This proposal is geared towards the High School Strand of a small class size. Athens State University is proposing a Bootcamp for current teachers who are already in the classroom having to teach Computer Science and related topics, and teachers who are interested in being able to teach these subject areas in their schools.

In today’s society, technology is considered a normal part of everyday life. Where technology was once considered a privilege, today it’s something expected, especially within the educational system. Students in the 21st century have access to technology like never before. It is integrated throughout their entire world; everything they know probably has some technology related to it. Even adults are frequently outsmarted by their young children when it comes to technology. It is one virtue to know how to use technology, but to create technology is a completely different world. The young generations of today have no issues in learning the use of technology, however, many of them are never introduced to the power of creating technology. In the rural south, the state of Alabama is trying to change this. Recently, Alabama became the 15th state in the U.S. to have the State Board of Education adopt Computer Science standards for the K-12 curriculum. Now that these standards have been established, the journey from adoption to implementation begins. How will tomorrow’s teachers receive the appropriate training to teach Computer Science across the curriculum, especially in Alabama schools [1].

It is a known fact that if students are not introduced to a discipline early on that area frequently will become difficult to get them interested in it. Many students that are not introduced to STEM fields early in their education have no interest in those fields as they get older. This is why young students need to be reached and a reason for the Computer Science initiatives that are happening across the country and across the world. In Alabama, in 2007, there were over 270,000 high school students and only 27 of those students took the Advance Placement Computer Science A exam, which is to be compared to an AP US History exam where 5,200 took it in the same year while 120 students took the AP Latin exam. In 2017, the number of students that took the AP CS A exam grew from 27 to 1,520. With additional teachers receiving the appropriate training and professional development the number of students that are exposed to computer science through their K-12 education is expected to continue to increase. [2]

Much of the work being done with the K-12 education system is in partnership with code.org and a lot of it is driven by individual teachers who want to expose their students to Computer Science. Now that Alabama has adopted Computer Science standards and K-12 teachers have guidelines, it is up to higher education to start preparing the future teachers that will be teaching Computer Science.

The Bootcamp being proposed will assist teachers in learning and becoming proficient with the use of the technology that they are being required to teach at the High School level.

Code.org is a nonprofit organization dedicated to expanding access to computer science in schools. Their mission is that every student in every school has the opportunity to learn computer science [2]. According to code.org, 90% of parents want their child's school to teach Computer Science. Unfortunately, even though there is a want from parents as well as an industry need, there is currently not enough being done to ensure code.org’s mission is met, especially in the state of Alabama. Different states are beginning to recognize and embrace the shift that technology has placed on society, especially in Alabama. In March 2018, Alabama became the 15th state to adopt Computer Science Standards for K-12 education.

By referencing the required curriculum guidelines provided by Code.org and the Computer Science standards that have been adopted by the State Board of Education, the Bootcamp will consist of sessions that will allow for teachers to have a hands on experience and learn how to integrate what they are learning from the Bootcamp into their own curriculum.

Sessions Offered and Information Covered:

Orientation

During orientation there will be a brief introduction to each session of the bootcamp that the participants will go through. Once each section is introduced participants will be provided with a pre-workshop survey to assess their knowledge based on each session.

1. Hardware – Determining Needs and Building a System

* Actual hands on – will need system kits for builds (purchased, donated or acquired from surplus? We do want them to actually run once the teachers put it all together)

1. Networking – Setting up a Secure Network

* Use the following site to create a basic network configuration simulation that is optimized for security:
* [http://malkiah.github.io/NetworkSimulator/simulator01.html#](http://malkiah.github.io/NetworkSimulator/simulator01.html)

1. Cybersecurity – What is it? It’s impacts & the CIA triad

* What is Cybersecurity?
  + Cybersecurity defined
  + Why is cybersecurity important?
  + Cybersecurity in the news
  + Cybersecurity and IoT (Internet of Things)
  + How do we prevent cyberattacks?
  + Example activities:
    - Summarize and discuss recent cyber attacks
    - Explore a threat map to see where cyberattacks are coming from and which countries are being targeted
* Impact of Cybersecurity
  + Why do we care about cybersecurity?
  + What information is at risk?
  + What are the impacts of cyberattacks?
    - Financial impact
  + Cybersecurity workforce
  + What are current cybersecurity career?
  + Example activities:
    - Review resources and reflect on or discuss
      * What information do cyber criminals steal?
      * What do cyber criminals do with stolen information?
* The CIA Triad
  + What is the CIA triad? (confidentiality, integrity, availability)
  + What are “secure systems?”
  + What do confidentiality, integrity, and availability mean in cybersecurity?
* Introduce teachers to the MITRE CAPEC Database

1. Secrecy - Encryption, Cryptography and Ciphers

* Cryptography, Cryptology, Cryptanalysis
  + Why do we need some secrecy in our transparent information age?
  + Explain general encryption with data, keys
  + Example activities:
    - Video and discussion on securing the cloud
    - Passing notes in class (offline activity)
* History of Cryptography
  + Why do we encrypt?
  + What are some classic encryption techniques?
  + What is the flaw in substitution ciphers?
  + What was The Enigma during WW2?
  + What is modern cryptography and how has cryptography changed over time?
  + What is 256-bit key encryption and how does this help cryptography overall?
  + Example activities:
    - How did the Enigma work?
* Why do we Need to Encrypt Data?
  + Explore the CIA Triad and encryption
  + Example activities:
    - Telephone game with math (offline)
    - Modulo math activity sheet
* Basic Cryptography Systems: Caesar Cipher
  + Explore examples of the Caesar cipher
  + Example activities:
    - Practice with a Caesar Cipher JavaScript program
    - Modify the program to create the decrypting Caesar program
* Basic Cryptography Systems: Cracking the Caesar Cipher
  + How do we solve the Caesar Cipher with brute force and using letter frequency analysis?
  + Example activities:
    - Practice cracking Caesar Cipher with brute force
    - Practice cracking Caesar Cipher with letter frequency

1. Accessing Resources and Virtualization – Using the Alabama Super Computer & Virtual Machines

* Alabama Super Computer
* What is the Alabama Super Computer?
* How do I access the Alabama Super Computer?
* What can I do once I have this access?
* Virtualization
* What is a Virtual Machine?
  + Installing a virtual machine

1. Programming – Basic understanding through Alice

* One dimensional array
* Lists
* Stacks & queues
* Conditionals & iteration
* Basic I/O
* Functions & parameters
* Recursion
* Object-oriented programming
* Class level methods and inheritance
* Basic user interface design

1. Taking it home – Integration into current curriculum

***Need to discuss with Dr. Hester as to the topics that would be covered here.***

Wrap-Up

During this wrap up session participants will be reminded of all the sessions that they have attended and asked to complete a post Bootcamp survey.

Each session will cover a 4 hour periods except the first session and the last. Those will only be 3.5 hours due to the Orientation and the Wrap up. Sessions would be 8:00am – Noon, Noon – 1:00pm lunch, 1:00pm – 5:00pm. Having two sessions per day means that this would be a 4 days’ workshop. While some of the sessions may not have enough information to be covered in a 4 hour periods, it will allow for more practical learning through hands on and discussions to take place. During the orientation the teachers will be split up into groups and a rotation system will be followed for the sessions. This way each session has a group of participants attending it each day, and by keeping the numbers down (at most 15 – 20 participants per session) allows for the trainers to provide more attention and discussion with the participants.

After the workshop is over training will continue through the use of online tools. Discord will be used for synchronous communications purposes while Basecamp will be used for Managing additional online trainings and resources. Using these tools will introduce the teachers to tools that their students may already be using as Discord is a popular gaming chat service, and Basecamp is used for Project Management which they can also introduce in their own classes. To continue the assessment of the training through the Bootcamp, throughout the year we will continue to conduct surveys to receive feedback and the integration of what they have learned at the Bootcamp with what they are teaching in the classroom.

The feedback that we are able to receive from the teachers through the Bootcamp and the follow up time will allow for us to be able to make improvements in the second year of offering the Bootcamp. However, the training cannot stop here. After the first two initial years we must then proceed with a phase 2. The recommendation is to treat the established Bootcamp from this proposal as an Introductory Bootcamp and have Phase 2 be an Intermediate/Advanced Bootcamp where we can then focus on other areas that are taught in the High School levels such as:

1. Python
2. Mobile programming
3. Web programming
4. Robotics
5. Advanced Cybersecurity – exploring common attacks and mitigations

Sources:

[1] K. P. Mayfield, and L. Hester, “What does it take to establish a computer science education degree? The collaborative journey between a computer science and a secondary education professor”, Proceedings of the 14th International Conference on Frontiers in Education: Computer Science and Computer Engineering, Las Vegas, NV, July 2018.

[2]Code.org. (2019). *Code.org: What will you create?* [online] Available at: https://code.org [Accessed 26 Sep. 2019].

[3] Codehs.com. (2019). *CodeHS - Teach Coding and Computer Science at Your School | CodeHS*. [online] Available at: https://codehs.com/ [Accessed 26 Sep. 2019].

[4] S. M. Biju, “Taking Advantage of Alice to Teach Programming Concepts”, E-Learning and Digital Media, Vol. 10, No. 1. February 2013.