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Northeast Florida Regional STEM2 Hub

21st Century Workforce Development Project
4th Quarter 2019

Outcomes Presented by:

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The **Northeast Florida Regional STEM2 Hub** was chartered in 2015 by the Jacksonville business community. The leaders noticed that there was a disconnect between the skills that students would need to be ready for the careers of the 21st century, and the experiences that students were receiving through their formal education.

The mission of the STEM2 Hub is to "**convene, inspire, and invest in the STEM2 field by providing the essential missing elements to accelerate the growth of STEM2 education and careers**." By the end of the program period, all school districts in the Northeast Florida region shall have the opportunity to offer **expanded and more equitable access** to 21st Century Skills Development Programs with a focus on robotics, coding, and high-quality instruction in mathematics, problem-based learning, and career exploration, with pilot programs in emerging technologies.

The purpose of this project is to increase the availability of educational programs that will build interest as well as the **needed prerequisite skills for high-demand STEM-related careers** throughout the Northeast Florida region. To be workforce-ready for these careers, students must have skills that include computer science and coding, as well as demonstrate competency in mathematics. Through this program, students will have the opportunity to participate in competitive robotics and mathematics programs, as well as receive an introduction to coding concepts beginning at the elementary school level. Program implementation shall be modeled after successful local and national programs, and shall include competitive elements, as appropriate. Robotics, math, and coding programs shall be developed to include an aligned progression to allow for the development of skills over time, assure alignment to state standards and curriculum for ease of integration into the school day, and shall provide guidelines for districts to implement professional development for those leading the programs and implementing the programs and curricula. Stakeholder engagement, through community partnerships and industry mentorships, will be developed to assure the building of relationships which focus on awareness of post-secondary career pathways.

Since our inception, we worked to build a board of committed business leaders in the Jacksonville community, and to pinpoint and target areas of the greatest need to begin this work. We began our work with a study of the State of STEM and held a kick-off event to share the findings with the community. Then, we got to work. We began in the

after school arena with a focus in robotics. Through this project, our work continues to advance beyond the after school setting, with the foundations of infusion into the school day through resource and media, science and math, and career/technical education programs. As the project continues to advance, we aim to develop a mindset of STEM learning across the school day through deliberate integration of meaningful and engaging STEM projects and advance the school climate of innovation and creativity.

We recognized the critical need to bring high quality computer science experiences to our region, so we fostered a partnership with the national nonprofit, Code.org, while they were still in their infancy. We began with two facilitators in our region introducing coding to elementary teachers, and now have blossomed into a full pathway continuing to offer Computer Science Fundamentals to elementary school teachers and expanded the program to include a middle school course (Computer Science Fundamentals) and high school courses (Advanced Placement and General Ed Computer Science Principles). We have gotten course codes added to the state catalogue so that these courses can be widely offered all around the state. Planning for summer teacher professional development to increase the impact of this work is currently underway. We also recognize that mathematics is critical for success in the computer science and tech fields, therefore we supported the expansion of Math Counts across our region, as well as the continued development of strong teachers to provide instruction to our students in mathematics so that we may empower students toward limitless options as they follow their passion from school to career.

In our second year, we applied to and joined the National STEM Learning Ecosystems work. We now are one of the forefront communities leading the national work and sharing our experiences at the national level. We also have the opportunity to learn about the great work that is being done around the nation and bring ideas back to Jacksonville. As the nation looks to STEM ecosystems as part of the newly released National STEM 5-Year Plan, we are closely following that work, gleaning best practices and bringing those best ideas here to the region.

During our earlier years, we began to build a foundation that would enable us to receive state funding to accelerate our work. The 2018-19 budget year yielded positive results of the appropriation process. We were awarded the Northeast Florida 21st Century Workforce Development Program.

We are Pleased to Present our Continued Progress through the End of the Fiscal Year Ending 6-30-2019.

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Executive Summary

The following pages discuss project interim outcomes from April through June 30 of 2019 as we continue to build upon the work previously reported in reports for the 1st, 2nd and 3rd quarters.

Thanks to this funding and our initiatives, we are continuing to accelerate career readiness pathways for STEM + CS access across our region. With a focus on equitable access, we have hosted events, provided professional development, served students through highly effective camps and programs all across our region. Our collaboration has reached new heights as a community of learners, and our impact, in terms of outcomes and students reached continues to grow.

Over the last quarter, we have deepened existing partnerships and developed new relationships to enhance and accelerate our work. We looked at core science content, especially in the area of environmental science and the biological and life sciences. We partnered with the Biomimicry Institute to bring life science to into focus, aligned with our biology and ecology standards to infuse the study of grand environmental challenges that we face in the future. Teachers were trained and are ready to return to their classrooms empowered to help students explore and develop solutions to problems grounded in our local environment. This application of the nature of science across the secondary spectrum of courses will engage students through the experiences of teachers!

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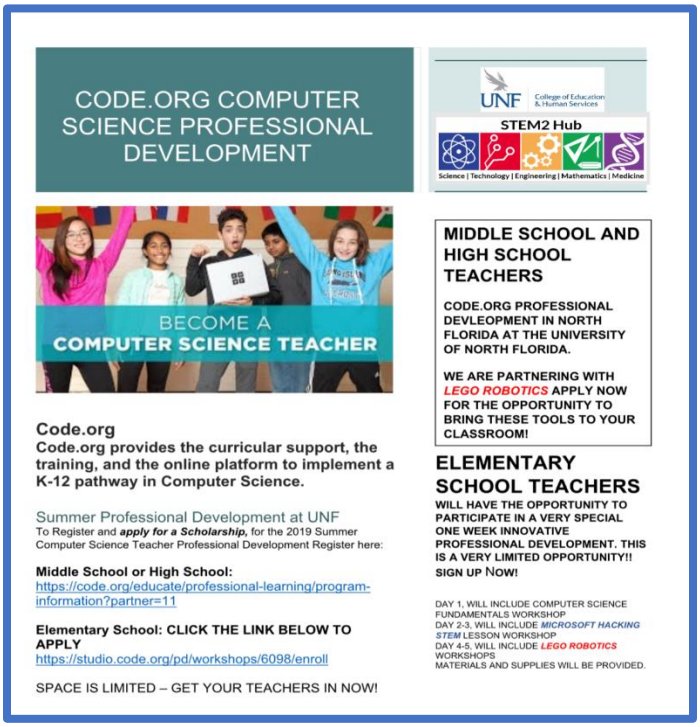
We continue to strengthen and develop partnerships with MIT Media Center and LEGO Education. LEGO Education hosted a meeting with global leaders in robotics education to review our project to date and provide input for the next implantation stage of the project. The goal of this sub-project was to work with media specialists in school to increase access for students to gain experiences with robotics and coding through the elementary media centers on campuses across the region. The multi-year project is broken into manageable chunks: Introductory Implementation, Development of Demonstration Schools, Expansion and Scaling. The first stage of the project began at the start of the school year, with over 75 media specialists and district leaders receiving training in robotics, basic introductory circuitry, and coding. The group was reconvened several times over the course of the school year to deepen their professional learning and build our STEM learning community. We prepared to move into the second stage of the project, working with the districts to identify the schools that will become demonstration schools. We planned implementation and began training at some sites. We ordered and delivered equipment to the schools, preparing them to begin infusing critical STEM content into the core content areas as aligned to standards.

Building capacity in administrators, both district and school levels, continues to be a powerful part of the implementation model. It is critical for educational leaders to understand the needs to prepare students for the workforce opportunities that lay ahead as we continue to have the need for a prepared workforce that will be solving problems that we do not yet know about with technologies that do not yet exist. While that statement may sound cliché, it is grounded in reality as we look at the emerging technologies that are present in our community now. Data science, as a foundational skill for an understanding of the algorithms that power machine learning and artificial intelligence, has never been more important. Our leadership must be empowered to understand the implications of these fields so that the school experience can be aligned

with these needs, while meeting the expectations of our state standards, and infusing new applications and methods of teaching through the use of new tools.

In the earlier parts of the year, administrators across the region attended inquiry-based workshops to increase their understanding of how the standards align to this content and these skills. Over the year, administrators from Clay, Nassau, Putnam, and Duval County attended workshop designed for their districts, purposefully aligned to their individual district plans, while weaving a common thread across the region for consistency and level setting for workforce development and high demand careers. With local economic development goals in mind, career pathways are being reviewed to meet the economic needs and demands for each of the areas. This has happened through community stakeholder meetings, meetings with our board of directors, and other sources of available data.



We continued to partner with the University of North Florida to provide professional development through both the College of Education and the College of Computer Science.

Our UNF/Code.org partnership continues to flourish and produce results. During the month of June, three weeklong professional development sessions were offered, preparing additional teachers to begin offering Computer Science Fundamentals in our elementary schools, Computer Science Discoveries in our middle schools, and Computer Science Principles/AP Computer Science Principles in our high schools. Computer Science Fundamentals teachers were also given training in robotics and Hacking STEM curriculum.

Amazon joined our team of partners by opening their doors to us for a celebration of our recognized STEM Students of the Week! Students, district level administrators, and members of our STEM2 Hub corporate board were able to tour the Jacksonville

Amazon Fulfillment Center. This experience showed students and administrators the application of coding and robotics in action. During the experience, the superintendent of one of the participating districts had the realization that we are not yet doing enough to prepare our students! She committed to doing more to prepare ALLL her student. Seeing the technology in action served as both a reality check and an inspiration to work together to do more. Our group also served as the pilot group for school field trips, and now Amazon Fulfillment Center has begun to open its doors for school groups to come and have this experience.

Drone technology continues to change the face of work. For that reason, we have continued to expand our partnership with WozU Education, bringing career facing drones pathways into our schools. Further, we have investigated additional types of drones, and explored competitive programs. We have joined onto a league and began a pilot of a drone competition which will be expanded at the start of the new school year.

We held several events giving students' experiences with drones, robotics, and coding, including participating with the Police Athletic League to participate in Friday Night Lights, an overnight camp for teenaged boys. At the event, students rotated through

sessions with drones, robotics, and career exploration through the Learning Blade platform. Students were given a username and password that would be theirs even after the event so that they may continue to learn about careers and code. Thanks to the generosity of Florida Blue and the PGA Tour, each of the 100 young men will be given a laptop computer of their own at an event on August 10th. This is just in time for the start of school, so they will now have a way to do their homework and have access at home to all of their on-line school resources.

Competitions continued throughout the spring, with many competitive teams winning state and national awards.

We also provided STEM related experiences to almost 500 students through partnership with the Police Athletic League and the Jacksonville Jaguars at the Calais Campbell STEM and Football Camp. In this conference style event, students rotated between athletic drills and STEM experiences. Students used the Hacking STEM Concussion Simulator to learn about their brain and the impact that a hit to the head has on the different parts of the brain. A local doctor spoke with students about helmet safety. Our partners from the Microsoft Store came out to give students experiences with mixed and virtual reality, and to code in Minecraft. Lego Education came out to support the students with robotic builds and programming activities. Drone flying skills were taught, and a competition ensued. The day empowered all children to know about the potential and possibilities that are available for them.

We held the second annual computer science fair, celebrating a year of accomplishments for our students taking Advanced Placement Computer Science Principles, Computer Science Principles, Computer Science Discoveries, and Robotics Teams, Drones Teams and other STEM related projects. Students came from the MOSH from all corners of the region, including Flagler County and rural districts from outside our immediate region. There were over 250 students present, competing for prizes.

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Computers, donated by our business partners, and paid summer internships were awarded by our business community. The Jacksonville CIO Council had a strong presence to judge projects and interact with the students, giving them tips and pointers on their projects. The students had a great day of learning, sharing their work and their code. The business community was impressed by the quality of the project. The grand prize winners represented Andrew Jackson High School, under the mentorship of Mr. Ian Lozano, Computer Science and 3D Game Design teacher.

Summer camps occurred at various locations across the region in partnership with the Boys and Girls Clubs of North Florida, the Boys and Girls Clubs of Nassau County, Communities in Schools, Andrew Jackson High School, and A. Phillip Randolph High School. Campers experienced projects in health sciences, robotics, coding, drone technologies, and mixed reality.

Teams "crash land" at a random starting Latitude/Longitude coordinate of their choice on the map. This point on the map will be the team's home base and exploration/data collection continue from there.

A one-week camp occurred each week of June and continued into July, multiplying the effect of the program and reaching more student. The Red Rover Robotics program, which we had developed in partnership with the MOSH (Museum of Science and History) for outreach to into the rural areas of our district, has been expanded to now impact students in the urban core through these camps.

This has allowed for an even greater return on investment for the development of this unit. In addition, Clay County intends to follow the Saint John's County model of bringing Red Rover Robotics to every fifth grader in the school district.

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Program Time Frame

June 2019

Program Days and Times

Monday – Thursday/Friday

Program Location

A. A. Phillip Randolph Career Academies (APR)
B. Andrew Jackson Center for Advanced Technologies (AJ)
C. Museum of Science and History (MOSH)
D. Microsoft Store (uSoft), St. John's Town Center

BGCNF Duval:

Mornings:

- 20 Upper Elem/Middle School Students M-W mornings 9:30 – 11:45am (APR)
- 20 Upper Elem/Middle School Students TH mornings **10:00** – 11:45am (MOSH)
- **10** Upper Elem/Middle School Students Fri mornings **10:00** – 11:45am (uSoft)

Afternoons:

- 20 Upper Elem/Middle School Students M-W afternoons 1pm – 3pm (APR)
- 20 Upper Elem/Middle School Students Th afternoons 1pm – 3pm (MOSH)
- **20** Upper Elem/Middle School Students Fri afternoons 1pm – 3pm (uSoft)
- 20 Middle School Students 1pm – 3pm (A. Jackson)

BGCNF Nassau:

Mornings:

- A.M. Bus: 20 Upper Elem/Middle School Students M-W 9:30 – 11:45am (APR)
- A.M. Bus: 20 Upper Elem/Middle School Students TH **10:00** – 11:45am (MOSH)
- A.M. Bus: **14** Upper Elem/Middle School Students Fri **10:00** – 11:45am (uSoft)
- A.M. Bus: 20 Middle School Students 9:30am – 12:00pm (A. Jackson)

Afternoons:

- P.M. Bus: 20 Upper Elem/Middle School Students 1pm – 3pm (APR)
- P.M. Bus: 20 Upper Elem/Middle School Students 1pm – 3pm (MOSH)

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Program Schedule

Andrew Jackson Center for Advanced Technologies Program Curriculum

Monday – Thursday

Part A: Basic Game Design;

Part B: Creating games in Virtual Reality using UNITY

A. Phillip Randolph Career Academies Program Curriculum

Monday - Robotics Beginners/Intermediate

Tuesday – Drones

Wednesday – Web Builder Tools Beginners/Intermediate (Medical)

Museum of Science and History

Thursday – MARs Red Rover Robotics

Microsoft Store

Friday – 1) Design/Create your own video game and/or

2) Game Team Tournament using Rocket League or Fortnite.

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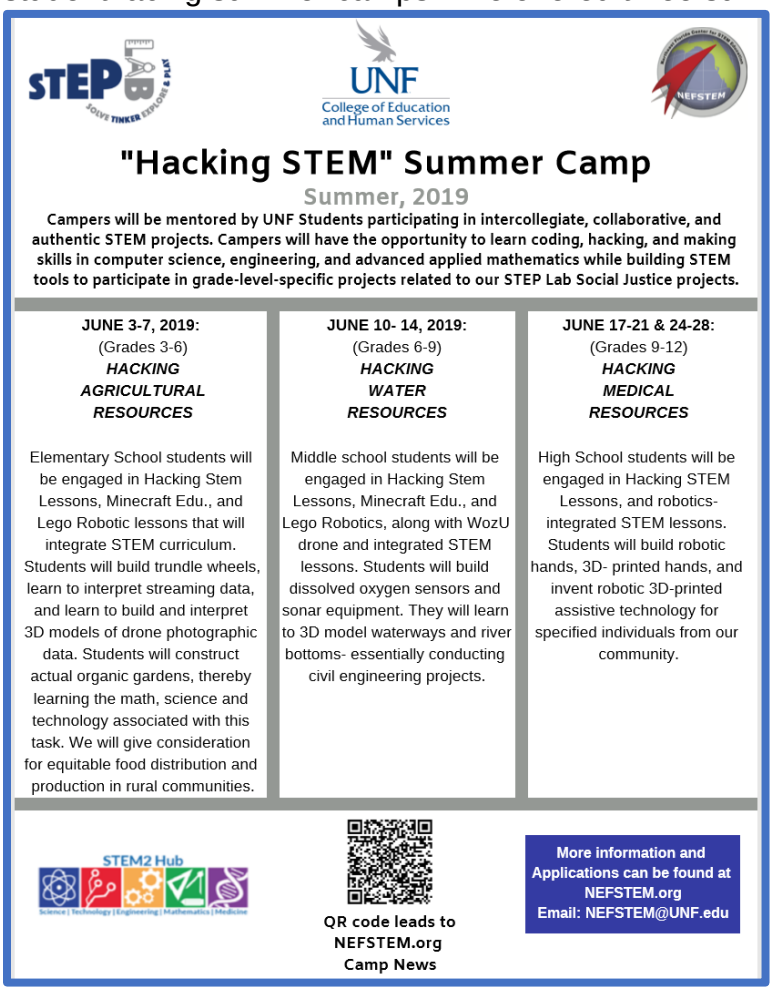
STEM Summer Camp Weekly Plan/Curriculum

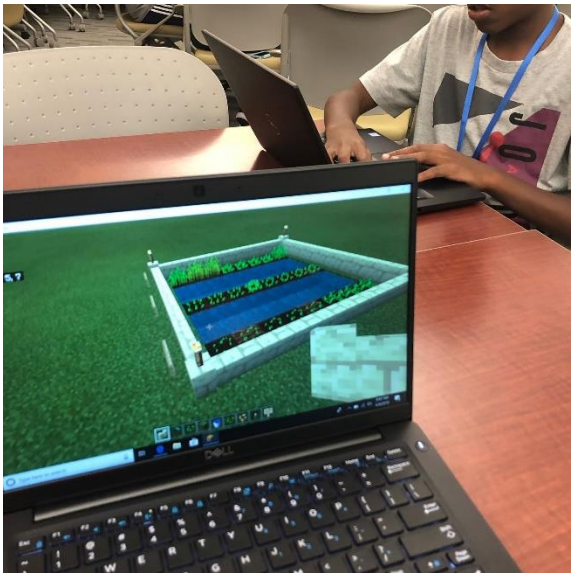
Date	BGCNF Duval & Nassau APR/MOSH/Microsoft Classes AM Buses (20 Students)	BGCNF Duval & Nassau APR/MOSH/Microsoft Classes PM Buses (20 Students)	BGCNF F Nassau AJ Class AM Bus (*20 Students)	BGCNF Duval AJ Class PM Bus (*20 Students)
June				
24	APR: Robotics	APR: Robotics	Part A: Basic Game Design	Part A: Basic Game Design
25	APR: DRONES Flying & Programming	APR: DRONES Flying & Programming	Part A: Basic Game Design	Part A: Basic Game Design
26	APR: Medical Web Builder Tools	APR: Medical Web Builder Tools	Part B: Creating games in VR	Part B: Creating games in VR
27	MOSH: Red Rover Robotics	MOSH: Red Rover Robotics	Part B: Creating games in VR	Part B: Creating games in VR
28	NO CLASSES	NO CLASSES	NO CLASSES	NO CLASSES

In addition to the camps offered above, camps were also offered for the month of June at the University of North Florida in the STEP Lab.

Through our partnership with Microsoft, we implemented Hacking STEM into our student facing summer camps. We offered three summer camps during the month of June at the University of North Florida, in partnership with the STEP Lab and NEFSTEM. Each camp was designed with a STEM focus and a social justice project. Upper elementary students focused on the concept of a food desert, and access to fresh fruit and vegetables. Students spent their time designing urban gardens in Minecraft, building prototypes of the gardens using tools such as 3D paint, and robotics, and hacking solutions to work around a theme of food equity. Middle school students studied the water quality of the St. Johns River, coding solutions and building devices to test and monitor water quality. They flew drones to learn how that technology could enable remote water sampling and monitoring. High school students learned about how they could help people obtain low cost prosthetic limbs. They built a robotic hand, coded the hand to perform minor tasks, and transferred their knowledge to 3D printing by designing a prosthetic limb. They visited with a member of the community who has had amputations due to spina bifida and learned about the struggles that he experiences as a double amputee. Through all the camps, students learned more than content. They developed empathy for people who are in circumstances that are not as fortunate as their own. During each of these camps, software engineers from Microsoft joined the students through TEAMS and



answered their questions about their projects, and answered questions about jobs and careers that would be available to students who study the STEM fields. This was extremely motivational for the students.



Due to the depth of this partnership and their interest in learning more about our systematic work, we have been invited to attend a week long training in Hacking STEM and participate with software engineers and builder to take part in the Microsoft Hackathon, the largest such event in the world. This is an unprecedented opportunity for teachers and leaders from our area build solutions to problems that they care about alongside Microsoft builders and engineers. This event is certain to have a profound positive impact on the nature of STEM education in our region. We plan to use the experience to build capacity first locally, and then assist our state by sharing best practices that come out of the work.

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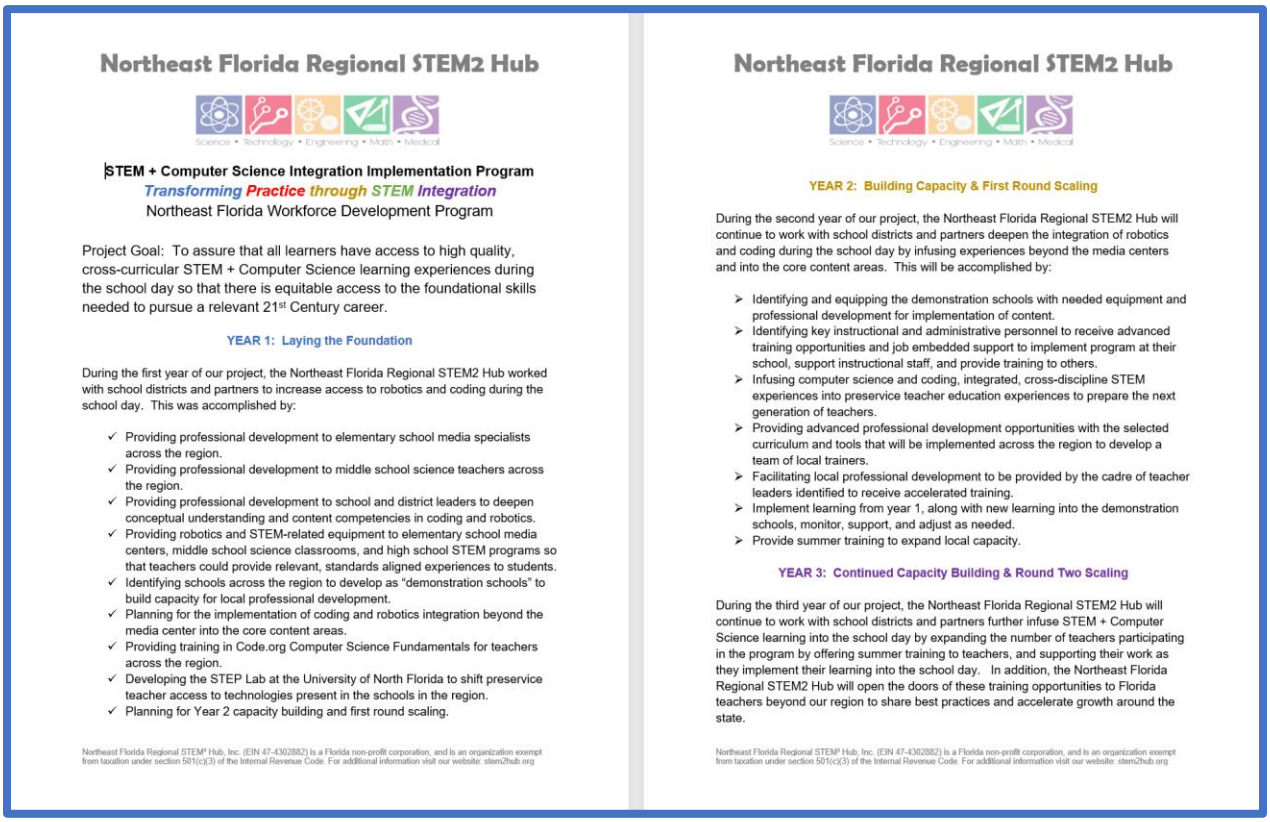
During the last quarter, we strategically planned for the visit to Redmond, developing a team representing all the corners of our region, different roles in the districts, as well as different levels of schools. This deliberate plan will help us maximize the impact of the training as we work to build capacity to reach as many teachers and students as possible, based upon the following professional development and project plan:



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STEM + Computer Science Integration Implementation Program

Transforming Practice through STEM Integration

Northeast Florida Workforce Development Program

Project Goal: To assure that all learners have access to high quality, cross-curricular STEM + Computer Science learning experiences during the school day so that there is equitable access to the foundational skills needed to pursue a relevant 21st Century career.

YEAR 1: Laying the Foundation

During the first year of our project, the Northeast Florida Regional STEM2 Hub worked with school districts and partners to increase access to robotics and coding during the school day. This was accomplished by:

- ✓ Providing professional development to elementary school media specialists across the region.
- ✓ Providing professional development to middle school science teachers across the region.
- ✓ Providing professional development to school and district leaders to deepen conceptual understanding and content competencies in coding and robotics.
- ✓ Providing robotics and STEM-related equipment to elementary school media centers, middle school science classrooms, and high school STEM programs so that teachers could provide relevant, standards aligned experiences to students.
- ✓ Identifying schools across the region to develop as "demonstration schools" to build capacity for local professional development.
- ✓ Planning for the implementation of coding and robotics integration beyond the media center into the core content areas.
- ✓ Providing training in Code.org Computer Science Fundamentals for teachers across the region.
- ✓ Developing the STEP Lab at the University of North Florida to shift preservice teacher access to technologies present in the schools in the region.
- ✓ Planning for Year 2 capacity building and first round scaling.

Northeast Florida Regional STEM² Hub, Inc. (EIN 47-4302882) is a Florida non-profit corporation, and is an organization exempt from taxation under section 501(c)(3) of the Internal Revenue Code. For additional information visit our website: stem2hub.org

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YEAR 2: Building Capacity & First Round Scaling

During the second year of our project, the Northeast Florida Regional STEM2 Hub will continue to work with school districts and partners deepen the integration of robotics and coding during the school day by infusing experiences beyond the media centers and into the core content areas. This will be accomplished by:

- ➢ Identifying and equipping the demonstration schools with needed equipment and professional development for implementation of content.
- ➢ Identifying key instructional and administrative personnel to receive advanced training opportunities and job embedded support to implement program at their school, support instructional staff, and provide training to others.
- ➢ Infusing computer science and coding, integrated, cross-discipline STEM experiences into preservice teacher education experiences to prepare the next generation of teachers.
- ➢ Providing advanced professional development opportunities with the selected curriculum and tools that will be implemented across the region to develop a team of local trainers.
- ➢ Facilitating local professional development to be provided by the cadre of teacher leaders identified to receive accelerated training.
- ➢ Implement learning from year 1, along with new learning into the demonstration schools, monitor, support, and adjust as needed.
- ➢ Provide summer training to expand local capacity.

YEAR 3: Continued Capacity Building & Round Two Scaling

During the third year of our project, the Northeast Florida Regional STEM2 Hub will continue to work with school districts and partners further infuse STEM + Computer Science learning into the school day by expanding the number of teachers participating in the program by offering summer training to teachers, and supporting their work as they implement their learning into the school day. In addition, the Northeast Florida Regional STEM2 Hub will open the doors of these training opportunities to Florida teachers beyond our region to share best practices and accelerate growth around the state.

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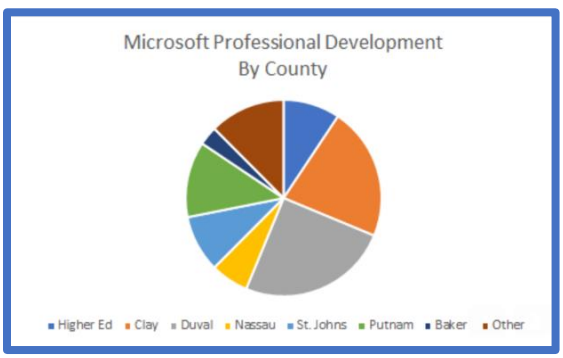
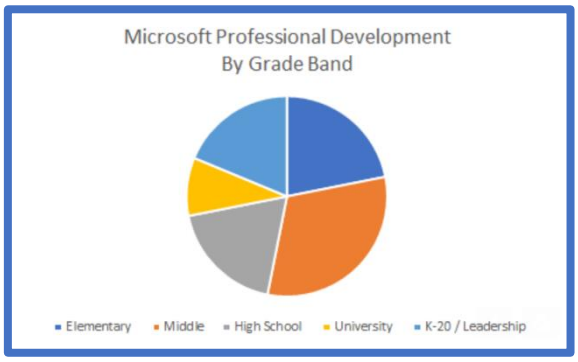
The distribution of the 30 spots that Microsoft provided us with is as follows:





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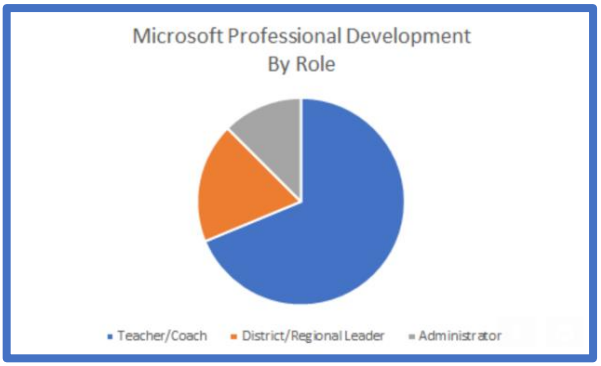

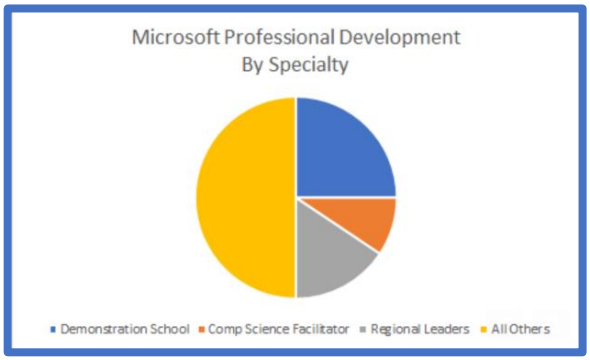

This blend of our region will allow us to build momentum, buy-in, and capacity at various levels and roles across the districts, while keeping a cohesive vision. Including higher education will allow us to continue to integrate best practices in the districts into the preservice education experiences, preparing a teacher with a new skillset, prior to graduation, and advancing those work that is already taking place. The group is looking forward to attending the training in July in time to ramp up for the start of school.

In addition to activities described above, many of our partners are providing in-kind programs and services to us at no charge to enhance and amplify the work happening across our region. Expert organizations, such as Code.org, and Microsoft, continue to weigh in and provide input to us to the types of skills that will be needed for the workforce of tomorrow, along with our local corporate leaders.

Coming to Secondary Schools this Fall – Chief Science Officer

We are ready to begin the pilot of Chief Science Officer when the school year begins. Leadership attended training to learn how to implement the program, start up districts were identified, and schools were selected for the initial roll-out. This program will be launched in three districts this fall, to include public and charter schools. This program will give students voice.

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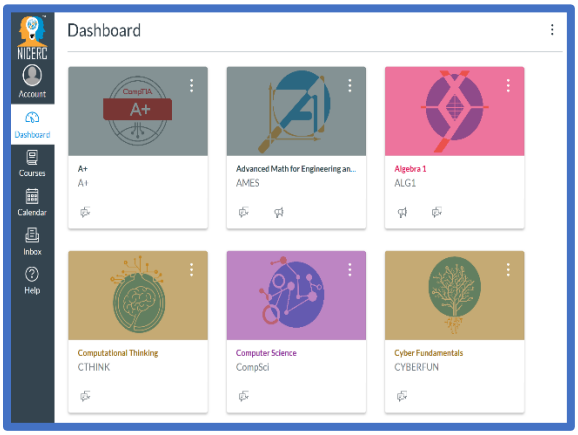
Under Development: Strong Cybersecurity Career Pathways

Cybersecurity and other related fields continue to be a pressing workforce demand. During the project period, our executive director reviewed the state of industry certification pathways by district with members of the STEM2 Hub corporate board, looking at the number of certifications received by students in all STEM areas, and also examined the pass rates for the most critical and foundational certificates. We found that there most high demand certificates had the lowest enrollment and pass rates, and some certificates with the highest pass rates are flooding the market with students now holding certificates that are not aligned to the most critical areas of need. To this end, and at no cost to the project, Florida Blue piloted a teacher professional development experience for CTE teachers in St. Johns County to learn about the local needs for economic development and the pathways to reach them. This was a successful pilot and we are now collaborating towards expanding the offering to make it available to teachers all around the region. One district, through an independent funding source, attended the national NICER conference to learn about pathways to infuse cybersecurity curriculum into their CTE pathways program. This knowledge is being shared with other districts. Districts have struggled with finding appropriate materials and resources to teach cybersecurity. We are excited for the promise of these resources and the potential to partner.

Currently, we have been given free access to investigate cybersecurity curriculum through this organization. Staff is taking the courses in the role of student to gauge the depth of the curriculum and scope of the materials presented, as well as to review the user experience.



We intend to implement from these programs at the start of the upcoming school year. We plan to begin the implementation in partnership with Putnam County School District, while piloting in an afterschool setting in the urban core. From there, we will work with our corporate partners and our schools who are offering cybersecurity programs to review these resources through the framework of their current programs, with a goal of assisting districts to build a stronger connection to workforce demands.

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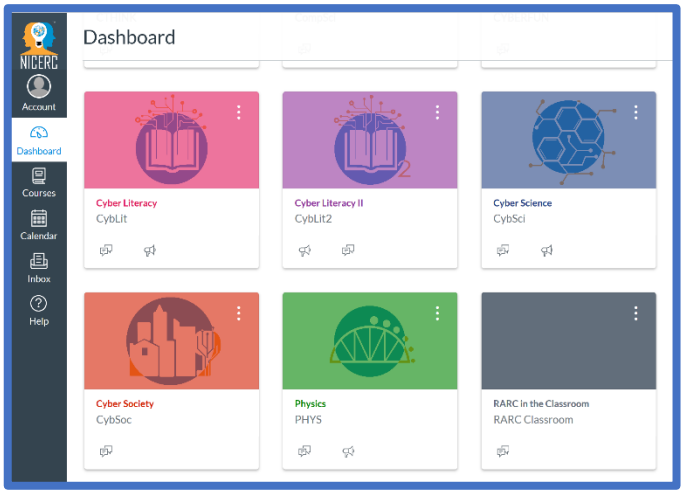
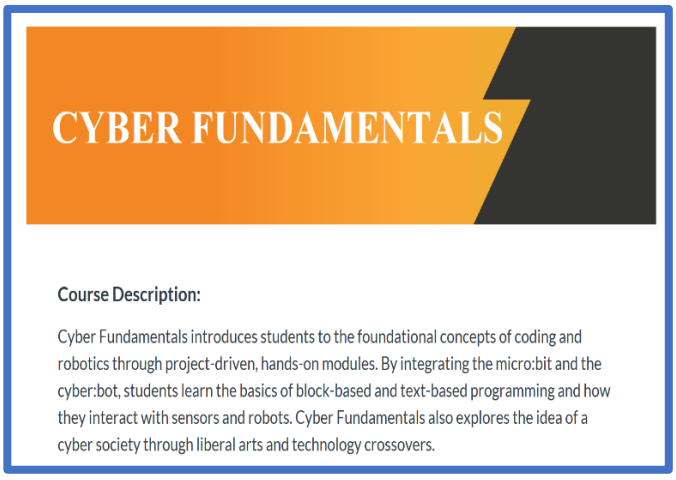
The curricula which has been identified as having the potential to put students on a trajectory towards building interest and aptitude for cybersecurity careers, specifically, and computer science, in general, include A+ Certification Course, Computational Thinking, RARC in the Classroom, and Algebra I, and Cyber Fundamentals. Other courses will be studied as well. Materials are available through a Canvas portal with a dashboard showing the course offerings.





Most materials are in a pilot stage, which is a good opportunity for our board and partners to weigh in on design and content.

The first course leading to a certification to be explored and implemented through various settings is the CompTIA A+. We are excited to be part of this pilot and explore the potential of delivering content through the afterschool setting, as well as supporting the work that is presently happening in our partner districts.

CompTIA A+

NICERC's A+ course is a hands-on curriculum that builds a strong understanding of the fundamentals of both the hardware and software of a computer system. This course supplies activities, alongside of textbooks, to help students grasp and retain the content. At the end of the course, the students are encouraged to take the CompTIA 220-1001 and 220-1002 exams. Upon completion of these exams, students are able to use these certifications for jobs in the IT field. This course is under development and is being piloted during the 2019-20 school year. **220-1001** is the first core of the exam.

This core covers make sure the students will have the knowledge required to:Install, configure, and maintain all the hardware technology involved in a personal computer.

- Know how to interact with the hardware and software of mobile devices.
- Set up a typical local area network (LAN).
- Know about available cloud services and how to set up and maintain virtual machines.
- Know how to troubleshoot hardware problems and networks.

220-1002 is the second core of the exam. This core covers make sure the students will have the knowledge required to:

- Configure, repair, and troubleshoot Windows, Mac, Chrome, and Linux operating Systems.
- Navigate around Windows and understand how to update, upgrade, and install Windows 7, 8, 8.1, and 10.
- Know about security, both physical and how to secure an individual computer.
- Know methods for securing networks.
- Knowledge to operate within the IT professional world.

The new Citi Teen Center at the Boys and Girls Club will be the initial pilot location. We plan to begin this pilot in the fall once the center is opened and students are enrolled.

Ongoing Projects:

After School Robotics

Our approach to implementation of this program was to work with community partners and school districts to directly fund or reimburse fees for new teams to be established. Registration fees, and equipment costs were covered, and the district or organization provided teacher or staff compensation to the mentor of the team. The STEM2 Hub provided coaches training all around the region to build team leadership capacity. Approximately 65 new teams were started this season, serving approximately 1,000 students. Equipment and registration fees were paid, and training was provided. Districts currently funding 100% of their robotics programs were given upgraded equipment, since many teams were working with outdated robots. **A total of 65 new robotics clubs & teams** have been successfully launched in after school programs all around the region impacting well over 500 students as a result of this project. We are pleased to report that 100% of Communities in Schools sites, Boys and Girls Clubs, and interested Girl Scout troops and YMCA programs now have robotics programs across

our region. We have coordinated with 21st Century Learning Grants across the region, as well, to build capacity for robotics within these programs.

Districts around the region are continuing to institutionalize robotics by assuring that teachers are provided a stipend to coach a robotics team. Clay, Putnam, and St. Johns Counties are amongst those who have funded this stipend for every school. We continue to work with after school programs in Duval County to expand access. Leadership buy-in and understanding of the critical workforce need for all students to have access to programs such as these is leading to robust participation, and a clear vision for STEM across our region.

At the end of the season, gaps were identified, and plans were made to expand the engagement of those still without a robotics team for the upcoming year.

STEM in the School Day

To achieve the overarching purpose of this project, which is to increase the availability of educational programs that will build interest as well as the **needed prerequisite skills for high-demand STEM- related careers** throughout the Northeast Florida region we must bring these skills and programs into the school day so that, eventually, all learners will be availed these opportunities and exposures. To this end, we are continuing to work with our school and district partners to align our work to impact the school day. The identified workforce-ready careers skills and dispositions that we continue to build include computer science and coding, competency in mathematics, and introductions to cutting edge and immerging technologies that are now beginning to enter the workforce and change the career outlooks. To continue this work, we are building upon projects that we began in the earlier part of the year, and – as planned – bring them into the next stages for capacity building. Demonstration schools have been identified in each of the districts, and supporting plans, as well as equipment needs have been developed. Materials have been ordered and are in place, training has begun at several sites, and deployment is scheduled for the start of the school year.

STEM in the Elementary Media Center – Coding & Robotics Infusion

Many students have the opportunity to participate in after school and summer robotics programs, but the number of students in robotics clubs represents only a small number of the total population in our schools. Robotics technology is a critical component for the jobs of the future, and we are already seeing robotic technologies infused into

multiple sectors including manufacturing, medicine, autonomous vehicles, and warehouse applications to name a few. Since all students need to have an understanding of robotics and their impact on the future of work it is important that we build capacity for all students to gain experience in this area. In addition to the workforce applications, there are strong alignments to standards, especially math, science, and computer science encountered through working with a robot.

The goal of the STEM in the Media Center project is to assure that all students have access to build a robot and learn to code during the school day. Students benefit from these experiences by strengthening their understanding of many math and physical science standards, as well as develop critical problem-solving skills and put the nature of science to work. The media center is an excellent setting to bring in these collaborative technologies. All students have access to the media center on a regular basis through the resource class, in many schools in our region. This approach also has enabled media centers to revision themselves to include 21st century media.

To accomplish this shift and begin the journey of providing media specialists with a new set of skills, professional development was provided by LEGO Education. Prior to the professional development, a planning meeting took place at LEGO North America Headquarters. LEGO convened a team and invited the executive director of the STEM2 Hub to visit and meet with the team. During the planning day, a tiered plan was developed to begin with the basics and then provide ongoing training and support to each media specialist. Input from Mitchell Resnick, the director of the Media Lab at MIT, met with the executive director of the STEM2 Hub and shared his ideas for the project, as well as best practices from his experience and viewpoint. The roll-out training was held early in October at the University of North Florida. Continued support for this work is being provided to the 71 media specialists and district leaders through continued professional development. From the initial 3-day professional learning experience, teachers left the training with equipment to take back to their schools for immediate implementation. Prior to bringing the teachers back together for the second iteration of the training, a survey was distributed to ask for what is working, and what challenges exist in the implementation so that the correct support

can be provided for participants. Excerpts from that report were provided in the third quarter report.

MIT's Mitch Resnick lends his thoughts to the visual representation of Schofield's visual logic model for systems transformation.

An analysis of the need shows that these media specialists, who are not STEM teachers, or math/science teachers by profession, are engaged in teaching standards that cross into the STEM content areas. They recognize the need for more training and support in both coding and robotics, as well as in content development. They also are loving using the materials with their students but have identified the need for the ratio of student to equipment to be much smaller. Some media centers are using a rotation model, while others are working with larger groups using a whole-class model. In either case, there is a need to increase access to the amount of equipment available to the teachers. In addition to this, teachers have identified the benefits to having classroom teachers become trained in the model so that infusion into the classroom can occur. This teacher-identified strategy leads well into the next phase of the project, which is to build capacity through demonstration schools, which are ready to deploy.

In phase two of the project, which occurred in the spring, eight schools around the region were identified to serve as demonstration centers so that capacity for leadership can be built around the region. In the demonstration schools, at least one teacher from each grade level will agree to take advanced STEM training and to integrate a robotics and coding-based lesson into their curriculum a minimum of one time per quarter. These sites will help build local capacity to provide training to other teachers and to give other local teachers the opportunity to visit a demonstration school and observe instruction.

Two districts did not fully participate in the first implementation of the elementary media center project because they had chosen to begin the journey with us with a different area of focus. They each have now collaborated with us to develop a modified implementation strategy that will allow them to join into this successful region-wide model. Those two districts are St. Johns County and Duval County.

Saint Johns County: While initially only sending a district STEM leader to attend the media center training to bring the ideas back to the county and discuss the strategy, through conversation and collaboration, they now wish to fully engage in implementing a

media center STEM strategy. Working with the district, we have developed a plan for a centrally based STEM lending library. In addition to this, through a STEM elective on the resource wheel, one elementary school will be coming onboard immediately to implement the Demonstration School model. This will occur while simultaneously while infusing the new robotics strategies into all media centers across the district.

Duval County: Charter schools in Duval County will be implementing the elementary media model in the upcoming round of districts, and one school in the urban core will also be selected to implement the program in the elementary schools immediately. Under the leadership of Dr. Diana Green, the district will continue to work with the STEM2 Hub team around the strong secondary implementations that were begun at the beginning of the project year and will work on expansion plans into the critical elementary areas.

These plans are moving forward as planned and will be accelerated in the upcoming school year.

Career Exploration and Readiness through Learning Blade:

We continued to infuse the Learning Blade curriculum into both formal and informal learning environments with positive impacts on student dispostions towards STEM careers. Learning Blade use in Florida is growing at a rapid pace and there is clear evidence of Learning Blade's impact on student STEM career awareness and interest. Through the support of the Florida's STEM2Hub Learning Blade has reached thousands of students with information about STEM careers and technologies.

The goal of this effort aims to assist Florida teachers providing them Learning Blade's Interactive STEM toolbox allowing them to inspire and increase student interest in and access to information around STEM careers while showing the students the relevance of what they are learning in school.

FLORIDA RESULTS

Learning Blade's cumulative results demonstrate the incredible reach and impact Learning Blade is having on the students and teachers in STEM2Hub zone of influence in Northeast Florida. In the 2018-2019 school year additional Florida schools received access to Learning Blade, increasing the impact of the investment.

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21st Century Workforce Development Project
4th Quarter 2019

STUDENT ENGAGEMENT IN COMPUTER SCIENCE AND STEM CAREERS

- **Online STEM Lessons Completed: 143,747**
- Hours of online STEM instruction: **19,600 (additional time is spent in offline activities)**
- Resources downloaded: **1,327**
- Training Events conducted, both In-Person and Online: **39**
- **Awarded seven (7) 3D Printers** to the following schools for completing 5,000 online STEM Lessons

    - First Coast High School (Duval County)
    - Stewart Middle Magnet School (Duval County)
    - James Weldon Jonson College Prep Middle School (Duval County)
    - Englewood High School (Duval County)
    - Twin Lakes Academy Middle School (Duval County)
    - Fernandina Beach Middle School (Nassau County)
    - C. H. Price Middle School (Putnam County)

DATA RESULTS

Research conducted with Learning Blade users has revealed significant differences exist between middle school students who use and those who do not use the online learning platform Learning Blade. In a quasi-experimental survey, students who used Learning Blade had improved STEM vocational aspiration, career development plans and STEM-related interpersonal interactions**.**

Learning Blade users were more likely to intend to pursue STEM careers:

- 59% more likely to be interested in a STEM career
- 84% more likely to want a job that designs or builds things
- 140% more likely to respond that they knew what STEM workers do

Learning Blade users were more likely to express interest in STEM to others:

- 70% more likely to be willing to like to talk about science with others

Learning Blade users were more likely to believe a STEM career is achievable:

- LB Users were 69% less likely to feel that STEM careers take too much schooling
- LB Users were 60% less likely to feel that science is too hard for them

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21st Century Workforce Development Project
4th Quarter 2019

Computer Science

Computer science is one of the most critical needs for the workforce. Computer science will continue to be a critical part in most every industry moving forward. Through this project, we are providing ongoing support to teachers and students, and expanding the number of teachers who will be able to provide instruction in this area so that schools will be able to offer more sections of the course in the years to follow.

Northeast Florida is in the fourth year of our regional partnership with the nonprofit organization, Code.org. Code.org has funded the first three years of this partnership for implementing a middle school course, Computer Science Discoveries, and a high school course, Advanced Placement Computer Science Principles, and a general education course, Computer Science Principles. We have built capacity in teachers around the region to introduce computer science to the youngest of students beginning with curriculum that is both digital and off-line (or unplugged) which teaches children as young as pre-K and kindergarten serious content and early computer science and computational thinking concepts. We will continue to set aggressive goals for training teachers until we reach the point where computer science is taught in ALL schools in our region.

Hour of Code – 2019 Goals

Hour of Code reached record breaking numbers this year with many schools committing to affording EVERY child the opportunity to participate. Through this work, a survey was administered asking school leaders to provide a brief summary of how they were able to implement the school-wide event. Thanks to the generous sharing of strategies, we now have collected data to provide a Blueprint for Success: How to Bring Hour of Code to 100% of Students (Regardless of the Bell Schedule). This document will be widely disseminated in time for planning for Hour of Code in December 2019, with a

goal of 100% of Northeast Florida students participating in a coding experience during the week. With the blueprint developed during the 2018 Hour of Code, we will extend a challenge for ALL students in our region served to participate in the Hour of Code during December of 2019!

Continued Focus on Mathematics

The partnership with the NICER group (described earlier) also offers a new approach to algebra content. The Algebra I curriculum is presented through a different lens than the traditional textbook. The materials are structured to present the content through context, content, application, and presentation. The intent is that these materials will be used to strengthen content knowledge of students who may need support in mathematics by presenting the materials through a different approach that is problem-based.

We consider this a strategic time to try a new approach to mathematics learning, especially, especially in the out of school setting. Math remains a critical factor as we continue to work across our region to build capacity to offer students the strongest experiences possible to build confidence, content, and self-efficacy in mathematics. We believe that this project-based approach to Algebra I will strengthen the ability of students who struggle with algebra, and may be a game changer to knock down a potential barrier for those who need a different approach to learning mathematics.

This is of critical importance because competency in mathematics is required in many of the jobs of the future. A lack of proficiency in mathematics closes doors for students for careers in computer science and coding, as well as many STEM careers, including engineering, medicine, and physics. Lack of a strong mathematical competency even limits entry into fields outside of STEM including finance and accounting, actuarial studies, and many manufacturing jobs. Students are even disadvantaged in managing their own financial decisions as they move from formal schooling to the workforce, and their adult life.

Mathematics achievement in Florida, and specifically in Northeast Florida, is not where it is needed to be. Proficiency, as reported by the Florida Standards Assessment (FSA), reveals startling data. Many students are not being given adequate preparation

in the area of mathematics in elementary schools, and a shaky foundation leads to struggles as the content in mathematics grows progressively more complex.

These goals, described above, represent our commitment to building pathways that will have a lasting and systemic impact on our educational system. Through the natural infusion of this work into our partnership, and with **no cost to the project**, for **the first time in the nation**, we have been able to graduate the **first cohort of 10 new teachers with a computer science education cord**, indicating that they will report to their schools with the ability to introduce computer science fundamentals to their students. We see this as just the first step in preparing teachers who are truly ready to infuse STEM + CS learning pathways into our K-12 education system. This approach, through deep partnership, is allowing us to envision system strengthening experiences for all young people through the development of our future teachers.

Ten newly graduated teachers will enter from the University of North Florida will heads to their teaching assignment ready to introduce computer science fundamentals to their students.

We will continue to prepare our teachers to facilitate learning in this environment and challenge our school and district leaders to continue with us on the journey to assure equitable access for all of our stakeholders.

Members of the University team will be joining us for our visit to Microsoft in July, where new lessons learned from industry will be brought back to our region for implementation and expansion in teacher preparation.

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Our region has continued worked together as a team, and as a STEM Learning Ecosystem, to implement the ***Northeast Florida 21st Century***

Workforce Development Project. We are looking forward to continuing our work beyond the current fiscal year and building upon the work that is in progress to bring true change to our system.

Should you need additional information, or have questions, please contact the STEM2 Hub's Executive Director, Kathleen Schofield, by email at kathleen@stem2hub.org or by phone at 904-502-0958.

You may also visit our Facebook page to see more pictures and videos from these and other events. Please "Like" us on Facebook: @NEFLSTEM2Hub

We would also like to acknowledge and thank the following key partners in the success of this work: The Florida Department of Education Bureau of Standards and Instruction, led by Kathy Nobles, and her team, The University of North Florida College of Education, led by Dr. Diane Yendol-Hoppey, and the College of Computer Science, led by Dr. Chip Klostermeyer, Dr. Betina Malhotra, Code.org Regional Partner, LEGO Education, Microsoft EDU, and the Microsoft Team at the St. Johns Town Center, WozU Education, Mitch Resnick at the MIT Media Lab, and all the local teachers and administrators who are working together to assure strong outcomes for our students.

On behalf of all stakeholders in the region, and our Board Members, listed below, we thank you, the members of the Florida Legislature, for your commitment to our work and your support as we continue to implement this project.

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Vice-Chair, STEM2 Hub
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David Balz
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Kathleen Brandt
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