Enhancing Science Education in the K-12 Classroom by Building a Network that Connects Educators with Local Cutting-Edge Research

Theuerkauf, Ethan J.[1,2], Ridge, Justin T.[1,2], Heenehan, Heather L.[2,3], Larkin, Alyse A.[2,3], and Paxton, Avery B.[1,2]

Objectives

1. Establish and sustain a network of scientists and educators to share resources and outreach opportunities
2. Assess whether **The Scientific Research and Education Network (SciREN)** enhances K-12 curriculum

Rationale

> "SciREN was the perfect outreach opportunity. It was one of the first times I was speaking about my research to a general audience. The educators found my work interesting, and many were able to offer suggestions for future improvements or potential collaborations for future work."
>
> - Shannon brown, Graduate student NCSU

> "[SciREN helps] form local connections with non blue collar jobs, open gateways to college, [and] build foundations to understand critical thinking and problem solving.
>
> SciREN allows us to bridge the gap between public school and higher ed research."

Educator Limitations

But educators are excited for new ways to teach required standards

> "It provides a 'one stop shop' for cutting edge, local research.
>
> Current information [is] important because our textbooks are so outdated."

Scientist Have Resources

SciREN provides...

> "Current local research [and] a field of researchers that I can get a hold of as a resource.
>
> ...high interest topics (ocean/beach) that extend our regular lessons about ecosystems, animal habitats, water cycle, weather, food chains, and force and motion, etc."

The Take Home...

Teachers often have limited time and money to implement creative classroom science activies

Scientists have resources that can help enhance K-12 science curricula

Teachers are enthusiastic about interacting with scientists and using their research as a resource

A localized network is a highly effective way of getting current science into the community

Barriers to Science Outreach

No Time

Effectively translating research

Establishing communication

Outreach opportunities have narrow focus

Difficulty maintaining communication

Utilizing a community or network approach will allow for more efficient and frequent outreach, broader outreach impacts and continued communication between educators and scientists

Establish the Network

Local Approach- Connect teachers and students to research that is being conducted in their backyard

"Connects a place students were familiar with to the more abstract concept of their research. This reinforced the idea that science investigation can be done everywhere." - Jess Purcell, Educator

Organizational Teams

Graduate student led, helps motivate peers to participate

Have the time and resources to conduct outreach

Teams are interdisciplinary and inter-institutional

Teams train each other from year to year, site to site

NC Coast Team

NC Triangle Team

Lesson Plan Workshops

Teach scientists how to translate their research into a format that is classroom-ready

Ensures that curriculum is easily understandable and adheres to state and national standards

Funding and Partnerships

Partner with informal educational institution (e.g., aquarium or museum) to provide space for workshops and advertisement through their networks

Funding provided by university departments and research institutions, foundations, and government programs (e.g., Sea Grant)

Scientist and Educator Networking Workshops

Where the conversations begin!

Researchers present the lessons they developed to K-12 educators, improving their communication skills

Educators receive ready-to-use resources as well as connections for future classroom visits

Researchers and educators get to network with peers

Teacher Testimonials

Why they like SciREN

> "Enhances a connection to science with local research. Allows children to see the connection in the community to science"

> "The opportunity to talk and meet with scientists and getting research and ways to incorporate it into curriculum"

> "I believe it brings real science into the classroom and exposes students to the true nature of science"

Classroom visits further the connections made at SciREN workshops

Benefits to students from a scientist visit...

> "Continuing discussion about the scientist and topics well after the visit...asking more questions!"

> "The biggest impact that I see is that it gives students more real-world experiences and background knowledge so that they can think deeper about science topics. When they can make a personal connection to a topic there is genuinely more enthusiasm and interest!"

> "The Q & A sessions between the students and visiting scientists were lively and, in my opinion, the most beneficial part of the visit. Not only did students ask questions about the scientist's specific research, but what courses and actions they took in middle and high school to get to where they were today."

> "I think that it is important for our young students to spend time with scientists so that they see that they are not necessarily all in white lab coats, crazy hair, nutty personalities."

> "The opportunity to hear stories of scientists experiences, outcomes, failures, and problem-solving gives more validation to having a growth mindset! Let unexpected outcomes or challenges be learning experiences!"

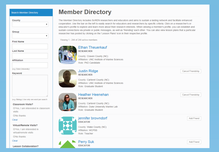
Sustain the Network

SciREN Coast April 2013 — SciREN Coast February 2014 — SciREN Triangle November 2014 — SciREN Triangle September 2015 — SciREN Coast February 2015 — SciREN Coast February 2016

Network must continue in the same location as well as expand

SciREN Portal: Facilitating Communication After Workshops

Lesson plans and other resources are hosted on the portal for educators to download free of charge

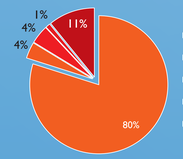


Member directory allows scientists and educators to further connections made at the workshops as well as establish new contacts

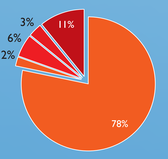
Forums are another way for scientists and educators to communicate. Provides a place for individuals to advertise outreach opportunities and discuss science education topics

Assessment

Who's Attending?

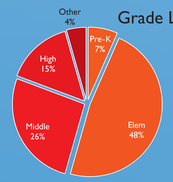


- K-12 Teacher
- Curriculum Specialist
- Informal Educator
- School Administrator
- Other

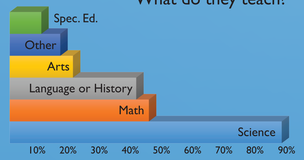


- Public
- Charter
- Private
- Home school
- NA

Grade Levels

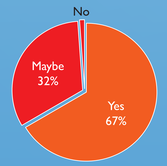


What do they teach?

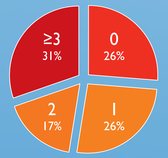


What are they looking for?

How many teachers plan to contact researchers for classroom visits?

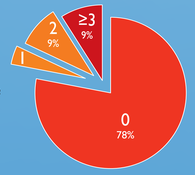


Are they using the Resources?



How many lesson plans have teachers implemented in the classroom?

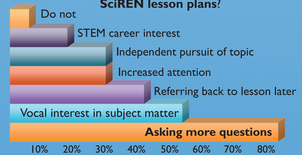
How many researchers have teachers had visit the classroom?



Is SciREN Enhancing Curriculum?

How do SciREN resources enhance curriculum?

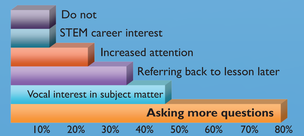
How do students show engagement with **SciREN lesson plans**?



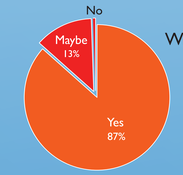
Classrooms Reached
78.3%

Average Students per Teacher
71.2 Students

How do students show engagement with **SciREN researchers**?

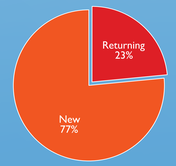


Will They Come Back?



What teachers say...

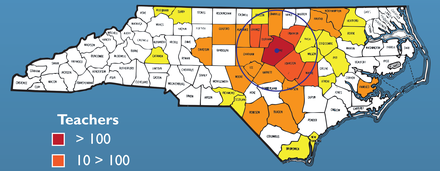
New vs Returning teachers at each event

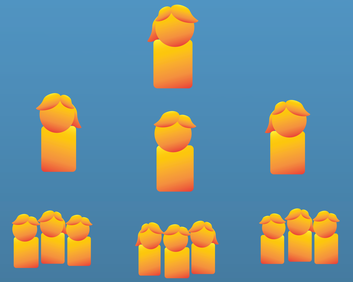


Impact

SciREN Coast

SciREN Triangle





200 Researchers

>500 Teachers

>25,000 Students

Portal Usage

140 Educators

101 Researchers

99 Lesson Plans

SciREN Scientific Research & Education Network

For more information check out: www.thesciren.org

Special thanks to our sponsors and partner institutions

UNC Institute of Marine Sciences · Duke Nicholas School of the Environment, Duke University Marine Lab · The University of North Carolina at Chapel Hill · Duke University · NC State University · North Carolina Museum of Natural Sciences · North Carolina Aquarium at Pine Knoll Shores · Sea Grant North Carolina

Author affiliations: [1] Institute of Marine Sciences University of North Carolina at Chapel Hill [2] The Scientific Research and Education Network [3] Duke University Marine Laboratory **Corresponding Author:** ejtheu@email.unc.edu