Public Schools of North Carolina
State Board of Education
Department of Public Instruction

Report to the North Carolina General Assembly

Impact of the Coding and Mobile App Development Program

SL 2017-57 (SB 257)

Date Due: 9/15/2018
Report #13
DPI Chronological Schedule, 2017-2018

STATE BOARD OF EDUCATION

SBE VISION: Every public-school student, through access to needed resources and rigor, will graduate ready for post-secondary education and work, prepared to be a globally engaged and productive citizen.

SBE MISSION: The State Board of Education will use its constitutional authority to lead and uphold the system of public education in North Carolina that guarantees every student in this state an opportunity to receive a sound basic education.

WILLIAM COBEY
Chair
Chapel Hill - At-Large

ERIC DAVIS
Vice Chair
Charlotte - At-Large

DAN FOREST
Lieutenant Governor
Raleigh - Ex Officio

DALE FOLWELL
State Treasurer
Raleigh - Ex Officio

MARK JOHNSON
Raleigh - Secretary to the Board

BECKY TAYLOR
Greenville – Northeast Region

REGINALD KENAN
Rose Hill – Southeast Region

AMY WHITE
Garner – North Central Region

OLIVIA OXENDINE
Lumberton – Sandhills Region

ALAN DUNCAN
Greensboro – Piedmont-Triad Region

GREG ALCORN
Salisbury – Southwest Region

TODD CHASTEEN
Blowing Rock – Northwest Region

WAYNE MCDEVITT
Asheville – Western Region

PATRICIA N. WILLOUGHBY
Raleigh - At-Large

NC DEPARTMENT OF PUBLIC INSTRUCTION

Mark Johnson, State Superintendent
301 N. Wilmington Street
Raleigh, North Carolina 27601-2825

In compliance with federal law, the NC Department of Public Instruction administers all state-operated educational programs, employment activities and admissions without discrimination because of race, religion, national or ethnic origin, color, age, military service, disability, or gender, except where exemption is appropriate and allowed by law.

Inquiries or complaints regarding discrimination issues should be directed to:

Maria Pitre-Martin, Ph.D.
Deputy State Superintendent
6307 Mail Service Center
Raleigh, NC 27699-6307
Phone: (919) 807-3759 / Fax: (919) 807-4065

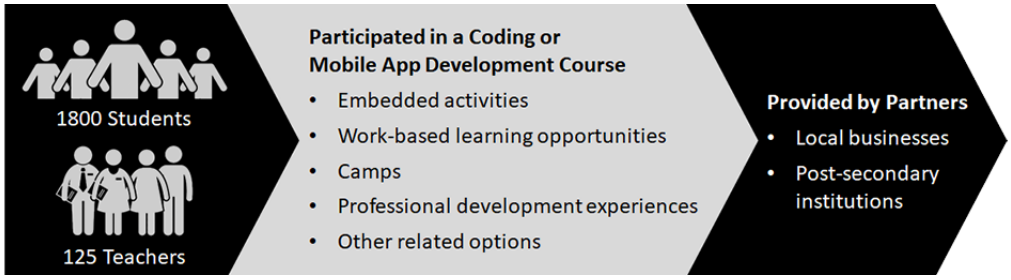
Visit us: www.ncpublicschools.org

M0518

Impact of the Coding and Mobile App Development Program

The grant program afforded almost 1,800 students and 125 teachers to experience a coding or mobile app development course. These experiences included embedded activities, work-based learning opportunities, camps, professional development experiences, and other options. Fifteen schools or school districts coordinated these experiences. Due to the media coverage for a couple of grantees, surrounding districts partnered with the grantees to expand opportunities for other students.

Partners consisting of local businesses and post-secondary institutions provided professional development, curriculum collaboration, computer science lab tours, pathway educational planning, or work-based learning opportunities. Students demonstrated soft skills as they worked in teams to problem solve, perform computational thinking using logic software or equipment, and persevere through robotic competitions or business and industry tours. Teachers shared they experienced professional growth for teaching coding related courses due to the comprehensive professional development and especially after accepting the role of learning leader.



The fifteen participating schools or school districts added or expanded new coding related middle or high school courses or supporting activities. The supporting activities included instructional opportunities within and outside participating classrooms.

Participating Schools or School Districts

1. Asheboro City Schools
2. Asheville Buncombe and Madison School Districts Consortium
3. Cumberland County School System
4. Dare County School System
5. Fuquay Varina Middle and High Schools
6. Lenoir County School System
7. North East Carolina Prep School
8. Perquimans County School System
9. Randolph County School System
10. Rowan-Salisbury School System
11. Rutherford County School System
12. Union County School System
13. Winston Salem-Forsyth School System

Courses or Supporting Activities

New or Expanded Courses or Supporting Activities	Middle School Level	High School Level
AP Computer Science Principles course		X
Business and Industry Tours	X	
Career and Technical Education Summer Coding Camp	X	
Career Interest Inventory	X	
Career Shadowing	X	
Coding Escape Room	X	
College Tours of Information Technology Related Programs	X	
Community Coding Night	X	
Computer Science Camps	X	X
Computer Science Club	X	X
Computer Science Discoveries Course	X	
Embedded Computer Science Activities	X	
Everyone Can Code Apple Education Computer Science Courses		
Guest Speakers	X	X
Google Computer Science course		X
Hour of Code	X	X
InnoVision Lab	X	
Middle School Students Touring High School Information Technology Classes	X	X
Parent Night Focus on Computer Science and Related Courses	X	X
Project Lead the Way App Creators Course	X	
Project Lead the Way Computer Science Essentials Course	X	X
Project Lead the Way Innovators Course	X	X
Python Programming Course		X
Robotics Club	X	
Robotics Competition	X	
Rokenbok Curriculum	X	
Rokenbok Competition	X	
Students at Work Week	X	X
Tour of Community Colleges and Universities	X	X

Professional Development Activities

Over 125 teachers experienced comprehensive professional development. Teachers showed growth in knowledge, skills, or readiness to teach computer science courses. Teachers were trained on teaching coding curriculum or using relevant equipment or software, participated in or supported work-based learning for students, participated in a computer science consortium or alliance meetings, or partnered with business, industry, or other educators.

The following table contains the wide range of experiences afforded to the teachers.

3D Design and Printing Training	Code.org Curriculum Training	Lego League Team Alliance	Raspberry Pi
Adafruit Circuit Playground	Computer Science Discoveries Courses	Project Lead the Way (PLTW) Innovator and Makers Training	Rokenbok Training
AP Computer Science Principles Course	Educators in Industry Tours	Project Lead the Way (PLTW) App Creator Online Training	Teacher Externships
AP Computer Science Course	Everyone Can Code Apple Education Computer Science Courses	Python Course Training	Virtual Reality Desktops
App Development with Swift I-II	Learn to Code I-III	Raising Awareness of Manufacturing Partners Planning Meeting	Workforce Development Summit

Student Demographics

The participating students showed growth in interest in coding curriculum or related careers and engaged in numerous instructional activities.

The tables below include demographics about the participating students. Most of the students are middle school students. Some schools or districts did not have student participants since the grant activities focused on professional development to prepare teachers to teach the coding and related courses next school year. The following tables are not correlated.

Total Participants	Males	Females	Gender excluded from report
1,766	458	326	982

Race Demographics for Most Grantees (Grantee Self Reporting)	Caucasian	Hispanic	African-American	Asian	Indian	Multiracial
671	352	158	137	4	1	19

Grade-Level of Students (Grantee Self Reporting)	6th	7th	8th	9th	10th	11th	12th
880	294	291	246	25	10	7	7

Equipment and Software

Teachers and students accessed computer labs, equipment, and software as integral or enhanced components of the grant program. The following table contains a summary of the equipment and software used.

Apple Sphero SPRK+ Units	Robots
Arduino Circuits	Rokenbok Equipment and Curriculum
Chromebooks	Server
Coding Kits	App Creator and Innovator Maker
Computer Labs	Sphero Robots
iPads	WiFi Computer Lab
Ozobots and Accessories	In-kind: Instructional Resources, Transportation, Promotional Materials, and Professional Development Services

Lessons Learned, Successes, and Sustainability or Future Plans

As a result of the initial program, it is critical to emphasize the importance of teachers experiencing professional development opportunities to improve or enhance their knowledge, skills, and professional practices of teaching computational thinking and computer science or related courses. Additionally, a student survey on the interest and understanding of the concepts around computational thinking and computer science or related courses would be of value. Teachers would benefit from this information by being able to increase the amount and effectiveness of instructional planning and content/resource development. Additionally, teachers and local administrators could better determine courses and course sequence offerings for the respective schools relative to an exploratory or pathway focus. The following tables list lessons learned, successes, and sustainability or future planning notes from the grant administrators or teachers. The responses vary, but provide insight for program planning, implementation, or maintenance.

Lessons Learned
Coordinate meetings with partners before grant awarded anticipating activities that would benefit students regardless of the funding.
Coordinate how to disburse funds smoothly and timely among consortium participants.
Survey students and teachers to be aware of high interest in learning more about computer science and anticipated registration for courses or professional development.
Increase middle school course offering to meet the demand of students.
Provide extensive professional development for teachers.
Consider more opportunities for work-based learning middle school students.
Determine difficulty of courses prior to enrollment and intended students.
Obtain commitment from students to finish at least more than one computer science course.
Breakdown the process more for the application or identification of computational thinking.

Among the successes to be noted, several schools offered computer science or related courses for the first time. In addition, teachers appreciated the time to collaborate with external partners and other educators. Teachers shared how they adjusted their classroom settings to accommodate students working on teams to solve problems or watching to grow to debug HTML codes, create hyperlinks, or use block code to create graphics. The relationship with respective partners provided opportunities for students to experience coding camps, tours of businesses, access to computer science labs, and additional emphasis on computer science courses at the local colleges: community and university.

Successes
Providing school counselors with information about computer science pathway including middle school through advancement courses.
Coordinating of parent introduction of new computer science courses during curriculum fair.
Expanding partnership with community colleges to help with Hour of Code or other events.
Working as a region to maximize opportunities for students that could not happen for individual schools or school systems.
Partnering with County Public Library and Information Center to offer Coding Camp.
Supporting teachers in industry experiences yielded encouraged teachers about teaching computer science or related courses.
Redesigning a classroom into an InnoVision Lab, which provided needed equipment for students to engage in computer science operations. The lab has become a showcase to attract other educators to visit, which has developed a partnership with a school in Virginia.
Growing a student female leader who at the beginning of the computer science course was overwhelmed and swear that getting it was impossible. By the end of the course, the student debugged an HTML code, imported images, inserted hyperlinks, and used block code to create graphics.
Creating a Computer Science STEM Academy
Influencing 85% of students participating in a special (Google Computer Science course) to enroll in the AP Computer Science Principles course.
Influencing all students participating in a Computer Science Middle School club registered for a Computer Science high school course.
Supporting students realizing that they can code.
Supporting teachers to work together to pace the curriculum and design instructional activities for students.
Supporting teachers through professional development in developing their confidence and skill level to teach computer science and related courses.
Providing professional development for teachers to be able to embed computational thinking into math and STEM.
Providing collaboration opportunities for five school districts unexpectedly. The surrounding districts reached out for support due to the media coverage of receiving the Coding and Mobile App Development grant.
Providing teachers work days to learn the Rokenbok curriculum.
Providing opportunities for students to work with teams for 90 minutes to learn the Rokenbok curriculum.

Successes, continued.
Offering for the first-time computer science courses on three high school campuses face-to-face.
Offering for the first-time computer science courses at the middle school level.
Becoming a lead learner while students are learning the curriculum too.
Supporting students in connecting to computer science using simulated activities.
Quote from a teacher: “When I taught Scratch during the fourth quarter of the 2017-2018 school year, student engagement and grades improved tremendously.”

Sustaining programs or future plans will include activities such as implementing a computer science pathway, providing professional development for teachers including partners, and support teachers in working through cohorts. There are plans to increase work-based learning, work with a local Career and Technical Education Advisory Business Council, and increase showcase opportunities of students’ work.

Sustainability or Future Plans
Support computer science pathway including middle school through advancement courses.
Dedicate funds for professional development for teachers to sustain, learn, or develop knowledge and skills for computer science or related course.
Develop a dedicated club for girls with a focus on computer science.
Coordinate partnership with business to provide work-based learning opportunities for students.
Offer the Project Lead the Way Cyber Security course.
Request for Project Lead the Way high school to be added to the Computer Science pathway as part of the CTE Essential Standards.
Continue offering the Summer Pathways Camps.
Increase Career and Technical Education concentrator rate over a four-year period.
Support teachers in a cohort to work together to meet criteria to computer science or related courses.
Coordinate to have at least one teacher at each middle school available to teach computer science or related courses.
Develop a technology lab.
Coordinate students conceptualizing an app that provides information about a hospital gift or snack shop.
Support students pursuing post-secondary in Information Technology with a concentration on computer science at local community college or university.
Anticipate almost 1,000 students in middle and high school enroll in a computer science or related course.
Provide ongoing support for teachers and students in developing knowledge and skills by including digital learning specialists, STEM teachers, Project Lead the Way teachers, and media coordinators in professional development.

Sustainability or Future Plans, continued.
Provide K-12 computer science content.
Plan for Career and Technical Education Advisory Business Council working with students for app development.
Plan to implement a Computer Science Discoveries pathway.
Coordinate for teachers to have access to automation/robotics/coding labs at local university to deepen knowledge and skills.
Partner with local education source such as Discovery Place Education Studio for access to professional development for the northeast region of NC.
Shift 10-months of employment from the high school to the middle school to support the Computer Science Discoveries curriculum.
Offer a regional EdCamp CODE.
Expand work-based learning to include possibly internships.
Expand computer science course offerings such as Python I-II, Computer Science Discoveries, and Advanced Placement.
Coordinate a field trip for high school students to visit Information Technology companies and high school academies.