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: --- September 15, 2019
Report # 12
DPI Chronological Schedule, 2019-20

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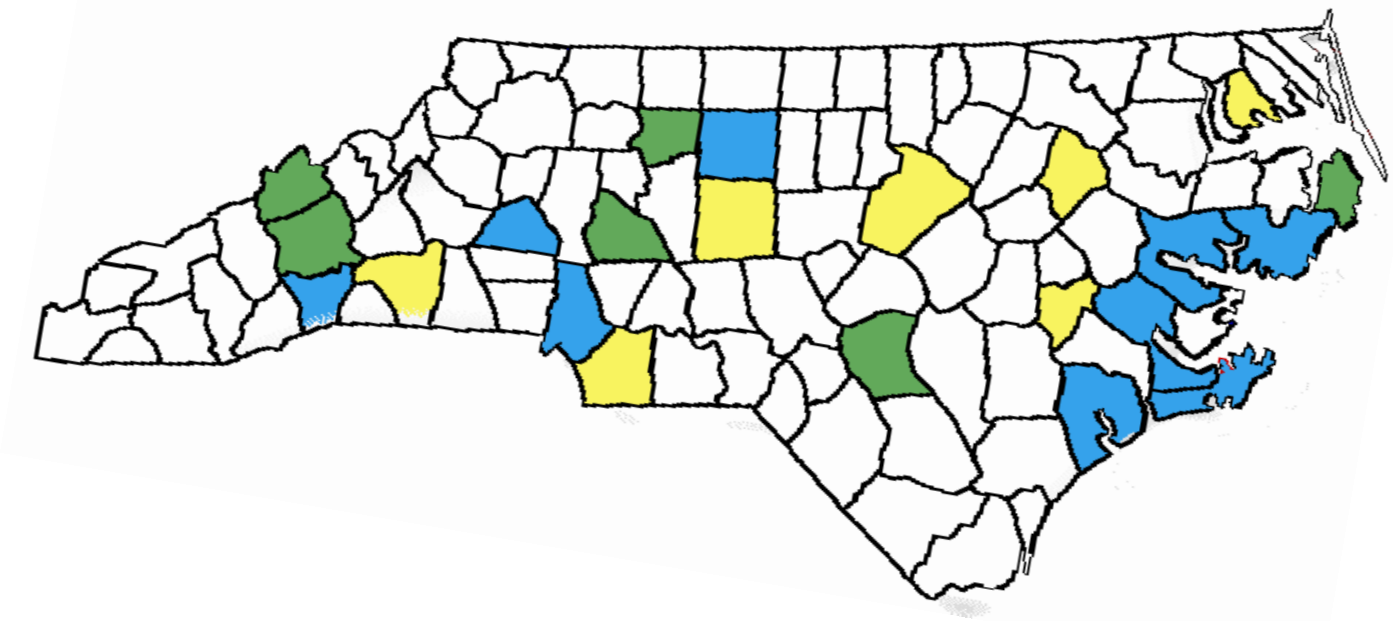
Impact of the Coding and Mobile App Development Program

The grant program afforded more than 17,000 students and their teachers, administrators and other staff members throughout the state to experience a coding or mobile app development course as well as exposure to computer science related work in business and industry. These experiences included embedded activities, work-based learning opportunities, camps, professional development experiences, and other options. Fourteen schools or school grant recipients coordinated these experiences. Five of the fourteen grantees received the grant both FY18 and FY19 to allow for 2 consecutive years of coding and mobile app development growth and support.

The fourteen participating schools or school grant recipients 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.

Coding and Mobile App Grant Recipients

- 2017 Awards
- 2018 Awards
- 2017 and 2018 Awards



Participating Schools or School Districts – Award Amounts

School District	2017	2018
Asheboro City Schools	$28,900	
Asheville Buncombe Madison Consortium	$40,000	$80,000
Beaufort County Schools		$76,000
Carteret County Schools		$28,000
Charlotte-Mecklenburg Schools		$80,000
Craven County Schools		$60,000
Cumberland County Schools	$27,500	$80,000
Dare County Schools	$25,000	$28,000
Guilford County Schools		$67,000
Henderson County Schools		$40,000
Hyde County Schools		$30,000
Lenoir County Schools	$36,160	
Newton-Conover Schools		$75,000
North East Carolina Preparatory School	$36,000	
Onslow County Schools		$46,000
Perquimans County Schools	$22,500	
Randolph County School System	$10,000	
Rowan-Salisbury Schools	$36,000	$30,000
Rutherford County Schools	$38,100	
Union County Public Schools	$39,992	
Wake County Public School System	$31,081	
Winston-Salem/Forsyth County Schools	$28,000	$80,000

Use of Grant Funds

The grant funds were used to purchase equipment, digital materials and cover the costs associated with teacher professional development activities to build capacity in coding, computer science and mobile application development initiatives. Students across the state were exposed to various topics and concepts related to coding and computer science. This exposure expanded beyond the classroom and included interactions with business and industry members, participation in community coding activities, increased course offerings and additional skill building activities which can increase employability skills. The sections below provide more details on the specific use of funds among the grant recipients.

Courses or Supporting Activities

Type of Activity	Middle School or Earlier	High School
Expanded CS Curriculum Offerings	8	3
Work-based Learning	4	5
Activities for Underrepresented Groups	2	3
After School/Club Offerings	3	4
Community Stakeholders Business & Industry Involvement	4	4
5th Grade Expansion	1	

Professional Development Activities

The Professional Development activities varied in nature and content, but all with the common goal of expanding teacher/administrator capacity to deliver Computer Science concepts to students within their schools. As a result of several hours of training, learning and exposure, students at the grantee sites have the benefit of being instructed by teachers who have participated in professional development experiences for computer science curriculum, robotics, etc.

Curriculum	Robotics	Other
Apple • Beginning Apple Coding Training • App Development with Swift I-II	Project Lead the Way (PLTW) • Teacher Training • Transformation Training	Remediation Platforms for Equity Support
NC State University Friday Institute – code.org • AP Computer Science • AP Computer Science Principles • Computer Science Discoveries	Lego EV3 Mindstorm Training	Staff Capacity Building for Cross-Curricular Collaboration
Coding in Minecraft: Education Edition	Sphero Training	

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.

Computer Hardware/Software and Peripherals	Robotics	Other
Laptops	Dash Robots	Drones
Tablets/Clear Touch Screens	Robotic Arm for Coding	Game Controllers for Coding Camp
i-Pads with Apple Care	Spheros & Mini-Spheros	Adafruit & Circuit Express Kits
Desktop Computers/ Monitors/Printer	Lego EV3 Mindstorms Robots	Arduino Circuits
MacBook Pro/Mac Minis	Insectabot Hex Kits	Circuit Boards
Zuludesk Software	Hummingbird Software	Raspberry Pi Coding Kits
3-D Printer/Plotter		VR Headsets

Student Demographics

Student participants at the various grantee sites were exposed to Coding and Computer Science concepts in a variety of ways. In the same manner, student participants represented a diversity of backgrounds and experiences, adding to the richness of the program impact throughout the state of North Carolina.

The tables below include demographics specifically related to gender, ethnicity and grade for participating students. The following information is self-reported by grantees. Please note, the tables are not correlated.

Total Participants	Males	Females	Gender Not Available
16828	10137	5900	791

Caucasian	African American	Hispanic/ Latino	Native American	Asian	Other	Ethnicity Not Available
6327	5885	2482	59	441	747	897

6th Grade	7th Grade	8th Grade	9th Grade	10th Grade	11th Grade	12th Grade
4250	5462	5140	329	424	303	263

Work-based Learning, Internships and Apprenticeship Participation

While the majority of students served by the grant funds are middle school students, there are some high school students who were able to participate in hands-on work-based learning opportunities, internships and apprenticeship programs.

The following numbers were reported by the grantees in the specific areas. It is important to note that this number is impacted by the number of opportunities which are available to students who are not yet high school age. While there were no participants in apprenticeships, this is an opportunity that districts are considering and pursuing within their local regions to provide more experiences for students as they progress through high school.

Work-Based Learning Participants	Internship Participants
1363	811

Lessons Learned and Sustainability of Future Plans

As in the previous year, there were several lessons learned among the grantees. Some of the lessons focused on the professional development format or offerings for teachers. Other lessons emphasized the need for pre-assessment and planning with students prior to fully engaging the business/industry partner(s). With these lessons, each LEA was able to make mid-course adjustments as necessary to achieve optimal results from the grant.

Fiscal year 2019 presented a unique challenge for some grantees that were completely out of their control, however. This was related to the unexpected and devastating hurricane which impacted many areas within the state of North Carolina, closing schools for extended periods of time. Because of this weather impact, many school grant recipients were closed and unable to function for several days and/or several weeks. This created a challenge in expending the grant funds and remaining consistent with the program as outlined in the grant applications.

The following lists lesson learned, successes and sustainability or future planning notes from the grant administrators or teachers. The responses vary providing great insight for program planning, implementation, or maintenance.

Lessons Learned

As with any complex but worthwhile project, it is important to employ the PDCA (plan-do-check-act) cycle to ensure continuous improvement. Valuable lessons were learned from purposeful observation in each of the phases.

It is imperative to include all stakeholders (and potential stakeholders) in the ***planning phase***. It was noted that teachers of content should be consulted when planning specific events for a more effective "boots on the ground" perspective. Local business and industry stakeholders should be included in the initial planning phase to ensure that necessary skills are being taught that will create natural pathways to internships, apprenticeships and other work-based learning opportunities. To do so requires establishing relationships with local entrepreneurs and business owners well before the project begins to provide the knowledge and expertise required to inform the work. Established goals of the project should represent input and commitment from all stakeholders as required by the grant specifications. In addition, it is critical to have a contingency plan in place for staff turnover so that grant activity is not negatively impacted – capacity building is of extreme value. Lastly, to make the most of available grant funds, it is important to fully research the types of technology required to deliver the curriculum or activity to completion to ensure the best resources are matched to the objectives. It is very difficult, sometimes impossible, to make last minute equipment and resource adjustments.

In the ***do phase***, more information should be gathered from students at the beginning of each event to determine personal interest, goals and values. All teachers (including elementary as appropriate) should be trained with the vision of creating a talent pipeline for coding and computational thinking throughout high school and college. Teachers, administrators and counselors should be trained well in advance to ensure buy-in and commitment. When possible, onsite "field-trips" should be coordinated to minimize unnecessary costs and travel time.

The ***check phase*** is one which brings erroneous assumptions to light. Some of the lightbulb moments for recipients of this grant administration included the realization that more often than not, technologically advanced computer hardware/software, digital resources and peripherals are necessary components of the grant. Model classrooms are required to pique student interest and simulate higher education and industry environments. In addition, a well-planned pacing model will prevent a lack of curriculum and resources to cover the entire grant period. To ensure continuity, grant recipients should make sure that more than one person in each organization is familiar with all components of the grant to prevent the delay of progress.

Finally, the ***act phase*** reveals things that should be done before moving on to enable the continuous improvement cycle to serve its purpose. In hindsight, grant projects should be implemented with fidelity at the earliest possible point to allow for adjustments in case of unforeseen circumstances such as the widespread flooding experienced during hurricane

Florence. While strategic computer science education can be implemented at the high school level, the long range effects of early acquisition, repetition and retention of coding and mobile app skills translate to an easier acclimation to higher level computer science skills during high school courses and pathways. To that end, coding, mobile app and computer science course options should begin as early as 5th grade continuing to 6, 7 and 8th grades before entering high school. As a final consideration, the targeting of underrepresented groups (e.g. females) requires advanced consideration and planning. The offering of after school clubs and events for girls will make a positive contribution to this effort.

Sustainability of Future Plans

As the Coding and Mobile App Development Grant Program has finished its second year of existence, it is important to note that the expansion of Coding and Computer Science curriculum has expanded tremendously in several areas. Students from diverse backgrounds are being exposed to the curriculum as an increasing number of teachers and administrators are receiving professional development to help expand course offerings. This expansion of curriculum and technology with younger generations has the potential to positively impact the economy in the state of North Carolina as more students are being exposed to and developing the skills necessary to meet workforce demands. Grantees have overwhelmingly expressed their desire to continue along this path of computer science expansion and exposure as we move into the future. In order to sustain this growth, communication and fostering plans with business and industry partners will be vital to create sustainable and seamless transition to work-based learning opportunities such as internships, apprenticeships. In addition, prioritizing computer science concepts and courses will spark interest and growth in the middle grades and create a pipeline through high school and beyond. Lastly, building teacher capacity through industry relevant professional development to support student learning needs is essential for the future of North Carolina.