Swarming Eagles
High School Outreach Report

TEAM MEMBERS

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Who: Coppin Academy High School
What: Outreach Report
When: 14 weeks; Fridays and Saturdays, 2-4 pm or 4-6 pm
Where : TBA
Why: To instruct young, upcoming college students on the highlights to programming and the wonders of robotics.

How: Providing insight, examples, and challenges that allow them to demonstrate their potential prior and current knowledge for concepts and syntax

INTRODUCTION:

The second annual Swarmathon was introduced to the Computer science department at Coppin State University thanks to Dr Leshell Hatley. Her passion and dedication in regards to pushing for the learning of programming and all other aspects of the computer science field made her suggest that we participate in the NASA Swarmathon competition.

Our team, consisting of 17 college students with varying strengths in doing different things. The strengths range from explaining code to a novice to properly writing C++ code. We planned to partner with a fantastic high school named Coppin Academy HS to teach what we have learned and also set them up for better understanding of programming and also the NASA Swarmathon. Perhaps some of these students will participate in the competition in the future. We did not get to offer our planned courses to students at Coppin Academy, but hope to do so next year. Following are details of our plan.

PURPOSE:

Coming up with a proposal for what exactly we want the students to understand and in the allotted time is not an easy ordeal. As a group, we understand that teaching students the different programming languages would be a daunting task. Therefore, we will narrow it down to a few critical topics and ultimately come up with a plan to ensure the students are given ample opportunity to engage and enhance their skills as amateur programmers. Our hope is that by the end of the planned course, they each would have experienced programming and to inspire youth to want to pursue fields in the endeavors of sciences and math. We also hope to build the bridge in the industry that normally doesn't exist which can deter many youth from inner city schools from chasing a career in computer science.

Following is our high school outreach plan by week.

OUTREACH WEEKS (1-5)

Starting out, our first step forward with the students will be introducing them to programming using Lego Mindstorms Robots along with other major languages used in the real world a, while also keeping them interested in what we ultimately want to achieve with them. We want to steer clear of anything that will scare them away from programming while at the same time not introducing them to loads of syntax or concepts from immediately. Those concepts can be repetitive and can lead to disinterest quickly. We will start them with general and real world logic instead. The first couple of sessions will also include discussions with the students on some of the benefits to pursuing a technical degree and becoming a programmer. In

these sessions, we will discuss the few ways programmers change and affect the world around us. We may write and run some codes for them to demonstrate what programming is all about. We also think it will be a great idea to brainstorm with the students and come up with some technological advances they hope to see in the future and how programming can be useful in the developing and implementing those ideas. As we are participating in a virtual robotics competition, briefly touching on Robotics with the students is a no brainer. We are confident that after the first couple of sessions with the students will be excited and keen to learn more throughout the rest of the semester as we dive into more complex topics.

OUTREACH WEEKS (6-11)

After the first few sessions with the students, we will begin to engage and instruct them on some of the various programming languages. As we all know, there are so many different coding languages out there and attempting to touch on every one with the students would be a waste. We have narrowed down 3 languages we plan to look at as a group (Python, Java, and C++) as well as a little bit of web design/development with HTML and CSS. We identified Scratch, a code learning platform developed by MIT as a good resource for the students how to code. To use the time we have effectively and efficiently, we will separate the students into 5 equal groups and assign one language to each group. Their first challenge will be to research that language extensively and collaborate with one another to come up with a short write up one some of the history and syntax of that particular language. This assignment will be great for them because they will not only learn a little about a programming language but they will learn to work with one another as team to accomplish something which they will be doing a lot if they decide to go further and become programmers/software developers. After these reports are analyzed, we will discuss briefly with the the entire group each language. We will compare and contrast each language and even talk about some of the common uses for each particular language. At this point we will be at least multiple sessions in with the students, and will want to start the students off on reading and writing code. A lot of emphasis will be placed on students staying engaged and participating in the discussions which are critical to their intellectual development as a programmer. We hope to spend about 3-4 sessions (weeks) reading, analyzing, and writing code with the students or at least until they feel comfortable with writing small programs on their own. We will provide the students with challenges for them to practice writing code and may even come up with a super challenge and give out a prize for the student who writes a code that meets the requirements.

OUTREACH WEEKS (12-14)

In the final stretch, we would shift the attention from programming and writing code to robotics. As a group, we feel since we are competing in a robotics competition, we should at least touch on robotics with the students so they can have a better understanding of what we are trying to accomplish. Before doing so, we will run through a quick review and answer any more

final questions they may have. Before we really dive into Robotics, we felt it would be best that we had small discussion with the entire body about how programming and robotics are intertwined. A discussion about algorithms could also perhaps prove useful. Once we begin to turn our attention to robotics, it will be critical that the students retain some of what they learned about programming. The first sessions with robotics will consist of brainstorming and discussions about what robotics does for our society and what the near future holds for them (similar to what we did before we started to learn how to program). Because C++ is a popular language used in robotics, we hope to share the importance of being able to at least read and analyze code. In this discussion, we would go over the different functions of robots and how we can control what they do with codes. At this point, we will be in one of the last few sessions, so the focus will be entirely on integrating what we've learned about programming with the little we know about robotics.

Hopefully, after the time we've spent with the students, we would have instilled in each of them, the confidence and will to pursue programming, Robotics or at the very least, stay engaged in the technical world enough to be able to read and write simple code. The importance of being able to analyze code could prove useful in their future job opportunities and could be the defining factor in getting a promotion or even getting the job itself. The goal for our group in doing this outreach activity is more than just a requirement for our competition. We as a team are very much interested in the overall growth of the youth that will soon take our places in the collegiate world and we simply want them to be as well rounded before they even step foot on a college campus. Whether or not they decide to pursue a technical degree or decide to compete in the Swarmathon, we want everyone in the outreach to have an experience that challenges them mentally, and at the same time fun and friendly.