

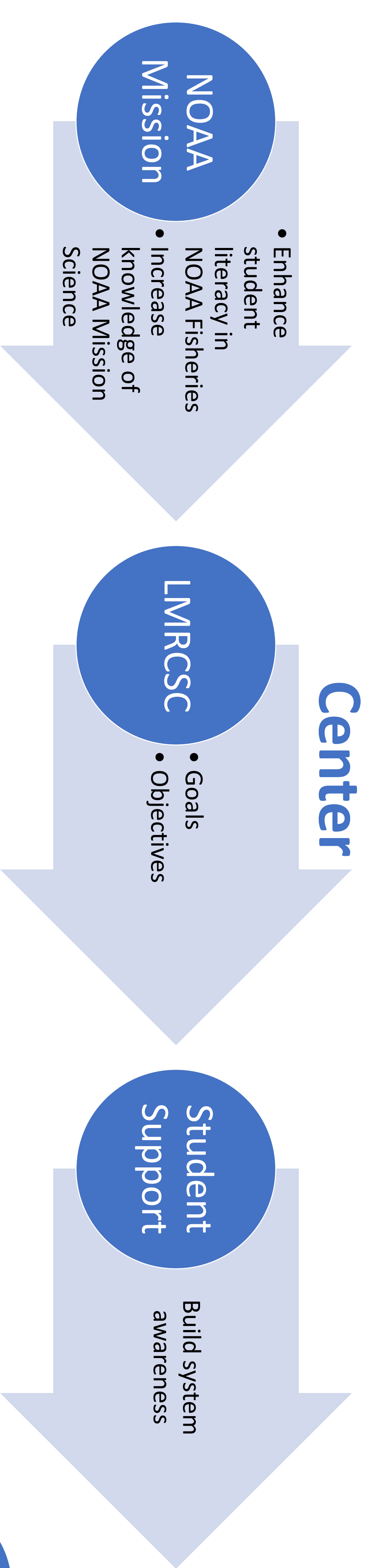
The NOAA LMRSC and its Multifaceted Approaches to Facilitate Student Development and Diversity in the Marine Sciences

Victoria Young, Dionne Hoskins-Brown, Paulinus Chigbu, Maggie Sexton, Deidre Gibson, Rosemary Jagus, Elizabeth Babcock, Jessica Miller, Stacy L. Smith and Bradley Stevens

Abstract

The number of graduate and undergraduate students, particularly underrepresented minority (URM) groups, choosing careers in ocean, earth and atmospheric sciences remains very low compared to the other scientific disciplines. The NOAA Living Marine Resources Cooperative Science Center (LMRSC) recruits, trains, and retains students, particularly those who are underrepresented in marine and fisheries science disciplines, by delivering content, instruction, and experiences that provide students with career-ready skills. Faculty and staff in the LMRSC leverage several approaches and programs to meet these objectives.

NOAA Living Marine Resources Cooperative Science



NOAA LMRSC Cohort Experience for Graduate Students, 2018. Photo credit: M. Sexton



Structure

- 5-day workshop focused on four core competencies in NOAA Fisheries Science
- Students engaged in 1/2 day and full day immersion experiences led by faculty and NOAA scientists
- Professional development workshops are given through the cohort experience

Professional development of students

- Core competencies in fisheries science

Social development of students

- Cohort experience
- Student forum

Academic development of students

- Research and mentoring
- Literacy in NOAA Mission related disciplines

Summer Research Experiences for Undergraduates	
NSF Research Experience for Undergraduates (REU)	<ul style="list-style-type: none"> University of Maryland Eastern Shore Oregon State University Savannah State University
Summer Undergraduate Program	<ul style="list-style-type: none"> University of Maryland Center for Environmental Science, Institute of Marine and Environmental Technology
LMRSC Rising Sophomore Experiential Training Program (RSETP)	<ul style="list-style-type: none"> University of Maryland Eastern Shore
Key Features	
Individual Research Projects	<ul style="list-style-type: none"> Receive Mentorship Hands on experience
Geared toward rising sophomores	<ul style="list-style-type: none"> Stipend program Technical writing skills
Participants develop Presentation skills	<ul style="list-style-type: none"> College credit (program dependent)



Above: 2018 SSU REU Cohort with Dr. Cheryl Hunt at 179th Street, CA. Photo credit: T. Cox
Below: 2018 IMET Summer Interns with Dr. Rosemary Jagus. Photo credit: M. Sexton

Professional Development

REU in Marine Estuarine Sciences Program and Interns in the RSETP at UMES participate in a joint program that includes individual research projects. The program employs a peer-led writing workshop that utilizes best practices for peer review and prepares students for professional writing.

The IMET Summer Internship Program provides students with individual research projects, training in science communication/visualization and exposure to pitching ideas for start-up environmental companies. Students are eligible to receive 3 credits at their home institution.



Above: 2018 SSU Coast Camp collecting marsh data Savannah, GA. Photo credit: E. Wagner
Below: 2018 IMET Summer Interns participating in a science fair on innovative ideas. Photo credit: M. Sexton

Goals of the LMRSC

Education Goal 1: Prepare the **future workforce** for marine and fisheries sciences

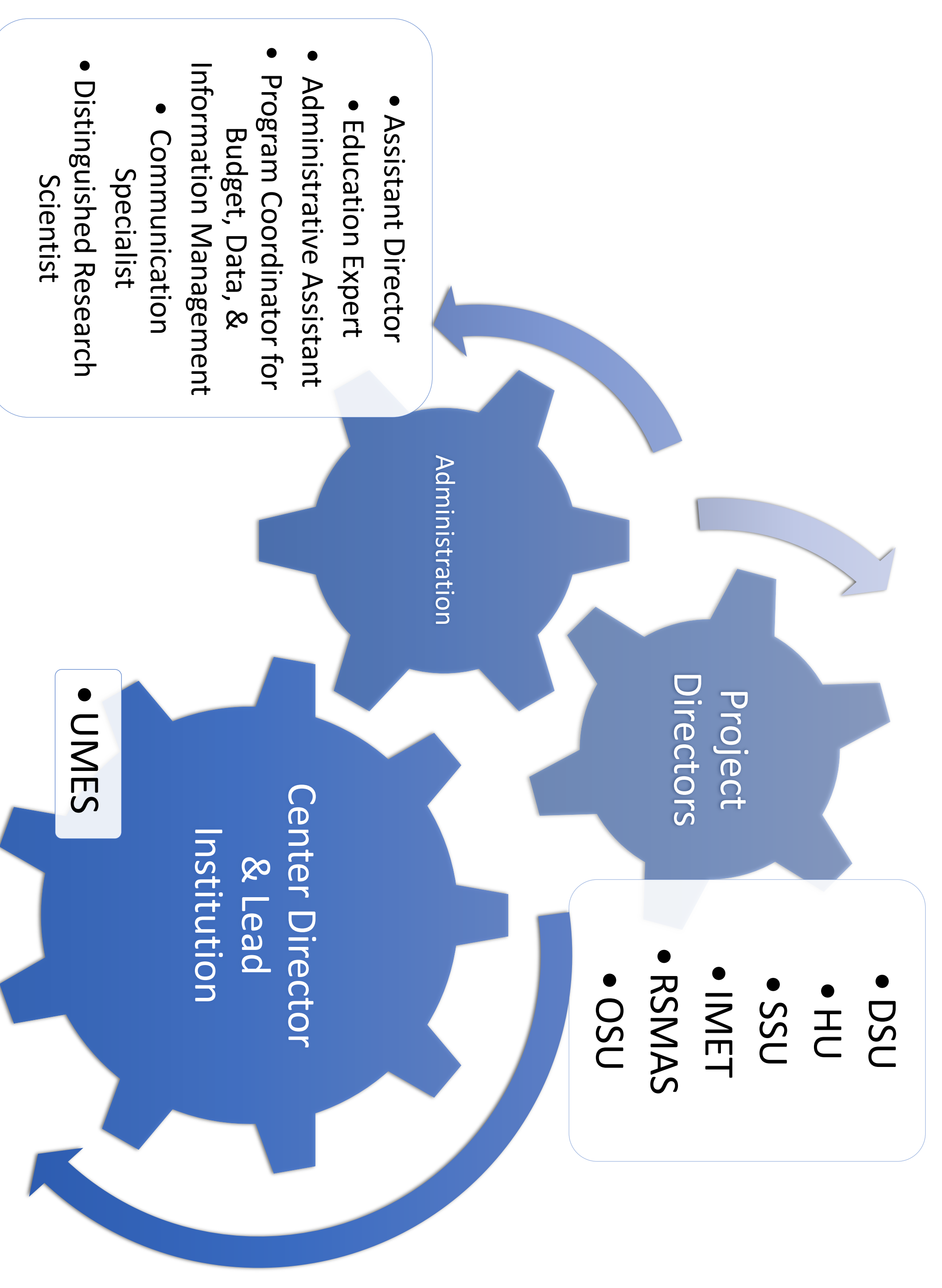
Education Goal 2: Strengthen collaborations across universities to **enhance academic programs** in marine and fisheries sciences

Research Goal 3: Develop an exemplary capacity for **scientific collaborations** among partner institutions in the fields of marine and fisheries sciences

Administration Goal 4: Organizational excellence for effective and efficient **management** of the programs and activities of the Center

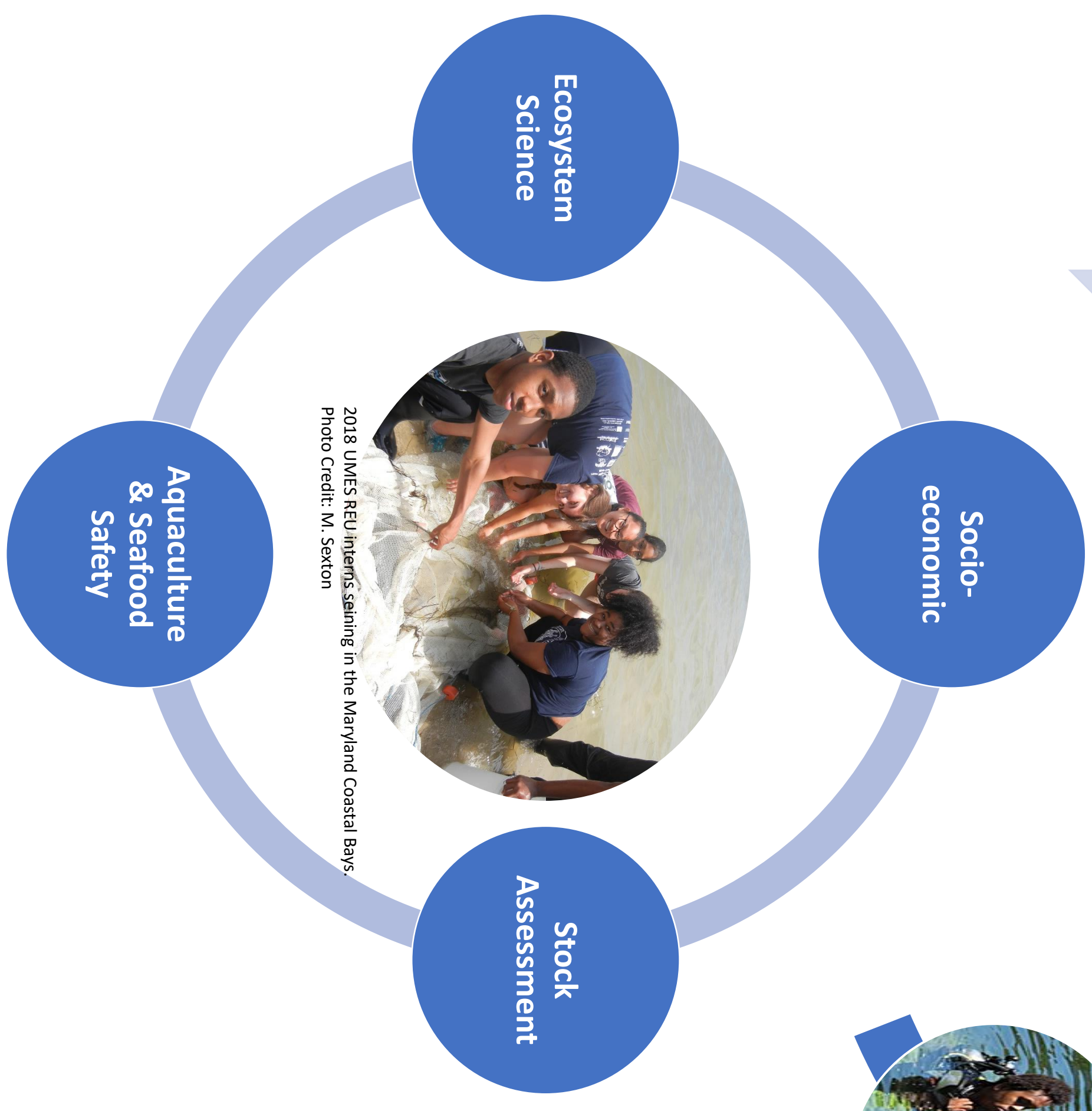
Administration Goal 5: Effectively **communicate** the activities and accomplishments of the Center

Administration Goal 6: **Assess and evaluate** the Center's goals and objectives



Evaluation of the Workshop

- 19 graduate students from 7 partner institutions (March 2018 workshop)
- 15 students completed a survey at the end of the workshop
- Students represented 6 of the 7 institutional partners
- 6 students are pursuing MS degrees, and 9 are PhD students



Two clusters of workshop modules emerged as statistically significant value points for student participants (based on Chi-square extractions at a $p \leq .05$ level).

Developing relationships between and among other students, faculty, and NOAA scientists was a significant experience in student scoring.

Obtaining career pathway information, interviewing skills, and enhanced knowledge of career opportunities was a significant experience in student scoring.

Stress and Conflict Management Seminar

- Realistic scenarios were presented
- Students engaged in debate
- Recommended resolutions were shared

Career Opportunities in Marine and Fisheries Science

- Pathways Program
- Resume workshop
- Application webinar

Seminar Series

- Student led seminar series
- Conducted online and is about 45 min
- Present current research
- Opportunity to share research with peers and receive feedback.

Proposal Writing

- Small group
- Utilized RFP for basis
- Student groups assigned roles to write grant
- Presented proposal to a voting committee
- Comments were provided to students

Summer Research Experiences for Undergraduates

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Hosted By	<ul style="list-style-type: none"> University of Maryland Eastern Shore Oregon State University Savannah State University
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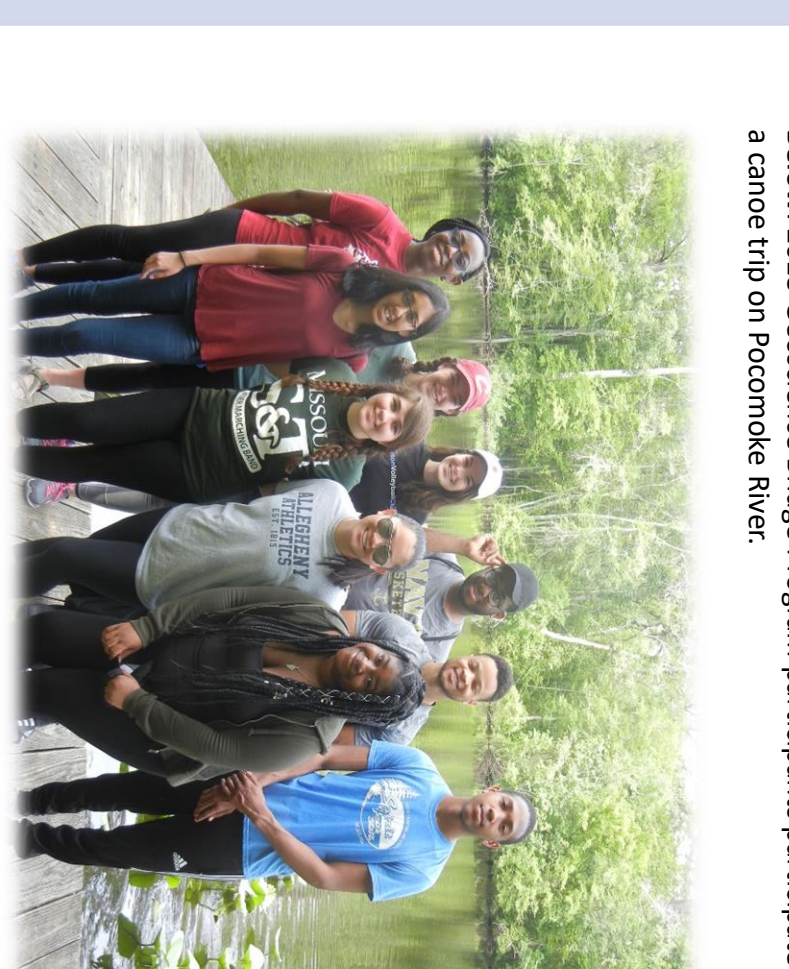
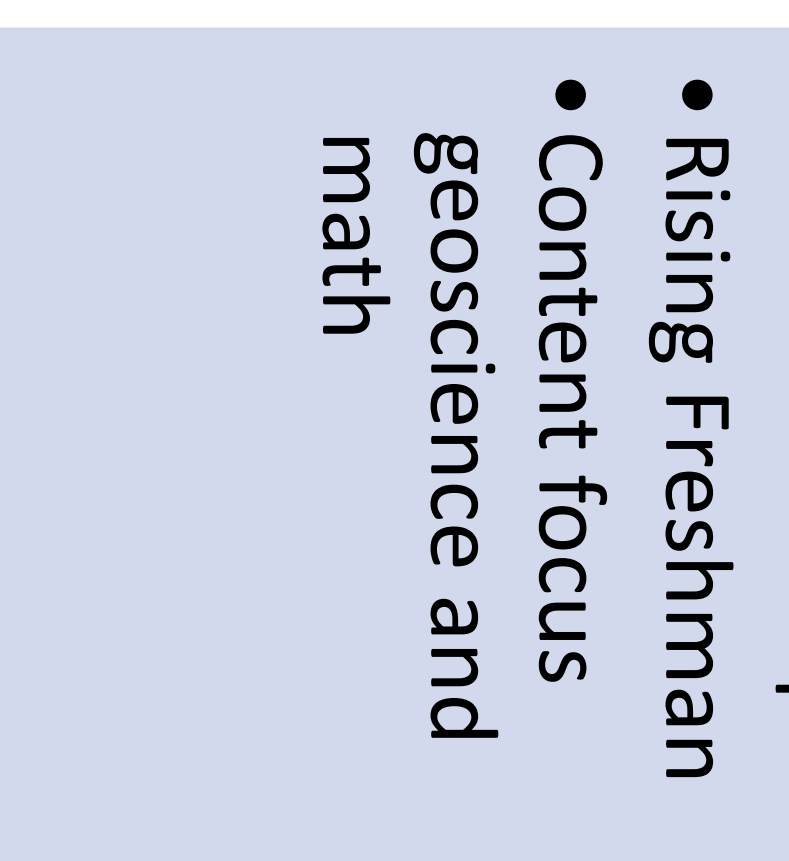
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Geosciences Bridge Program

- 6 week experiential experience
- Paid Internship
- Rising Freshman
- Content focus on geoscience and math

Coast Camp Program

- 4 week, half day program
- Experiential program
- Ages 7-18yrs
- Content focus on marine sciences and local resources and community



K-12 programs

The Coast Camp program takes place on a college campus with a marine science program. This instructional design is to introduce students to collegiate practice as well as recruit them to Bachelor of Science programs in marine science.

The Geosciences Bridge program at UMES. These seniors earn two college credits towards a bachelor's degree in a geoscience discipline. The program acts as a pipeline for students who are seeking STEM education and careers

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The NOAA LMRCSC and its Multifaceted Approaches to Facilitate Student Development and Diversity in the Marine Sciences

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Savannah State University, ²University of Maryland Eastern Shore, ³Hampton University, ⁴University of Maryland Center for Environmental Science-IMET, ⁵University of Miami-RSMAS, ⁶Oregon State University, ⁷Delaware State University

The number of graduate and undergraduate students, particularly underrepresented minority (URM) groups, choosing careers in ocean, earth and atmospheric sciences remains very low compared to the other scientific disciplines. The NOAA Living Marine Resources Cooperative Science Center (LMRCSC) recruits, trains, and retains students, particularly those who are underrepresented in marine and fisheries science disciplines, by delivering content, instruction, and experiences that provide students with career-ready skills. Faculty and staff in the LMRCSC leverage several approaches and programs to meet these objectives. A cohort workshop was developed to enhance students' literacy in NOAA Fisheries related disciplines, increase their knowledge of NOAA mission science and the LMRCSC goals and objectives, and build systems-awareness for each student cohort across the LMRCSC institutions. The workshop content focused on socio-economics, ecosystem science, stock assessments, and aquaculture. Instructors for each short course module included NOAA scientists and LMRCSC faculty. Nineteen students (M.S. and Ph.D.) who participated in the 2018 workshop indicated strong perceptions that the workshop met its goals ($p \leq .05$). Faculty and staff working in the NOAA LMRCSC have wide-ranging experience in STEM education as mentors and program directors in a variety of programs, including the National Science Foundation (NSF) Research Experiences for Undergraduates (REU) at multiple partner sites, LMRCSC-funded Rising Sophomore Experiential Training Program (RSETP), IMET's Summer Undergraduate Program, Geoscience Bridge programs and, summer camp programs for K-12 students. The interns in the REU in Marine Estuarine Sciences Program and interns in the RSETP at UMES participate in a joint program that includes individual research projects. The program employs a peer-led writing workshop that utilizes best practices for peer review and prepares students for professional writing through the process of guiding them to produce posters, oral presentations, and manuscripts about their research. The IMET Summer Internship Program provides students with individual research projects, training in science communication/visualization and exposure to pitching ideas for start-up environmental companies. The Geosciences Bridge Program trains rising freshmen in various areas of geosciences and strengthen their math skills. The marine science summer camp was begun in 2007 to serve as a pipeline for students to pursue STEM education and careers at the NOAA LMRCSC. Curriculum focus for the marine science program includes the ocean literacy principles in addition to the state science standards. The summer camp incorporates best practices used in the NOAA LMRCSC cohort experience and REU programs to engage K-12 students in experiencing science. Throughout these undergraduate and K-12 programs, graduate students are involved as mentors and instructors, thus providing supervised mentorship and teaching experience. These multi-tiered approaches engage small cohorts and broad assemblages of students at different levels of the academic development, incorporate NOAA and academic mentors and culminate by reinforcing competencies that will assist students in any STEM field.