



Addressing the STEM Divide

STEM Summer Camps to Promote Future STEM Leaders

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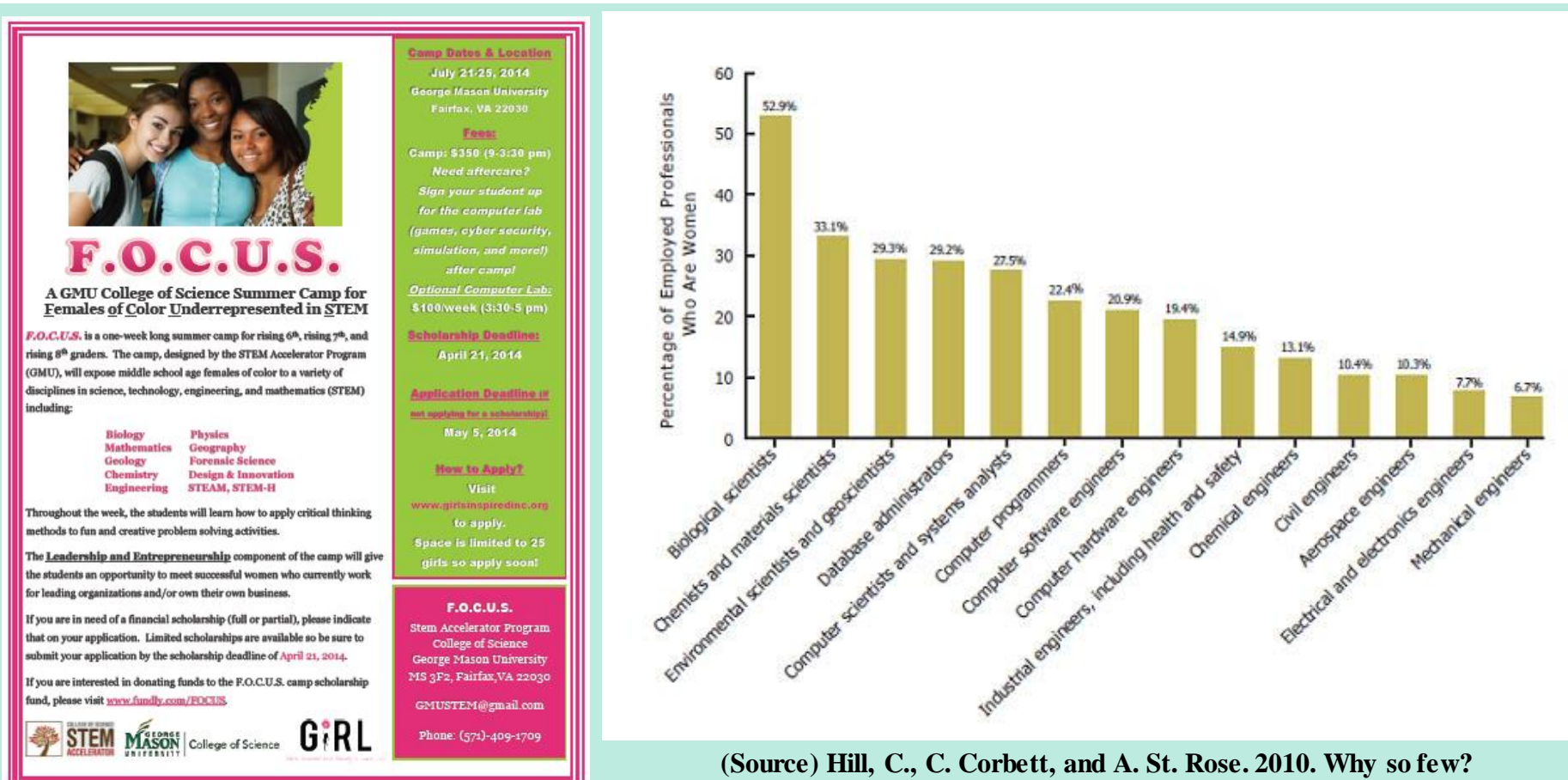


Engaging Women in STEM

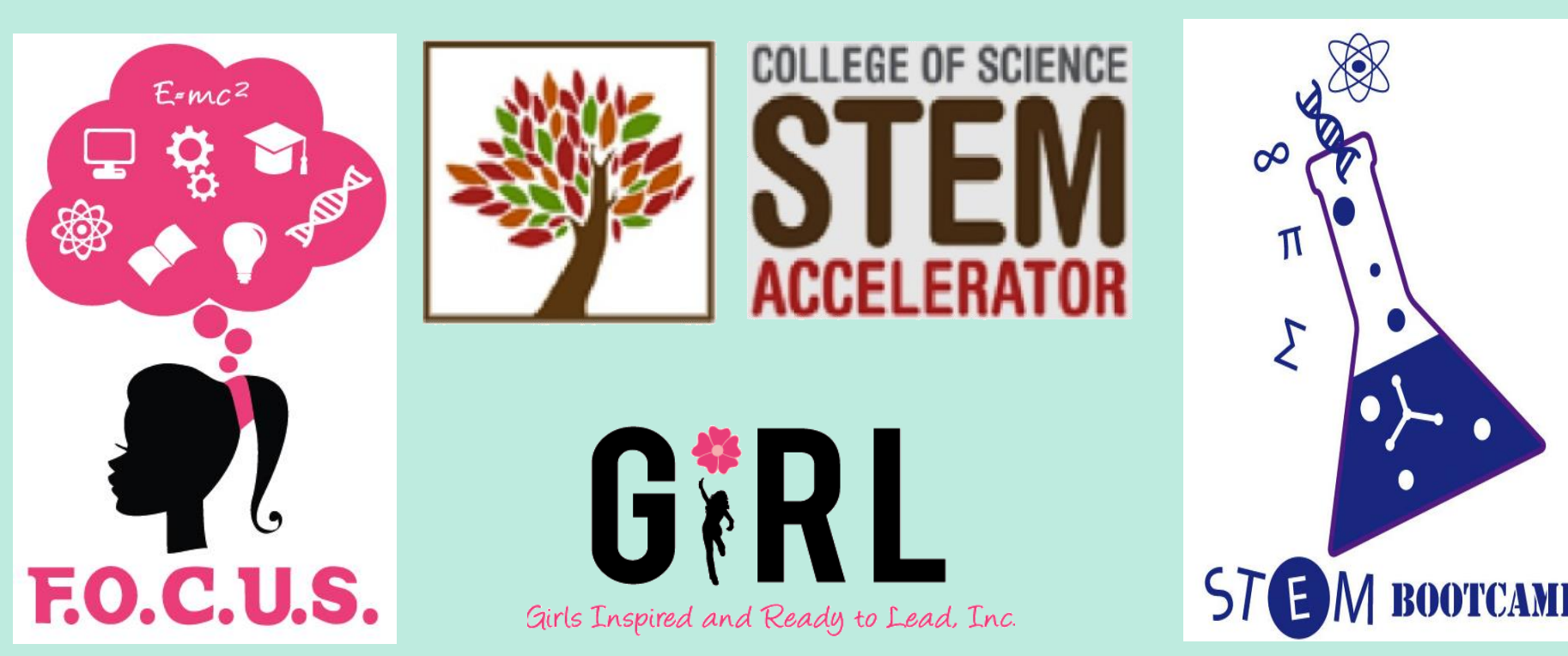
"If we are going to out-innovate and out-educate the rest of the world, we've got to open doors for everyone. We need all hands on deck, and that means clearing hurdles for women and girls as they navigate careers in science, technology, engineering, and math."

....First Lady Michelle Obama

A girl or woman of color who wishes to pursue a career in STEM requires a support system that includes mentoring, network building and leadership development. The STEM Accelerator Program in the College of Science at George Mason University has taken steps to provide such a support system. With a goal on recruitment, retention, on-time graduation and finding jobs in STEM, the Accelerator Program has initiated a variety of programs at all levels. Two of these programs include (a) **FOCUS** (Females Of Color Underrepresented in STEM), a program that is jointly coordinated with Girls Inspired and Ready to Lead, Inc. where middle school girls of color worked closely with undergraduate mentors on a week-long STEM program and; (b) a **STEM Boot Camp**, a program that helps incoming freshmen in STEM to get prepared for the college road ahead by immersing them in a content class such as Calculus I, General Chemistry, Introduction to Physics and Cell Biology in one week taught by faculty as well as give them exposure to undergraduate opportunities and other STEM career pathways. Both the FOCUS and STEM Boot camps are great models of intervention that have helped provide great insights to faculty in the STEM Accelerator program to understand important transition that represent the greatest points of loss of women of color from the STEM fields. They have also helped to understand how the recruitment, retention, and advancement of women of color in STEM may be improved through research and practice.



(Source) Hill, C. C. Corbett, and A. St. Rose, 2010. Why so few? Women in science, technology, engineering, and mathematics. Washington, DC: AAUW, 14.



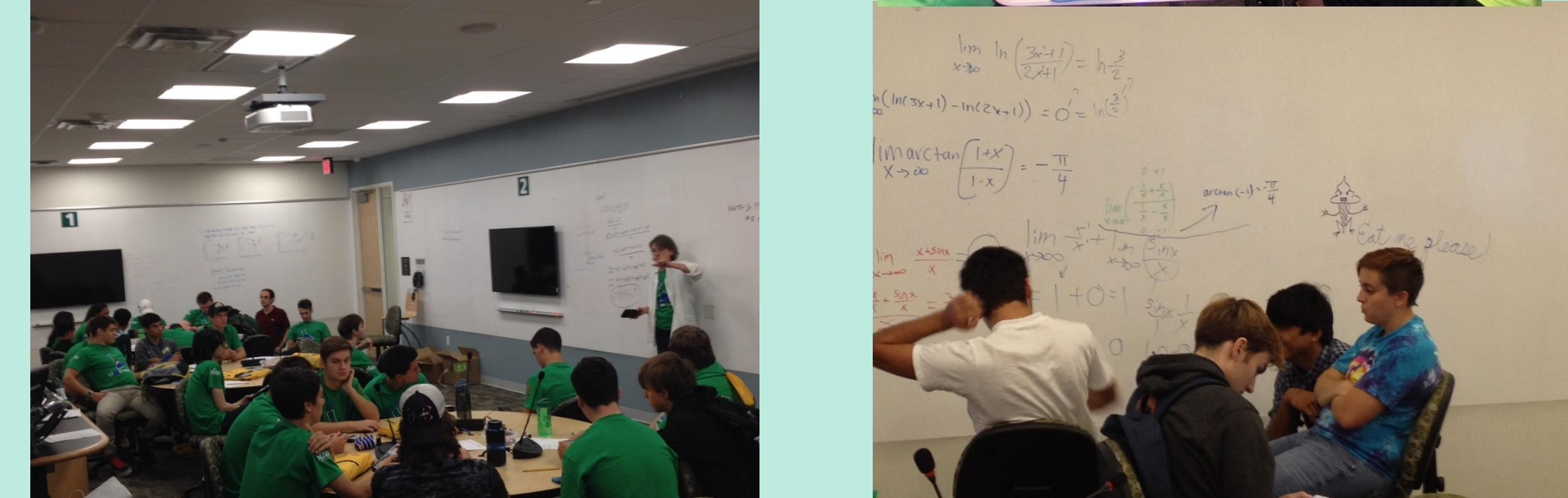
STEM BOOT CAMP

The President's Council of Advisors on Science and Technology stated that 1 million more college graduates in STEM fields must be produced to meet the growing needs of our economy within the next decade. Unfortunately less than 40% of students entering college and declare science, technology, engineering and mathematics (STEM) majors complete a STEM degree, thus there is an urgent need to solve retention issues for STEM majors across the country. The reasons why students are not successful in postsecondary schools range from personal to academic: economics; adjustment problems to college (first time away from home); poor study skills; poor critical thinking skills. The purpose of the one-week STEM Boot Camp is to introduce our incoming STEM (Biology, Chemistry, Math, Physics & Engineering) majors to the rigors of college prior to the start of the semester. The Boot Camp also serves as an opportunity to form learning communities within the group. The program has helped the students to build strong social and collaborative networks on campus and to become familiar with rules of competitive academic environments and the resulting pressure to manage conflicting priorities and expectations. Although the Boot Camps are open to all incoming College of Science students, we are particularly interested in those underrepresented women of color.

STEM Boot camp is a one-week pre-interventional program to expose incoming freshmen to content in gatekeeper classes such as Calculus I, General Chemistry, Cell Biology, Introduction to Physics along with hands-on labs, study skills and college readiness activities. All students also participate in important college life skills (how to study, how to take an exam, time management and learning styles). Results from our first cohort of students show 83% of those who declared a STEM major are currently in their major. The Camps serve to: (1) reduce the likelihood of a losing a STEM major; (2) introduce students to their first introductory STEM course through lectures and exams; (3) let's students know where their weak points are before the semester begins; allow students to meet fellow classmates; (4) provide structure for first time college students; (5) take the mystery out of 'what am I going to expect when I get to college'.

Inquiry-based and Active Learning

Participants during the week in seven 75-minute content lectures in biology, physics, chemistry & calculus. Students engaged to think by doing. Students work in groups to solve strip sequences on cellular respiration and solve calculus problems in an active-learning



In addition to lectures, staff from GMU's Learning Services office lead sessions on learning styles, time management, studying for exams and taking exams



FOCUS

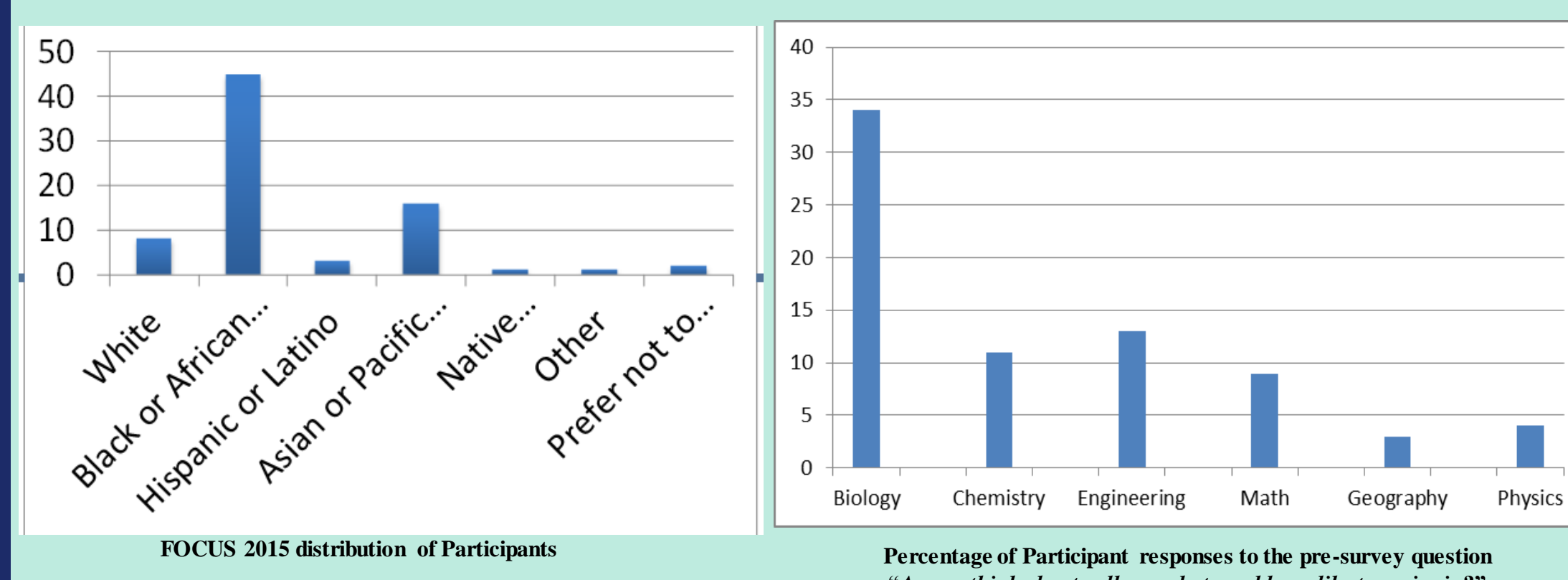
The FOCUS camp was designed to engage and pique the interest of students by offering exciting hands-on STEM activities. The camp is supported by Mason undergraduate and graduate mentors of color and STEM faculty who have a vested interest in their continued interest in a STEM career. Results from our surveys suggest students were thoroughly pleased with the activities and professionals in STEM they encountered during the week. The data collected from the camp clearly suggests that the program has had a great impact and the students were greatly motivated to pursue STEM degrees after the camp. Such early exposure to STEM supports children's overall academic growth, develops early critical thinking and reasoning skills, and enhances later interest in STEM study and careers.



FOCUS Schedule

Time	Session	Time	Session	Time	Session	Time	Session
8:30 am	Parent Orientation	8:30-8:55 am	Group D-CHEM 001	8:30-8:55 am	Group D-CHEM 001	8:30-8:55 am	Group D-CHEM 001
8:55-9:15 am	Student Orientation (Content Pre-Assessment)	9:15-9:40 am	Group D-CHEM 001	9:15-9:40 am	Group D-CHEM 001	9:15-9:40 am	Group D-CHEM 001
9:40-10:05 am	Student Orientation (Content Pre-Assessment)	10:05-10:30 am	Group D-CHEM 001	10:05-10:30 am	Group D-CHEM 001	10:05-10:30 am	Group D-CHEM 001
10:30-11:00 am	Group D-Sea Perch	11:00-11:30 am	Group D-Sea Perch	11:30-12:00 pm	LUNCH	12:00-12:30 pm	Group D-CHEM 001
12:30-1:00 pm	Group D-CHEM 001	1:00-1:30 pm	Group D-CHEM 001	1:30-2:00 pm	Group D-CHEM 001	2:00-2:30 pm	Group D-CHEM 001
2:30-3:00 pm	Group D-CHEM 001	3:00-3:30 pm	Group D-CHEM 001	3:30-4:00 pm	Group D-CHEM 001	4:00-4:30 pm	Group D-CHEM 001
4:30-5:00 pm	Group D-CHEM 001	5:00-5:30 pm	Group D-CHEM 001	5:30-6:00 pm	Group D-CHEM 001	6:00-6:30 pm	Group D-CHEM 001

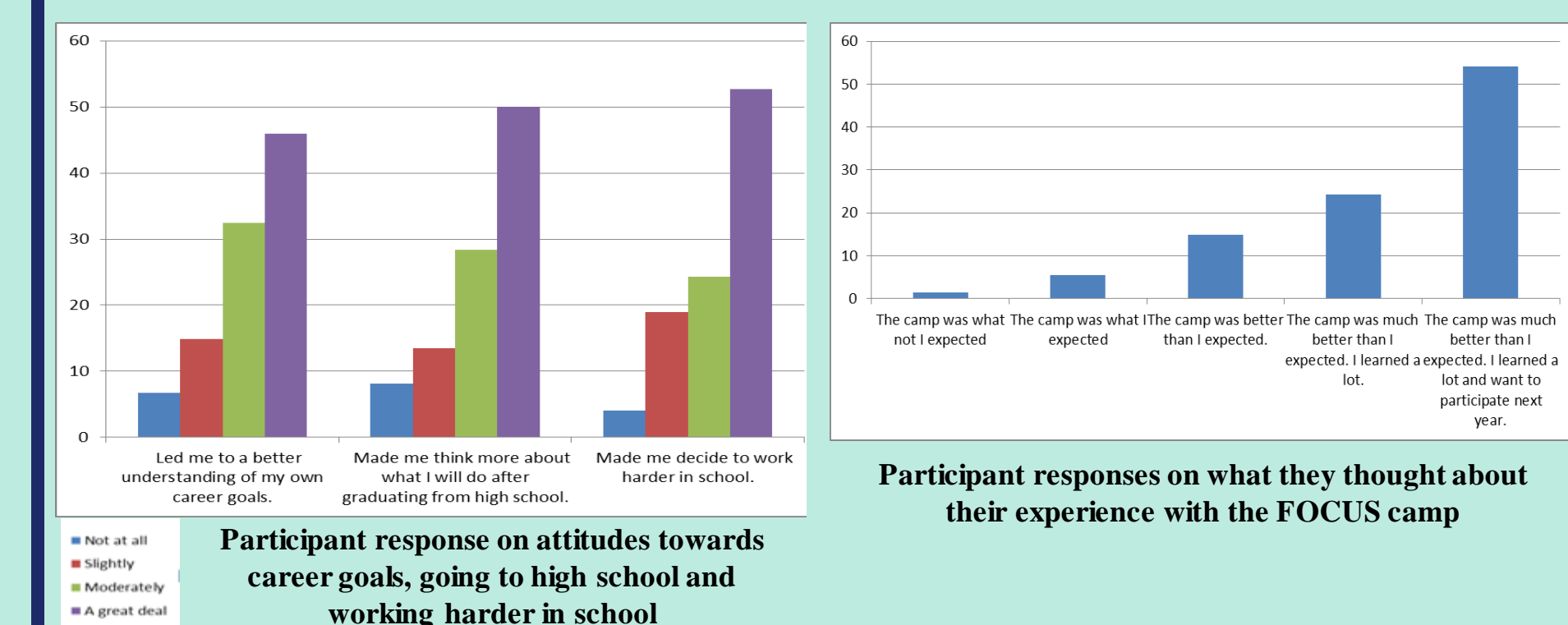
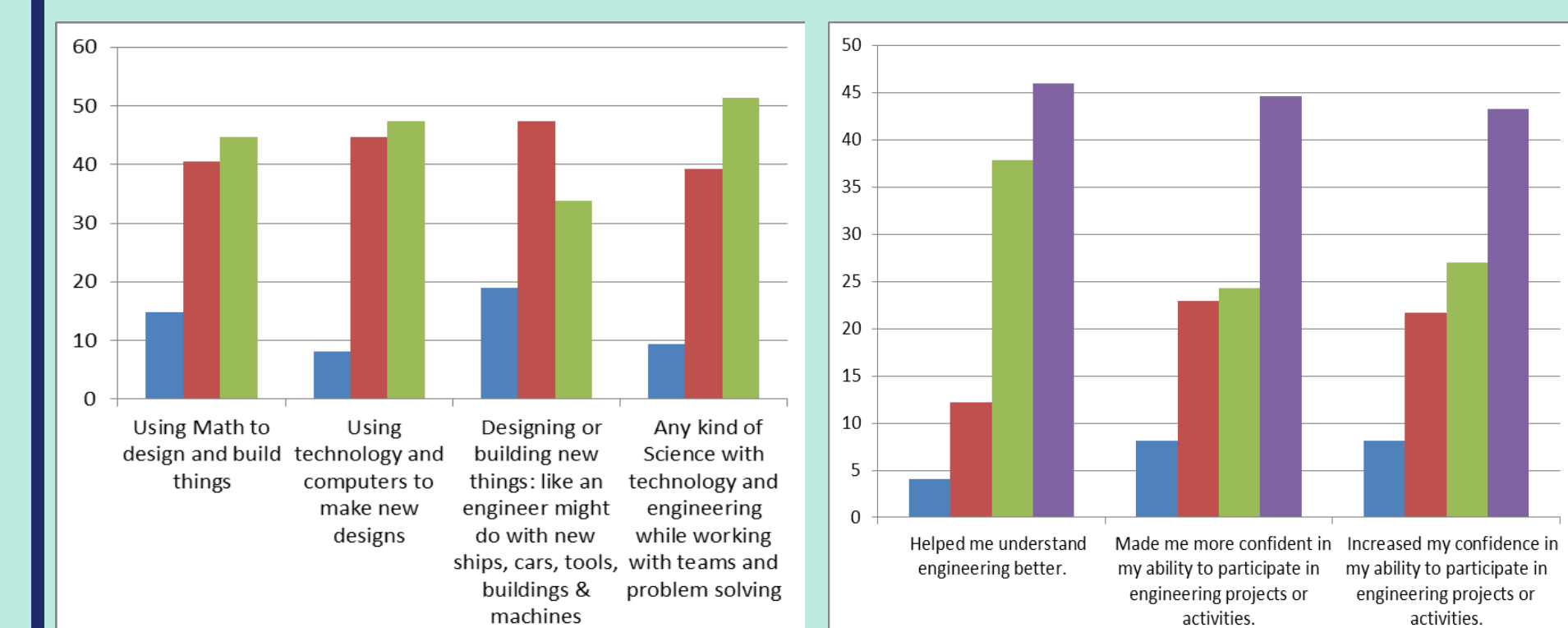
FOCUS: Pre-Survey



Learning by Doing



FOCUS: Post-Survey



STEM Boot Camp: Post-Survey

Exit Survey Questions	Participant Responses (n=69)
1. How do your expectations about the Camp compare to your expectations now?	42% reported the Camp experience was a little better than expected.
2. How did your Study Group experience affect you?	67% reported their study group enhanced their Camp experience and was one of the best parts of the Camp.
3. Would you choose to do STEM Boot Camp again?	86% reported they would choose to do STEM Boot Camp again.
4. What was your overall experience from this year's STEM Boot Camp?	53% reported they had a good time, learned a lot and would do it again.
5. How confident are you about the start of your freshman year after this year's STEM Boot Camp?	57% reported they were confident about the start of their freshman year.
6. How eager are you to begin your freshman year?	84% reported being eager or very eager to begin their freshman year.

Outcomes and Impact

Selected written responses from some parents of FOCUS participants: "We love this FOCUS camp, my daughter is very happy to work real world problems in the camp. She absolutely loved every single activity, class and project. I believe that the instructions provided in the camp will help her not just academically, but in preparing for the world of work in her further. Plus, it is like, not just parents telling kids math and science are important, it is colleges, and employers as well. The camp is well organized!! Thank you all for making my daughter's camp experience so positive!!!"

"The FOCUS Camp allowed her to know that females have great opportunities in the field of science. It also, confirmed her ability to do anything no what others may say considering her desire to be in a career dominated by males."

One of the instructors who co-taught Calculus with Dr. Seshaiyer reflected: "I can't help but think that this is a great start for these students. Getting a preview to college is invaluable. Learning how to seek help and from whom is important. Seeing, first hand, that it is up to the individual student to learn is crucial - the teacher is no longer responsible! And boy, did that make me think about my own practice! I think that flipping my BC Calculus class is a great start, but there is more that I can be doing to help when my students from mama-teacher! I saw gender inequality in numbers - certainly not in the treatment. But I think that it is significant, and I think that it is something to work on. Each of the three young women made a point to spend some time talking with me. They clearly want women mentors."

Selected written responses from students' regarding their greatest take home experience from the STEM Boot Camp: "Meeting new people, developing an efficient study group, experiencing college life!"; "...understanding some of the difficult material." "The people! They were just like me and I was happy it was so easy to click. I studied with them which was great because it was like a real study group. This week is not one I will ever forget (as well as the material)."; "How much studying and preparation is needed to get good grades."; "Learning my learning style."; "How important it is to communicate with people."

Publication: "FOCUS: Females of Color in STEM," Padmanabhan Seshaiyer, Claudette Davis, Kelly Knight and Danielle Blunt Craddock, Book Chapter in *Women of Color in STEM: Navigating the Double Bind*, Accepted and to appear (2016).

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