

# Wade Institute for Science Education



## 2022 Annual Report



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# Message from the Wade Institute's Executive Director

2022 has been a great year for the Wade Institute. We continued to bring back in-person programming, enabling us to offer a mix of virtual and on-site programs. Our inclusion in Rivet Education's National Professional Learning Partner Guide, and our certification as OpenSciEd Professional Learning Providers has enabled us to expand our Customized Professional Learning Services for individual schools and school districts.

Our staff has grown to include 7 education specialists to support our professional learning programs, and each brings new skills and expertise to our programs. We also expanded our Board of Directors welcoming 4 new board members, Ruth Ellen Fitch, Andrea Gwosdow, Obi Onochie and Kathy Zagzebski, to support our work.

In September we engaged Empower Success Corp to guide us through the development of a rigorous Strategic Planning Process. We expect to have a plan completed by mid-July to help guide us in strengthening the sustainability of the Wade Institute over the next 5 years.

We have also been recognized by the Massachusetts Department of Elementary and Secondary Education as a provider of high-quality professional learning and received funding to offer programs in 2023 and 2024 as part of their Open Access Professional Learning (OAPL) program. This funding enables Massachusetts educators to participate in these courses at no cost as well as earn a stipend for their participation.

We are looking forward to a program-filled year in 2023 as we continue to work with new partners and school districts across the Commonwealth, as well as collaborate with organizations such as the National Science Education Leadership Association and the National Science Teaching Association at the national level.

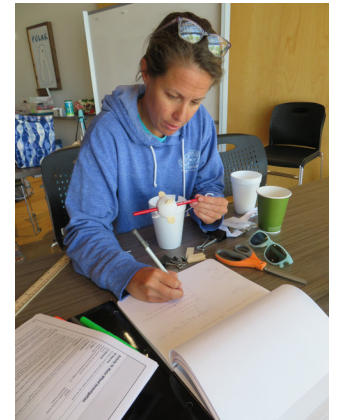
Thank you for your support as we continue to move forward with our mission to support phenomena-based inquiry STEM education.

*Sandra Ryack-Bell*

Sandra Ryack-Bell  
Executive Director

# 2022 Summer Professional Development Institutes

The 2022 Summer Professional Development Institutes took place in July and consisted of three on-site programs in different regions of Massachusetts. Teacher participants explored a variety of topics in a collaborative learning environment supported by professional scientists and engineers, environmental and informal educators, horticulturalists and agriculturalists. Most days were spent outside in the field investigating phenomena in the natural world, as teachers hiked, measured trees, found fossils, and collected data. Each course was based on an anchoring phenomenon, which educators explored by using the science practices to conduct guided inquiry investigations. At the close of each course, teachers gathered these experiences and resources to develop inquiry-based investigations and phenomena-based units to support their students in inquiry-based hands-on, minds-on learning.



## ***Nature and Design: Connections Between Science, Engineering, and the Natural World***

During this Institute in the Central region of Massachusetts, middle and high school educators explored how humans can design the built environment while caring for the natural one. At New England Botanic Garden at Tower Hill, educators observed pollinators at work, dissected plants, and learned how to build a pollinator garden. At the Blackstone River Valley Heritage Center in Worcester they learned about blending the built and natural environment from a variety of practicing scientists and engineers, designed model water wheels, and identified features of the LEED certified building that was designed to support the natural environment.



The Institute continued at Mass Audubon's Broad Meadow Brook Conservation Center and Wildlife Sanctuary, where educators drew connections between the watershed, natural environment, and the built elements of the site. Through a nature hike and site exploration, educators tested bioswales, observed wildlife, and explored each element of the watershed. The week concluded back at New England Botanic Garden at Tower Hill where educators uncovered the challenges and benefits of urban trees, measured air quality, and analyzed data on tree coverage in Worcester. They drew upon all their experiences from the week to design a city plan that balanced the natural and built environment. Their participation in the course encouraged educators to look closely at their built world to identify the ways in which it harms or helps the natural environment.

### ***Rivers to Range: Exploring the Geology of the Pioneer Valley***

This Institute supported educators in exploring the past and present geology of the Pioneer Valley. At the Hitchcock Center for the Environment, educators investigated earthquakes and engineered an earthquake resistant building. Then at the Beneski Museum of Natural History, they learned about ichnology and used this knowledge to design their own dinosaur track stories in plaster of Paris. This work prepared them to conduct inquiry investigations interpreting dinosaur tracks both ex situ in the Museum's collection, and in situ at the Trustees of Reservations Dinosaur Footprints site in Holyoke. Guided tours of the museum collection helped educators frame their understanding of geological time scales, and explorations and discussions of artist's renderings of paleo-landscapes helped surface connections between science and art.



The Institute continued at the Springfield Science Museum, where educators demonstrated water erosion in real time using a stream table, investigated plate tectonics, and discussed how to incorporate these activities into their classroom practice. Educators returned to the Hitchcock Center to classify rock types and develop a rock age timeline. They also hiked to the summit of Mt. Holyoke to experience what they had been learning about in the field. As a result of this course, educators thought more deeply about how the modern landscape can provide clues to a very different past and help us think about and prepare for the future.

### ***Utilizing Your Local Ecosystems as Laboratories for Investigations***

This Institute in the Southeast region supported educators in integrating field research and real time data into their science curriculum. At Round the Bend Farm, participants explored the farm ecosystem, investigated the environmental impacts of meals featuring local versus store-bought ingredients, and enjoyed a farm to table lunch. The Lloyd Center for the Environment introduced a week-long project called Conserve It or List It, through which educators chose an area of the landscape to deeply explore and prepare a presentation on. With instructors from the Lloyd Center, educators also conducted investigations in four ecosystems, including identifying mollusks on the beach and plants on the dunes, using seine nets to discover marine organisms, and collecting soil samples in a salt marsh.



Educators then continued exploring the marine ecosystem through the lens of whales. With Krill Carson from the New England Coastal Wildlife Alliance, they participated in a variety of hands-on activities to explore whale adaptations, including stepping inside a life-size inflatable whale to investigate its anatomy. Educators further explored whales at the New Bedford Whaling Museum where they investigated sound in the marine environment. They explored how sound moves through water and how the ecosystem is impacted by sound disturbances, then engineered a solution to the problem of man-made sound in the ocean. The week concluded with the Conserve It or List It presentations and a celebration of what they had learned. Educators left the Institute with the tools to include more data and fieldwork in their classroom practice.





# Focus Workshops

## *Connecting Science and Literacy in the Elementary Classroom*

Developed in partnership with the EcoTarium, this four-session virtual workshop supported teachers in incorporating more science into their literacy lessons. Educators were sent a kit of materials to do the investigations at home, some of which they could reuse in their classrooms. They were also provided with five books, thanks to a grant from the Michigan Science Teachers Association and a donation from ABDO Publishers. Educators designed a flinker to explore the levels of inquiry, then were introduced to squirrel behavior as a phenomenon. They made sense of this phenomenon through a variety of investigations, including playing a communication game, building a balanced sculpture, and engineering a squirrel tail. Along the way they made literacy and science connections, participated in interactive readalouds, explored annotated texts, and interpreted evidence to make claims. Between each virtual session educators collected data on squirrels and, during the last session, graphed and analyzed it using the notice and wonder strategy. By the close of the workshop, educators had become more confident in integrating literacy in their science teaching.

## *Engaging Students in the Engineering Design Process Using Sensors*

This two-day focus workshop supported educators in the use of sensor technology in guided inquiry investigations. Teachers employed the engineering design process and science practices in short engineering challenges, before exploring the sensors they would be using throughout the workshop. They used reverse engineering and problem-based learning to troubleshoot common issues with the breadboards and fix a broken traffic light. They also built a spaceship interface, a color mixing lamp, a light theremin, and a motorized pinwheel. Educators were then tasked with designing a classroom lesson plan that drew upon their knowledge of the sensors and the pedagogical concepts explored during the workshop. They built a prototype for the lesson, then presented in a gallery walk. At the close of the workshop, educators had a better understanding of the sensors, a cache of classroom investigations, and an Arduino sensor kit for their classroom.



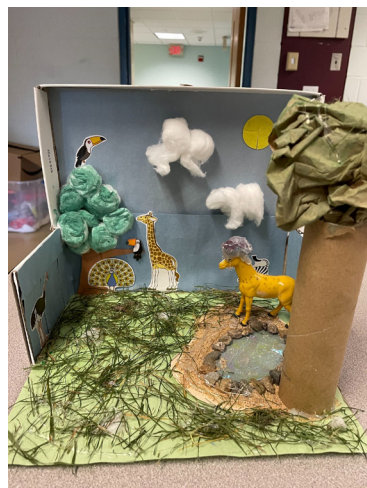
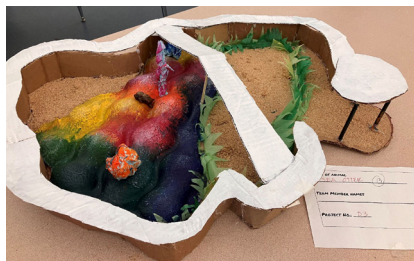
## *Investigating Climate Change: Exploring Resources and Data for the Classroom*

During this two-day workshop, developed in collaboration with Salem Sound Coastwatch, educators were introduced to a variety of resources and datasets available to support their teaching of climate change. They designed and conducted an experiment to demonstrate albedo, then leveraged their results into a discussion of the urban heat island effect and environmental justice. They then used data literacy strategies to analyze a graph of rising urban temperatures and investigated the connection between tree rings and climate change. Brian Helmuth from Northeastern University demonstrated how his robomussels collect data on the shoreline, then walked educators through an urban heat island mapping role play activity they could do with students. Bob Chen from UMASS Boston supported educators' understanding of systems thinking through a demonstration and discussion and introduced some indicators of climate change. Each participant left the workshop with a collection of resources and a kit of materials to implement climate-change data investigations in their classrooms.



# Extreme Zoo Makeover: A STEM Approach to Habitat Design

The statewide 2022 MA STEM Challenge, sponsored by the MA STEM Advisory Council and the MA Department of Higher Education centered on the theme of See Yourself In STEM. The Wade Institute received funding to run one of the challenges. In partnership with the Lloyd Center for the Environment and Buttonwood Park Zoo, we developed Extreme Zoo Makeover: A STEM Approach to Habitat Design. The design challenge scenario was to redesign your local Zoo's old habitats, which are no longer adequate. The challenges included: design habitats that meet the specific needs of the animals for which you are designing them, engineer an enrichment item for an animal that will stimulate natural behaviors, and create an interpretive sign and interactive features the public in your animal habitat. Over 94 teachers signed up to participate in the Challenge. Teachers received a curriculum packet and a classroom kit of materials for running the challenge with their students. For the first time since 2019 teachers were able to participate in an on-site pre-challenge teacher workshop at Buttonwood Park Zoo where they were able to experiment with the challenge investigations. For teachers unable to attend the on-site session we offered a virtual pre-challenge workshop. 62 teachers participated in the pre-challenge workshops. During STEM week in October, teachers conducted the challenge with their students and shared their experiences in a virtual showcase.

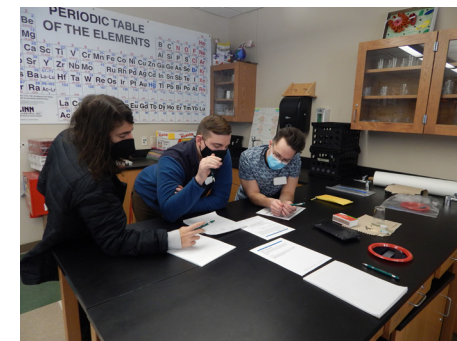


# Customized Professional Learning Services

Through its Customized Professional Learning Services, the Wade Institute provides programs that address the professional learning needs and interests of individual schools and districts. In 2022 the Wade Institute provided Customized Professional Learning Services programs to middle and high school teachers in six Massachusetts school districts. The 2022 Customized Professional Learning Services sites ranged from large school districts such as Springfield to smaller districts such as Wakefield.



True to its mission, the Wade Institute provides Customized Professional Learning Services programs that model hands-on, minds-on, phenomena and inquiry-based instruction. The programs in Leominster and Framingham focused on inquiry-based instruction and using the Science and Engineering Practices, specifically, while other programs addressed the needs of the increasing number of schools implementing phenomena-based instruction. For those schools, the Wade Institute provided programs to support teachers in their transition from teacher-focused instruction to student-focused sensemaking. Its programs modeled using anchoring phenomena, effective formative assessment, and the establishment of a classroom culture that safeguards equity.



The Customized Professional Learning Services programs in Framingham, Leominster, Springfield, and Holyoke focused on phenomena-based instruction, while Fitchburg's program spotlighted strategies for student-centered discussion and sensemaking. In all, during 2022, the Wade Institute advanced the professional learning of more than 200 teachers statewide through our Customized Professional Learning Services.



# OpenSciEd Professional Learning

After successfully achieving Certification to provide OpenSciEd training in 2021, the Wade Institute began delivering OpenSciEd professional learning in the summer of 2022. In each of these training programs teachers were introduced to the overarching elements of OpenSciEd's phenomena-based storyline teaching model, and experienced crucial lessons in "student hat", including the anchoring phenomena routine, key investigations and assessment components.



While OpenSciEd has developed materials for a suite of teacher professional learning centered on specific OpenSciEd units, the Wade Institute is introducing greater flexibility and functionality by designing professional learning programs to support units not within the existing OpenSciEd materials. There is a high investment in staff time to produce new OpenSciEd professional learning materials, but as the Massachusetts Department of Elementary and Secondary Education suggests a different sequence in OpenSciEd unit delivery, offering this flexibility to Massachusetts schools is important.

In June, the Wade Institute was contracted by Belmont Public Schools to deliver 4 days of OpenSciEd Launch training for their 7th and 8th grade teachers, encompassing Units 7.1 and 6.3, one of which was developed by the Wade Institute specifically for this group. In August we were asked by Wakefield Public Schools to deliver a slightly abbreviated 3 ½ day OSE Launch training on Unit 7.5 for their 7th grade team, again developing the professional learning to include this unit not found in OSE's existing materials. In October the Bridgewater-Raynham School District brought us in to work with their 6th grade teachers, delivering Launch training for Unit 6.1.



## 2022 Collaborating Partners

Atlantic White Shark Conservatory  
Beneski Museum of Natural History  
Berkshire Environmental Action Team  
Blackstone River Valley National Heritage Corridor  
Department of Conservation and Recreation, Mount Greylock  
EcoTarium  
Flying Cloud Institute  
GLOBE Mission Earth (Boston University)  
Hitchcock Center for the Environment  
Hoosic River Watershed Association  
Housatonic Valley Association  
Lloyd Center for the Environment  
Manomet Inc.  
Massachusetts Farm to School  
Mass Audubon's Broad Meadow Brook Conservation Center  
& Wildlife Sanctuary  
New Bedford Whaling Museum  
New England Botanic Garden at Tower Hill  
Round the Bend Farm  
Salem Sound Coastwatch  
Springfield Science Museum



# Staff and Board

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Kathryn L. Atkins, *Director of Education*  
Allison Paglario, *Assistant Education Director*  
Amanda Noble, *Marketing & Education Resource Coordinator*  
Rosemary Rak, *Education Specialist*  
Margaret Brumsted, *Education Specialist*  
Kathy Renfrew, *Education Specialist*  
Diana Cost, *Education Specialist*  
Jane Heinze-Fry, *Special Programs Director*

## Wade Institute Board of Directors

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Terry Kwan  
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# Supporters

We are grateful to the many individuals, companies, and foundations who contribute their talent, time, and funds to support our work.

## Foundations and Corporations

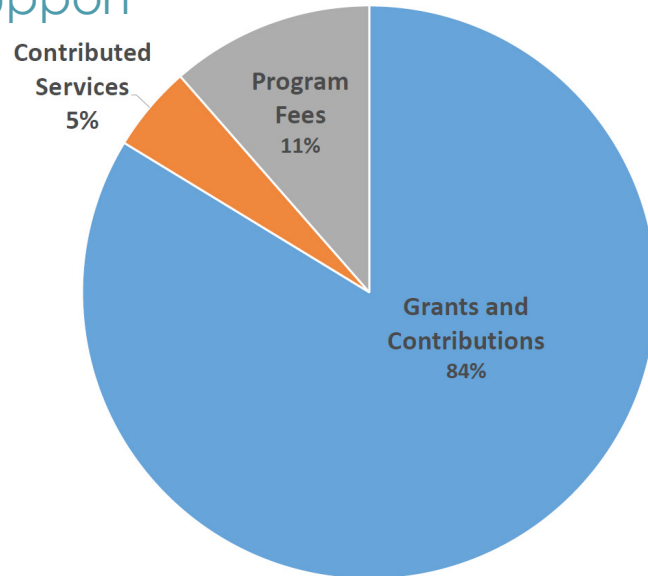
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George Garretson Wade Charitable Trust  
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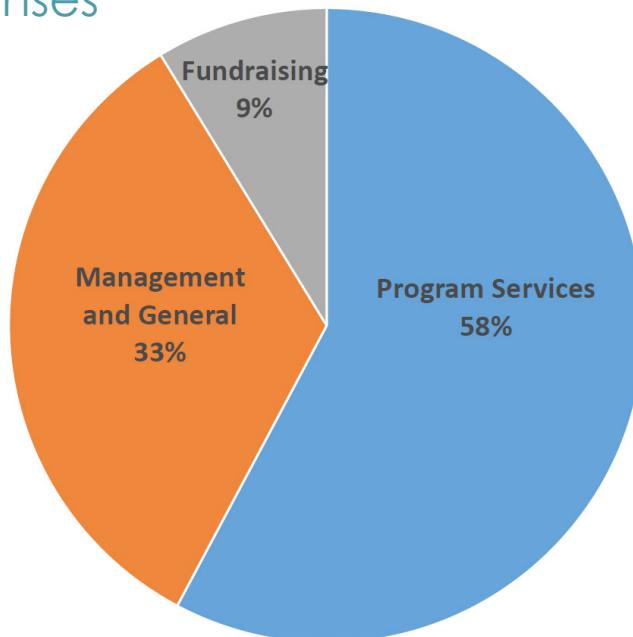
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Mary S. Dailey	Kim Kastens	
Brit d'Arbeloff	Scott Kirsner	

# Financial Statement

## Revenues & Support



## Expenses



# Financial Statement

## Revenues & Support

Grants & Contributions	\$731,111
Contributed Services	\$42,312
Program Fees	\$99,838
Interest	\$4
Total Revenues	\$873,265

## Expenses

Program Services	\$441,850
Management and General	\$255,740
Fundraising	\$66,933
Total Expenses	\$764,523

Net Assets Beginning	\$294,350
Net Assets Ending	\$403,092

*A full copy of the audit is available from the Wade Institute office.*



# Reflections on Programs

*I loved making the ichnological samples with plaster - so FUN! I also loved getting to explore the museum collection. Today was really inspiring and I'm brimming with curriculum ideas. I also really loved looking and learning about the paleolandscape paintings in the classroom. They were beautiful. I'd love to do something similar with my students in an art class where they imagine the landscape during the time of dinosaurs.*

- The Greenfield Center School (Nonprofit Private School) Teacher



*The hike along the Blackstone River and the observation in the hula hoop were both great! I really enjoyed the time to make observations outside.*

- Spencer-East Brookfield Regional School District Teacher

*The protocol for leading a Scientist Circle was eye-opening. I really like how we are using our journals! Having that technique modeled for us was super helpful for me, to visualize how I could run that discussion in my classroom.*

- Scituate Public Schools Teacher

*I loved this workshop! I was excited to go back for a second day when usually I can't wait to leave from the first day in most workshops I attend. I hope to get more comfortable with using the Arduino and coding so that I can get some of my students interested too!* - Engaging Students in the Engineering Design Process Using Sensors Participant

*Storyline routines provide equity and engagement beyond isolated science lessons.* - Springfield Public Schools Teacher

*I am having so much fun that I do not want it to end next week! Is there a way to stay connected?* - Connecting Science and Literacy in the Elementary Classroom Participant

*I gained insight on the importance of empowering students and allowing them to take ownership of their learning.* - Leominster Public Schools Teacher

*Thank you so much. This has been an EXCELLENT course and I hope to take many more in the future.* - Winchester Public Schools Teacher