APECS-ARICE Webinar
From icebreakers into classrooms
– opportunities for educators and scientists

Moderation: Josefine Lenz (AWI, APECS & ARICE)






Speakers:

Mauro Hermann (MOSAiC Ambassador, ETH Zurich)
Rainer Lehmann (Polar Educators Germany)
Friederike Krüger (Integr. Gesamtschule Bothfeld)
Falk Ebert (Herder Gymnasium)
Anne Gold (CIRES, CU Boulder)

Arctic Research Icebreaker Cons.
ARICE

APECS
Association of Polar Early Career Scientists

Introduction to our speakers


© H. Honold

Josefine Lenz
Moderator
APECS Project Officer in ARICE @ AWI
Coordinator of the MOSAiC School 2019


© S. Cornish

Mauro Hermann
MOSAiC Ambassador
PhD candidate
@ ETH Zurich
Participant of the
MOSAiC School 2019

Rainer Lehmann
Teacher in Geography & Biology
Polar Educators
Germany

Falk Ebert
Teacher in Maths & Physics
Herder Gymnasium
Berlin
Lecturer in the
MOSAiC School 2019


© M. Hoppmann

Friederike Krüger
Teacher in Geography & German
Integr. Gesamtschule
Bothfeld
Lecturer in the
MOSAiC School 2019

Anne Gold
Educator
Director Education &
Outreach @ CIRES,
CU Boulder
Lecturer in the
MOSAiC School 2019

MOSAiC Ambassador Projects






Mauro Hermann

(ETH Zurich)

Today, you will hear about…

…how 20 young scientists became MOSAiC Ambassadors

…some great examples of science outreach we created for kids and classrooms

- Anika Happe (MSc@University of Oldenburg, marine environmental sciences)
- Francesca Doglioni (PhD@Alfred Wegener Institute, physical oceanography)
- Carolynn Harris (PhD@Montana State University, environmental science & ecology)
- Pierre Priou (PhD@University in Newfoundland, fisheries and marine sciences)

…where to get materials, contact details, and further information

MOSAiC Embassy: purpose

© Jan Rohde

MOSAiC embassy: getting ready in Tromsø

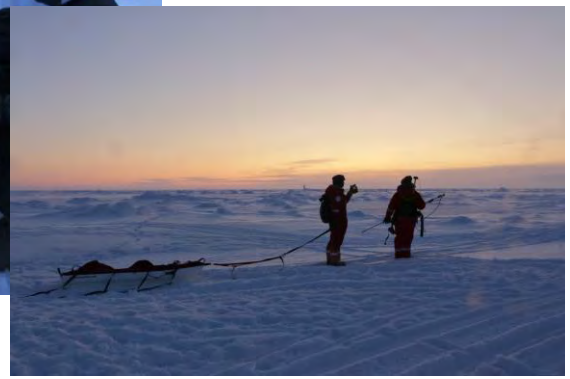
photos by Josefine Lenz

MOSAiC embassy: growing in the Arctic

assisting, experiencing

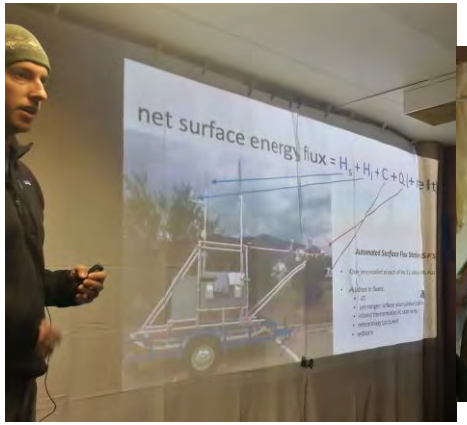
© Sean Horvath

© Katie Gavenus



© Jari Haapala

learning, discussing



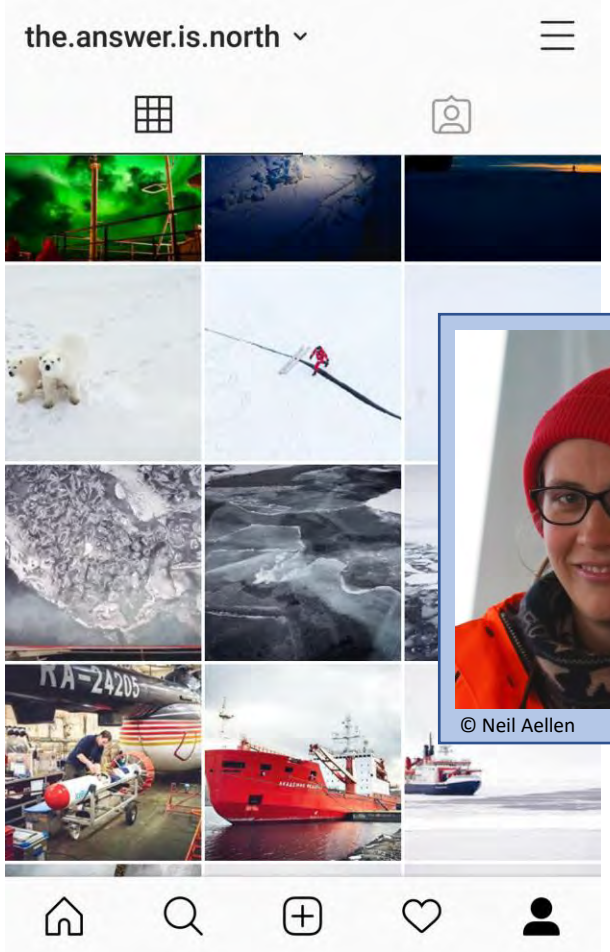
creating, collaborating

© Anika Happe

© Julika Zinke

MOSAiC embassy: growing together

Some MOSAiC entertainment

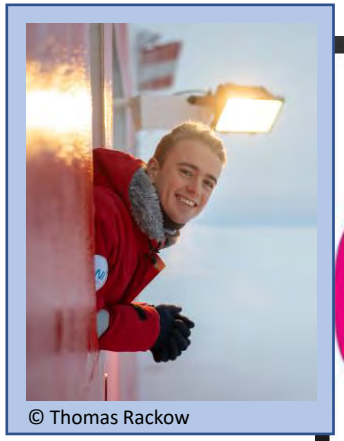


[Thea: Check out on instagram]

© Neil Aellen

[Rosalie: MOSAiC School in 52 seconds]

© Sam Cornish



© Thomas Rackow

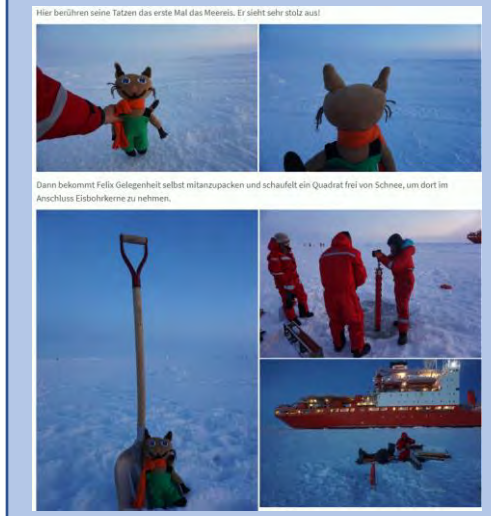
[Sam: Play on spotify]

Anika & Felix - #felixerkundetdiewelt

Together with **“ZukunftWald” foundation**

Painting contest >> mascot Felix

Felix joined Anika to learn about the Arctic climate system, equipped with questions from students around **age 10-13**



- **39-day diary** of their journey to the Arctic (aboard Akadmeik Fedorov, MOSAiC leg 1a)
- **Advent calendar**, answering 24 questions about ice, snow, daylight, polar bears, ship life, and many more…

https://www.zukunftwald.de/felixerkundetdiewelt/ (in German)

Francesca – classroom experiments

Francesca wants to equip the students with **tools to answer big questions** on climate change themselves, by organizing fun hands-on experiments

Directed towards students of **age 14-18**

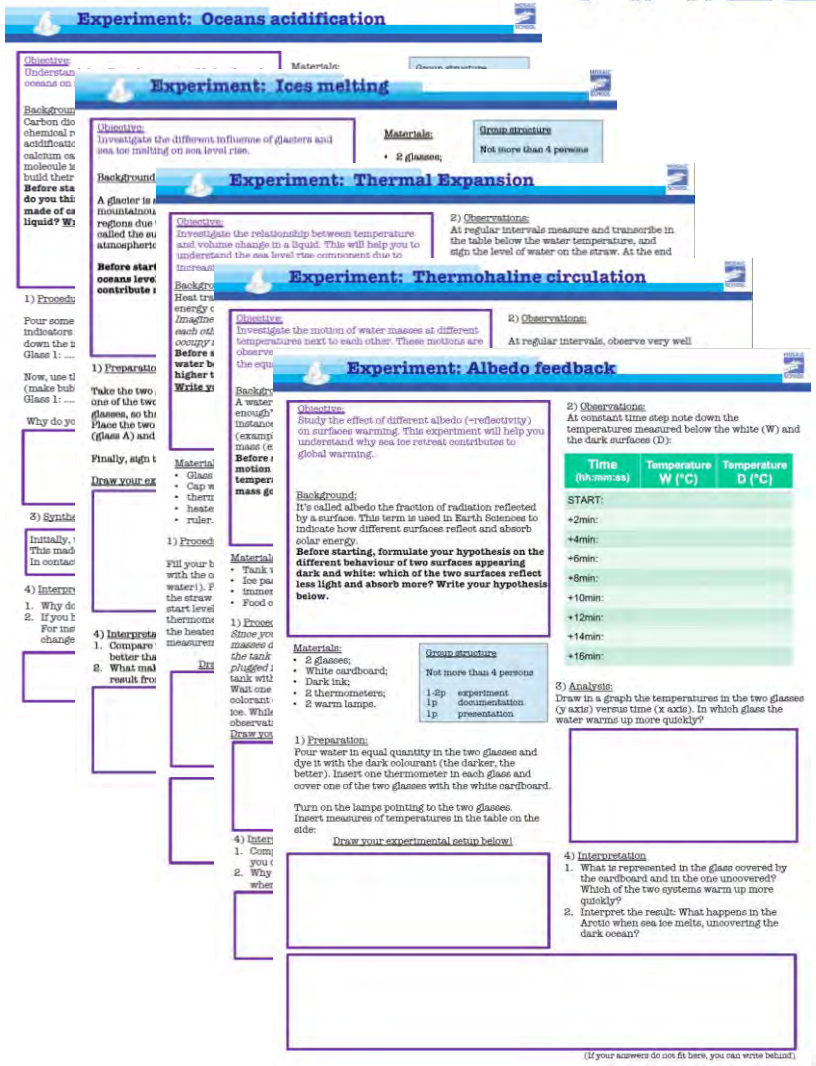
Worksheets freely available in Italian, English, and German & experiments are easily replicable at home (some DIY for lockdown times)

1) prepare

2) observe

3) analyze

4) interpret



Carrie – science and outdoor skills

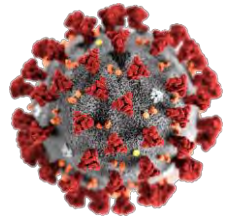
Science & adventure education for girls

- age 11-16
- lab coat
- science
- adventure skills

Girls **aged 11-16** are reporting less confidence and interest in science. Teaching science and adventure skills in tandem will broaden their perspective on what a scientist looks like.

Collaborating with **Girl Scout** leaders in her home country (USA)

Currently halted but Carrie continues to **virtually speak** to school groups
https://www.youtube.com/watch?v=Kmduf3_BQck&t=70s



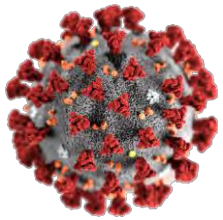
Pierre – “éTer(re)nelle”

Pierre started discovering fascinating Arctic research together with a large group of students (**age 13-15**) already since 2018.

Drafting **an illustrated book** with educational purpose (in a humorous way)

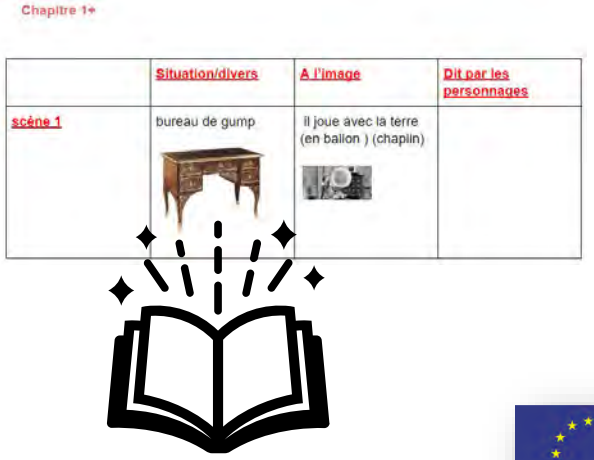
Story about Gump, who is discovering polar research & global warming from hands-on **experiments**,…

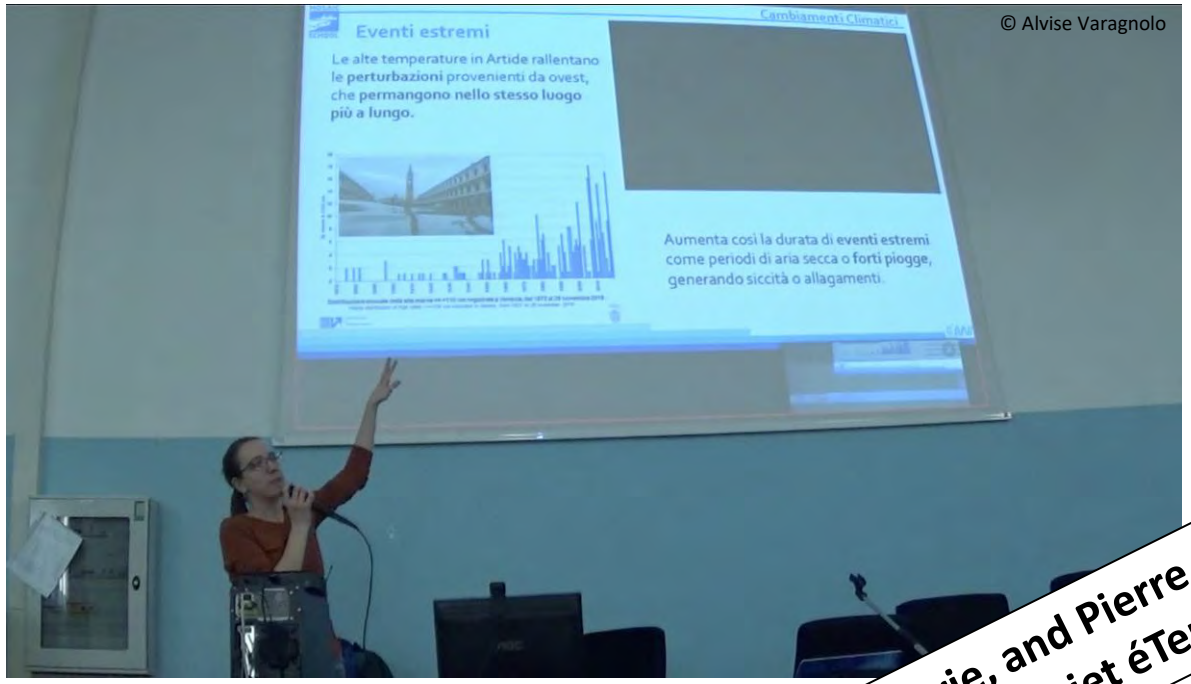
Project currently put on ice



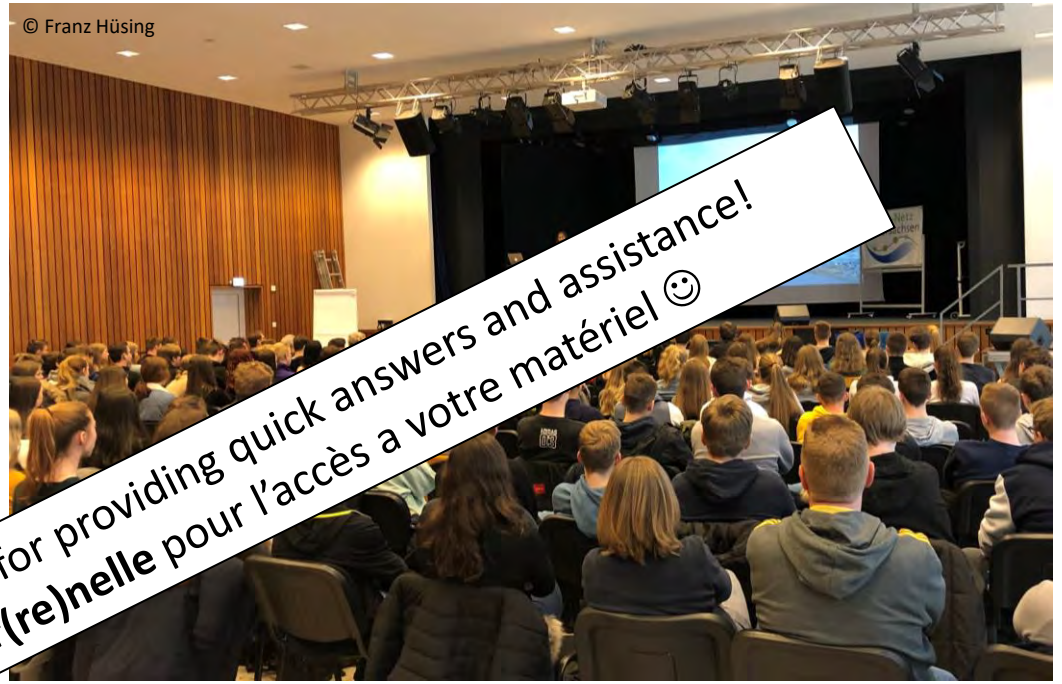
Pierre summarizing the story written **by the students of éTer(re)nelle**

“It is about a rich person, called Gump, who wants to buy Greenland because there is oil. Because of a volcano eruption in Iceland, planes are grounded, and he then jumps on his yacht and sets sail to Greenland. Suddenly, he hits an iceberg and his yacht sinks. He starts drifting in the Arctic and gets rescued by scientists. These researchers are part of a drifting expedition in the Arctic Ocean, MOSAiC. Once aboard he starts to learn about how climate science is done, the effects of climate change in the Arctic and globally, and **starts changing his mind**…”





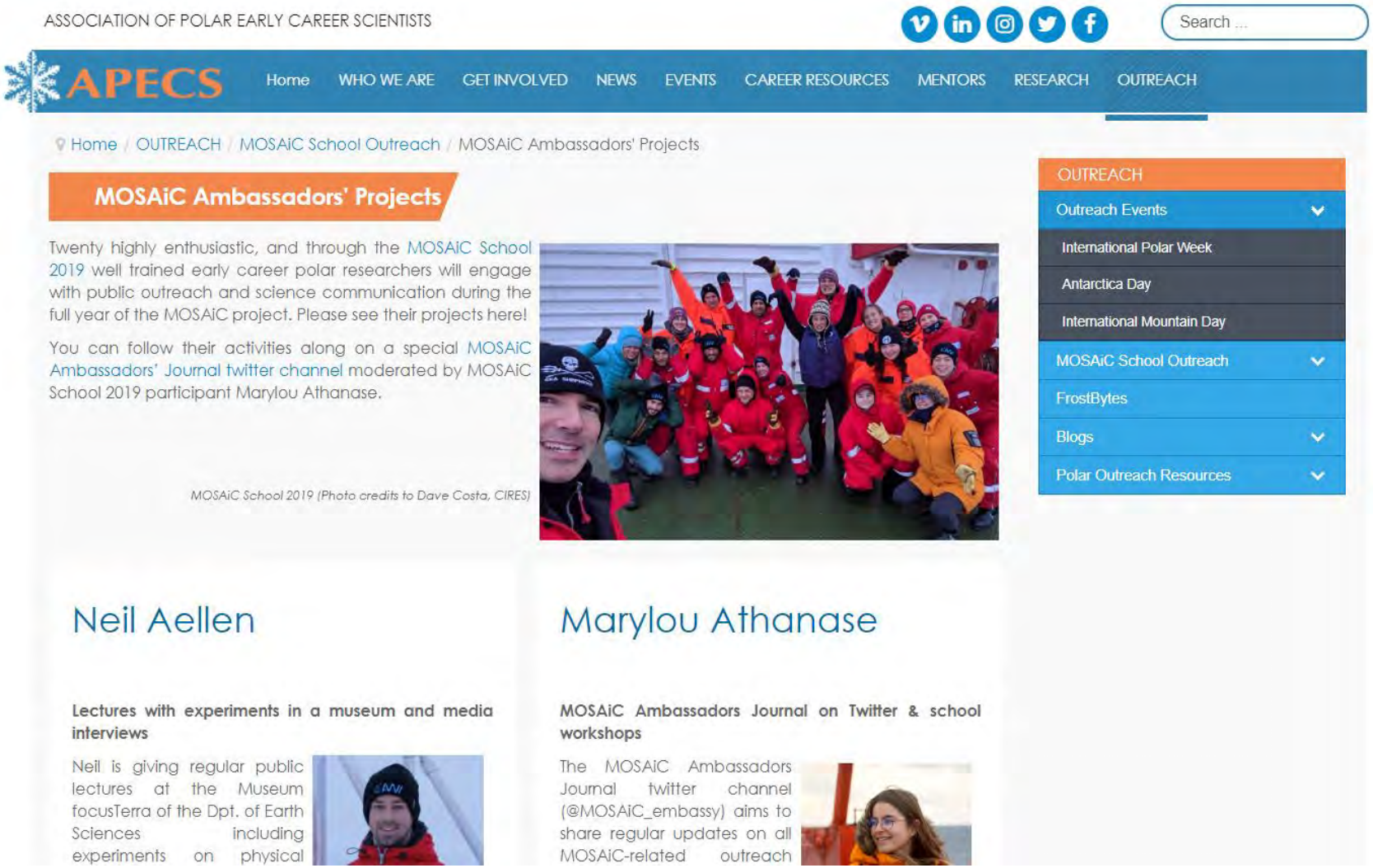
© Alvise Varagnolo


© Franz Hüsing

Thanks to **Anika, Francesca, Carrie, and Pierre** for providing quick answers and assistance!
Un grand merci **aux élèves du projet éTer(re)nelle** pour l'accès a votre matériel ☺


Dupont

APECS – MOSAiC Ambassadors' projects



https://www.apecs.is/outreach/mosaic-school-outreach/mosaic-ambassadors-projects.html

MOSAiC Ambassador activities

Ambassador projects

- Outreach from us
- Description of realized and planned outreach activity

MOSAiC school 2019

- School programme
- Personal background of all ambassadors
- Educators and lecturers

MOSAiC Embassy

- @MOSAiC_embassy
- Recent outreach activity related to MOSAiC
- Link to ambassadors

Facebook

- News from during MOSAiC School
- Link to ambassadors

Ctrl+click on the icons

MOSAiC Ambassadors' Journal

- MOSAiC homepage
- Social media MOSAiC (Twitter, Instagram)
- Social media APECS (Twitter, Facebook, Instagram)
- Social media ARICE (Twitter, Facebook)

Concepts for Polar Teaching in Germany






Rainer Lehmann

(Polar Educators Germany)

Polar Educators Germany

German Society for Polar Research

Concepts for polar teaching in Germany

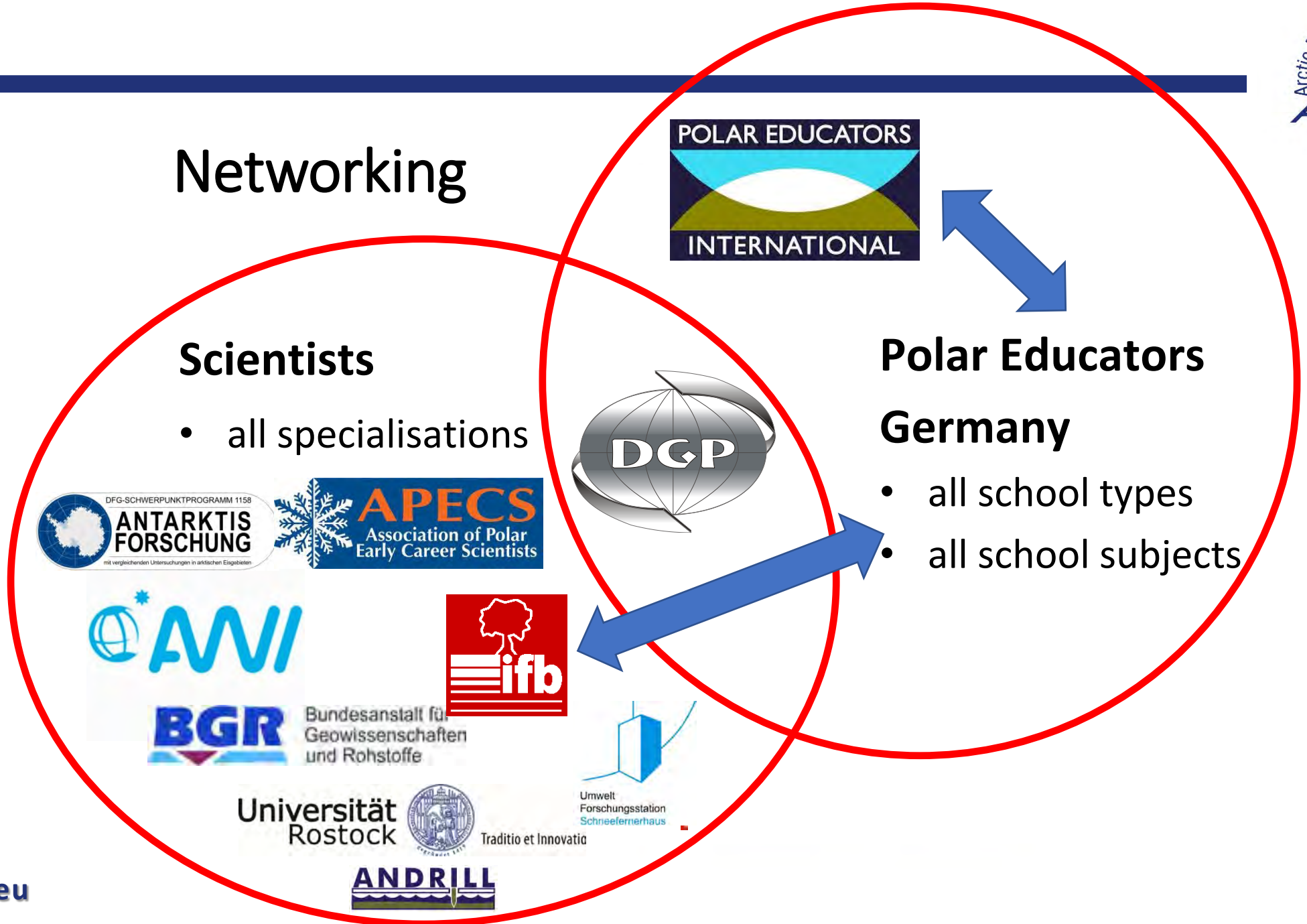
Rainer Lehmann

ak-polarlehrer@polarforschung.de

https://www.polarforschung.de/arbeitskreise/ak-polarlehrer/

https://www.polarforschung.de/

Networking


POLAR EDUCATORS
INTERNATIONAL
Scientists
• all specialisations
DGP
Polar Educators
Germany
• all school types
• all school subjects
DFG-SCHWERPUNKTPROGRAMM 1158
ANTARKTIS FORSCHUNG
mit vergleichenden Untersuchungen in arktischen Eisgebieten
APECS
Association of Polar Early Career Scientists
AWI
ifb
BGR
Bundesanstalt für Geowissenschaften und Rohstoffe
Universität Rostock
Traditio et Innovatio
Umwelt Forschungsstation Schneefernerhaus
ANDRILL

Educator participation

Expeditions

Involving the students

Educator participation

Workshops

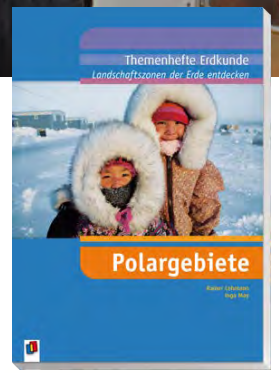
Advanced training

Conferences

Presentations

Publications

Newsletter



Educator participation activities

Example ANDRILL

From science in Antarctica
to the classrooms

Rainer Lehmann

2007

Drill site

Core tour

Thin sections

Curators

XRF-Scanning

Outreach

→ active participation in different working groups

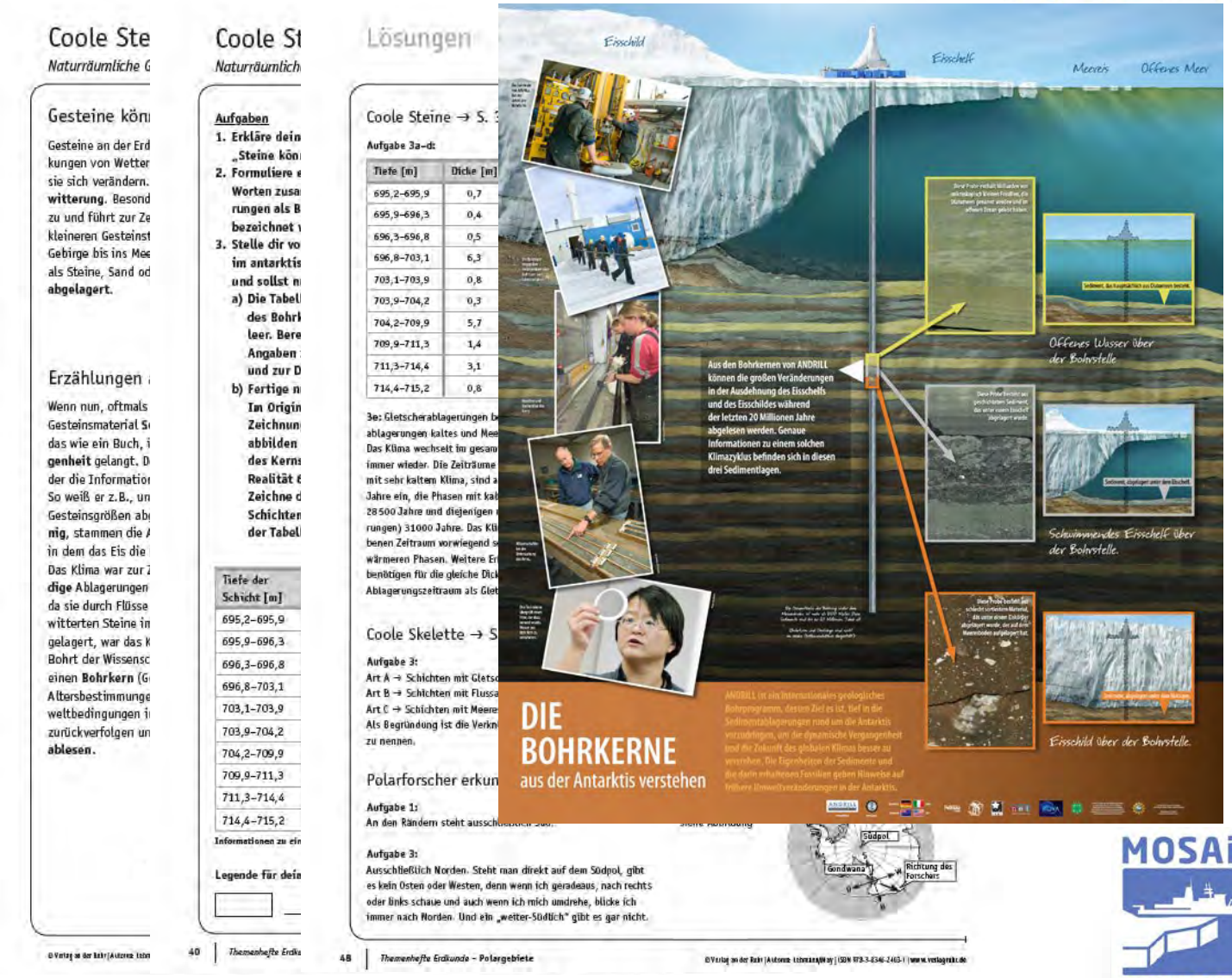
www.arice.eu

Educator participation results

Example ANDRILL

From science in Antarctica to the classrooms

LEHMANN, R. & MAY, I. 2013: Polargebiete.- In der Reihe: Themenhefte Erdkunde – Landschaftszonen der Erde entdecken. Verlag an der Ruhr, 48 Seiten.



www.arice.eu

APECS cooperation

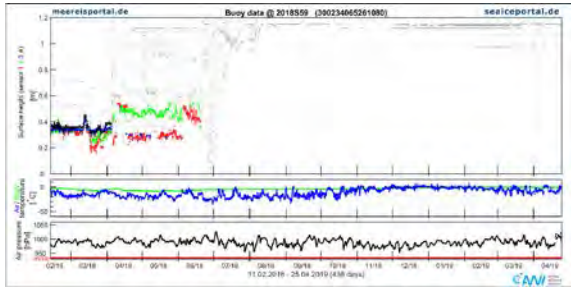
Example Buoy Project:

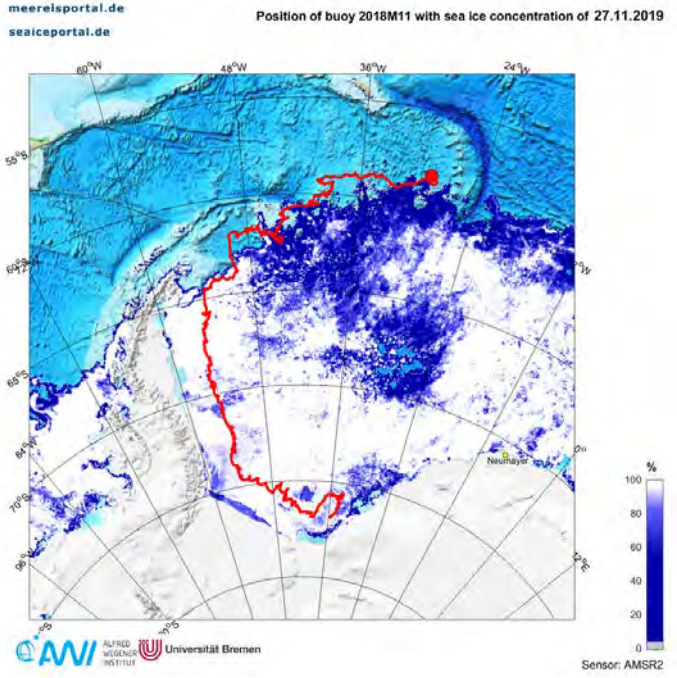
From Polarstern into the classrooms

Stefanie Arndt, AWI

2017-19

https://www.meereisportal.de/archiv/2020-kurzmeldungen-gesamttexte/das-bojenpatenschafts-projekt-geht-nach-ueber-zweieinhalb-jahren-zu-ende/





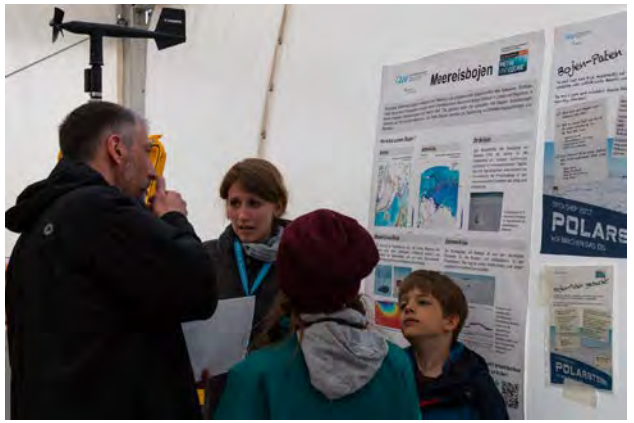


Foto: M. Nicolaus

https://www.meereisportal.de/archiv/2017-kurzmeldungen-gesamttexte/openship/

www.arice.eu

Polar Educators Germany

German Society for Polar Research

Concepts for polar teaching in Germany

One current project is MOSAiC

Thank you for your attention

Rainer Lehmann

ak-polarlehrer@polarforschung.de

https://www.polarforschung.de/arbeitskreise/ak-polarlehrer/

https://www.polarforschung.de/

MOSAiC Teaching Materials






Friederike Krüger

(IGS Bothfeld)


@Mario Hoppman

MOSAiC-Expedition
Educational work

Friederike Krüger
teacher at IGS Bothfeld (Germany)
contact: friederike.krueger@igs-bothfeld.org
instagram: fkruegr

ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG

Niedersächsisches Kultusministerium

IGS Bothfeld Kultur:Schule

Questions of students and public interest, that are discussed in the school material during MOSAiC

- How does climate change effect the Arctic?
- What is MOSAiC about?
- Who owns the Arctic?
- What are the scientists doing in the Arctic?
- What is life like on board?
- How do they measure ice thickness?
- How do they read coordinates?

www.mosaic-expedition.org/education

Example of material: What are the scientists doing in the Arctic?

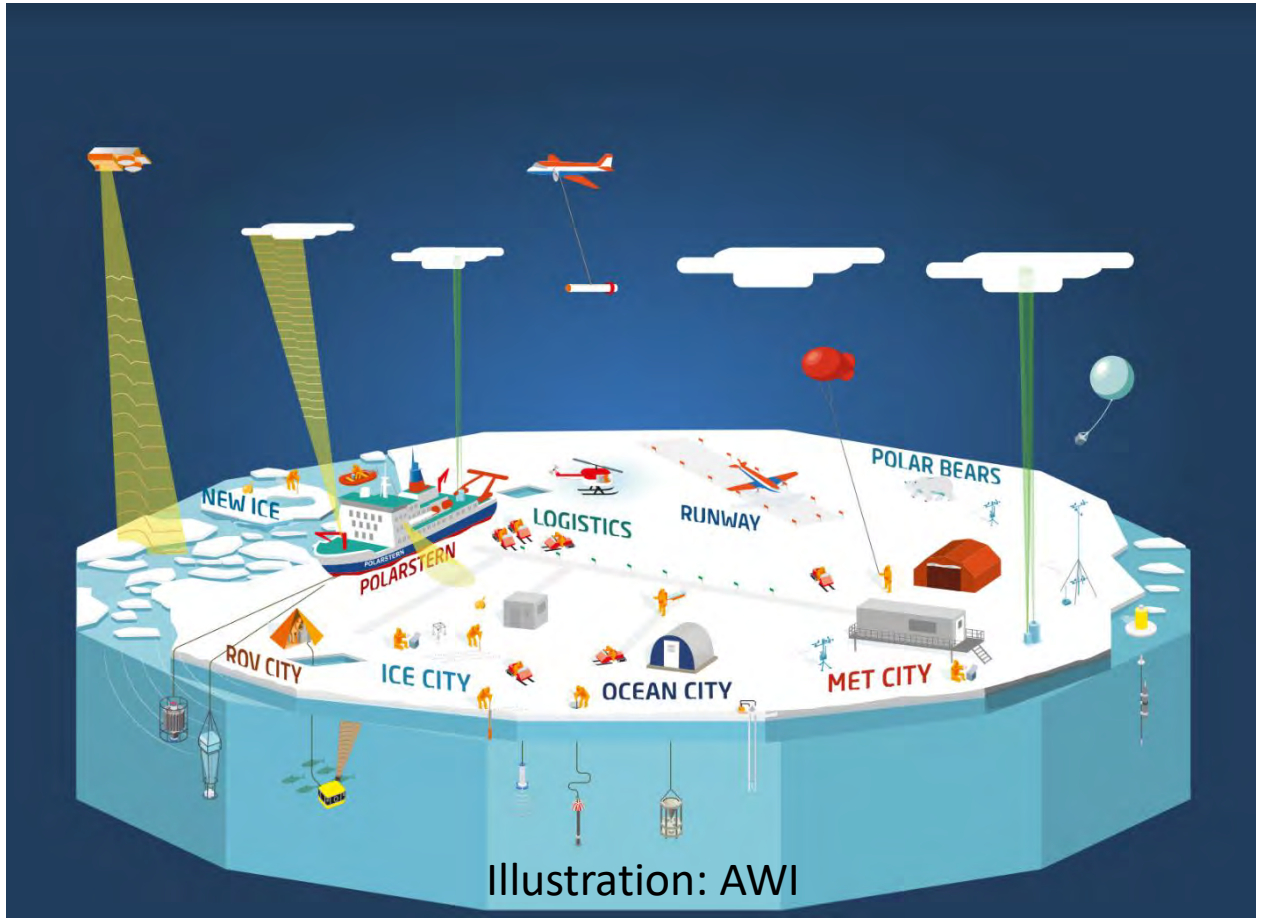
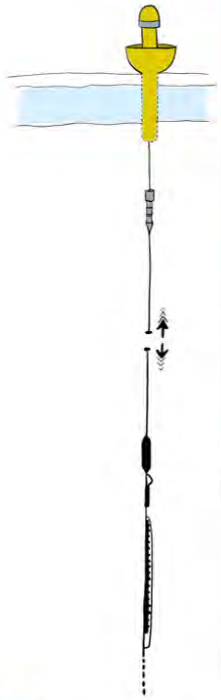


Illustration: AWI

MOSAiC International Arctic Drift Expedition

Autonomous Ocean Flux Buoy (mit Pycnocline Spar)

AWI CIRES Education & Outreach



Aufbauzeit:
8-10 Stunden auf dem Eis

Weight:
260 Kilogramm

Stellfläche:
1 Meter

Entfernung zu anderen Instrumenten:
30 Meter

Kosten:
EUR € 80,000

Herausforderungen:
Diese Instrumente sind handgefertigt, komplex und schwer zu handhaben, sie überstehen jedoch sehr gut die eisigen Bedingungen

Fotos: Katie Gavenus

Wie werden AOFBs installiert?

Zuerst wird ein 0,5 m breites Loch in das Eis gebohrt. Dann wird ein Stativ mit einer Handkurbelwinde aufgestellt. Dies hält das Gewicht des Instruments. Nun wird ein Kabel am Instrument befestigt und an diesem etliche Sensoren. Das Kabel verbindet die Sensoren mit der Schwimmboje, die auf dem Meereis liegt. Langsam wird das Kabel ins Wasser hinabgelassen. Schließlich wird die Boje über dem Loch in Position gebracht. Kleine Solarmodule und eine Windturbine liefern zusätzliche elektrische Energie für das Instrument.

Welche Parameter werden aufgezeichnet?

Das AOFB misst Wassertemperatur, Salzgehalt und Strömungen, um zu bestimmen, wie sich Wärme und Salz in den 3 Metern unter dem Eis innerhalb der Wassersäule vermischen. Es misst auch Chlorophyll-A (ein Indikator für die Photosynthese) und Trübung (Finsterkeit im Wasser). Ein Höhenmesser prallt vom Boden des Meereises ab, um die Eisschmelze zu

Further outreach products and educational work

- about 20 Lectures in schools for single classes and up to 500 students

- about 15 Lectures in museums, zoos, public institutions, clubs, publisher’s etc.

therefore AWI provides me with different original objects

- 10-minutes-documentation about MOSAiC for schools

  → soon at mosaic-expedition.org

- Different publications
- Media work (radio, newspaper, social media)

working together with Landesmuseum Hannover and Leibniz University Hannover

- educating children and adults in the Landesmuseum Hannover about Climate Change and MOSAiC
- educating future teachers at the university about MOSAiC-related topics in lectures and seminars

Climate Physics in Experiments






Falk Ebert

(Herder Highschool)

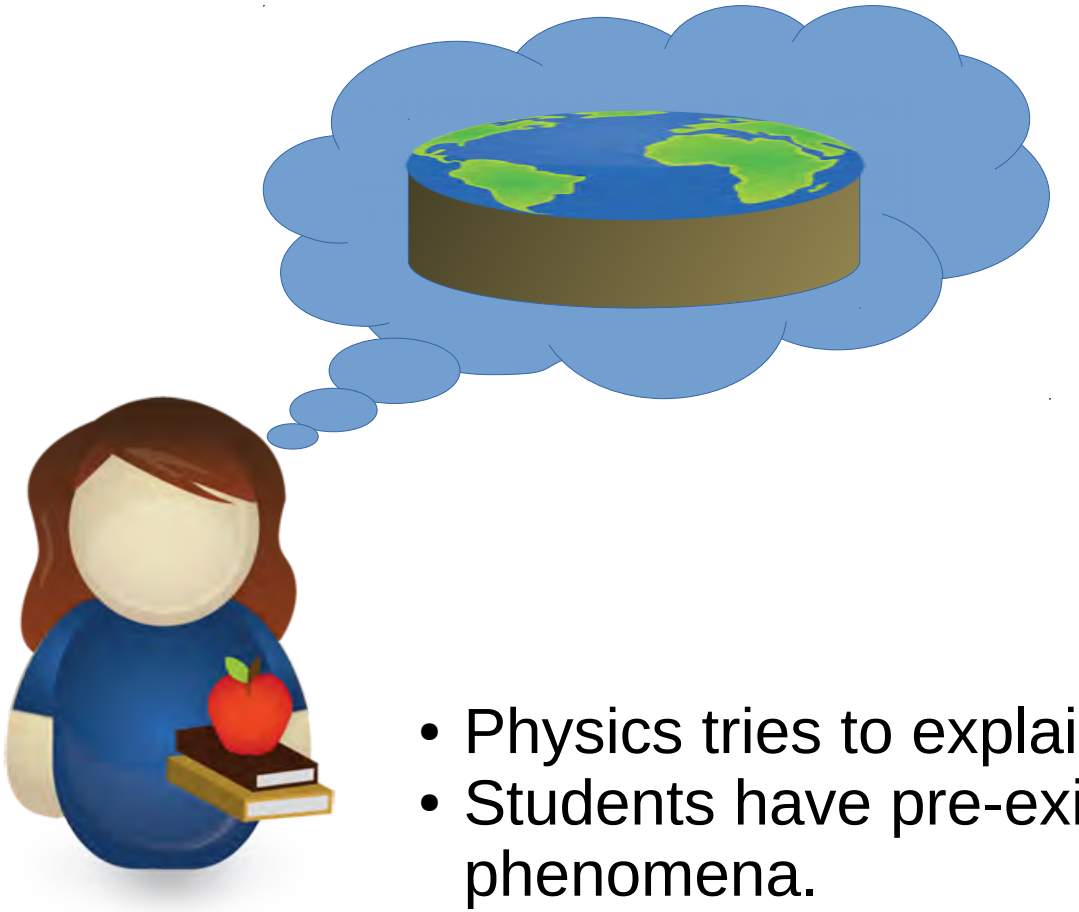
Falk Ebert

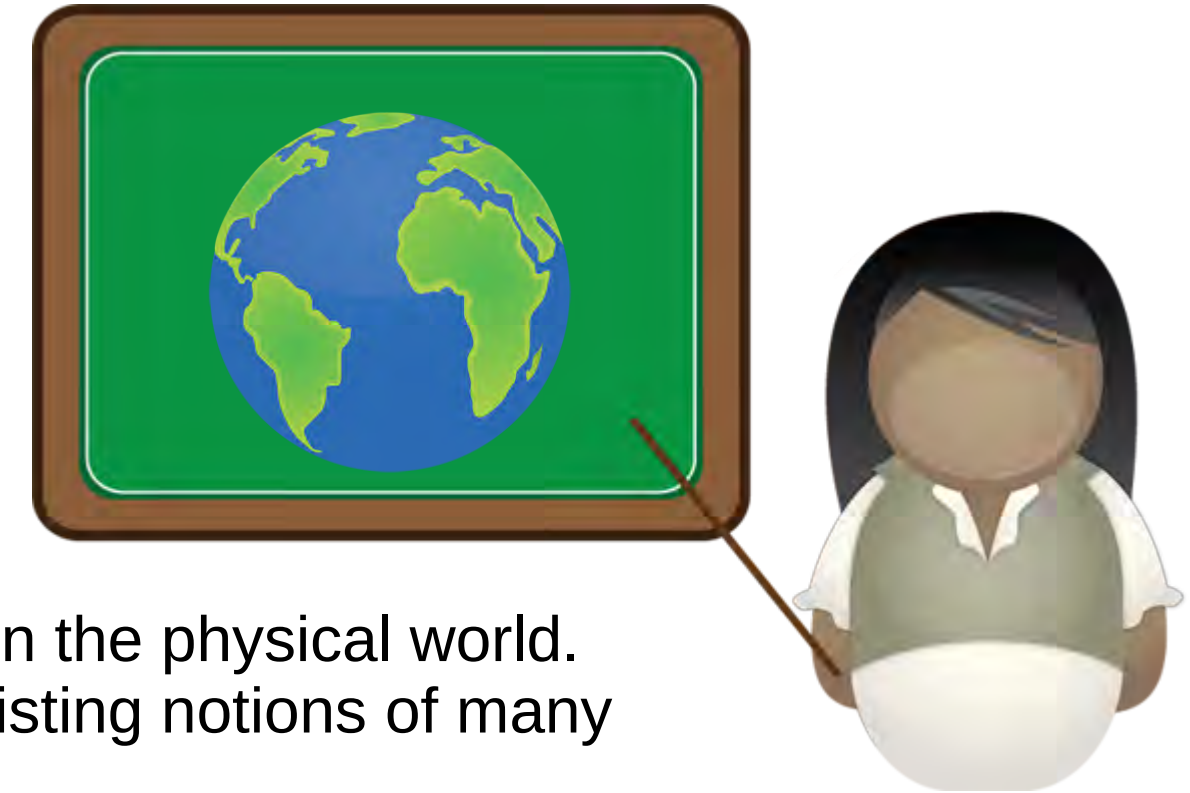
Herder High School
Berlin Germany

Falk Ebert

Jan Rohde

Understanding (climate) physics





- Physics tries to explain the physical world.
- Students have pre-existing notions of many phenomena.
- Educators need to „bend“ these notions.

Understanding (climate) physics

climate hysteria

media hype

fake data

Greta marketing

green propaganda

CO_2 is a natural gas

Adobe stock

- Everybody has pre-existing notions about climate effects
- often wrong
- often counterintuitive

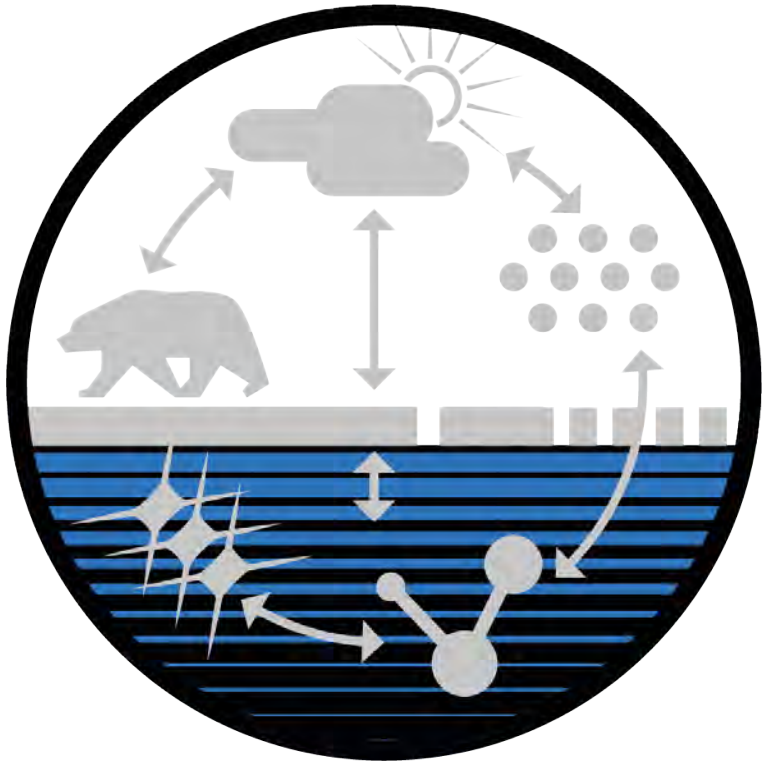
There is so little CO_2 in the atmosphere? How can it have an effect?

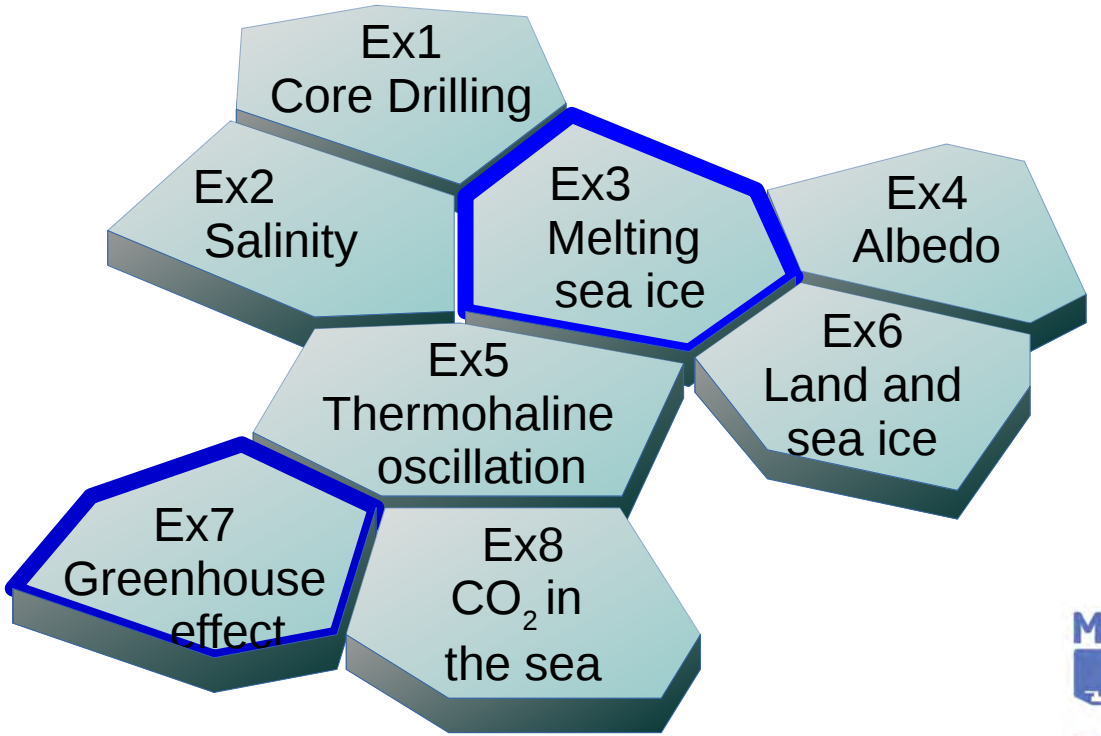
CO_2 is transparent. Why does it absorb infrared light?

It is easier to dissolve salt in warm water. Thus, CO_2 should dissolve better in warm water too.

Interconnected effects

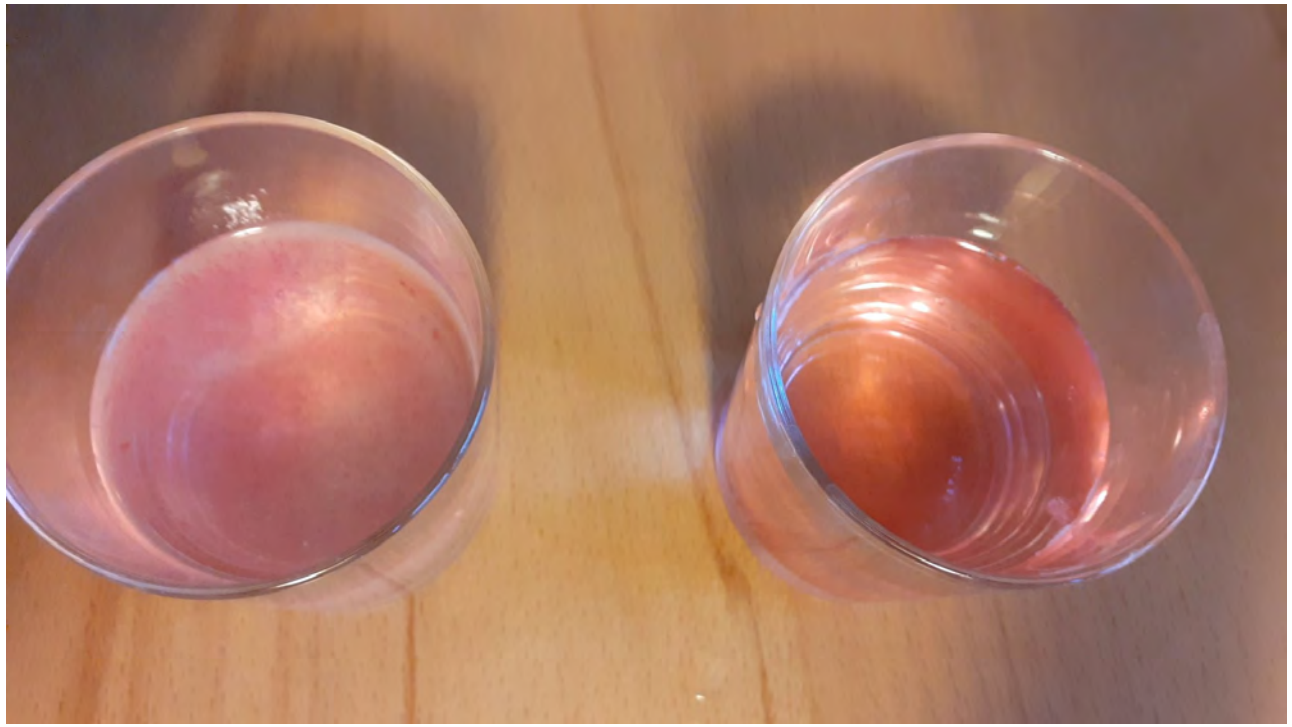
- Experiments provide cognitive conflict
- Possibility to adapt previous misconceptions





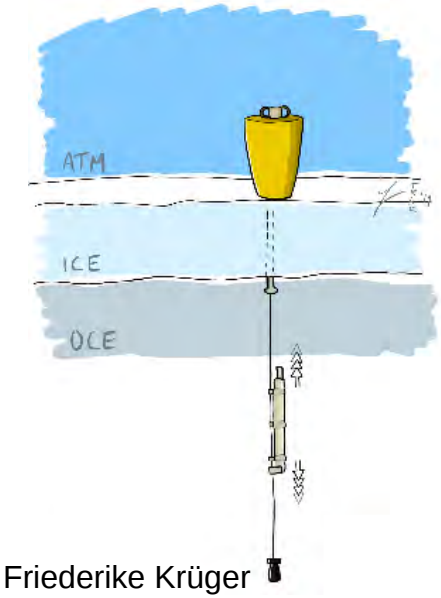
Melting sea ice

- Put two ice cubes into fresh and salt water.
- Which will melt first?
- Use coloring for more effect.



But doesn‘t salt make ice melt faster?

- formation of layers
- exchange of heat
- buoyancy

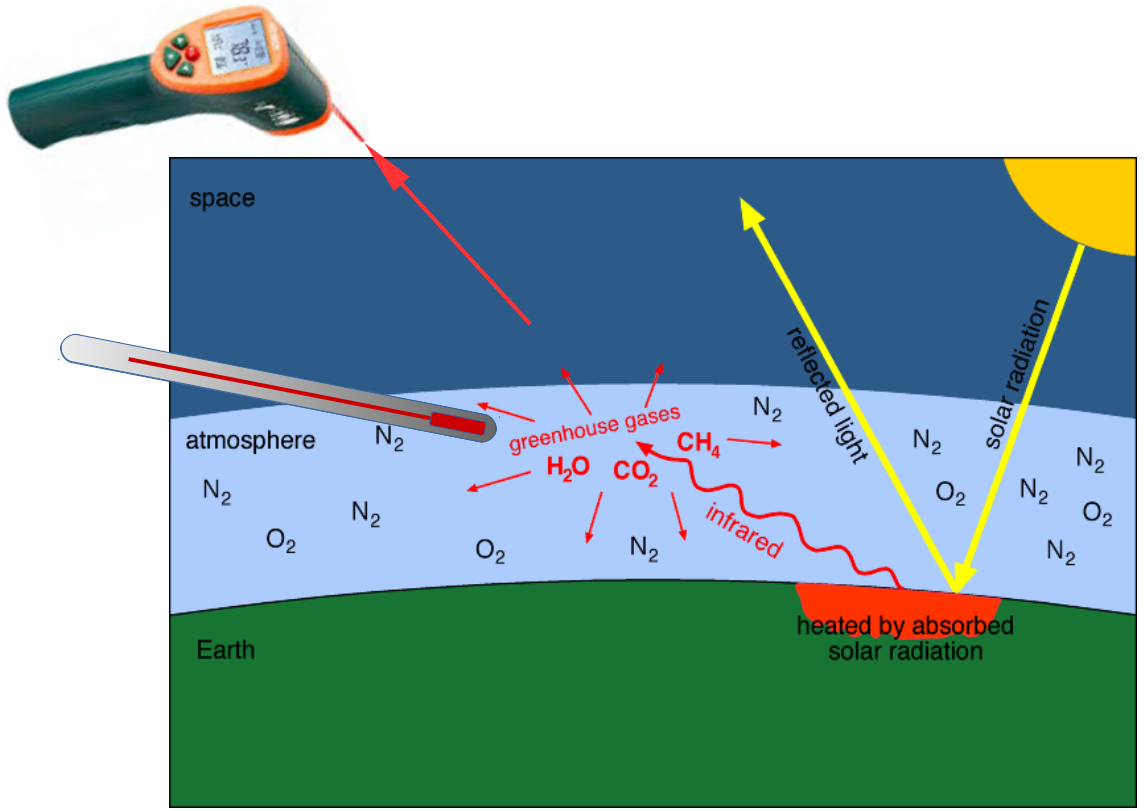


Friederike Krüger

Greenhouse effect

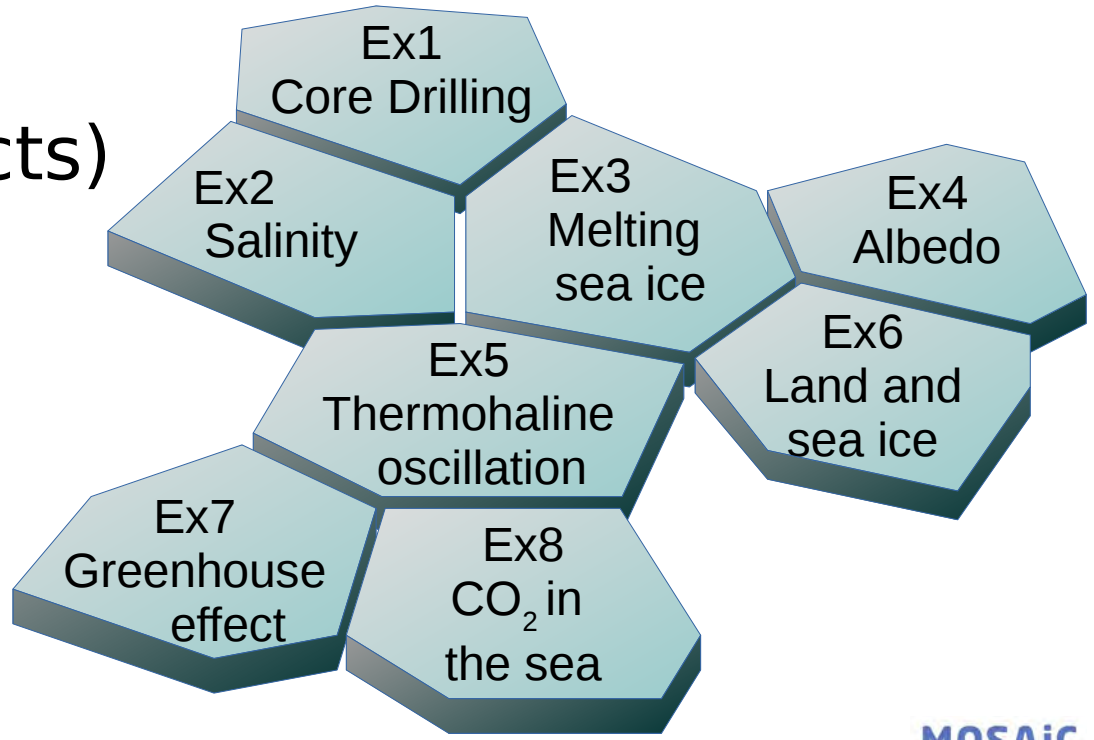
- two bottles (1/3 full) with plain/sparkling water
- heating lamp for 10min
- compare temperature inside

Hotter or colder?



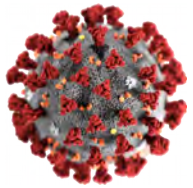
www.columbia.edu

- Basic effects with simple materials
- Results need to be discussed
- Often exaggeration necessary
  (othewise too long or too small effects)
- Interdependence of phenomena
  + scientific areas



So far:

- set of 8 experiments (introductory text, complete setup, questions, cross-references)
- tested with students aged 10-16
- integrated into curriculum
- ~~presentation in school network~~
- ~~presentation in DPG~~
- possible publication



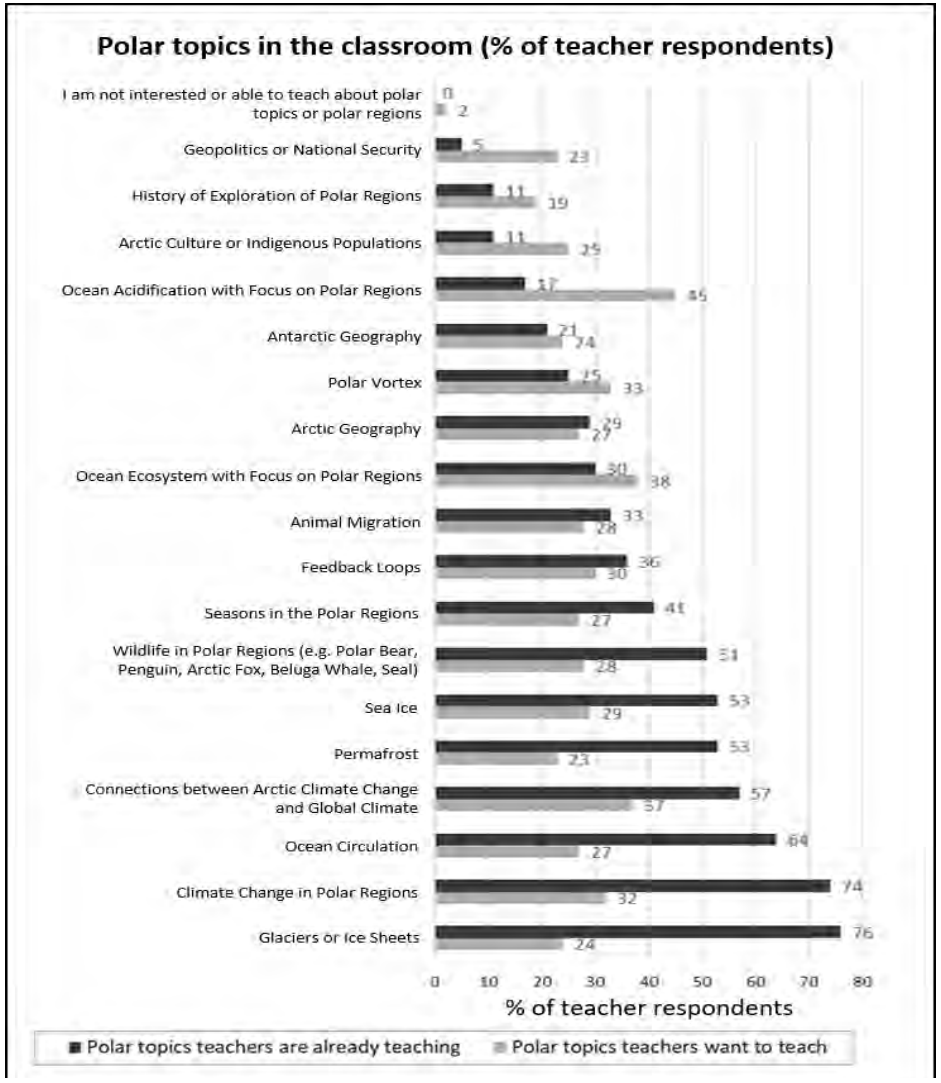
MOSAiC US
Education & Outreach






Anne Gold
Lynne Harden, Jonathan Griffith,
Katja Schloesser

Educator Needs Assessment



What do educators need?

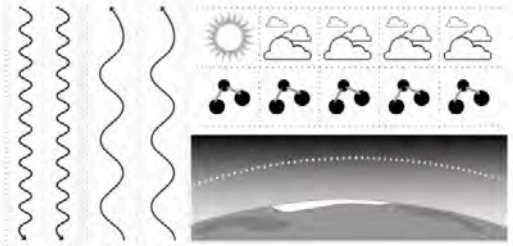
- Classroom activities/lesson plans -- 84%
- Data on polar regions for students -- 80%
- Video or multimedia resources (67%)
- Professional development training (56%)

Schloesser & Gold (2020)

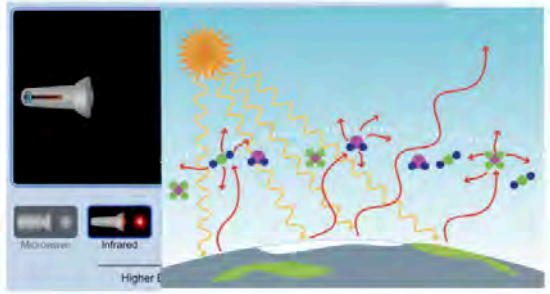
Curriculum – Arctic Feedbacks

Anchoring Phenomenon: Why might the Arctic be warming twice as fast as the rest of the world?

1. Earth's energy budget



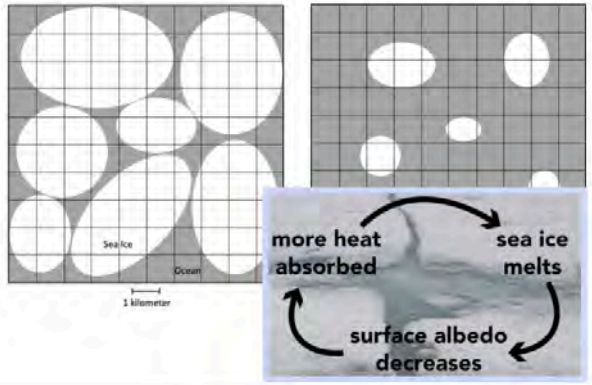
2. Greenhouse Effect



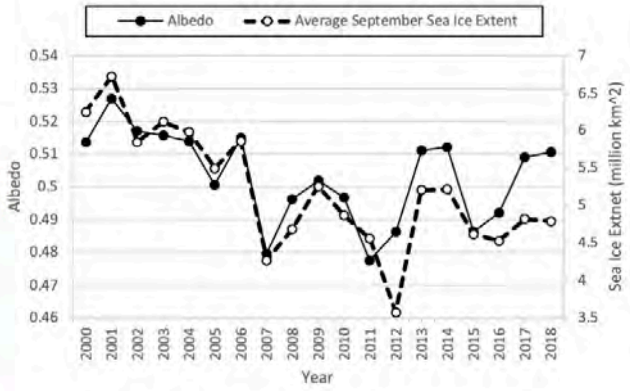
3. MOSAiC Distributed Network in VR

4. Albedo Reflectance App

5. Ice-Albedo Feedback



6. Real-Time Arctic Data

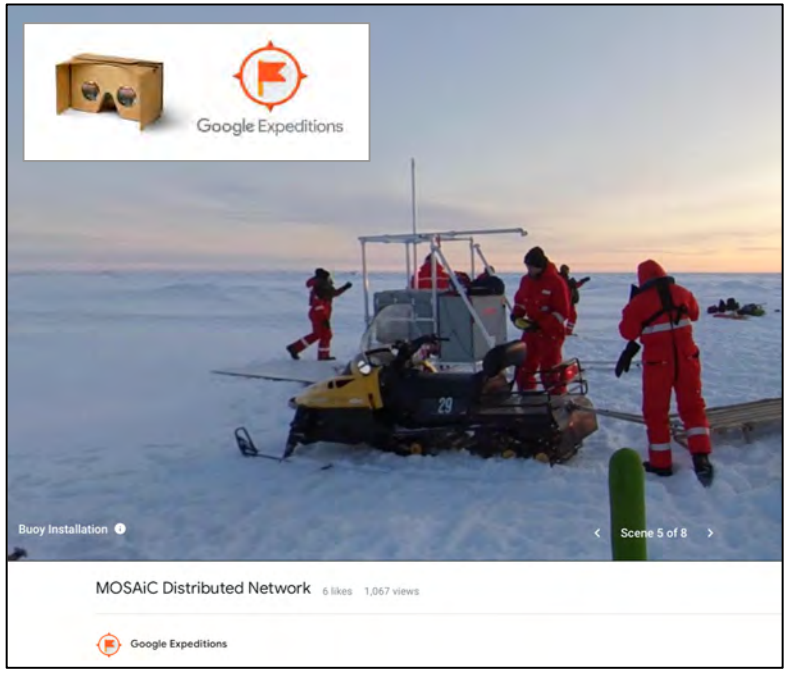


Anchoring Phenomenon: How have motivations, methods, technologies, and our knowledge of the Arctic changed over the past 125 years?

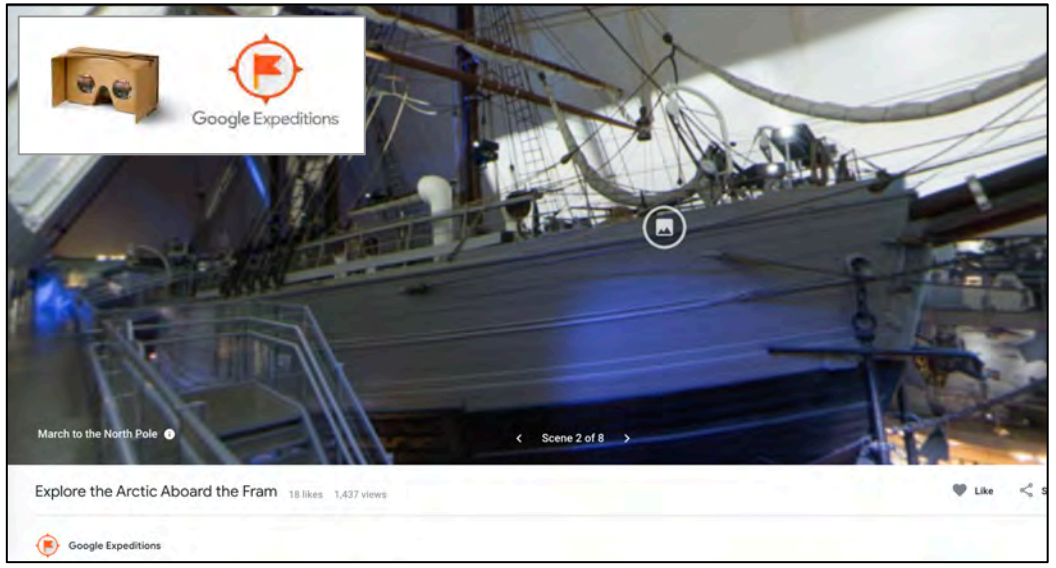
Photo: National Library of Norway

Photo: Stefan Hendricks

Google Expeditions

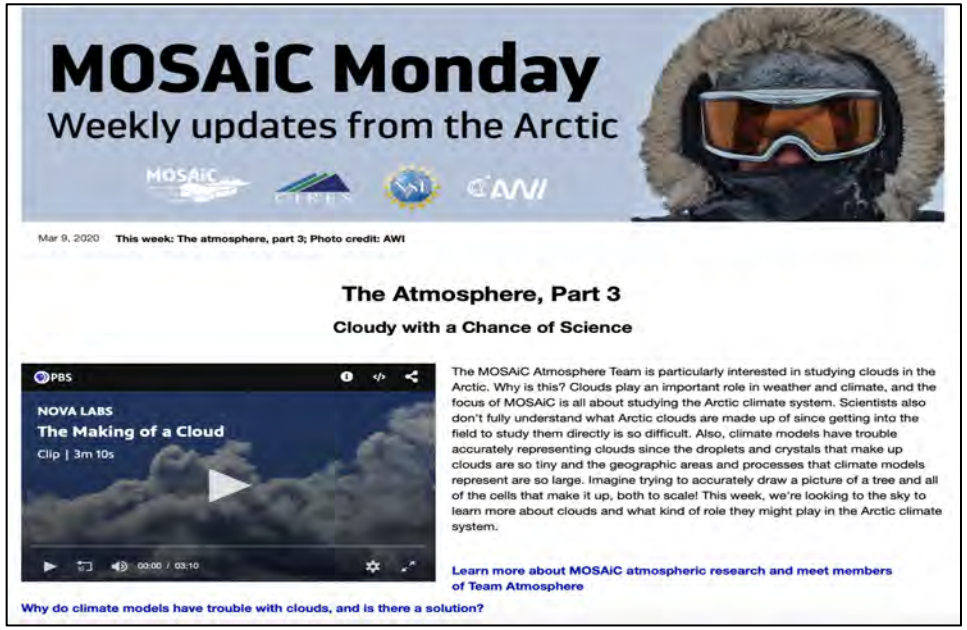


MOSAiC Distributed Network:
https://poly.google.com/view/beIkmpdxevd



Explore the Arctic Aboard the Fram:
https://poly.google.com/view/6UdZ-VJScpL

Newsletters



Sign up for MM newsletter:
http://bit.ly/MOSAiCMonday

MM Homepage:
https://mosaic.colorado.edu/education/mosaic-mondays

Remote Learning Resources

University of Colorado Boulder

A Year in the Ice

MOSAiC: Multidisciplinary Drifting Observatory for the Study of Arctic Climate

Home About News People Education Blogs Partners MOSAiC Monday

Remote, online, and at-home polar learning resources

Remote, online, and at-home polar learning resources

Do you have resources you'd like us to add to the list below, or is there something in particular you are looking for? Email us at **mosaic@colorado.edu**!

1. Videos and other multimedia

***Frozen in the Ice: Exploring the Arctic* MOSAiC MOOC now on Coursera!**

Created by the University of Colorado Boulder in partnership with the Alfred Wegener Institute and with funding from the National Science Foundation, *Frozen in the Ice: Exploring the Arctic* is a new massive open online course (MOOC) about the MOSAiC expedition. The course features 50 videos from MOSAiC scientists and Arctic experts on topics ranging from the behavior of sea ice, to Arctic clouds, to how climate change is impacting Arctic indigenous peoples. All videos are available for **free** to everyone, and certificates of completion or graduate credits (coming soon) can be obtained for a small fee.

Go to the course on Coursera

Watch all of the course videos on YouTube

MOSAiC and Arctic video collection from CU Boulder

What is it like to be a baker on the *Polarstern*? What changes have we been observing in the Arctic climate system? How do you deploy a buoy in Arctic sea ice? Explore our carefully curated collection of MOSAiC and Arctic-related short videos to learn the answers to these questions and more!

Go to the CU Boulder MOSAiC and Arctic video collection

MOSAiC Media Center

Browse this continuously-updated and extensive collection of photos from the MOSAiC expedition, courtesy of the Alfred Wegener Institute.

University of Colorado Boulder

A Year in the Ice

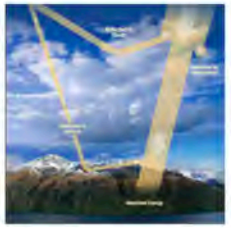
MOSAiC: Multidisciplinary Drifting Observatory for the Study of Arctic Climate

Home About News People Education Blogs Partners MOSAiC Monday

Educational Resources

Subject - Any - Grade Level - Any - Resource Type - Any - Search

Apply



Albedo: measuring the reflective properties of different surfaces

Students measure the albedo and surface temperature of various ice surfaces and changing processes as the ice melts over time. Students apply what they've learned in the experiment to the understanding of albedo, and the role albedo plays in the Earth's energy budget.

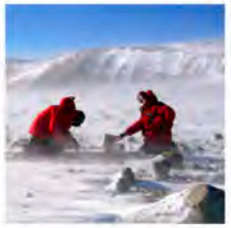
NGSS Aligned Lesson plan

Subject: Analyzing and interpreting data, Asking questions, Developing and using models, Earth science, Obtaining and evaluating information, Physical science, Planning investigations, Sea ice

Grade Level: Middle School, High School, University/college

Developer: U.S. Ice Drilling Program

View Resource



Arctic Climate Curriculum: Do you really want to visit the Arctic?

This jigsaw activity is designed for students to become familiar with several datasets of Arctic weather data, collected in Eureka on Ellesmere Island. Students join a role-playing activity to read and interpret graphs while considering the optimal time to plan a research mission to the Arctic.

NGSS Aligned Lesson plan

Subject: Analyzing and interpreting data, Arguing from evidence, Asking questions, Climate, Computational thinking, Constructing explanations, Earth science, Obtaining and evaluating information, Physical science

Grade Level: Middle School, High School, University/college

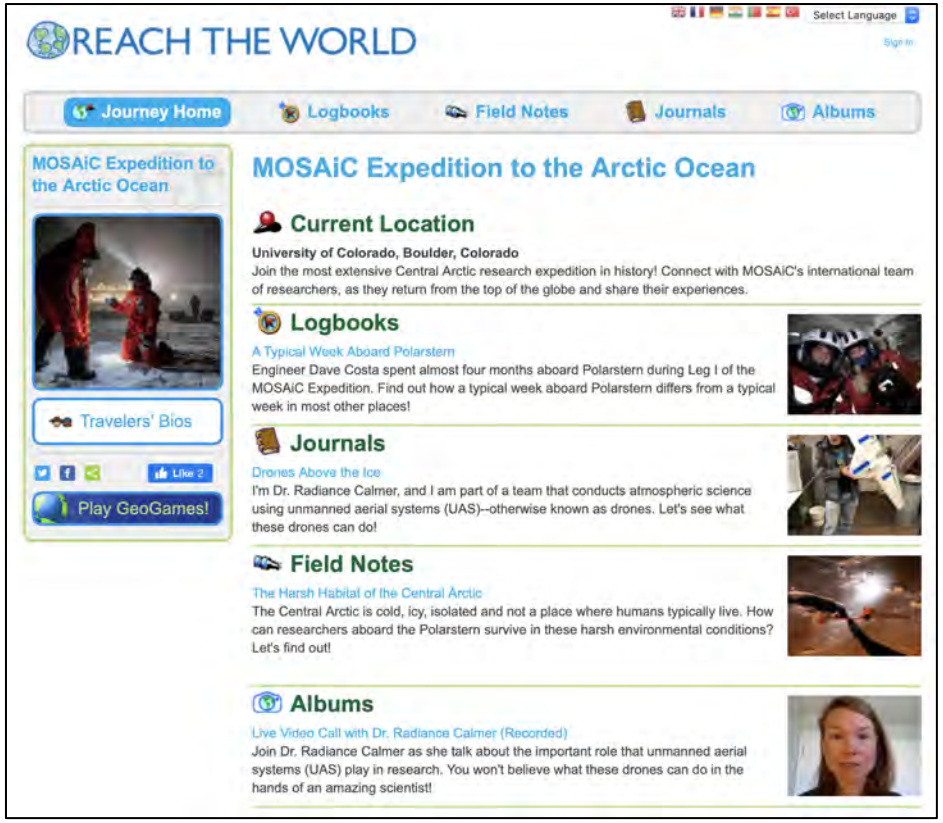
Developer: CIRES

View Resource

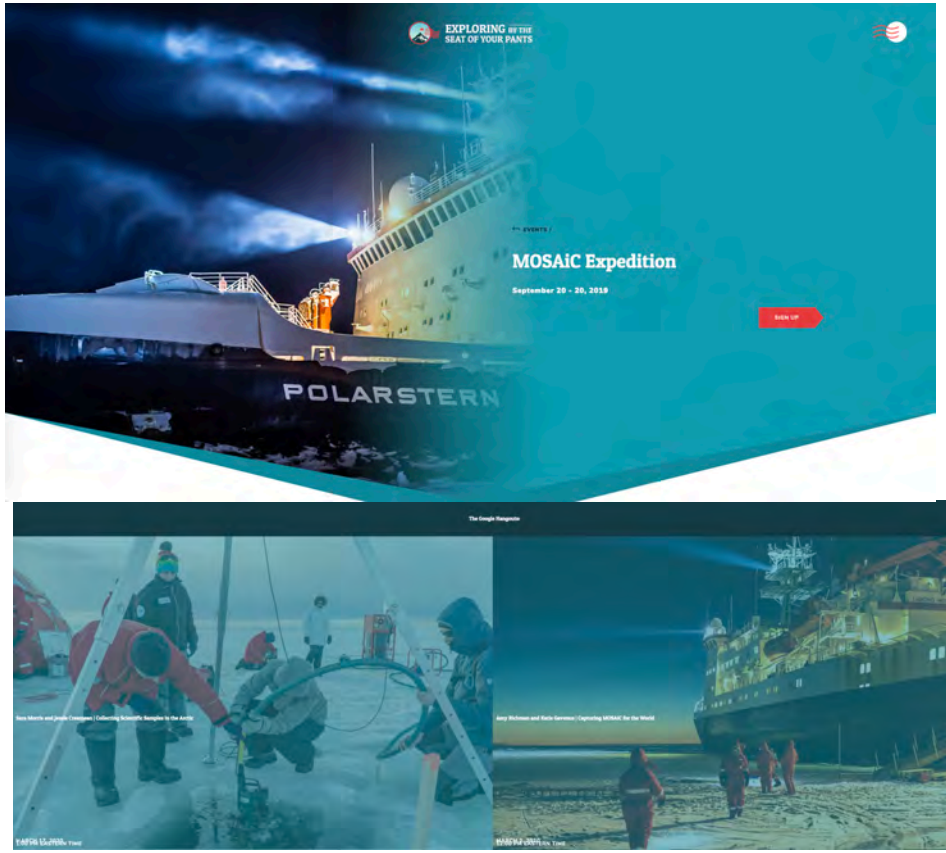
Arctic Climate Curriculum: Exploring Arctic Climate Data

https://mosaic.colorado.edu/remote-online-and-home-polar-learning-resources

Live Chats & Expedition Journals



RTW MOSAiC Expedition Page:
https://www.reachtheworld.org/mosaic-expedition-arctic-ocean



Exploring by the Seat of Your Pants:
http://www.exploringbytheseat.com/event/mosaic-expedition/

Massive Open Online Course (MOOC)

https://www.coursera.org/learn/frozen-in-the-ice

50 Lectures from 37 different presenters covering the breadth of MOSAiC science and Arctic change

Assessments use MOSAiC data

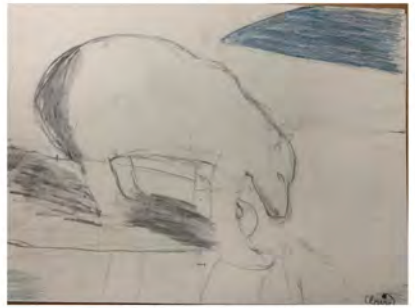
Museum of MOSAiC Art (MoMoA)

Gallery: MOSAiC Science

Artist: Dylan, age 10, from Truro
Title: Scientist at Work

I drew this piece of art because we did a project called Walk In Someone's Snow Boots. It's a project where you go on the slideshow on MOSAiC Monday for January 20. The slideshow was full with photographs of people, the conditions they work in, and other kinds of photos like that. Also, captions gave information about the photo and it was taken. You pick a photo with a person in it, and then you write an imaginary letter to your family pretending you're the person writing. I drew a picture of one of the scientists to go along with my letter.

Gallery: Arctic Flora and Fauna



Artist: Claire, age 11, from Boulder, CO
Title: N/A

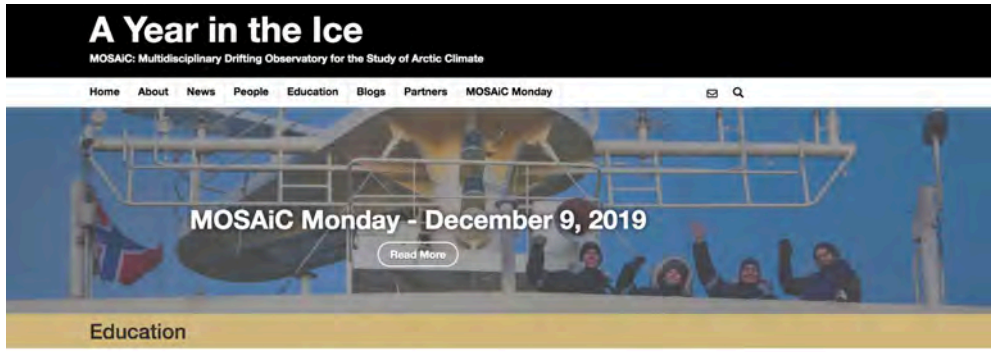
Gallery: Arctic Land and Seascapes

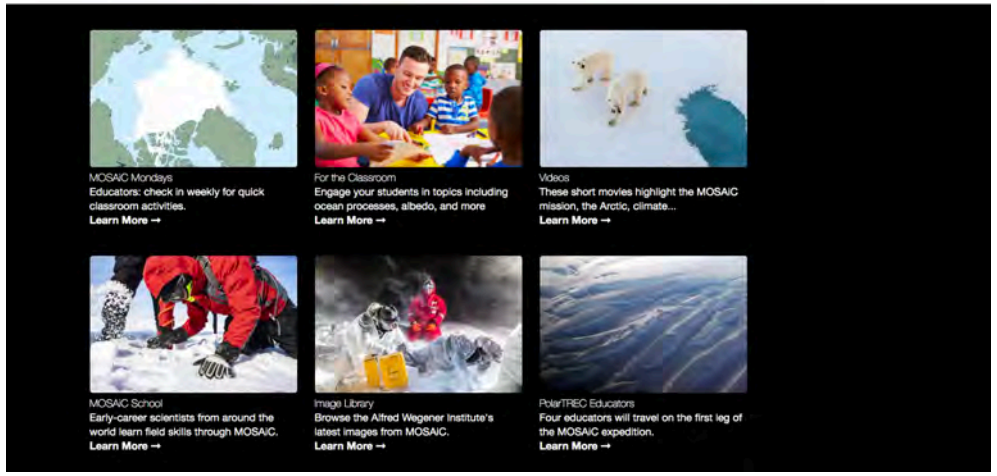
Title: MOSAiC Mug (MOMu)
Artist: Katy

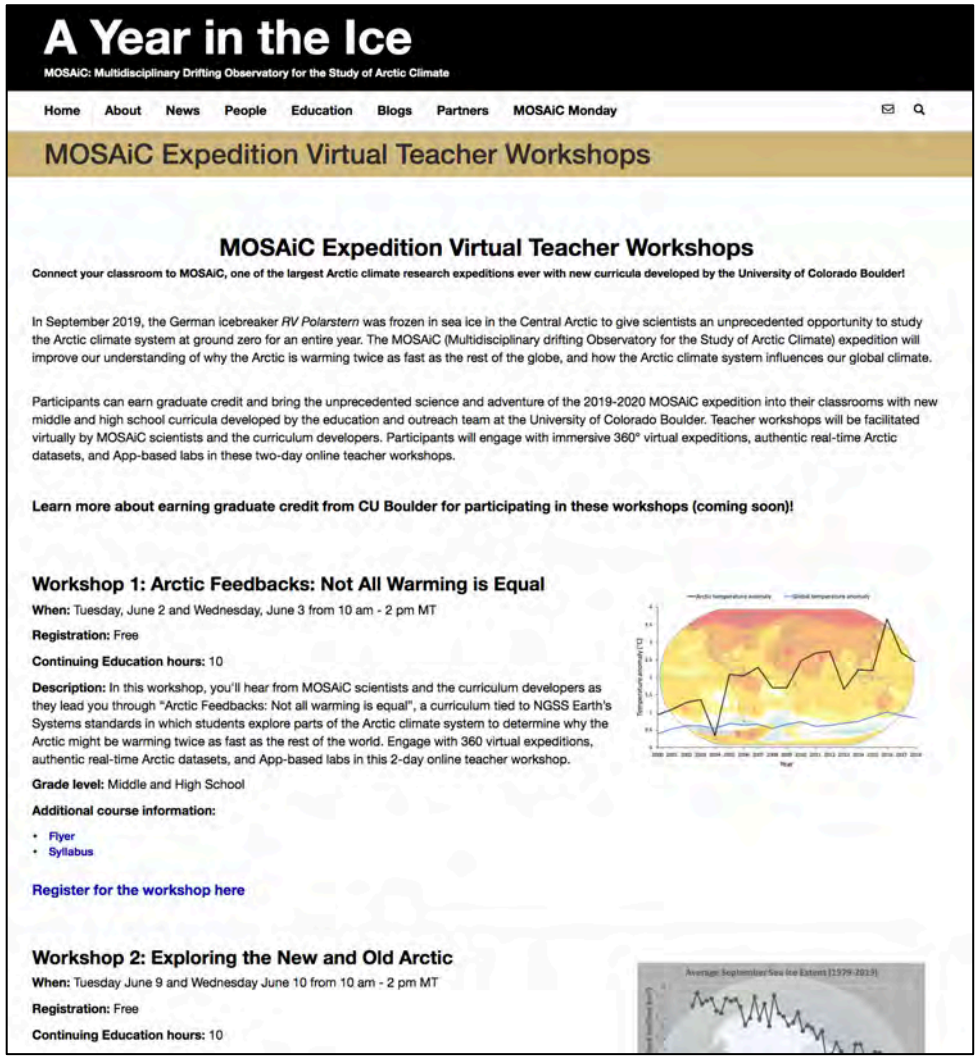
I've been obsessed with the MOSAiC mission for more than a year now; it's part of my work as a communicator. This fall and winter, especially, I've spent months thinking about my colleagues up there on the ice, in the dark. I make pottery as a hobby, and I wanted to make a set of mugs that somehow represented MOSAiC. This is one: The sea ice below is white and atmosphere black, and the glazes mix in a way that (to me) reflects the interconnections of the ocean-ice-atmosphere system. Can you see the aurora? It's normally not visible from Polarstern (the ship is too far north) but I wanted to put something in that dark sky...

https://mosaic.colorado.edu/museum-mosaic-art-momoa

Webportal







https://mosaic.colorado.edu

ARICE Webinar
From icebreakers into classrooms

Questions!?






Arctic Research Icebreaker Cons.
ARICE

An international collaboration strategy for meeting the needs of marine based research in the Arctic

Home About News Outreach Training Apply for Ship Time Call Results Intranet

ARICE Webinar
From icebreakers into classrooms

Thank you very much!






Arctic Research Icebreaker Cons.
ARICE

An international collaboration strategy for meeting the needs of marine based research in the Arctic

Webinar recording will be available on arice.eu and on the APECS website

Home | About | News | Outreach | Training | Apply for Ship Time | Call Results | Intranet