Dear Friends and Supporters of Science Bound,

The Merriam-Webster dictionary defines transition as “a passage from one state, stage, subject, or place to another: change.” In transition seems an appropriate way to describe Science Bound during the 2017-2018 academic year. It has been a year of transition for Science Bound as I became the program’s first full-time director in October, and it has also been a time of transition for me, as I made the formal move from scientist to program director. I strongly believe that this transition, and the welcoming of new staff members (page 11), brings renewed energy, opportunities for enrichment, and growth within Science Bound.

It is exciting for me to join a well-established program that has served young people of color and their families in Des Moines, Denison and Marshalltown successfully for such a long time (28 years in Des Moines, and more than 10 in Denison and Marshalltown). And when I consider the forward-thinking individuals in Iowa and at Iowa State University (ISU) who were devoted to increasing the number of ethnically and racially diverse Iowans prepared to meet our nation’s need for a technical workforce before it was the “popular” thing to do, it motivates me to carry out this work with passion and excellence.

Over the past 11 months we have been proud to accomplish:
• 1 Environmental Sciences and Goal Setting retreat
• 2 Science Bound Saturday visits to Iowa State
• 2 ISU retreats
• 3 summer orientation and math programs
• 3 Crossover ceremonies for 8th grade students and families
• 3 Nothing Less Than Success science fair competitions
• 3 Honors and Awards banquets for graduating seniors and high school students
• 4 ISU seminars
• 6 Countdown to College meetings to prepare seniors and their families for post-secondary education

Each of these program components are critical to transitioning students successfully into an ASTEM field.

Beyond program delivery, I am proud to share our staff’s and scholars’ latest accomplishment. Science Bound attained national recognition as one of 77 programs to receive the 2018 Inspiring Programs in STEM Award from INSIGHT Into Diversity magazine, the largest and oldest diversity and inclusion publication in higher education.

It has been an exciting and busy time of transition, but I know none of this would be possible without you. Thanks to your continuing partnership, Science Bound is still expanding the ASTEM pipeline, resulting in more young people with talent from populations that are underrepresented in ASTEM who are becoming professionals in these fields. This year’s annual report outlines some of those successes.

As I complete my first year, I look forward to meeting with, and learning from, more of you during the upcoming year. I am confident you will find that the program remains strong and is well-positioned to continue its established excellence into our 28th year and beyond. We welcome your ideas and hope that you feel free to reach out to us at any time.

Respectfully,

Dr. Alexis Campbell
Iowa State University’s mission is to **create, share and apply** knowledge to make Iowa and the world a better place (2017-2022 Iowa State University Strategic Plan). The mission of Science Bound is consistent with that of the university. First, we **create** knowledge to support Iowa’s youth, and empower those young people of color (primarily Black/African American and Hispanic/Latino) to excel generally, and in agriculture, science, technology, engineering and mathematics (ASTEM) fields specifically. To accomplish this goal, Science Bound utilizes its research-based understanding of how to create and sustain a program that school districts desire, teachers appreciate, students grow in, parents trust, and private and corporate partners value.

At the same time, Science Bound has, and is, **sharing** that knowledge. The program was the model for Purdue Bound and is the subject of numerous conference presentations and research publications (see p.11). Knowledge accumulated over years of interacting with nearly 3000 mid-Iowa students and families is increasing the number of Iowa youth of color who go on to careers in ASTEM fields. That knowledge includes:

- an understanding of adolescent development and the importance of creating engaging and meaningful ways and spaces for students to connect with, and make personal meaning of, content and program expectations;
- a research- and evaluation-informed understanding of program essentials and experiences that lead to the successful scaffolding of student academic excellence; and
- respect for, and affirmation of, the cultural backgrounds and assets of our students and families, which is foundational to developing relationships that lead to student success.

The program’s activities:
- **Expose** students to ASTEM disciplines and careers,
- **Engage** students with ASTEM experiences, and
- **Equip** students with the academic knowledge, skills and self-efficacy to navigate and negotiate higher education.

**Applying** this knowledge requires the program to focus on student transitions: we consider what is essential to moving students successfully into the ASTEM pipeline, through it, and on to a career. This year’s annual report provides an overview of the programming that supports those transitions.

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Nearly 130 eighth graders are invited to become a Science Bound student each year. New families learn about the benefits and expectations of the program and, if families make the commitment, students begin participating in a set of intentional experiences including:

- An orientation (all districts) and Algebra Champions (Des Moines), where students form bonds, learn key math concepts and develop strategies for their success;
- Bi-weekly meetings at the middle school with Science Bound teachers, with its opportunity for students to develop their support system among peers and SB teachers;
- The Environmental Sciences and Goal Setting Retreat, where students learn about earth science and develop academic goals;
- The local Nothing Less Than Success Science Fair, where students demonstrate their understanding of the scientific method and gain confidence in their presentation skills;
- Saturday Visits to Iowa State to explore the many fields in ASTEM; and
- The Learn and Earn academic program (Des Moines), where students increase their math confidence, helping to ensure a smooth transition to high school.

Additionally, students must write an exemplary essay, communicating what they have gained from their experiences in Science Bound and sharing how they will contribute to the program if permitted to continue.

These deliberately-designed experiences and requirements ensure that the students will successfully make the transition to high school – both academically and as a Science Bound student.
Marshalltown Overview

The Marshalltown Science Bound program began in 2005 as a pilot funded by the National Aeronautics and Space Administration (NASA). With community support, the program had its official start in 2007.

The Marshalltown High School program launched the 2017-2018 year with a Backyard Bash, which included leadership and team building activities. Students also participated in the local Homecoming Parade in the fall, and the Earth Day Trash contest in the spring.

Additionally, in the spring, students prepared for oral justifications (which 100% completed) and began applying for summer ASTEM experiences to meet the 40 hour program requirement. Students also met with the incoming 8th grade SB students to share the benefits of remaining in the program. High school students achieved a 99.7% average SB participation rate and the program retained 100% of its students.

Miller Middle School Science Bound participants kicked off their year with an overnight orientation experience in August, where they were joined by Denison’s 8th graders. The group then participated in the program kick-off, learned about environmental sciences and goal setting at the Boone Y Camp retreat, and completed exemplary science fair projects and reflection essays.

A YEAR OF TRANSITION: REFLECTIONS BY DOMINICK GARTH

Being a Science Bound student is a once-in-a-lifetime opportunity. One of the activities that taught me the most at the Y Camp in Boone was the stream ecology lesson. I really liked learning more about life that exists in water.

...On one of the Science Bound trips we visited the Ames Laboratory and we watched several demonstrations. I got to see how strong magnets can be used to make machines. I learned that a current creates a magnetic field and that the magnets ... used were made out of recycled materials. Being a mechanical engineer sounds great and is something I could look at in the future when I go to Iowa State.

January 29, 2018 was a very special night for me because it was science fair night. I chose to perform an experiment about which fast food restaurant had the most preservatives in their cheeseburgers. After all of the research about what they put in their food, it would be interesting to become a food scientist.

I want to thank everyone that helped me and impacted my life. I appreciate all the support at the Boone Camp, all the Saturday meetings at ISU and the science fair.

Dominick Garth at the Marshalltown Science Fair
High School: Scaffolding the Skills

Science Bound continues to apply what we know about youth development, as well as student and family engagement, through the high school years to ensure student success. High school students:

• Participate in weekly meetings, where they continue to develop their support system among peers and SB teachers;
• Conduct ASTEM career exploration projects to hone their professional interests;
• Take advantage of program study tables, where extra support is provided to ensure that students rise to academic challenges;
• Develop and present yearly oral justifications, ensuring that students are reflecting on, and benefiting from, their experiences in SB, as well as meeting the requirements and supporting others; and
• Complete 40 hours of a summer ASTEM or academic experience each year to identify their ASTEM career potential and interests and increase their academic skills.

Since most of the program’s participants will be the first in their families to attend college, Science Bound developed the Countdown to College (C2C) program to provide students and families with the information they need to understand the college admissions process, apply to college, search for and obtain scholarships, secure housing, and understand financial aid. C2C also brings college experts together with families to increase the network of support for Science Bound students once they come to Iowa State. The program helps students and families prepare for the transition to post-secondary education.

Students arrive at ISU for Science Bound Saturday.

High School Program: 2018 Retention Rate
All Districts
90%

Science Bound Saturdays

During three Saturdays each academic year, all students travel to the ISU campus for experiences with faculty and staff. This year students had opportunities to learn about:

• Agronomy
• Analyzing oil spills
• Antibodies
• Chemical and Biological Engineering
• Chemistry
• Computer science
• Crime scenes and DNA
• Earthquake-safe buildings
• Engineering problem-solving
• Food microbes
• Foods and thickeners
• Game Theory and Prisoner’s Dilemma
• Geology
• Human nutrition
• Magnetic liquids
• Management Information Systems
• Materials science
• Math and forensics
• Neuro research
• Planetary explorations
• Plant molecular raincoats
• Plant pathology and microbiology
• Research on Spinal Muscular Atrophy
• Robotics
• Seed investigations
• Spider silk protection
• The Physics of Star Wars
• Toxicology
• Transportation and logistics
• Veterinary Medicine
• Wind energy
The Des Moines program began as a pilot in 1989 with resources provided by Ames Laboratory and Iowa State University. The full program launch occurred in 1991 with funding from the National Science Foundation after the award made in 1990.

In its 27th year (2017-2018), Des Moines Science Bound focused on the program theme of Defining Your Success Trajectory. At Meredith Middle School, this meant that 8th graders tracked their academic success trajectory milestones throughout the year. McCombs Middle School students built and launched straw rockets, and archery and physics lessons helped reinforce the trajectory concept. Other 8th grade activities included a visit to the Blank Park Zoo, hydrogel lessons, a UV light experience, starfish dissection, making snow, and hosting the incoming 8th grade students.

In the high school programs, students concentrated on career exploration and science fair projects, as well as oral justifications. For the first time in Science Bound’s history, two North High Science Bound students qualified to be observers at the Intel International Science and Engineering Fair in Pittsburgh, Pennsylvania. The two spent a week discussing research with college faculty and graduate students, and learning how to improve their research projects and presentation skills.

PREPARED FOR THE NEXT TRANSITION: JUSTYNE CRAWFORD

The transition from high school to college can be nerve-wracking as students are faced with new experiences and expectations. For North High School graduate Justyne Crawford, her transition to college will be a bit smoother thanks to Science Bound.

In high school, Crawford focused on maintaining good grades and fulfilling her commitments to the program.

Whether it was Learn & Earn (SB’s summer academic program), the weekly meetings or other Science Bound events, the programming helped her prepare.

“Saturday visits gave me the opportunity to see campus and [meet] the different professors. They also gave me the opportunity to see how creative some of our careers can be,” she said.

Crawford also benefited from the weekly Science Bound meetings at North.

“Study tables were really helpful because I was able to go to teachers and get help from other students.” Crawford also had this to say about the Science Bound instructors at North, “we had mentors who really cared and wanted to make sure we were on track.”

Additionally, the activities at the school-based meetings helped Crawford in other ways.

“Projects like the career exploration [helped push me to] figure out what [I] wanted to do,” she said.

Crawford spent part of her senior year participating in Countdown to College (C2C). C2C is a series of meetings designed to assist families in the transition from high school to post-secondary education. And family is important to Crawford.

“My family is close and tight-knit,” she said. “They’re why I do what I do, and why I try to be the best I can be.”

This fall, she will become part of the close-knit Science Bound family at ISU.
The Denison Science Bound program began in 2007 with funding from Smithfield Foods. Smithfield has remained the primary funding source.

In 2017-2018 the high school program adopted a robotics theme, and students learned how to build and program their robotics. They ended the unit with a competition.

Middle school students began the year with an orientation in Ogden with 8th grade students from Marshalltown, then competed in a series of team building ASTEM challenges in August through October, including the Marshmallow Tower and water bottle flipping challenges. Students also created water filters.

Marilin Rodriguez knows a lot about transitions: at age seven, she moved from Honduras to Iowa. As she continued through middle school, Rodriguez quickly developed her confidence and began laying the foundation for academic excellence. At Denison High School, she graduated with a 4.0 GPA. Now a sophomore at Iowa State, Science Bound helped Rodriguez tackle yet another tough transition.

“If not for Science Bound, I probably would not have attended college,” Rodriguez said, speaking on the financial strain that college costs would have placed on her family. Additionally, “the program itself, and the staff, inspired me to pursue a career through ISU.”

Rodriguez, who is progressing towards a degree in Kinesiology and Pre-Dentistry, participated in SB’s first-year retreat after successfully completing the pre-college program. She shared how the retreat helped her make friends that she would later see in classes, find campus resources and connect to SB staff.

“The staff do their best to support us in every way they can,” added Rodriguez.

“College is definitely different from high school,” she continued. “The older SB students would always tell us that during our Saturday visits, but I never believed it until I actually got to ISU.”

As she heads into her second year of college, Rodriguez is still adjusting to change. But she feels confident that she will be successful with the help of Science Bound.
Each year, high school seniors who have met the program’s expectations earn a tuition scholarship to Iowa State if they remain in an ASTEM major. To ensure the success of students who choose to pursue their degree at ISU, the college programming includes:

- A retreat for first year scholarship students, which introduces them to resources at the university and provides opportunities to build community;
- First year seminar, which supports study skill development and ASTEM field commitment; and
- Leadership development opportunities:
  - Acting as peer mentors, panelists, or activity leads for visiting Science Bound scholars on Saturday visits to ISU
  - Providing support to first year peers as an Academic Success Mentor
  - Hosting families, participating on panels, or working in the office in support of the district programs

ISU SCIENCE BOUND – FALL 2017

by the Numbers

Science Bound Scholarship Students: 116
Non Scholarship Undergraduates: 35
Retention Rate: 97%
2018 Graduates: 25
ASTEM degree majors: 92%

1. Science Bound graduates at ISU, not on Science Bound scholarship
2. includes three mid-year re-entries or first time entries

Denison first year students take advantage of a special study night.

Iowa State University students on Science Bound scholarship pose for a picture in August 2017.
ISU and Beyond: The Post-College Transition

Much of the college Science Bound program connects students to resources and ensures access. Programming after the first year includes:

- A retreat for returning scholarship students, which promotes links to career preparation resources at ISU and continues the community building;
- Sophomore seminar, which continues career preparation and connection to ISU’s resources; and
- Continued leadership development opportunities:
  - Acting as peer mentors, panelists, or activity leads for visiting Science Bound scholars on Saturday visits to ISU
  - Providing support to first year peers as an Academic Success Mentor
  - Hosting families, participating on panels, or working in the office in support of the district programs

During the summer of 2017, the program anticipated 168 students could be on the ISU campus during the fall of 2017. Fifteen students graduated between fall of 2017 and spring of 2018. Four students transferred (or returned) to take advantage of their Science Bound scholarship and six students exited, or transferred from, Iowa State.

The Science Bound Alumni Society

As students graduate from the program in high school and college the Science Bound Alumni Society, can be an important transition connection. The Society hosts general meetings every month and contributes to a variety of events to impact the next generation of ASTEM professionals. For more information visit: scienceboundalumnisociety.weebly.com

TRANSITIONING TO A CAREER: DANNIEL ARRIAGA

Iowa State senior, Danniel Arriaga spent most of his time at Roosevelt High School fostering his creative talents. Passionate about writing and music, it was finally in his AP chemistry class during senior year that he discovered his love of science.

Originally torn between mathematics and chemistry, Arriaga ultimately decided to double major in chemical engineering and chemistry. And Science Bound has been there to help him succeed.

Arriaga appreciated Science Bound’s enforcement of study hours, for instance. First-year students who accept the Science Bound scholarship are required to study 10 hours each week in the program’s space. According to Arriaga, that helped him to focus on his classes.

Now in his last year of college, Arriaga has grown. His college journey has helped him discover his own leadership skills, guide others along the way and find his path to a career.

Arriaga found further guidance through SB’s student program coordinator, David Mwirichia. Mwirichia helped him secure a research position with the VanVeller lab. The lab, headed by Assistant Professor in Chemistry Brett VanVeller, investigates the interaction between organic chemistry, chemical biology, and synthetic materials with an aim to develop the tools necessary to understand the interaction between (bio)macromolecules (molecules that are typically composed of thousands of atoms).

Arriaga’s research is centered on biomaterials called isothiazoles. “I’ve been working over a year to synthesize a new class of molecules commonly found in medicinal chemistry. Major compounds are used for treatment of schizophrenia, and also used for pesticides. If our method works out it could make creating these compounds a lot easier,” he explained.

In the future Arriaga has plans to study abroad in Spain before embarking on his next transition into graduate school.
Science Bound Staff
This has been a year of transition for the Science Bound staff as well. You will find that Science Bound has a number of new team members this year:

David Mwirichia – Student Programs Coordinator, new to serving Des Moines

Brian Le – Student Programs Coordinator at Iowa State University

Jocelyn Drzycimski – Student Programs Coordinator serving Denison and Marshalltown

Jennifer Velasquez – Programming Assistant serving all districts

Financial Support
During 2017-2018, a collaboration between Iowa State, industry partners, and private donors totaled $650,000 for program/staffing and $1,333,176 for student scholarships.

New Partnerships
Science Bound brings value to its corporate partnership by means of recruitment, philanthropy and employee engagement. These partnerships also provide opportunities for students to make invaluable connections with professionals in the ASTEM community.

This year the program welcomes Ingersoll Rand. The parent company of Trane Corporation helped fund the college program’s retreats for first-year and returning students.

Award
Science Bound Received INSIGHT Into Diversity Magazine’s 2018 Inspiring Programs in STEM Award
The Inspiring Programs in STEM Award honors colleges and universities that encourage and assist students from groups that are underrepresented in science, technology, engineering, and mathematics (STEM) to excel in these fields.

Inspiring Programs in STEM Award winners were selected by INSIGHT Into Diversity based on efforts to inspire and encourage a new generation of young people to consider careers in STEM through mentoring, teaching, research, and successful programs and initiatives.

Research
Each year Science Bound staff publish and present in a variety of venues. This year’s publications and presentations include:

PRESENTATIONS

PUBLICATIONS

Science Bound is Iowa State University’s premier pre-college educational program created to increase the number of racially and ethnically diverse Iowans who earn degrees in agriculture, science, technology, engineering, mathematics, and STEM education. Science Bound partners with middle and high school students, their families, school districts and corporate partners in Des Moines, Denison, and Marshalltown.

Dr. Alexis Campbell, Director
Anita Rollins, Manager
Meccah Muhammad, Communications Intern
Where Are They Now?

One hundred fifty-one Science Bound alumni have earned degrees from Iowa State University. The map below shows where these graduates, as well as some other Science Bound alumni, have continued their journeys.

Where do SB alumni work?*

- Anderson Erickson
- AstraZeneca
- Baker Group
- Charles Schwab
- CoStar Group
- General Motors
- Iowa Legislature
- Iowa State University
- John Deere
- Kemin Industries
- Monsanto
- Nationwide Insurance
- Principal Financial Group
- Rockwell Collins
- Toyota USA
- UnitedHealthcare
- United States Senate
- VCU Health
- Voya Financial
- Wells Fargo

* as of July 2018