



IODP Education & Outreach

Sharon Cooper, Education and Outreach
Lamont Doherty Earth Observatory, Columbia Univ.
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International Ocean Discovery Program
JOIDES Resolution: has been drilling for the program since 1985

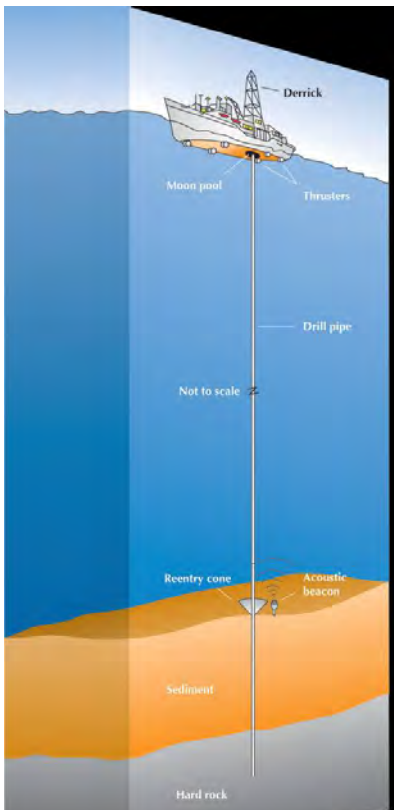
Length: 143 m (471 ft)

Dynamic positioning

-12 thrusters: 10 retract, 2 fixed

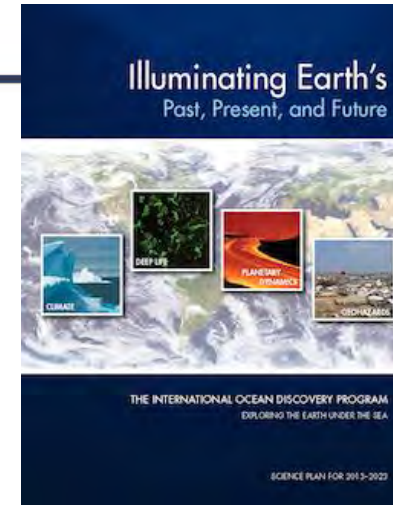
Shipboard complement

-Holds ~130 people including crew, scientists, technicians, drillers, support staff



Education & Outreach - Overview

- **IODP Science Plan E&O Goals:**
 - Training the next generation of scientists
 - Fostering stewardship of the planet
 - Informing and inspiring the public
- **Challenges**
 - Limited budget
 - Diverse community priorities: Be all things or focus on a limited number?
- **E&O plan is a coherent, strategically constructed program, it leverages small amounts of funding**
- **Summarized in E&O White Paper, with goal of making objectives, processes and metrics clear to the community**



*IOSSP Outreach and Education White Paper
Revised October 2018*

I. Introduction and Overarching Goals

As a significant national and federally-funded science endeavor, IODP has an important role to play in its corresponding public outreach and science education. While the U.S. Science Support Program (IOSSP) has a limited budget, its strength is in providing broad, specifically selected resources and opportunities that strategically target a wide range of audiences. Each component of the E&O program is firmly rooted in science education best practices and designed with these best practices, as well as past experience, in mind. This approach includes use of authentic data, inquiry-centered activities, and interdisciplinary explorations drawing from the activities of the IODP platforms (primarily the JOIDES Resolution) and related technologies.

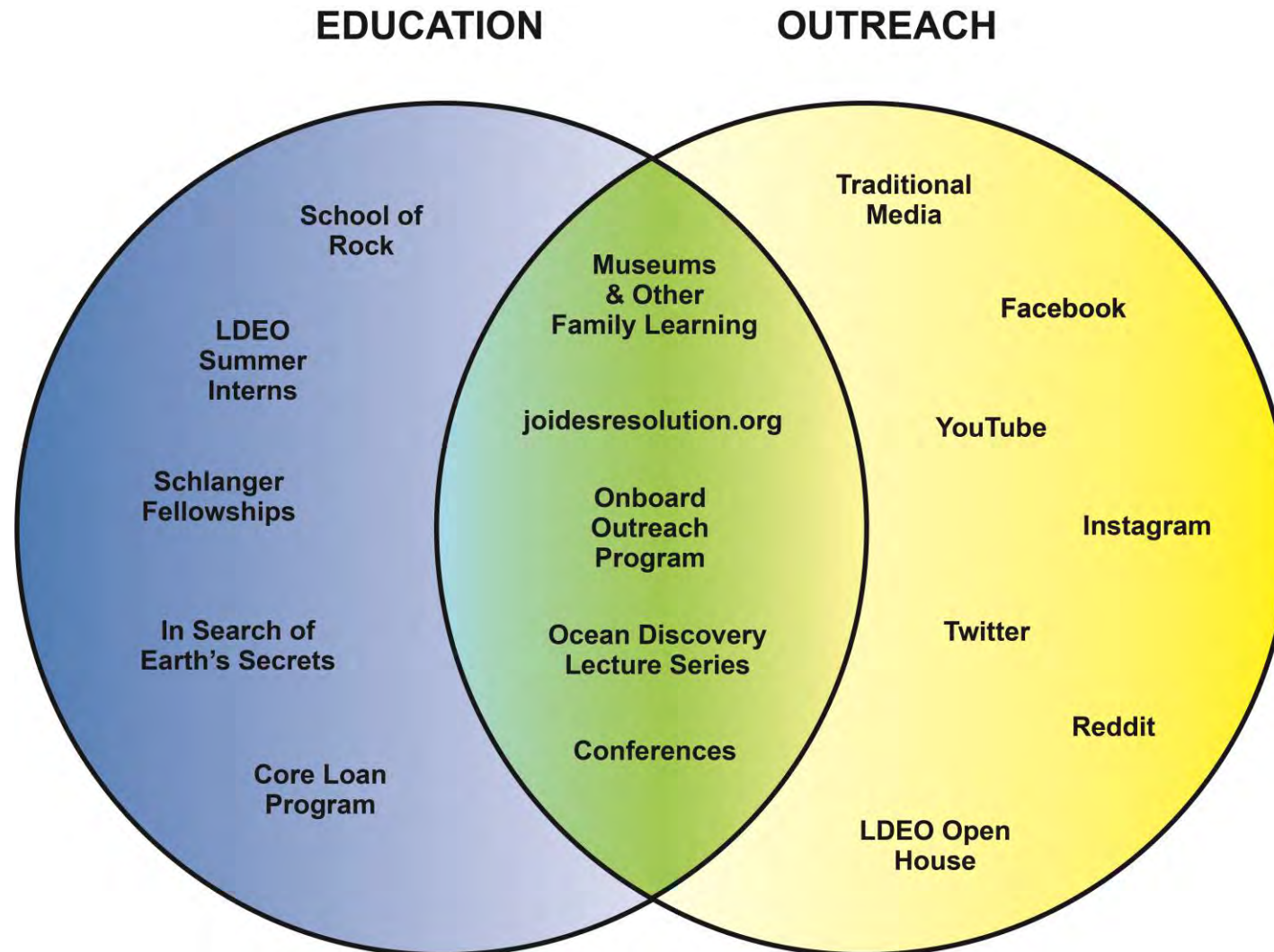
The primary goals of the Outreach and Education program are to:

- A. Raise awareness of Earth science in general, and IODP in particular, and its central role in our understanding of the Earth's past, present and future. The primary audiences for these objectives are the general public, stakeholders (e.g., politicians and taxpayers), and students at all levels.
- B. Promote and support the science of IODP specifically, and assure a steady influx of future IODP leaders, by encouraging and providing opportunities for students and educators to participate in IODP expeditions and/or research. This activity targets primarily graduate and undergraduate students and their professors, and to a lesser extent K-12 students through their teachers.
- C. Inspire and help prepare students for careers in general fields of science, technology, engineering and math (STEM). The primary audience for this activity is K-12 students, again mostly through their teachers.
- D. Empower science educators to incorporate data and observations from deep ocean cores, allowing them to develop learning materials based on fundamental Earth system science concepts. This activity targets K-16 and informal science educators.
- E. Increase ethnic and gender diversity in IODP and geosciences in general.

Budget constraints dictate that our programs be carefully chosen, relatively small in scope, and as impactful as possible. Figure 1 (next page) maps each of our programs to the objectives described above. Figure 2 (page 3) maps each program to the audiences to which it is targeted.



Education & Outreach - Overview



Education & Outreach - Aims

- Raise awareness of Earth science in general, and IODP in particular, and its central role in our understanding of the Earth's past, present and future.
- Promote and support the science of IODP *specifically*, and assure a steady influx of future IODP leaders, by encouraging and providing opportunities for students and educators to participate in IODP expeditions and/or research.
- Inspire and help prepare students for careers in *general* fields of science, technology, engineering and math (STEM).
- Empower science educators to incorporate data and observations from deep ocean cores and exploration tools, including facilitating and developing learning programs and materials based on fundamental Earth system science concepts.
- Increase ethnic and gender diversity in IODP and geosciences in general.



The communities we serve...

Deep Earth Academy

Activity of the Month – September, 2008
It's "Sedimentary," My Dear Watson

Summary
 In this introduction, set-up, students will analyze core sample data to identify sedimentary structures on the ocean floor. During this process they will map rock layers and determine the relative ages of rock layers from sample images from Google Earth. Students then will create an investigation, and analyze their data to determine the relative ages of rock layers. This activity is designed to give students an understanding of the types of sedimentary structures.

Learning Objectives
 Students will be able to:

- Use Google Earth to locate sites and read maps.
- Formulate a question or hypothesis.
- Design and conduct an investigation.
- Analyze core sample data.
- Calculate ratios/proportions.

National Science Standards
 Standard 4 – Science as Inquiry
 Standard 4 – Physical Science
 Standard C – Life Science
 Standard H – Earth and Space Science
 Standard I – Science and Technology
National Geographic Standards
 Standard 1 – Using Maps
 Standard 10 – Characteristics, Distribution, and Complexity of Earth's Surface Features
 Standard 11 – Changes that occur in the landscape, and the human and natural processes that cause them.

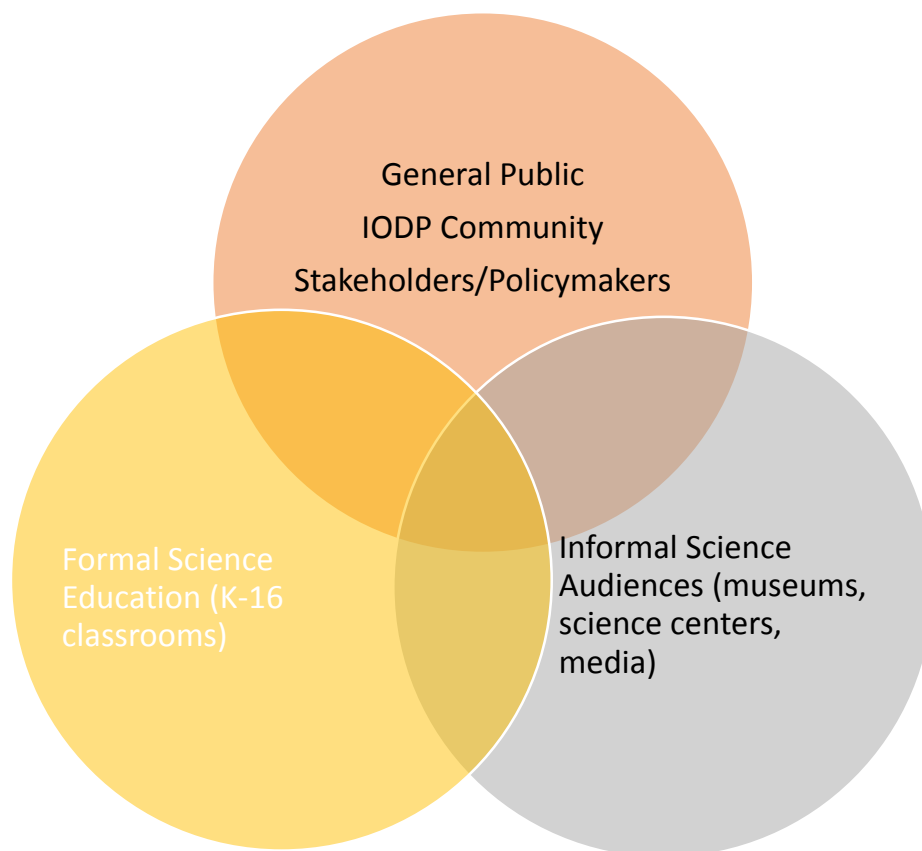
National Math Standards
 NC-M1-NA-5.1 Understand numbers, ways of representing numbers, relationships among number systems, and number systems.
 NC-M1-NA-5.2 Understand the meaning of operations and how they relate to multiplication and division.
 NC-M1-NA-5.3 Compute mentally and make reasonable estimates.
Target Age: Grades 4-8
Time: 1-2 class periods
Materials:

- Photo video and map.
- Google Earth (with map, bookmarked home).
- Student Data.
- Table 1: Student Name Identification Chart.
- Table 2: Sample Data Storage Identification Chart.
- Core: Transverse Section Lines.
- Core: Longitudinal Section Lines.
- Core: Cross-sections.
- Core: Data Tables.
- Core: Data Tables.

Optional:

- Google Earth backed onto computer.
- Computer with internet access.

Background:
 Thousands of miles of ocean floor have been explored using satellite technology. The data collected is used to understand the past. For scientists to get the most out of a core sample, they need to be able to identify the sample's location, depth, and other characteristics. This activity is designed to give students an understanding of the types of sedimentary structures.



Education & Outreach - Overview

E&O Programs Mapped to Goals

	Raise awareness of IODP	Promote/support IODP science	Inspire/promote STEM learning	Utilize IODP data in classrooms	Increase Diversity
Onboard Outreach Program	✓	✓	✓	✓	✓
Ocean Discovery Lecture Series		✓			
School of Rock		✓	✓	✓	✓
Schlanger Fellowship Program		✓			
LDEO Summer Intern Program		✓			✓
AMNH Collaborations	✓	✓	✓	✓	✓
JOIDESresolution.org	✓	✓	✓	✓	
Social Media	✓	✓	✓	✓	
Community Update / Ocean Discovery Newsletter	✓	✓			
Conferences	✓	✓	✓	✓	✓
LDEO Open House	✓	✓	✓		
In Search of Earth's Secrets Exhibit	✓	✓	✓		✓
Port Call Outreach & Press Releases	✓	✓			
Core Loan Program	✓	✓	✓	✓	



Education & Outreach - Overview

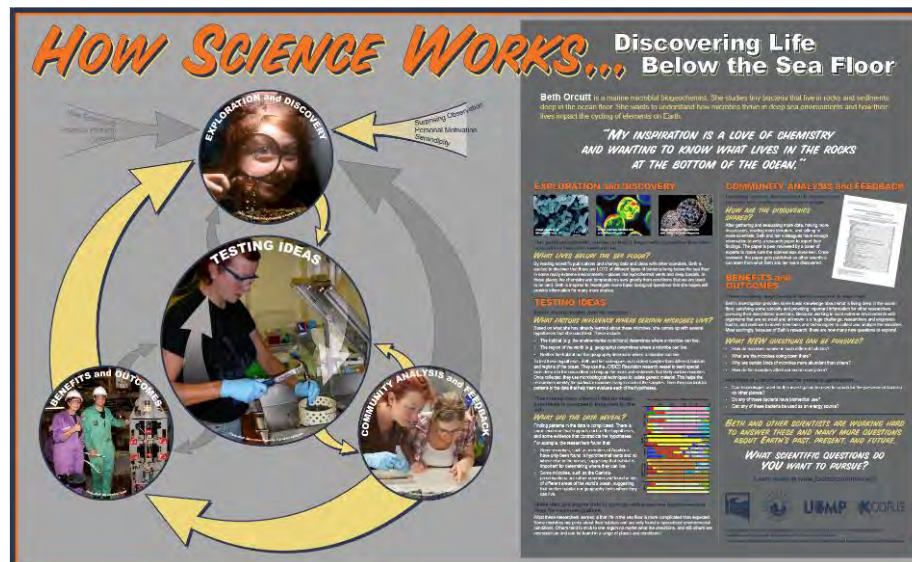
E&O Programs Mapped to Audiences

	K-12 Students	K-12/Informal Educators	General Public	Undergraduate	IODP Community/ Undergraduate Instructors	Stakeholders/ Policy Makers
Onboard Outreach Program	✓	✓	✓	✓	✓	✓
Ocean Discovery Lecture Series		✓	✓	✓	✓	
School of Rock	✓	✓		✓		
Schlanger Fellowship Program					✓	
LDEO Summer Intern Program				✓		
AMNH Collaborations	✓	✓	✓			
JOIDESresolution.org	✓	✓	✓	✓	✓	✓
Social Media	✓	✓	✓	✓	✓	✓
Community Update / Ocean Discovery Newsletter	✓	✓	✓	✓	✓	✓
Conferences		✓		✓	✓	
LDEO Open House		✓	✓			✓
In Search of Earth's Secrets Exhibit	✓	✓	✓	✓	✓	✓
Port Call Outreach & Press Releases	✓		✓	✓		✓
Core Loan Program	✓	✓		✓	✓	



Evidence-based programming

- All programs based on research and best practices in science education and professional development
- Advisory input from scientists, educators and program staff have been sought along the way for ALL programs
- Metrics collected as formative and summative evaluation throughout



Assessments and Evaluation

- USSSP does not have an external evaluator dedicated to its E&O programs, however, it is continually soliciting feedback from its users and advisors,
- Assessments conducted through online surveys, web analytics, in-person surveys, and informal discussions
- Starting now, our advisory board membership includes an “outside” (i.e., non-IODP based) *ex-officio* member with expertise in outreach and education
- Conducting continuous, long-term and wide-ranging external evaluations would be the gold standard, relying on the research literature and best practices in the field is an appropriate and widely accepted strategy in a resource-limited environment.

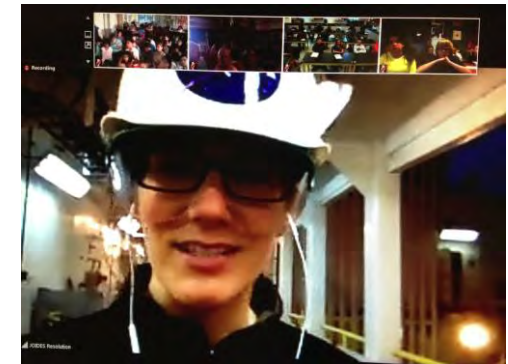


Onboard Outreach Program

Key Audiences: general public, science students and educators at all levels

Goals:

- Share the science stories of IODP expeditions to shore-based non-technical audiences in creative ways and raise general awareness of IODP science among students, teachers, families and the general public.
- Create synergistic relationships and projects between scientists and outreach personnel that lead to meaningful broader impacts for IODP science.
- Provide unique opportunities for education and outreach professionals to participate in IODP expeditions.



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05. Organizing Agencies 06. Setting an Understanding 07. Safety & Responsibilities 08. Shipping Platforms 09. IODP Expeditions 10. Ship Deck 11. Shipping & Cargo Operations 12. Crew Roles 13. On-Deck Back 14. Deck Use and Forward 15. Tower Operations 16. Storage Deck 17. Safety	18. Onboard Outreach Office 19. Safety & Responsibilities 20. Shipping Platforms 21. IODP Expeditions 22. Ship Deck 23. Shipping & Cargo Operations 24. Crew Roles 25. On-Deck Back 26. Deck Use and Forward 27. Tower Operations 28. Storage Deck 29. Safety	32. Outreach Planning & Coordination 33. Outreach Planning & Coordination 34. Outreach Planning & Coordination 35. Outreach Planning & Coordination 36. Outreach Planning & Coordination 37. Outreach Planning & Coordination 38. Outreach Planning & Coordination 39. Outreach Planning & Coordination 40. Outreach Planning & Coordination 41. Outreach Planning & Coordination 42. Outreach Planning & Coordination 43. Outreach Planning & Coordination 44. Outreach Planning & Coordination 45. Outreach Planning & Coordination 46. Outreach Planning & Coordination 47. Outreach Planning & Coordination 48. Outreach Planning & Coordination 49. Outreach Planning & Coordination 50. Outreach Planning & Coordination	52. Scheduling Ship-to-Shore Broadcasts 53. Preparing for the Ship-to-Shore Broadcast 54. Plan Your Route 55. Preparing the Group on Shore 56. Broadcast Activities for Shore 57. Post-Broadcast Debrief	59. Expedition Wrap-Up 60. Post-Expedition Activities 61. Post-Expedition Activities 62. Post-Expedition Activities 63. Post-Expedition Activities 64. Post-Expedition Activities 65. Post-Expedition Activities 66. Post-Expedition Activities 67. Post-Expedition Activities 68. Post-Expedition Activities 69. Post-Expedition Activities 70. Post-Expedition Activities 71. Post-Expedition Activities 72. Post-Expedition Activities 73. Post-Expedition Activities 74. Post-Expedition Activities 75. Post-Expedition Activities 76. Post-Expedition Activities 77. Post-Expedition Activities 78. Post-Expedition Activities 79. Post-Expedition Activities 80. Post-Expedition Activities	64. Assets 65. Assets 66. Assets 67. Assets 68. Assets 69. Assets 70. Assets 71. Assets 72. Assets 73. Assets 74. Assets 75. Assets 76. Assets 77. Assets 78. Assets 79. Assets 80. Assets 81. Assets 82. Assets 83. Assets 84. Assets 85. Assets 86. Assets 87. Assets 88. Assets 89. Assets 90. Assets 91. Assets 92. Assets 93. Assets 94. Assets 95. Assets 96. Assets 97. Assets 98. Assets 99. Assets 100. Assets



School of Rock

Since 2005, the School of Rock Program has aimed to:

- provide educators with increased knowledge of IODP, Earth science, and ocean drilling processes, while highlighting related STEM careers.
- assist educators in becoming familiar with how IODP Earth science research relates to education standards and societal relevance
- create a cadre of ambassadors for IODP throughout the education community

The program:

- Capitalizes on *JOIDES Resolution* transits, tie-ups
- Provides participants the opportunity to work intensively with scientists, staff and educators
- If the drilling vessel is unavailable, SOR events are held elsewhere, with partners as appropriate
- Curricula vary from year to year
- Participants collaborate or work individually on educational products or programs
- Experiences disseminated through: teacher workshops, public lectures, presentations and demonstrations in classrooms or science/education conferences, social media, journal publications, or multi-media/internet-based products.

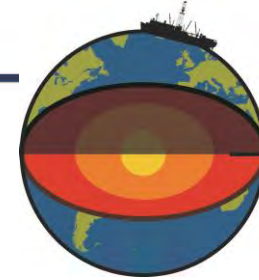


In Search of Earth's Secrets

In Search of Earth's Secrets: A Pop-Up Science Encounter is a 5-year initiative through NSF's Advancing Informal Science Learning (AISL) program (i.e., NOT facility funding)

- **Goals**

- Increase access to and awareness of ocean/earth science and careers especially in disadvantaged communities, by bringing the activities, exhibits and scientists themselves to non-traditional venues .
- Create a sustainable model for STEM learning in informal environments.
- Increase interest in the scientific drilling and research activities of the *JOIDES Resolution* among the general public.
- Foster partnerships between educators and scientists that lead to broader dissemination of scientists' research.



IN SEARCH OF EARTH'S SECRETS

A Pop-Up Science Encounter



Conference presence

USSSP maintains a presence at both science and education conferences:

- AGU
- GSA
- NSTA
- NMEA
- Regional conferences
- SACNAS

These allow us to reach different segments of our audiences in targeted outreach.



Looking for the Mobile App?

<http://sacnas.org/conference/>



Joidesresolution.org

Key Audiences: General public, K-12, informal science

Goals:

- Raise awareness of IODP
- Promote and support IODP science
- Inspire and promote STEM learning
- Utilize IODP data in classrooms
- Traffic averages around 120,000 page visits and 30,000 users per year.
- Primary users: from United States but analytics show that the site is accessed from populations in virtually every country in the world

