shared their STAAR Math scores for participating students.

A few themes emerged from the study. By the end of year, teachers were less consistent in their usage and even their report of usage (for example, one teacher indicated they are using STEMscopes Math as their core curriculum and yet they could not say how much they use it because their usage was “here and there”).

Across the board teachers felt students were behind grade level and several cited this as the main barrier to using problem-based learning components. Despite tepid perceptions and usage, **teacher-rated student enjoyment and engagement increased across the year.** We also found if we asked “what students find engaging” then most teachers indicated that the students liked the explores, but when asked what the teacher used most and what they thought increased student achievement, they focused on assessment. Associations between teacher responses and student data were complicated. At the beginning of the year STEMscopes Math use by teachers and teacher-perceived student enjoyment of STEMscopes Math both positively predicted NWEA spring standard scores and math progress/growth across fall to spring. By end-of-year (EOY), the association between teacher use and spring scores was negative and there was no association between EOY teacher use and progress/growth from fall to spring. Student enjoyment continued to predict EOY standard scores and math growth/progress.

Given teacher survey responses, we hypothesized that student enjoyment was a key factor for student success. Specifically, we felt **if teachers used STEMscopes Math more, students would enjoy the program more, which would, in turn, lead to higher scores. This was supported: We found that teacher use at EOY was positively and significantly associated with student spring standard scores through student enjoyment.**

Specifically, when teachers used STEMscopes Math more at the EOY, EOY enjoyment increased, which, in turn, increased student spring standard math scores.

Crandall ISD:

We also conducted a second-year study of STEMscopes Math in Crandall ISD. During 2021–2022, teachers were given the opportunity to try STEMscopes Math, while during the 2022–2023 school year, Crandall adopted STEMscopes Math district wide. Twenty-four kindergarten–6th grade teachers and their 583 students opted in to the study for the 2022–2023 year.

Overall, we saw significant increases in teachers’ perception of student mathematical learning and teacher-rated student enjoyment across the year. The teachers recognize that hands-on learning is an important element of this learning, but they also liked and relied on the evaluate components of STEMscopes. Results indicated that STEMscopes Math increases end of year scores on NWEA progress monitoring assessments for K – 1st grade students, and STAAR math scale scores among English Language Learners. Most teachers were using STEMscopes Math as their full curriculum and most would recommend STEMscopes and recognize its value in supporting teachers and students as well as preparing students for the future.



Case Studies

A case study is an in-depth analysis of an individual or group. In our case, it typically focuses on the successful use of a product in one school and includes administrative and teacher interviews as well as descriptive numbers that help the reader understand the school context and the products' use in the school better.

NISE

Wilemon STEAM Academy:

Wilemon STEAM Academy is a Kindergarten through fifth grade lottery elementary school in Waxahachie ISD in Texas. Wilemon serves 406 K–5 students (22% Hispanic, 5.4% Black/African American, 72.6% White). Wilemon STEAM Academy opened its doors to students in the fall of 2018. During that first year, Wilemon's principal, assistant principal, librarian, and all K–5 teachers completed the National Certificate for STEM Teaching (NCST). **In the spring of 2019, Wilemon STEAM Academy became the first in the district to earn the National Certificate for STEM Excellence (NCSE)–Campus Certificate.** Wilemon strove to create a campus where students and teachers wanted to be truly engaged in hands-on, real-world STEAM problem solving. One teacher noted:

“I thought it would be tons of work, but in reality, my workload feels like it's less because I've learned to become a facilitator. The kids are the ones exploring and solving problems, and I'm there to guide them. It's more student-centered and it's easier. The NISE certification also changed my mindset about STEAM. Before, I thought STEAM was just about building. But STEAM isn't about cardboard and hot glue guns. It's about problem solving, the 4 Cs, and so much more.”

Not only were teachers enjoying what they learned to apply during certification, Wilemon's curriculum has played a role in its success, according to school leaders and teachers. Wilemon has used STEMscopes Science since 2018, and added STEMscopes Math in 2020. **While many schools saw decreases in student performance as a result of the COVID-19 pandemic, Wilemon STEAM Academy has seen steady growth.** As one administrator noted: “In 2018–19, we were a “B” campus, which was really good for our first year. The next two years were pandemic years, so we didn't receive a rating. In 2021–22, we again received a “B” and were very close to an “A” rating. But more than the rating is the growth of the students. We see growth at each grade level every year.”

From 2021 to 2022, the percentage of fifth grade students who approached, met, or mastered grade-level learning goals increased by six percentage points in math and in science on the STAAR. A Wilemon teacher provided the best summary of the outcomes the NCSE and NCST certification activities and STEMscopes curricula:

“Our STAAR scores are higher because our kids are happy to dig in and do the work. We don't need to drill word problems or STAAR questions into their heads, because we're teaching them how to problem solve. The level of problem solving I see in my students is amazing, and it's because they've been doing it since kindergarten.”



MATH NATION

Liberty Middle School, School District of Pickens County – Liberty, South Carolina:

After seeing a downward trend in mathematics performance in grades 6–8, the School District of Pickens County (SDPC) decided a change was needed. After reviewing Math Nation, SDPC offered the 6–8th Grade Math curriculum to its middle schools in the fall of 2020. In 2021, one Liberty Middle school teacher began using Math Nation in her 8th grade math classes — and achieved exceptional results.

“On the NWEA MAP assessment, her students were growing multiple years rather than just a full year. They were outscoring students across the district,” noted the principal of LMS. “After that first year with Math Nation, other principals were calling and asking, ‘What are you doing in that 8th grade math class? How are students growing so much?’”

On the NWEA MAP Growth assessment’s conditional growth index—a standardized measure of observed student or school growth compared to NWEA norms—**these 8th grade students achieved more than twice as much growth (0.29) as the rest of the school (0.12). They also showed more growth than 56.32% of schools nationwide. In addition, while students’ projected growth was 5.35 points, their observed growth was 7.53 points.** In fall of 2022, LMS implemented Math Nation schoolwide in grades 6–8. In year two, the same 8th grade middle school teacher kept up the stellar results: **On the conditional growth index, her students achieved seven times more growth (0.73) than the rest of the school (0.10). Her students showed more growth than 68.88% of schools nationwide.** What about the rest of the school? **The evidence was clear: Math Nation helped all of LMS increase scores, exceeding their expected growth for the year.** Now the whole district has adopted Math Nation. LMS’ 8th grade teacher summarizes it best:

“I was hesitant to use Math Nation at first. I didn’t like having to change what I had always done, but I am so glad I did for my students’ sake. The proof is in the results.”

STEMSCOPES MATH

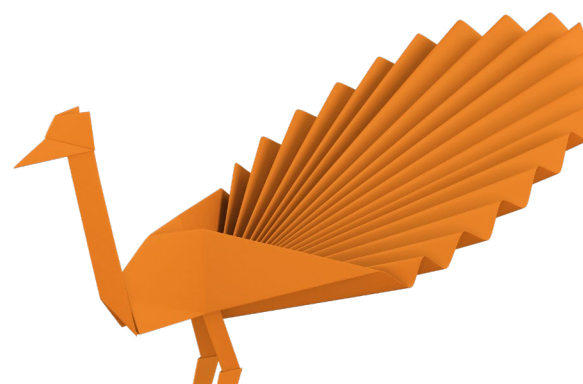
Brownsboro ISD – Brownsboro, Texas:

Brownsboro ISD includes six schools, serving 2,584 K–12 students in Northeast Texas (17.4% Hispanic, 5.8% Black/African American, 76.8% White). They struggled with inconsistent math curricula across campus and inconsistent results. Brownsboro ISD began using STEMscopes Math in grades K–5 in fall 2021 and expanded it to grades 6–7 the following year. Results soon followed. As one administrator put it:

“The difference in students’ understanding in foundational math practices made our teachers’ jobs much easier this year. They also said that their students came to them with a much better understanding of fractions. When they got to that unit, they said our kids blew it out of the water. The mini-lessons and the Explores in STEMscopes have helped our students make big gains.”

Not only did Brownsboro see significant increases in their math curriculum-based assessment scores, but they also saw growth in STAAR (see table). In summary, **“STEMscopes Math is a quality product. Teachers all want what’s best for their students and it takes a while to build teacher trust. But STEMscopes Math has won over even our hardest sells, and our kids are benefiting, which you can see from their assessment scores. Just walking into a classroom, it’s evident how much students are enjoying math. They want to go to math. It’s a lot more fun.”**

Grade	APPROACHES			MEETS			MASTERS		
	2021	2022	+/-	2021	2022	+/-	2021	2022	+/-
3	76%	80%	+4	35%	51%	+16	17%	27%	+10
4	71%	75%	+4	42%	42%	+0	26%	21%	-5
5	78%	86%	+8	45%	60%	+15	20%	25%	+5

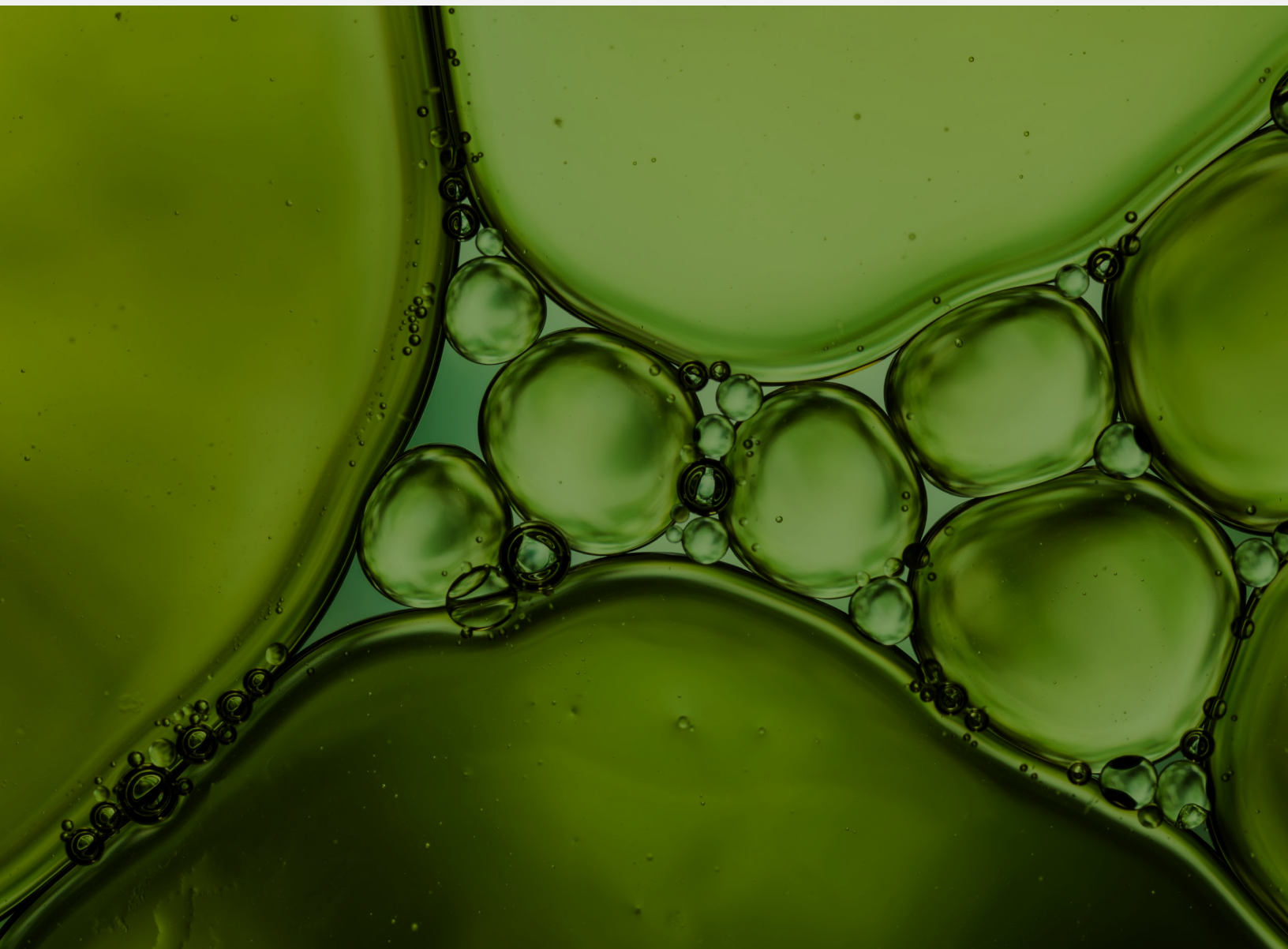


STEMSCOPES SCIENCE

Brinson Memorial Elementary – New Bern, North Carolina:

Brinson Memorial Elementary School is a large (n = 449) elementary school in Craven County School District, New Bern, North Carolina. They serve a diverse population (e.g., 17.5% Hispanic and 19% Black/African American) and were looking to raise end of grade science test scores, as only 54% of students passed their 2017 North Carolina End of Grade Science Assessment. Brinson noted that part of the problem was that teachers had to find their own science materials. Thus, in 2017 Brinson selected STEMscopes Science and implemented it in 5th grade. Over the next few years, Brinson Memorial expanded STEMscopes Science from grade 5 down to kindergarten. By 2022, 72% of fifth graders were performing at or above the proficient level on the EOG Science assessment, an 18 percentage point increase. The school also outperformed district and state averages in 2022. “What I have gleaned from this is that our students have improved because science is now engaging to them so they’re interested in learning. That was an eye-opener for me as a principal,” says Christopher Germain, principal of Brinson Memorial.

Germain also worked with the Craven County Schools (CCS) Director of Elementary Education and Federal Programs, Jason Griffin, to get STEMscopes into other CCS schools. Based on Brinson Memorial’s success, CCS gave all 15 elementary schools the option to implement STEMscopes Science in fall 2022. Eleven schools chose to implement it in grades K–5, two schools began using it in grades K–2, and two schools started using it in grades 3–5. “Our schools are building the leaders of tomorrow,” said Griffin. “With STEMscopes, we’re not just providing science content, we’re giving students opportunities to practice real-world skills. When you think about Bloom’s Taxonomy, I see students using higher order thinking skills in classrooms that use STEMscopes. Students are engaged and collaborating, and that’s a beautiful thing to see.”



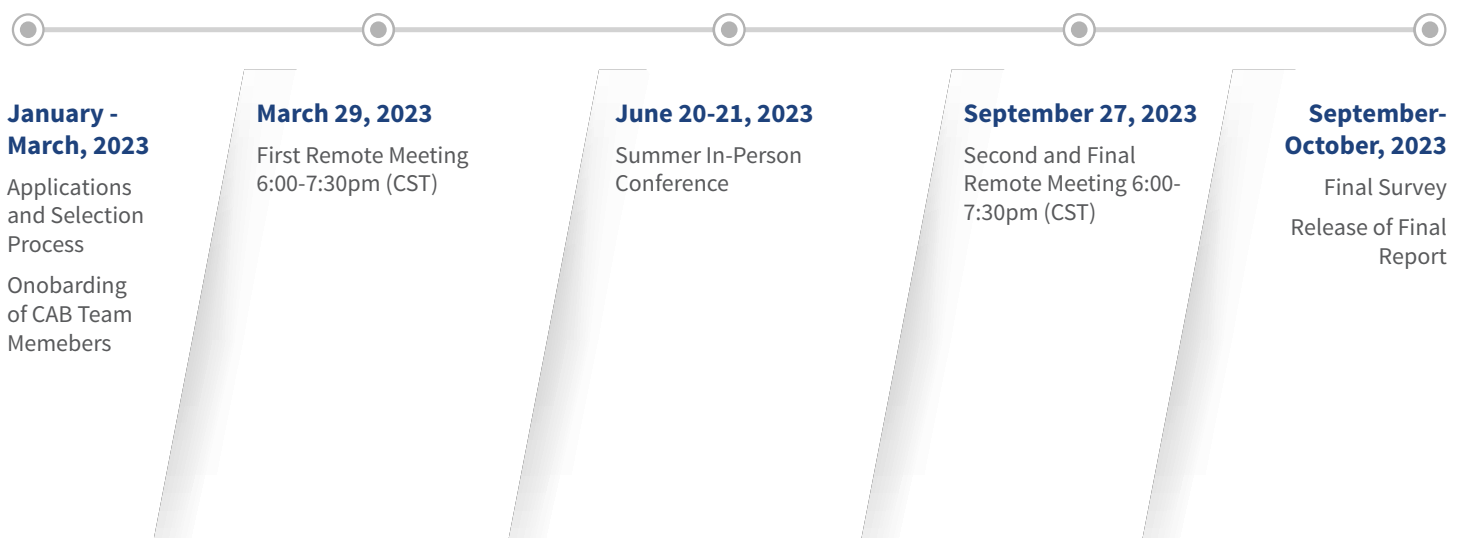
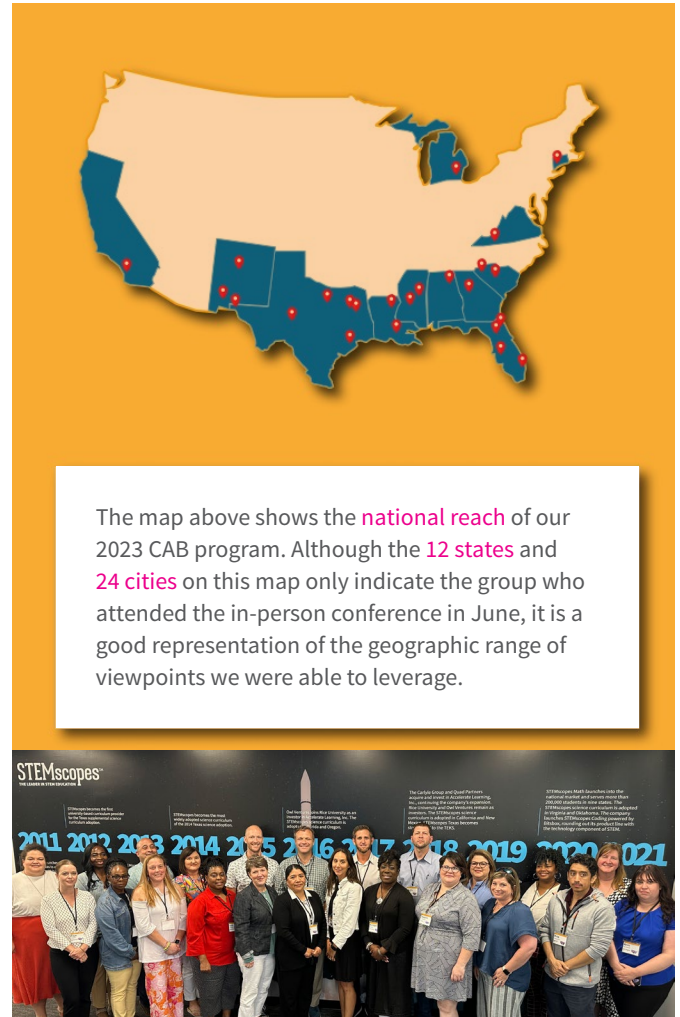
Customer Advisory Board (CAB)

Some of the most important research activities we conduct are those that ensure teachers and school experts are being heard regarding our products. Research in this category tends to be “descriptive,” meaning we are describing and listening to the opinions of our users to make sure we give them *exactly what they want and need*.

Early in 2023 we launched the inaugural version of the Customer Advisory Board (CAB). We designed our CAB to be a representative group of users and STEM education experts that would meet once per year face-to-face and twice remotely. The members of the CAB were called upon to provide us with feedback on our product and guidance on innovations. Our intent was to collaborate with key stakeholders to establish a consistent, steady, dependable group of users we could rely on to discuss our current resources as well as proposed enhancements.

The 36 original participants in the CAB team were more or less evenly divided into three groups based on their familiarity/expertise with the three products for which we were seeking feedback: STEMscopes Science, STEMscopes Math, and Math Nation. After an onboarding process the CAB team members met online once in the spring, attended an in-person conference in the ALI offices over the summer in Houston, and participated in a final online meeting in the fall.

Overall, the CAB participants felt engaged with the process and eager to collaborate in helping us maintain our high standards while providing guidance as we explore innovative new directions. Similarly, the ALI team found interactions with CAB members to be useful in learning about the practices, attitudes, preferences, and wishes of our current user base.



Customer Surveys

MATH NATION

Teacher survey conducted with WestED:

In early spring 2023, ALI research and WestED collaborated by surveying 106,000 active Math Nation teachers to evaluate how often teachers used Math Nation, their perceptions of the program, and if there were any differences in usage and perception by teacher experience, classroom usage, and school level (middle versus high school). While 2,158 teachers responded (2%), many teachers were not using Math Nation at the time for a variety of reasons and so the sample was trimmed to active users, leaving 952 teachers (~1%). Respondents represented 16 different states, with the majority from Florida (40%) and South Carolina (25%); 455 teachers taught middle school (only), and 399 taught high school (only).

Program Use. WestED asked about Math Nation use in the classroom as well as at home. The most common response was that teachers used it once a week at school and assigned it for homework once a week. Of the 952 teachers, 161 (17%) noted they use it every day in the classroom.

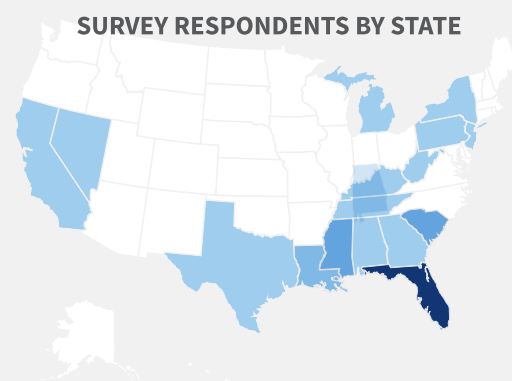
Teacher Perceptions. Overall, teachers reported highly positive perceptions of Math Nation. Most teachers reported positive perceptions regarding the general accessibility of Math Nation, specific benefits of Math Nation to students and teachers, as well as specific features of Math Nation. The data also revealed some differences between teachers with different levels of teaching experience, different levels of Math Nation usage, and teachers who primarily teach middle or high school grade levels. For example, teachers with five years or less teaching experience placed more value, comparatively, on the Teacher Wall and the On-ramp courses, while more experienced teachers placed more value on the Check Your Understanding Tool and the student workbook. Another example of differences related to teachers who used Math Nation once a week versus those who used it daily. Specifically, the majority of teachers with low classroom usage selected online accessibility as the most important reason (77%), while the majority of teachers with high usage selected alignment with state standards as their top reason for using Math Nation (73%). As a final example of findings, when asked which Math Nation tools teachers feel are the most effective for improving students' success in math, regardless of the grade level teachers teach, the top two tools selected were the Check Your Understanding Tool and the Study Expert videos. However, middle school and high school teachers showed some differences in their response patterns. Middle school teachers placed more value on the Check Your Understanding Tool and the Test Yourself Tool, compared to high school teachers. High school teachers placed comparatively more value on ACT, PSAT, and SAT Prep Courses, as effective tools for improving students' success in math. **In conclusion, the findings from the survey were overwhelmingly positive and offered insight into how teachers with different experience levels, usage patterns, and grade levels felt about Math Nation.**

Math Nation Feedback on Books Survey:

In July, we sent a survey to 19,912 current Math Nation users to solicit feedback on new features and components of the Math Nation books. The survey was completed by 795 users, representing a 4% response rate. Respondents represented 15 different states, with the majority from Florida (64%) and South Carolina (17%).

Book Access. Overall, it was common for student books to always stay in the classroom (42%), although roughly a third of respondents had students take books home and bring them back (29%). This pattern was consistent across states.

Ratings of Book Features and Components. On a scale of 0 to 10, teachers rated the two-volume book set at 5.4. Florida users rated the book at 5.9, while non-Florida users rated it at 5.1. Respondents were most interested in the color (64% "I want it"), perforation (60% "I want it"), and 3-hole punch (60% "I want it"). **Collectively, respondents felt that the content components (70%) and student working space (74%) were just right.** These patterns were consistent across each state, and when comparing Florida to non-Florida users.



STEMSCOPES MATH

Teacher Survey conducted with WestED:

In early spring, 2023 ALI research and WestED collaborated on a survey of 350,000 active STEMscopes Math teachers to evaluate how often teachers used STEMscopes Math, their perceptions of the program, and if there were any differences in usage and perception by teacher experience, and classroom usage. A total of 7,918 teachers responded (2%); however, many teachers were not using STEMscopes Math at the time for a variety of reasons and so the sample was trimmed to active users, leaving 3,911 teachers (~1%). Respondents represented 44 different states, with the majority from Texas (54%) and Florida (16%).

Program Use. WestED asked about STEMscopes Math use in the classroom. The most common response was that teachers used it 1–2 times a week (27%), while 25% noted they use it every day.

Teacher Perceptions. Overall, the results of this survey demonstrated highly positive perceptions of STEMscopes Math from teachers. Most teachers reported positive perceptions regarding their general impressions of STEMscopes Math, specific benefits of STEMscopes Math to students and teachers, as well as specific features of STEMscopes Math. The data also revealed some differences between teachers with different levels of teaching experience and different levels of STEMscopes Math usage. For example, less experienced teachers (fewer than five years) generally had more positive perceptions regarding the programs efficacy to increase test scores and prepare students for

future learning than more experienced teachers (six or more years), although most teachers rated it highly across the board (average “agree” or “strongly agree” on these items was 88%). In addition to teacher experience and based on teachers’ responses on their STEMscopes Math usage in the classroom, respondents were split into two groups: those who reported using STEMscopes Math once every other week or once a month (low classroom usage; n = 797) and those who reported using STEMscopes Math every day or 3–4 times per week (high classroom usage; n = 2,023).

When comparing teachers’ response patterns regarding their perceptions of STEMscopes Math, teachers with high STEMscopes usage were found to consistently have more positive perceptions, compared to teachers with lower STEMscopes Math usage.

For example, teachers who used the program more were more likely to agree that they would recommend the program, that the program was efficacious, and that many program elements were helpful, compared to the lower users.

In summary, responses were very positive and offered insight into how teachers with different experience levels and usage patterns felt about STEMscopes Math, with high usage especially leading to more positive perceptions as teachers became accustomed to the program and how its model.



STEMSCOPES SCIENCE

Teacher survey conducted with WestED:

In early spring, 2023 ALI research and WestED collaborated and sent a survey to 390,000 active STEMscopes Science teachers to evaluate how often teachers used STEMscopes Science, their perceptions of the program, and if there were any differences in usage and perception by teacher experience, and classroom usage. A total of 8,841 teachers responded (2%); however, many teachers were not using STEMscopes Science at the time for a variety of reasons and so the sample was trimmed to active users, leaving 6,540 teachers (~1.7%). Respondents represented 49 different states, with the majority from Texas (48%) and California (8%).

Program Use. WestED asked about STEMscopes Science use in the classroom. The most common response was that teachers used it 3–4 times a week (32%), while 19% noted they use it every day.

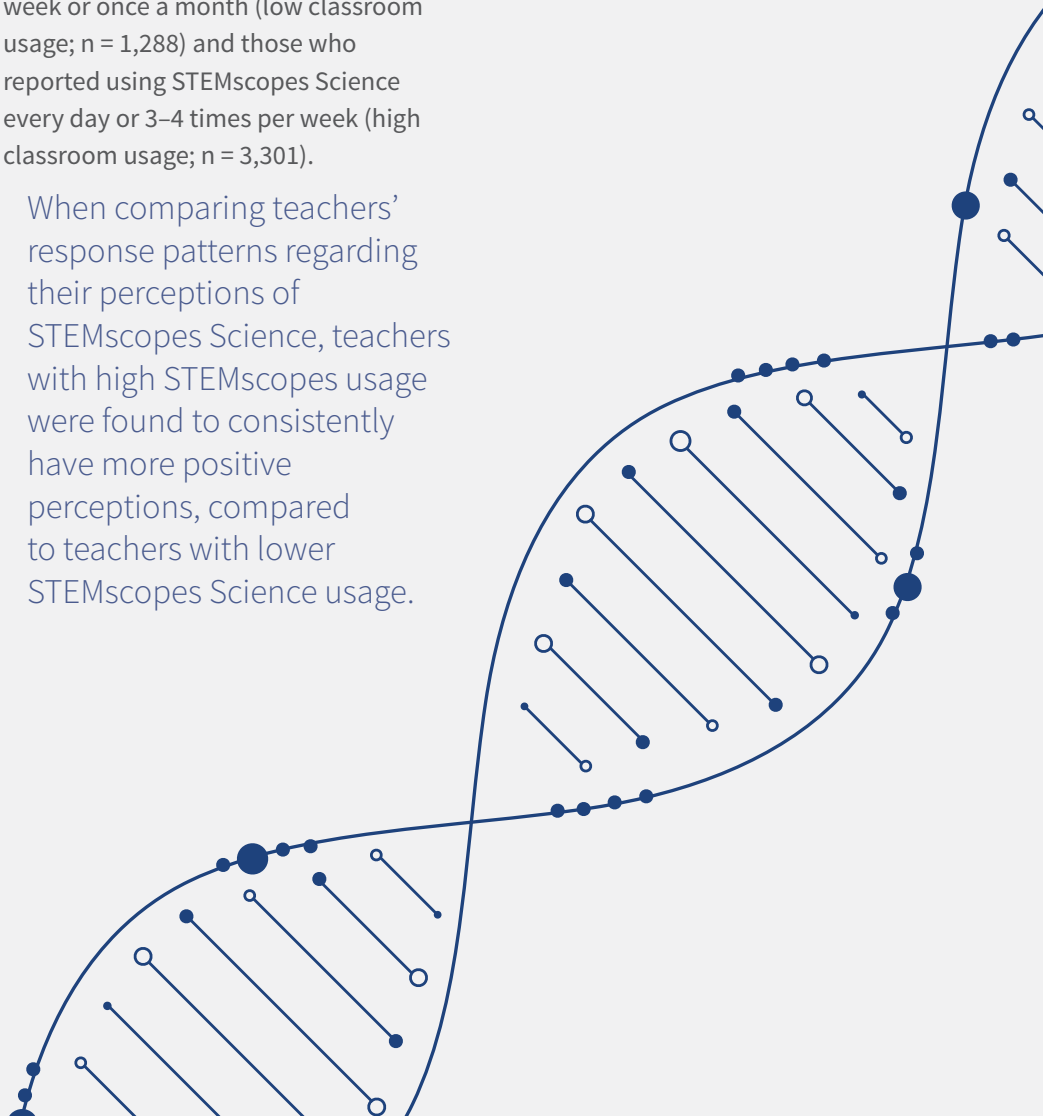
Teacher Perceptions. Overall, the results of this survey demonstrated highly positive perceptions of STEMscopes Science from teachers.

Most teachers reported positive perceptions regarding their general impressions of STEMscopes Science, specific benefits of STEMscopes Science to students and teachers, as well as specific features of STEMscopes Science. The data also revealed some differences

between teachers with different levels of teaching experience and different levels of STEMscopes Science usage. For example, less experienced teachers (fewer than five years) generally had more positive perceptions regarding the program’s ability to help differentiate instruction, although numerous prompts resulted in high responses with no differences (e.g., “STEMscopes Science assumes all students are capable of learning and doing science,” to which 95% of teachers with five years or less and 94% of teachers with six years or more experience agreed or strongly agreed). In addition, based on teachers’ responses regarding their STEMscopes Science usage in the classroom, respondents were split into two groups: those who reported using STEMscopes Science once every other week or once a month (low classroom usage; n = 1,288) and those who reported using STEMscopes Science every day or 3–4 times per week (high classroom usage; n = 3,301).

When comparing teachers’ response patterns regarding their perceptions of STEMscopes Science, teachers with high STEMscopes usage were found to consistently have more positive perceptions, compared to teachers with lower STEMscopes Science usage.

For example, teachers who used the program more were more likely to agree that they would recommend the program, that the program was efficacious, and that many program elements were helpful, compared to the lower users. **In summary, responses were very positive and offered insight into how teachers with different experience levels and usage patterns felt about STEMscopes Science, with high usage especially leading to more positive perceptions as teachers became accustomed to the program and how its model.**



GENERAL ED TECH SURVEY

Teacher survey conducted with WestED:

In early spring 2023, ALI research and WestED collaborated on a survey sent to teachers who do not use Math Nation or STEMscopes Science/Math to see what these teachers value in the other programs and materials they have selected (please note that Kide was not yet part of ALI at the time of the survey). WestEd sent the survey to ~50,000 emails of teachers, sourced by Agile Education Marketing. WestEd also evaluated whether survey responses were different by teacher type (Math, Science, or teachers who teach all subjects). WestEd received responses from 806 participants (1.6%) across 38 states, spread evenly across regions, with the highest percentage coming from Illinois (12%). Descriptive statistics showed that most respondents were not familiar with Math Nation, STEMscopes Math, or STEMscopes Science (90%, 83%, and 78%, respectively).

Product Decisions. Teachers were asked to report how education products were selected for purchase and used for instruction. The majority (84%) reported that this decision is based on the selection of their district, 41% reported it being based on the selection of their school, and 26% reported it being based on their personal selection. The top three reasons leading to the selection of specific education products were 1. Alignment to state standards (52%); 2. Quality and rigor of materials (42%); and 3. Levels of student engagement (38%). Teachers were asked to rate how important different characteristics of an ideal education product are to them.

For example, **98% of teachers find levels of student engagement important or very important and 96% of teachers find relevance or meaningfulness of activities to students important or very important.**

Differences in product decision by subject/s taught. WestEd examined differences in responses between math teachers (n = 173), science teachers (n = 95), and teachers teaching all subjects (n = 354). Note that those teaching primarily math or science were mostly middle school teachers (62% and 72% only taught middle school grades, respectively) and those teaching all subjects mostly taught grades K-5 (89% only taught in grades K-5). The three groups selected similar reasons that lead to selection of education products, such as alignment to state standards.

However, math teachers placed more value on accessibility of online materials, research based/previous evidence of impact, and the ease of integration into the classroom, compared to science teachers and teachers who taught all subjects. Science teachers placed more value on active or hands-on learning, quality user experience, and alignment with the 5E method of teaching, compared to math teachers and teachers who taught all subjects. Teachers who taught all subjects placed more value on student enjoyment, up-to-date materials, and support for instruction, compared to math and science teachers.

Results also revealed some differences regarding the importance of different characteristics of an ideal education product. For example, a significant difference was seen for active or hands-on learning, which was rated as important or very important by 98% of the science teachers, but only by 82% of the math teachers and by 92% of teachers who taught all subjects. **These trends imply the need to adapt products and their marketing to align with the ideals of teachers who teach different subjects.**



Dissemination

The most important part of the research process is that we conduct high quality studies of our products. Yet, equally important is making sure those studies are described and disseminated. Below we present peer reviewed research papers, white papers, and conference presentations. Peer reviewed papers are written by experts in the field and undergo the scrutiny of other experts in the field. They can range in topic and type, including reviews, original research, data reports, and theory articles (to name a few). White papers are informational papers issued by a company to promote a solution to a critical problem that faces education today. Conference presentations describe research that was presented nationally and internationally to peers.

PEER REVIEWED

Although this report delineates research completed in 2023, we take this opportunity to introduce the excellent peer reviewed articles that support Kide Science, as this is their first year as part of the ALI family.

Kide Science. Kide Science's pedagogical model, Playful Inquiry, has been developed through over five years of academic research (Vartiainen, 2016). The model was studied in classrooms involving children aged 3 to 8 years (n=135) from 2017 to 2020 (Vartiainen & Kumpulainen, 2019a, 2019b, 2020). We used an ethnographic research design. Ethnographic research is a deep dive into people's lives. Instead of just asking questions, researchers become a part of the educational community they are studying. They observe daily routines, talk to individuals, and soak in the educational and classroom context firsthand. Specifically, this research emphasized understanding children's engagement in science and STEAM practices during Playful Inquiry lessons through their perspectives and points of view. Video recordings (>500 h), observations, and children's drawings/schoolwork (whatever the artifacts were) were collected as data. The outcomes revealed the pivotal role of play in young children's

STEAM education. Through play, children acquire the cultural norms of science, and play serves as a scaffold for the entire inquiry process. The children demonstrated an ability to use versatile scientific process skills, connect science-related conversations to their prior experiences and knowledge, adapt outcomes to familiar contexts, such as their play and home environments, and propose expansions and enhancements for inquiry. Playful Inquiry encourages children to evolve their everyday concepts into scientific concepts and fosters science-related talk among children.

Vartiainen, J., & Kumpulainen, K. (2020). Playing with science: manifestation of scientific play in early science inquiry. European Early Childhood Education Research Journal, 28(4), 490-503.

Vartiainen, J., & Kumpulainen, K. (2020). Makerspaces, Multiliteracies and Early Science Education: The Finnish Approach. In A. Blum-Ross, K. Kumpulainen, & J. Marsh (Eds.), Enhancing Digital Literacy and Creativity: Makerspaces in the Early Years: Makerspaces in the Early Years (pp. 38-52). Abingdon, Oxon: Routledge.

Vartiainen, J., & Kumpulainen, K. (2019). Promoting young children's scientific literacy as a dynamic practice. In K. Kumpulainen, & J. Selton-Green (Eds.), Multiliteracies and Early Years Innovation: Perspectives from Finland and Beyond (pp. 77-94). (Routledge Research in Early Childhood Education). London: Routledge.

Vartiainen, J. (2016). Design-based educational research: Young children's inquiry-based learning in non-formal learning environments. Academic dissertation. Unigrafia, Helsinki.

WHITE PAPERS

STEMscopes Science:

We have created a manuscript for publication and distribution to the wider STEM education community. The main thesis of this paper, entitled “The Use of a Constructivist-Based Inquiry Curriculum Leads to Greater Engagement and Higher Achievement Scores for All Student Populations,” is that a constructivist approach to STEM education is particularly effective in narrowing the achievement gap because,

rather than operate from a deficit model that focuses on what students can’t do, the approach takes into account the learners’ current understanding and supports them in building and refining their mental model of the world.

The paper moves from this theoretical foundation to provide evidence of how the constructivist model, as exemplified by STEMscopes Science curriculum, has demonstrated effectiveness in raising the scores of historically underserved and low-performing populations of students. The document uses studies from four contexts—Dallas, Florida, Texas, and Alabama—to highlight the positive outcomes in achievement for all students, including those who typically do not perform as well as the general population.

Thompson, C.J., Whitaker, J.R., May, K., & Monroy, J.J. (2023). The Use of a Constructivist-Based Inquiry Curriculum Leads to Greater Engagement and Higher Achievement Scores for All Student Populations. Manuscript in preparation.

SCIENTIFIC CONFERENCE PRESENTATIONS

European Science Education Research Association Conference, Turkey:

The study investigated young children’s deviations from a task while working with playful inquiry activities. Task deviations have the potential to reveal what kind of knowledge children find it meaningful to produce during an inquiry activity. Thus, it provides teachers with an understanding of children’s thinking and helps them to make learning STEAM more meaningful for children. The video data (810 min) was collected from a group of kindergarten children (n=6, 4–5-year-olds) and their teacher. The teacher implemented a nine-week playful inquiry program with the children, consisting of nine inquiry-based science learning units embedded in stories and dramatic play. **The data revealed that teachers used three interaction types to answer children’s initiations. The interaction that followed children’s initiations and deviations was the only one that developed children’s scientific literacy at all levels.** The study finds that, in inquiry-based science education, teacher and children form a learning community and the power of deciding what knowledge is worthwhile and meaningful to produce is not owned by a teacher but is a result of negotiation and allowing children to take agency.

World Bank Presentation, Washington:

The World Bank invited Jenni Vartiainen, PhD to share insights from her research and Kide Science to improve the possibility of high-quality early childhood education based on play. The main message of the presentation was that play is a leading activity that gives children countless opportunities to practice essential skills they will need in the future. Despite this, children play less now than in previous generations. At the same time, children’s well-being is rapidly decreasing, and children suffer mental health problems and problems in their physical health at very early ages. We could improve children’s well-being in kindergartens, preschools, and schools significantly by bringing more play aspects into learning.

Dr. Vartiainen ended the presentation by stating, “Sometimes I’m asked to prove that learning by playing is more effective than direct teaching. I’m asked to give a number: How much more effective is play-based learning? The question is ridiculous. When we talk about play and playful learning, we are not talking about pushing children to accomplish even better grades. We are talking about children’s well-being, mental health, and physical health. Their well-being is dependent on the possibilities to play and their possibilities to learn the way children naturally learn: by playing.” The presentation received excellent feedback.

Grants and Upcoming Projects

As noted previously, this year ALI began partnerships with numerous outside partners. Some of these partners helped us conduct and complete the studies described above, while other projects started this year and are ongoing. We are excited to describe these partnerships, as they demonstrate the type of research findings can be expected soon. We are particularly excited to describe that, for the first time ever, ALI research has applied for and been awarded several grants. Research grants are awards given to companies or research universities/entities to conduct a study. Overall, ALI was awarded over 9.5 million dollars worth of funding for research and development grants this year.



KIDE SCIENCE

Tools Competition:

In November, we submitted a proposal for the Tools Competition. If we are successful, we will receive \$300,000 for research and development of a resource that will support Instructional Coaching for Early Childhood Education. The proposed innovation is “The Kide Science Tool Chest,” a novel coaching resource designed to empower teachers in their individual professional development journey. The Tool Chest includes coaching tools that support teacher-coach pairs in improving their interaction and the quality of coaching and provide a step-by-step guide for teachers to learn play-based instructional methods, especially in STEM and literacy. These methods benefit all learners, including bilingual children and those with diverse learning needs. Additionally, the Tool Chest shifts the coaching power to the teachers themselves, enabling them to self-assess their progress and establish goals for their unique professional development path.

MATH NATION

US Department of Education Innovation and Research (EIR) Grant, Alabama RCT Study:

Accelerate Learning, in partnership with WestEd, received an \$8 million dollar grant (\$3 million for ALI) to conduct a randomized control trial (RCT) across 34 schools in Alabama, randomly assigning half of the schools to use Math Nation for Algebra 1 (Cohort 1) while the control schools use business-as-usual Algebra 1 courses (Cohort 2). **The study will collect data on adoption, implementation, cost, scaling, and sustainability of Math Nation, while including an impact study to analyze Math Nation’s effect on teachers’ instructional activities, students’ opportunities to learn, and students’ achievement outcomes.**

This research investigates how an intervention that combines evidence-based components, including varied approaches to teacher PD (e.g., technology-enhanced approaches), can impact success for all students in Algebra 1. **Although Math Nation is widely implemented and a number of research evaluation studies have been published, there are no large-scale experimental studies to date. This large-scale RCT study will address this need by providing more rigorous evidence.** We expect the study to show increases in student math achievement and course performance following implementation of Math Nation. Moreover, the study will explore the impact of contextual factors, such as school contexts, teacher and classroom characteristics, and student characteristics on student achievement, teacher instructional activities, and opportunities to learn.

The results of the RCT will produce rigorous evidence and provide critical information for educators, policy makers, and education technology developers. As such, this project will determine whether a standards-aligned, research-based, comprehensive support program can successfully improve Algebra 1 achievement in a largely rural setting with a high percentage of high-need students across Alabama. Moreover, this study will build additional evidence of effectiveness around the strategies used by Math Nation to tackle a critical national issue, meeting the ESSA 1 standard for strong evidence. It will also unpack several of the educational problems and issues around implementing and navigating technology-based Algebra 1 support programs.

To launch the study, teachers were invited to a two-day professional development training in the summer to familiarize themselves with the curriculum and platform and learn how to use the Math Nation resources effectively. Thirty-four schools are enrolled in the study and randomly placed in either the control group (n = 17) or the treatment group (n = 17). In the 17 schools in the treatment group, 19 Algebra I teachers and 6 others are participating. All participants have the opportunity for four days of in-person PD and 10 hours of virtual PD. To accommodate schedules and locations, 12 days of in-person PD and 32 hours of virtual PD have been offered to date. Teachers will have an additional in-person opportunity in January, and each of the virtual trainings will be offered once more.

Schmidt Foundation LEVI Grant:

In partnership with the Lastinger Center at the University of Florida, Math Nation has been awarded a \$1.8M grant through the Learning Engineering Virtual Institute (LEVI) **to develop and test an artificial intelligence (AI) powered learning by teaching agent to support students’ math learning.** Math learning faces several challenges, including a lack of deep understanding, critical thinking, engagement, and knowledge retention. An effective approach for students’ learning by empowering, guiding, and engaging them is learning by teaching (LT), a pedagogy where students take on the role of the teacher and explain or teach the material to a simulated audience or their peers. In addition, this pedagogy aligns well with important learning sciences’ constructs and strategies (e.g., misconceptions, monitoring, and self-reflection) to further improve students’ learning. **We plan to further augment LT with the latest AI technologies to support math education.**

Specifically, this project will infuse multimodal large language models (LLMs) to empower students with LT. To help the conversation flow, students will first select among prepared discussion topics based on a student’s current learning progress. Students will then conduct in-depth conversations with the agent to correct, touch up, and provide feedback on its responses. The Lastinger Center will engineer the agent to generate responses showing misconceptions, which can be achieved by fine-tuning smaller-sized models (e.g., LLaMA 7B) by using the conversational data mapped with misconceptions in Math Nation. Once the students believe the teachable agent is ready, they can evaluate its learning outcomes through automatically generated quizzes. Based on the evaluation results, students will be scaffolded to assess, reflect on, and enhance their learning.

This project will expand the types of innovative, technology-based supports Math Nation provides students, while building additional evidence around the strategies used by Math Nation to improve student knowledge and retention in Algebra. Moreover, this partnership represents a critical step forward to remain at the cutting edge of developments within the ed-tech market. Given the rapid technological advancement and prevalence of AI, it is imperative that we harness the potential of AI technologies to support students and innovate teaching and learning practices, while ensuring that its application in educational contexts is guided by the core principles of pedagogy. We expect this partnership to contribute to the growth of AI-powered educational tools.

Bill and Melinda Gates Foundation Grant: Develop a K–5 Math Nation Illustrative Mathematics (IM) Curriculum:

ALI, in partnership with WestED, has been awarded a \$4.8M grant from the Bill and Melinda Gates Foundation to 1) develop a high-quality, online K–5 Math Nation IM curriculum; and 2) to conduct strategic rapid-cycle testing to assess the product’s usability, feasibility, and influence on student motivation, engagement, and persistence, as well as learning outcomes. ALI will develop the full Illustrative Mathematics curriculum and WestEd will conduct rapid cycle testing. This innovative approach aims to provide real-time feedback and analysis to support immediate implementation and desired results within a program.

This will produce a large and lasting impact that will help inform the K–5 Math Nation curriculum and future product developments. The development of a K–5 Math Nation Illustrative Mathematics curriculum through a cutting-edge approach represents an important contribution toward ALI’s vision to “prepare all students for the challenges of tomorrow by leading STEM education of today.”

Microsoft MSFT Research Partnership:

Math Nation has been invited to partner with Microsoft (MSFT Research) and the University of Florida to develop and test an open-multimodal large language model (LLM) focused on math tutoring. This language model would support the development of an artificial intelligence (AI) powered math tutor. MSFT has invited ALI to partner on the project to train their model and have first use of the AI tool. The University of Florida Lastinger Center will serve in a project management role.

The personalization of learning through individual tutoring has long been known to improve student achievement (Bloom, 1984; Cohen et al., 1982; Kulik, 1994). Technology offers promise for increasing its availability (Escueta et al., 2017). Digital tutoring has been shown to positively impact algebra performance (Koedinger et al., 1997) and preparation for standardized tests (Arroyo et al., 2004; Beal et al., 2007). However, few studies to date have examined the prospective impact of AI technologies on the learning process, and how AI can be leveraged for digital tutoring.

We plan to further augment digital tutoring with the latest AI technologies to support math education.

Specifically, this project will infuse multimodal large language models (LLMs) to empower students via an AI-powered math tutor. MSFT Research will engineer the agent to generate responses by using the conversational data in Math Nation, which will provide insight into the nature of conversations necessary to build a high-quality math tutor.

National Science Foundation DRK12 RCT Study in Mississippi Grant:

In partnership with WestEd, ALI submitted an NSF DRK12 grant **to study the impact of supplemental Math Nation resources on Algebra 1 achievement in Mississippi**. The proposed project is an efficacy study of 8th grade Math Nation, a curriculum administered as a blended learning environment. The study will involve school-level randomization with approximately 80 schools, 200 teachers, and 10,000 students. Participating schools will receive access to the digital curriculum, teacher guides, student books, instructional coaching, and professional development at no cost. Participating schools will also receive funding to implement the curriculum as well as teacher stipends. Schools in Mississippi will be randomly assigned to Cohort 1 or Cohort 2, with their 8th grade classrooms as participants. Cohort 1 teachers in the treatment schools will teach 8th grade math supplemented by Math Nation during Year 1 of the study. Cohort 2 teachers will teach 8th grade math as they normally would during Year 1 and receive full access to the Math Nation curriculum and training in Year 2.

Outcomes of interest include scores on state tests, passing rates for 8th grade math, and student enrollment and pass rates following two years of mathematics course.

The study will collect data on adoption, implementation, cost, scaling, and sustainability of Math Nation, while including an impact study to analyze Math Nation’s effect on teachers’ instructional activities, students’ opportunities to learn, and students’ achievement outcomes.

The study will produce rigorous evidence and provide critical information for educators, policymakers, and education technology developers. We will receive notice in February of 2024.

Mississippi State University Expert Videos Study:

According to a recent Pew Research report, the demographics of the US teacher workforce do not match the demographics of our nation’s students. While approximately 30%, 15%, and 5% of US students are Hispanic, Black, and Asian, respectively, about 80% of US teachers are White (Schaeffer, 2021). Prior studies have demonstrated that shared teacher-student identity markers can foster a sense of belonging and enhance students’ mathematical self-efficacy (Goffney et al., 2018). Moreover, mutual lived experiences between teachers and students can enhance mathematics teaching and learning (Frank et al., 2021). **In partnership with Mississippi State University, Math Nation is evaluating how Study Expert videos contribute to students’ mathematical self-efficacy and math achievement. This project will investigate how students select a Study Expert and whether working with Study Experts with shared identity markers (e.g., race, gender) impacts achievement.**

Hillsborough County (Florida) Algebra 1 Product Effectiveness Study for 2023–2024:

Math Nation is partnering with Hillsborough County School District (Florida) to evaluate teacher use and opinions of the Algebra 1 Math Nation curriculum and student enjoyment related to student math growth. Recruitment for the study began in September of 2023. To date, four teachers have signed on to participate. Participating teachers will be asked to complete a survey about their curriculum usage, student enjoyment, usage of the Math Nation components, and student progress. Teachers will also participate in a one-hour online teacher focus group in March of 2024. Once the 2023–2024 school year has finished, we will correlate teacher survey responses with student math progress monitoring data for students of participating teachers to evaluate the positive association between Math Nation Algebra 1 use by the teacher and student math growth, and to evaluate the association between student enjoyment of Math Nation Algebra 1 and student math growth and enjoyment.

STEMSCOPES SCIENCE

Mixed Methods Equity Study:

In the spring we began a collaboration with Texas Tech researcher, Dr. Rebecca Hite, to conduct a mixed-method study of teacher experiences with STEMscopes Science. Specifically, **the study examines how utilizing STEMscopes as a curricular resource can improve teachers' comfort, familiarity, and proficiency in constructivist techniques and how this intersects with their ability to address equity in their classroom.** After collecting more than 100 surveys and conducting 30 interviews, Dr. Hite is now analyzing the data to produce a preliminary report. She will use qualitative content-driven analyses to delve into what the teachers said (instead of counting how many different teachers said it). She will specifically be looking for patterns and themes around classroom equity.

STEMscopes Science Florida Study:

In the fall we began a collaboration with Dr. Walter Leite. Dr. Leite is a professor and quantitative methodologist in the Research and Evaluation Methodology Program as well as the director of the Virtual Learning Lab at the University of Florida. He will conduct analyses to evaluate the potential effect of STEMscopes Science on Florida schools' passing rates on the 2023 Florida Statewide Science Assessment (FSSA). STEMscopes schools will be matched on school demographics to non-STEMscopes schools to test potential passing rate differences. In addition, Dr. Leite will evaluate whether schools that purchased the STEMscopes Science materials kits had additional increases in FSSA passing rates. Results will provide outside evaluation and important evidence in a key state that has many STEMscopes Science schools.

STEMscopes Science Dallas ISD School Efficacy Study for 2023-2024:

We are continuing our partnership with Johns Hopkins University (JHU) to conduct an efficacy study with an outside evaluator. This study is designed to meet ESSA Tier 2 standards of evidence. As part of this study JHU will match Dallas STEMscopes schools to non-STEMscopes schools prior to the end of year STAAR Science test, based on key school demographics. Once STAAR is complete, they will analyze student level scores to test whether student achievement is higher in STEMscopes schools than in non-STEMscopes schools. JHU will also consider student demographics in relation to scores to evaluate STEMscopes uptake among different student subpopulations. Expected positive results demonstrating that students who learn with STEMscopes Science have higher scores than peers in matched schools will be submitted for peer reviewed publications and to websites such as evidenceforESSA.org that help schools evaluate program efficacy.

STEMscopes Science Randomized Control Trial (RCT) Study with LXD Research and WiKIT:

In collaboration with LXD Research and WiKIT, ALI had been awarded up to \$50,000 matched dollars from the Jacobs Foundation to complete a full randomized controlled trial of STEMscopes Science. Schools in Texas will be randomly assigned to Cohort 1 or Cohort 2, with their elementary classrooms as participants. Cohort 1 teachers in the treatment schools will teach science with the STEMscopes Science curriculum as their core curriculum during Year 1 of the study. Cohort 2 teachers will teach science as they normally would during Year 1 and receive full access to the STEMscopes Science curriculum and training in Year 2.

Outcomes of interest include scores on progress monitoring and state tests.

The study will collect data on adoption, implementation, cost, scaling, and sustainability of STEMscopes Science.

The study will produce rigorous evidence and provide critical information for educators, policymakers, and education.

LXD is a leader in the field, helping companies conduct high quality research studies. To date, they have helped numerous private education companies collect high quality evidence for the EvidenceforESSA.org website.

NISE

North Carolina State University Research Partnership:

The purpose of this study is to evaluate the associations between the NISE professional development micro credentialing programs and teacher outcomes. Specifically, NC State is collecting survey data from teachers as they start NISE micro credential courses and again six months later, after they have completed at least two courses. The main outcomes of interest are understanding factors that support teacher motivation and implementation of what they have learned during their micro credential courses; what barriers impede implementation; and whether there are teacher factors (such as whether the teacher sees themselves as an independent learner) that also affect teacher perceptions of the value of their micro credential courses. This is part of a larger study evaluating several STEM micro credential courses and how these courses may be an efficacious way to prepare STEM teachers. This evidence provides ALI with important information about our customers as well as pilot data that will help us to design a larger scale study of teacher professional development and its association with student outcomes.

COLLABORATE SCIENCE

Department of Education IES Maturation study:

In September, we submitted a grant proposal to the Institute of Educational Sciences (IES) with WestEd to study the implementation, use, and impact of Collaborate Science in 3rd and 4th grade classrooms. Collaborate Science is a K-5 phenomenon driven storyline Multiple Literacies in Project-Based Learning (ML-PBL) curriculum aligned to the Next Generation Science Standards (NGSS). Collaborate Science leverages meaningful, hands-on, inquiry-based projects so that students develop a deeper understanding of the world they live in as they learn about science. The interdisciplinary focus emphasizes science learning and literacy and math knowledge and skill, as well as aspects of social and emotional learning (SEL). Questions that focus on real-world problems and complex scientific phenomena drive the learning and anchor the lessons. The ML-PBL approach includes curricular and instructional resources, and professional-learning support for teachers. Notably, Collaborate Science is the first K-2 ML-PBL curriculum on the market, yet no studies to date have examined the efficacy of a PBL curriculum in early elementary. Towards this, we will conduct a maturation study to determine if the approach improves 2nd and 4th grade students' science learning and aspects of their social and emotional development related to science learning.

If awarded, the project will begin during the summer of 2024, when we will create instrumentation, on board personnel, and create the appropriate connections with the school districts. In the 2025-2026 and 2026-2027 academic years, we will systematically study how Collaborate Science is being implemented, how teachers and students are responding to and engaging with Collaborate Science, and how Collaborate Science ultimately impacts students. Data collected will evaluate the full user experience from teachers and students along with the aspects of the program that drive motivation, engagement, persistence, and other ideal learning conditions. Accelerate Learning, Inc. (ALI) will analyze Collaborate Science's effect on teacher instructional activities, student opportunities to learn, student social emotional outcomes, student interest in STEM and STEM careers, and student performance on state standardized tests.