

BUILDING UNIQUE
INVENTIONS TO
LAUNCH DISCOVERIES,
ENGAGEMENT AND
REASONING IN STEM

TUSKEGEE BUILDERS ACADEMY

JUNE 15, 2018

WELCOME TO THE 2018 BUILDERS ACADEMY!

INSIDE THIS ISSUE:

WELCOME TO THE 2018 BUILDERS ACADEMY	1
WHAT DO BUILDERS DO?	1
THE BUILDERS TEAM	2
OUR TEACHERS	3
INTRODUCTION TO MAKING	4
PROBLEM SELECTION	5
DESIGNING IN A MAKERSPACE	6
PROTOTYPES OF PROTOTYPES	7

We are back at it! The 2018 BUILDERS Academy started June 11 for three weeks of researching, designing, and building the first version of our students' prototypes.

The goal of the BUILDERS Academy is to have teams of students research and design possible solutions for a real problem that could impact their community. During the 3-week summer Academy, stu-

dents begin research and design of prototypes for their proposed solutions. Students will continue working on these prototypes through the school year, and will present their final products in a March showcase.

This year, we have two participating schools: **Notasulga High School**, with 9 participating students and one teacher, and

Robert E. Lee High School, with 32 participating students and 4 participating teachers. Please, look inside to meet the entire BUILDERS team and get a peek at what our students will be doing this year!



WHAT DO BUILDERS DO?

BUILDERS select a problem, research the problem, and come up with a prototype for a solution to the problem. They work collaboratively in a **makerspace** to create an inexpensive, portable, solution, made of readily available materials and which could be easily replicated. To get to that point, our BUILDERS must learn and understand a variety of STEM and design concepts and learn to work as a team.



Makerspaces...

- teach students how to use technology with a purpose
- foster independent thinking and independent work
- allow for learning from experience
- create communities based on common interests
- foster creative ways to use materials, a critical skill in the 21st century
- make students feel proud of their intellectual capacity and creativity
- Teach students that failing is part of the process of reaching long-term goals

The BUILDERS



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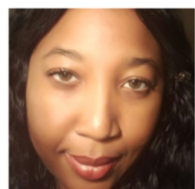
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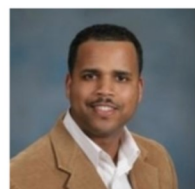
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Our Teachers



In a lighthearted moment, our teachers demonstrate how to use bubble wrap as a blanket (it was cold in the gym that day!). From left to Right: Ms. Febles, Mrs. Jones-Stallworth, Mrs. Williams, and Mrs. Johnson (Robert E. Lee High School), and Mrs. Thompson (Notasulga High School).

Our teachers make the daily activities of the Academy possible. They work collaboratively with each team to guide them as they research, design, and develop their prototypes, and will continue working with students through the academic year.

Ms. Manuela Febles has a B.S. in Biology from Tuskegee University and an M.A. in Education with an endorsement in Biology from the University of North Alabama. She currently teaches Biology and Plant Biotechnology at Robert E. Lee High School. She expects her students to **form meaningful relationships** with their peers and adults while **understanding how their learning can contribute to their community and to the world**. She considers herself a Naturalista, and loves natural hair!

Mrs. Carla Jones-Stallworth is a native of Thomasville, AL. She received a B.S. UAB's Dental Hygiene program, and a Masters of Divinity from Samford University. After working as a dental hygienist, she be-

came a didactic instructor at Fortis Institute (Birmingham, AL), and an adjunct at multiple UAB Dental Outreach initiatives. She decided to continue her career as a Science teacher at Robert E. Lee High School. She enjoys traveling with her husband, Dan, and their son, Daniel. She hopes the BUILDERS program will **spark the brain of future leaders** from Robert E. Lee High School.

Mrs. Keshia Williams has dual B.S. degrees in Biology and Food and Nutritional Science/Food Science from Tuskegee University, an M.A.T. in Secondary Education from LaGrange College, an M.S. from Clemson University in Biological Science, and an Ed.S. in Secondary Education Science from The University of Alabama. Ms. Williams serves as the multicultural director of the Alabama Science Teacher Association. She currently teaches AP Biology and Environmental Science and Robert E. Lee High School, where she is also the advisor of the Science Club and Senior Class. Ms. Williams' goal is to **make students more scientifically literate** in preparation for 21st century demands in STEM fields.

Mrs. Crystal M. Johnson received a B.S. in Biology from Tuskegee University, an M.S. in Secondary Science Education from Auburn University, and is a past GK-12 Fellow of the National Science Foundation. Mrs. Johnson is currently a 9th grade Biology teacher at Robert E. Lee High School, and an active member of the Alabama Science Teacher Association. She is married to Rev. Eugene A. Johnson, Jr. and they are blessed with one rambunctious 3 yr. old, Eugene III. She has long been motivated by the **desire to inspire students**, and hopes to realize this desire in the makerspace.

Mrs. Cheryl Thompson is a native of Mobile, AL, and a Tuskegee University alumna. She started her teaching career in the Macon County school district, taught for many years in Lee County, and returned to Macon County last year. Mrs. Thomson is currently part of the Math faculty at Notasulga High School. She is happily married to Melvin Thompson, Jr. Mrs. Thompson wants her students to use the opportunities provided by the BUILDERS Academy to **work out of their comfort zone and push themselves to achieve more than they ever thought they were capable of achieving**.

A favorite quote of Mrs. Jones-Stallworth:

"I'm not saying I'm gonna change the world, but I guarantee that I will spark the brain that will change the world."

— Tupac Shakur

Summer Academy — Week 1

PROBLEM: CREATE A SOUNDBOX THAT COMPLETELY MUFFLES THE SOUND OF YOUR CELL PHONE



Students were tasked with creating a sound box that attenuated the sound of their cell phone playing music. Each team was tasked with taking a measure of background noise, baseline sound, and muffled sound.



Readily available materials:

- Cardboard boxes
- Foam paper
- Styrofoam
- Bubble wrap
- Tape

Special equipment:

- Sound pressure level meters

Concepts acquired:

- Properties of sound
- Sound pressure level scales
- Density
- Sound perception
- Absolute vs. relative measures

Time limit:

- 2 hours
- Activity ended with each team presenting their box and providing rationales for their choice of materials and design

PROBLEM: CREATE A SOUNDBOX THAT COMPLETELY MUFFLES THE SOUND OF YOUR CELL PHONE

WHAT ARE WE MAKING?

Problem 1: Create a device that can be powered effectively and inexpensively by an alternative energy source and which has minimal ecological impact.

Problem 2: Create a system that can test for toxins, virus, or bacteria that can be damaging to health.

Problem 3: Develop an inexpensive water purification system that can be used anywhere in the world.

Problem 4: Invent a backpack that stores a heavy-duty but lightweight shelter/privacy tent and which could provide relief from the elements to a homeless individual.

What is our task?
Choose a problem, come up with a solution to the problem.

How do we do that?
Research the problem, make a design, get the materials, develop and test a prototype.

What are the rules?
Must be inexpensive, portable, and built from readily available materials.

WHO COMES UP WITH THESE PROBLEMS? WHO RESEARCHES WHAT? THE MAKINGS OF THE BUILDERS EXPERIENCE

Program faculty propose problems to the participating teachers, who decide which of those problems better aligns with their students curriculum. These problems are sensitive to the sociocultural environment of our students, so they can clearly understand the impact of finding a solution.

Teachers select 5 problems that are presented and explained to students. Students rank those problems based on their interest, and teams of 4 students are created based on their expressed interest.

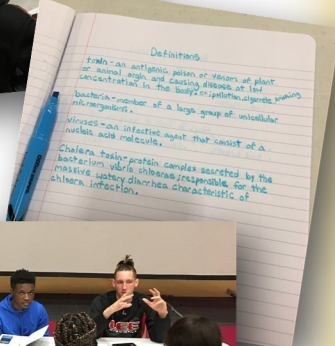


Teachers (front, left), students (all tables in the back), peer mentors (front, right), and program faculty/graduate students (front, center) share a collaborative space at Tuskegee University.

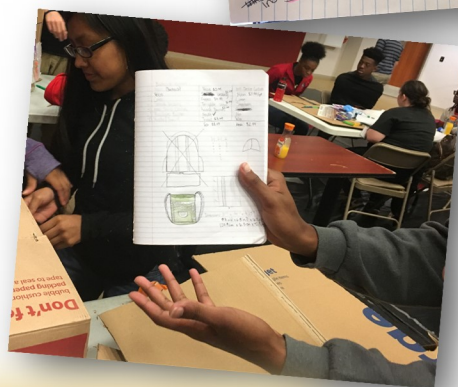
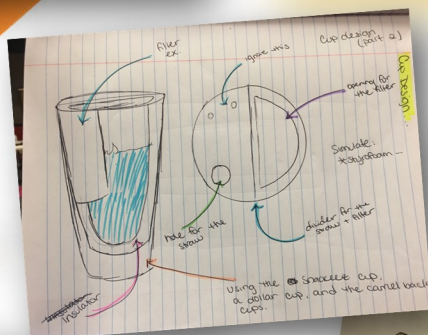
A favorite quote of Mrs. Thompson:
"The function of Education is to teach one to think intensively and to think critically. Intelligence plus character — that is the goal of true education."
 — Rev. Martin Luther King, Jr.

Problem Selection

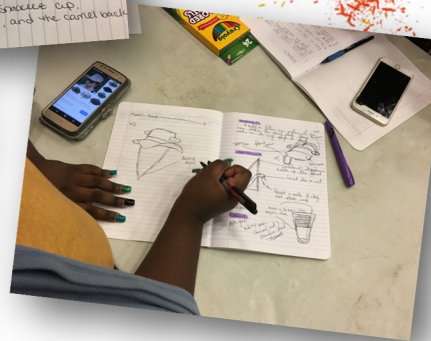
Designing in a makerspace



Good design begins with thorough research. Students were encouraged to use the Internet and our “people resources” (teachers, BUILDERS faculty, and peer mentors) for guidance and direction for their projects. Brainstorming led to many ingenious and creative ideas, but research suggested that some of those ideas were not possible or practical. Students use notebooks to record what they have learned, why ideas are worth pursuing, and why some ideas must be abandoned.



Students quickly understood the value of visual sketches. Many of the initial designs had to be dismissed and reimaged as part of the creative process.



*In our Makerspace, we try
to redefine our students'
concept of "trash."*

Leftover materials are saved for future projects, and failed projects are upcycled into new projects.

Prototypes of prototypes



By the end of Week 1, we had miniature versions of the students' ideas for prototypes. Now, the research will turn to materials, ways to test products, and feasibility analyses.



Who are these young people??? They are our fabulous peer mentors selected from the 2017 BUILDERS Academy, and who spend every day of the Academy sharing their experiences as former BUILDERS Scholars with our new teams. Meet them in our next newsletter!!!



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