



NORTH CAROLINA
State Board of Education
Department of Public Instruction

Report to the North Carolina General Assembly

Mitigating Learning Loss in STEM
due to COVID-19 with Betabox

SL 2021-180, sec. 7.27(a)(33)

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Legislative Requirements

The original legislative requirements for this project were put forth in [Session Law 2021-180 sec 7.27\(a\) \(33\)](#) which provided \$2,042,000 for NCDPI “to contract with Betabox, Inc., in response to the COVID-19 pandemic, to mitigate learning loss in the areas of science, technology, engineering, and mathematics by providing students in public school units with experiences, curriculum, instructional coaching, hands-on equipment, and other needed resources”. SL 2021-180 further stipulated that the Department submit an interim report by October 1, 2022, and a final report by October 1, 2024, to the Joint Legislative Education Oversight Committee, the Senate Appropriations Committee on Education/Higher Education, the House Appropriations Committee on Education, and the Fiscal Research Division on the use of the funds allocated pursuant to this subdivision and their impact on student success.

Session Law 2023-134 sec 7.15(b) (6) provided additional funds totaling \$4,000,000 for the Department to contract with Betabox in FY2023-2024 and FY2024-2025.

Program Background

The program was intended to mitigate learning loss in the areas of science, technology, engineering, and mathematics by engaging students in STEM, and then sustain and build the instructional capacity of participating schools by supporting teachers after the conclusion of the Onsite Field Trip. The Betabox program provided hands-on STEM enrichment student experiences and educators-focused STEM instructional support resources to under-resourced middle and high schools throughout the State of North Carolina.

The total initial contract value of \$2,042,000 was comprised of \$595,000 in Onsite Field Trip operations, \$820,000 in capital expenditures including mobile unit manufacturing and equipment purchases, \$250,000 in curriculum development and checkout program development and operating costs, \$277,000 in educator follow-up resources including professional development and instructional coaching, and \$100,000 in evaluation costs. The initial program operations have now concluded.

The primary objectives of the program were to:

- Provide 150 Onsite Field Trip Days to majority Title 1 or schools with >50% Economically Disadvantaged Students(EDS) at no direct cost to the school or district.
- Provide in-class STEM resources to teachers participating in the program including standards-aligned lesson plans, professional training, and instructional coaching.
- Establish and operate a hands-on equipment checkout program, allowing educators to access STEM equipment and materials on demand at no direct cost.
- Manufacture three Betabox Mobile Labs that will be owned and operated by Betabox and serve the state of North Carolina.
- Enroll more than 100 schools either by school or as district cohorts in our program on an application basis.

Following each Onsite Field Trip Day, participating teachers were provided access to a follow-up resources portal. Additionally, teachers were provided a budget of \$1,250 per school site to spend on hands-on STEM equipment, either in the form of equipment purchases or 1 to 3-month equipment rentals, known as Checkouts.

In order to measure the impact and effectiveness of the program the contract also included the requirement for Betabox to hire an external evaluator to design an evaluation plan, collect program data and create a final program evaluation report. Program effectiveness data was collected by the Vela Institute, the external evaluator contracted by Betabox, Inc.

Program Implementation

Betabox's initial implementation was conducted in two stages. The first stage was the design and manufacture of three mobile units and the acquisition of equipment needed to outfit the labs, conduct the Onsite Field Trip Days, and establish an inventory to loan equipment to schools. This included acquiring hands-on STEM equipment assets such as 3D printers, drones, robotics equipment, and other engineering technologies.

The second stage was hosting webinars to help generate interest among schools statewide, developing a collection of post-field trip materials including lesson plans and professional development trainings, and

developing an online portal solution to offer educators an optional method to access follow-up enrichment and instructional materials as well as checkout equipment online.

During the operational phase, Betabox conducted a total of 162 Onsite Field Trip days at 102 schools in 40 school districts. In total, 12,393 students participated in these STEM enrichment experiences, based on sign-in sheets completed by educators at each event. This represents a 124% higher volume of student participants than originally anticipated by Betabox in the initial contract.

Final Betabox Program Participation Values (May 2022 - May 2024)			
	Contract Goal	Actual Totals	Contract vs Actual Percentage
Schools Enrolled	100	102	102%
Districts Represented	32	40	125%
Onsite Field Trip Days Completed	150	163	109%
Student Participants	10,000	12,393	124%
Teacher Participants	300 - 450	372	<i>Within Expected Range</i>

A complete list of all schools that received an Onsite Field Trip is listed below.

Full List of Betabox Onsite Field Trips

Participating Schools	District	Date(s) of Event	Number of Days	Teachers	Students
Alexander Central High School	Alexander County Schools	8/3/22	1	2	85
Alexander Central High School	Alexander County Schools	10/12/22 - 10/13/22	2	5	190
East Alexander Middle School	Alexander County Schools	11/14/22 - 11/17/22	4	6	328
Asheboro High School	Asheboro City Schools	3/20/24 - 3/21/24	2	6	193
Beaufort County Schools (Multiple Middle and Elementary Schools)	Beaufort County Schools	7/25/23	1	5	47
Central Cabarrus High School	Cabarrus County Schools	3/26/24	1	4	105
West Cabarrus High School	Cabarrus County Schools	3/27/24	1	7	110
Concord High School	Cabarrus County Schools	4/16/24	1	2	102

Jay M Robinson High School	Cabarrus County Schools	4/17/24	1	4	77
Summer Bridge Academy (West Caldwell High School, various Middle School students)	Caldwell County Schools	6/27/22-6/28/22	2	18	138
Chapel Hill High School	Chapel Hill-Carrboro City Schools	7/12/22	1	2	32
McDougle Middle School	Chapel Hill-Carrboro City Schools	7/13/22	1	4	47
Culbreth Middle School	Chapel Hill-Carrboro City Schools	7/14/22	1	2	44
Smith Middle School	Chapel Hill-Carrboro City Schools	11/15/22	1	1	71
Culbreth Middle School	Chapel Hill-Carrboro City Schools	11/16/22	1	1	49
Philips Middle School	Chapel Hill-Carrboro City Schools	11/17/22	1	1	77
McDougle Middle School	Chapel Hill-Carrboro City Schools	11/18/22	1	1	66
Charlotte Lab School	Charlotte-Mecklenburg	3/13/24	1	4	78
Movement Charter School	Charlotte-Mecklenburg	3/14/24 - 3/15/24	2	2	67
East Mecklenburg High School	Charlotte-Mecklenburg Schools	10/23/23 - 10/24/23	2	6	234
Chatham SparkLab (Multiple Middle Schools, Chatham Early College, ONE Academy)	Chatham County Schools	3/21/24 - 3/22/24	3	6	93
Douglas Byrd Middle School	Cumberland County Schools	11/27/23	1	3	69
John Griffin Middle School	Cumberland County Schools	3/1/24	1	4	72
Douglas Byrd High School	Cumberland County Schools	11/28/23 - 11/29/23	2	4	247
Westover Middle School	Cumberland County Schools	3/27/23 - 3/29/23	3	7	331
Davidson County High School	Davidson County Schools	10/16/23	1	3	57
Yadkin Valley Regional Career Academy	Davidson County Schools	10/17/23	1	3	80
South Davidson Middle/High School	Davidson County Schools	11/13/23 - 11/15/23	3	5	213
Carrington Middle School	Durham Public Schools	12/5/23 - 12/7/23	3	3	201

Phillips Middle School	Edgecombe County Public Schools	10/10/23 - 10/11/23	2	5	140
SouthWest Edgecombe High School	Edgecombe County Public Schools	3/12/24 - 3/13/24	2	4	175
Northeastern High School	Elizabeth City-Pasquotank Public Schools	12/7/23 - 12/8/23	2	2	68
Crosscreek Charter School	Franklin County	11/3/23	1	2	77
Franklinton Middle School	Franklin County Schools	10/30/23 - 11/1/23	3	3	194
Bunn Middle School	Franklin County Schools	5/13/24 - 5/14/24	2	1	133
Stanley Middle School	Gaston County Schools	1/25/23 - 1/26/23	2	8	188
W.C. Friday Middle School	Gaston County Schools	10/11/22 - 10/11/22	2	2	209
Cherryville High School	Gaston County Schools	10/17/22 - 10/18/22	2	3	101
Cherryville High School	Gaston County Schools	9/14/23 - 9/15/23	2	5	135
Butner-Stem Middle School	Granville County Schools	11/9/23	1	1	108
Northeast Guilford High School	Guilford County Schools	6/30/22	1	1	11
Southeast Guilford High School, Southeast Guilford Middle School	Guilford County Schools	3/18/24	1	1	99
Western Guilford High School	Guilford County Schools	11/28/22 - 12/1/22	4	12	266
Northeast Guilford High School	Guilford County Schools	12/6/22 - 12/8/22	3	10	280
Enfield Middle School	Halifax County Schools	9/12/23 - 9/13/23	2	6	183
Southeast Halifax Collegiate Prep Academy	Halifax County Schools	9/6/23 - 9/8/23	3	3	165
Harnett Central Middle School	Harnett County Schools	3/6/24 - 3/8/24	3	4	294
Mattamuskeet School	Hyde County Schools	3/27/24	1	1	88
Ocracoke School	Hyde County Schools	5/16/24	1	3	49
NB Mills Elementary School	Iredell-Statesville Schools	4/29/24	1	4	43
East Iredell Middle School	Iredell-Statesville Schools	4/30/24	1	1	114

Third Creek Middle School	Iredell-Statesville Schools	5/1/24	1	1	117
Troutman Middle School	Iredell-Statesville Schools	5/2/24	1	3	119
Northview Academy	Iredell-Statesville Schools	5/3/24	1	3	21
West Iredell Middle School	Iredell-Statesville Schools	11/6/23 - 11/8/23	3	4	239
Selma Middle School	Johnston County Public Schools	10/16/23 - 10/19/23	4	11	269
SanLee Middle School	Lee County Schools	10/3/23 - 10/4/23	2	4	183
Southern Lee High School	Lee County Schools	10/5/23 - 10/6/23	2	3	187
Contentnea Savannah K-8	Lenoir County Public Schools	2/26/24	1	2	88
E.B. Frink Middle School	Lenoir County Public Schools	10/10/23 - 10/11/23	2	1	122
Crain's Creek Middle School	Moore County Schools	12/11/23 - 12/12/23	2	3	161
Mount Airy High School	Mount Airy City Schools	2/20/24	1	5	132
Mount Airy Middle School	Mount Airy City Schools	4/22/24	1	5	120
Northern Nash High School	Nash County Public Schools	9/26/23 - 9/27/23	2	11	205
Eugene Ashley HS	New Hanover County Schools	9/23/22	1	2	65
SEA Tech	New Hanover County Schools	2/29/24	1	1	78
Williston Middle School	New Hanover County Schools	10/3/22 - 10/4/22	2	6	176
SEA Tech	New Hanover County Schools	9/21/22 - 9/22/22	2	2	120
Newton-Conover Middle School, Newton-Conover High School	Newton Conover City Schools	10/30/23 - 11/3/23	5	16	460
Cape Fear Middle School	Pender County Schools	7/26/23	1	1	6
Topsail Middle School	Pender County Schools	7/27/23	1	2	16
Topsail High School	Pender County Schools	7/31/23	1	1	6
Pender High School	Pender County Schools	8/1/23	1	1	13
Person Early College of Innovation and Leadership	Person County Schools	2/6/24	1	4	67

Person High School	Person County Schools	2/9/24	1	3	67
Northern Middle School	Person County Schools	2/16/24	1	1	73
Wellcome Middle School	Pitt County Schools	11/13/23 - 11/14/23	2	2	114
C.M. Eppes Middle School	Pitt County Schools	4/2/24 - 4/3/24	2	7	182
Uwharrie Ridge 6-12	Randolph County School System	12/4/23	1	2	81
Southwestern Randolph Middle School	Randolph County School System	4/22/24	1	5	141
Wheatmore Middle School	Randolph County School System	4/25/24	1	1	128
Randleman Middle School	Randolph County School System	10/12/23 - 10/13/23	2	2	191
Trinity Middle School Day	Randolph County School System	12/13/23, 12/15/23	2	1	179
Southeast Randolph Middle School	Randolph County School System	4/23/24 - 4/24/24	2	2	150
Northeast Randolph Middle School	Randolph County School System	4/29/24 - 4/30/24	2	1	186
Hamlet Middle School	Richmond County Schools	4/15/24	1	2	93
Cordova Middle School	Richmond County Schools	4/17/24	1	5	126
Rockingham Middle School	Richmond County Schools	4/18/24	1	3	126
Ellerbe Middle School	Richmond County Schools	4/19/24	1	2	101
Ashley Chapel Educational Center	Richmond County Schools	5/17/24	1	4	34
The Score Center	Rockingham County Schools	10/26/23	1	2	36
Scotland High School	Scotland County Schools	9/19/23 - 9/20/23	2	2	85
Carver Middle School	Scotland County Schools	9/21/23 - 9/22/23	2	3	150
STEM Early High School, Center For Innovation	Vance County Schools	9/20/23 - 9/22/23	3	8	290
Warren County Middle School	Warren County Schools	11/6/23	1	3	59
Warren County High School	Warren County Schools	12/4/23 - 12/6/23	3	12	140

Career Center High School	Winston Salem / Forsyth County Schools	3/29/23 - 3/30/23	2	4	68
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Services Provided by State Board of Education Region

State Board Region	Number of Event Days	Teachers	Students
Northeast (1)	14	29	896
Southeast (2)	13	19	690
North Central (3)	47	101	3,341
Sandhills (4)	18	42	1,595
Piedmont-Triad (5)	32	71	2,611
Southwest (6)	25	63	2,059
Northwest (7)	14	47	1,201
Western (8)	0	0	0

Feedback Provided by Participating PSUs

In preparation for this report, the Department solicited direct feedback from participating schools and PSU relative to intended outcomes for participating in the Betabox program, data being collected, and any general feedback.

PSUs reported participating to support hands-on science, alignment with SparkNC, increasing engagement with STEM, furthering career exploration, increasing awareness of emerging technologies, and providing interactive experiences. Schools have been monitoring progress toward these intended outcomes through direct student feedback, teacher feedback, testing data, career readiness indicators, and CTE enrollment. General feedback from PSUs is summarized with the quotes below:

- “Students said the activities were fun and that they learned a lot. Teachers enjoyed participating and learning how to teach STEM lessons related to their content areas.”
- “High interactivity, engaging and relevant”
- “The students loved it. They were able to program drones and vehicles. In the classroom the students did further research on autonomous vehicles and designed (drawings) of their own vehicles and how they would program them to benefit their everyday lives.”
- “BetaBox is absolutely incredible. They were fully engaged with our students while they ran low-risk, highly engaging activities with drones and self-driving cars. This was part of our SparkNC experience but we have had Betabox at our school prior to SparkNC. Both visits were incredible and engaged, authentic learning.”
- “It was a great experience for our students with well-trained, patient, and organized facilitators.”
- “The students really liked the event and were surprised that they could fly a drone.”

The Department has not received any negative feedback.

External Program Evaluation

To evaluate the effectiveness of Betabox, an independent external evaluator, the Vela Institute, was contracted by Betabox during the term of the initial contract.

The Vela Institute is currently conducting an external evaluation, with a final report to be submitted on October 1, 2024. The evaluation design consists of three main components:

- Analysis of student-facing pre/post-OSFT questionnaires
- Analysis of student-facing, post-OSFT focus group interviews administered by Vela Institute
- Analysis of educator-facing, post-OSFT questionnaires

Data Collection and Methodology

Data has been collected from 35 participating school sites across various districts in North Carolina, covering Onsite Field Trips (OSFT) completed during the FY 2023-2024 program period. The methodology includes:

- **Student Pre/Post-OSFT Questionnaires:** This two-questionnaire set, designed by the Betabox evaluation specialist and administered by participating educators, examines any changes in students' STEM content knowledge, interdisciplinary and community STEM connections, and STEM identity as a result of their participation in a Betabox onsite field trip experience. One questionnaire is administered to students before they attend the OSFT, and the other is administered afterward, enabling a comparative analysis of the program's impact.
- **Student Post-OSFT Focus Group Interviews:** The Vela Institute developed and administered an interview protocol to evaluate students' experiences immediately following their field trips; questions were focused on students' STEM content knowledge, STEM identity, and general OSFT experience insights. Active and informed consent was obtained for all participating students from a parent or guardian. These focus groups, facilitated by both Vela and Betabox staff, and administered solely by Vela staff, provided qualitative insights into the program's effectiveness from the students' perspectives.
- **Educator Post-OSFT Questionnaire:** This questionnaire, developed and administered by Betabox in consultation with Vela Institute, is designed to gather educators' feedback on the Betabox OSFT experience; these questionnaire items focus on OSFT implementation/logistics (e.g., enrollment processes, lab placement, Betabox curriculum), educators' experience (e.g., inclusion, educator STEM identity), and educators' perception of their students' experience (e.g., content knowledge, student STEM identity).

Key Findings

The Vela Institute's report compared pre and post-survey responses from both teachers and students. Their analysis found that:

- Statistically significant increases in students' knowledge of the content taught during the onsite field trip.
- The survey allowed educators to reflect on Betabox's impact on their students and themselves, as well as the logistics of working with Betabox.
- Overall, educator feedback shows that the process of working with Betabox is easy and enjoyable.

- Each stage of the implementation process was highly rated for educator satisfaction and the entire experience has been highly recommended for other schools.
- Educators indicated that Betabox participation had a moderately strong effect on increasing their students' awareness and understanding of STEM careers and connections to their everyday lives.

In addition to the surveys, Vela conducted focus groups with students after they participated in on-site field trip experiences as well as individual interviews with teachers. Key findings from those focus groups included:

- Students report increased knowledge and interest in STEM careers and enjoyed the hands-on learning in a small group.
- Students were able to make connections to STEM applications outside of the experience.
- Educators perceived students as gaining interest in STEM concepts and careers; many educators wanted more support after the experience to answer students' inquiries into how to pursue STEM careers, including careers utilizing drones and other autonomous technology.

Vela's report included several recommendations for continued improvement including:

- Improving communication of what Betabox is, supports, and its ease of use.
- Send career information connected to the on-site field experience to help students connect to a possible interest or career path.
- Expand the number of mobile learning lab topics.