

## **IceBridge - Arctic 2012**

### **An Airborne Mission for Earth's Polar Ice Feature**

#### **Embedded Educators: Teacher Research Experience in Greenland with Operation IceBridge**

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The DMS expert explains the instrument to teachers-in-the-field accompanying the IceBridge flight. DMS instrument team member James Jacobson (left) explains the basics of the P-3's Digital Mapping System to teachers Tom Koch Svennesen (top) and Peter Gross (right). Credit: NASA/Jefferson Beck

In mid-April, scientists working in a remote corner of Greenland on NASA's Operation IceBridge gave five teachers a taste of what airborne polar science is like and in the process provided the educators with better tools to teach students about science. Through a joint effort with the U.S. Embassy in Denmark, the Danish Education Ministry and the U.S.-based education initiative PolarTREC, IceBridge was joined on April 13 by Erik Jakobsen, from the Aalborg Gymnasium in Aalborg, Denmark; Peter Gross from the

Roskilde Tekniske Gymnasium in Roskilde, Denmark; Tom Koch Svennesen, from Aasiaat GU in Aasiaat, Greenland; Sine Madsen from the Building and Construction School in Sisimiut, Greenland; and on April 14 by Tim Spuck, from Oil City High School in Oil City, Penn. PolarTREC is a program funded by the National Science Foundation that works to expand teacher knowledge and student interest in polar science by teaming teachers up with polar researchers.

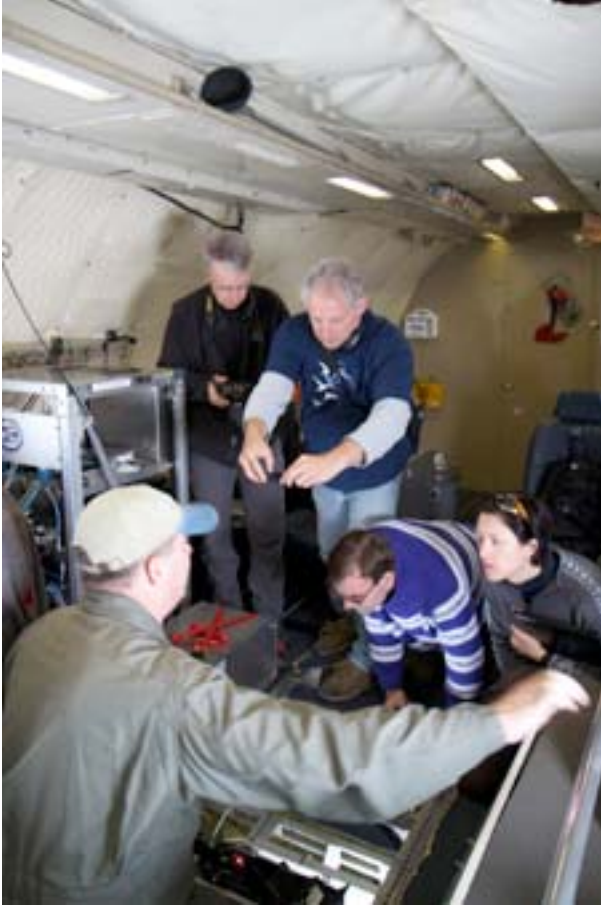
### Getting a Taste of Research

For several days, these five educators lived and worked alongside IceBridge science and instrument team members in Kangerlussuaq, Greenland, and saw firsthand how IceBridge data are collected. As a result of this experience, the teachers were able to come up with potential new ideas for the classroom, learn more about the process of research and exchange ideas and experience with each other in the spirit of international collaboration.

One of the driving factors behind educator research experiences is the fact that many physical science teachers have backgrounds in life science or other fields than physical science. But even a teacher with a background in physics benefits from having applicable research experience. “Teaching about something that we’ve never experienced ourselves is a real challenge,” said Spuck, who teaches Earth and space sciences.

By including teachers in the field, scientists are playing a pivotal role in educating the next generation. “On a long-term basis, scientists must improve science education and grow new scientists,” Gross said. What teachers learn about the scientific process during these experiences often changes the way they teach years down the road. For example, teachers will rely more on research-based classroom activities and less on textbooks.

### Teacher Experiences and Activities



Airborne Topographic Mapper program manager Jim Yungel lifts a floor panel to show the ATM laser altimeter to teachers on an IceBridge flight. Clockwise from top: Erik Jakobsen, Tim Spuck, Peter Gross, Sine Madsen and Jim Yungel. Credit: NASA/Jefferson Beck



Greenlandic teacher Tom Svennesen stands in front of the Russell Glacier. Credit: NASA/Jefferson Beck

Shortly after arriving in Kangerlussuaq, the teachers settled into their new home for the next several days, the Kangerlussuaq International Science Support, or KISS, facility before meeting the IceBridge P-3 as it returned from the day's flight. For the next several days, the teachers participated in science meetings, toured a nearby glacier and took turns flying on survey flights.

One of the largest challenges faced with visitors on IceBridge flights is finding enough seats for them. Having five people wanting to come along can make things difficult. "Space is limited, but we work to accommodate visitors as much as we can," said IceBridge project scientist Michael Studinger. By alternating groups of two or three teachers, each one was able to fly at least twice.

On the flights the teachers got to see how IceBridge collects its vast amount of data and, if they looked out of the plane's windows, views of Greenland's amazing terrain. The eight-hour-long flights gave each teacher plenty of opportunities to take photos, talk with IceBridge team members about their work and just soak in what they say was a memorable experience. "Being on the P-3 was like being a kid in a candy store," Spuck said.

Back on the ground the exchange continued, with teachers and scientists talking about a wide variety of topics in the evenings. This is one advantage of having everyone in the KISS facility: its dorm-like atmosphere easily facilitated discussion. The teachers and many on the IceBridge team also took advantage of a no-fly day on April 15 to visit the nearby Russell Glacier. Being able to get up close and personal with the ice helped add context to what teachers saw from the air. "Seeing the glacier up close was amazing," Gross said.

## Lessons Learned

These experiences left the teachers with examples and inspiration for new lessons and other ways to better reach their students. Jakobsen plans to use his photos and video footage as real-life examples when teaching about different geological features, and Gross plans to use what he learned about the various instruments to create geometry and physics projects for his students. Spuck has already started using his experience, conducting a webinar and answering student questions, and has more ideas in store. And Madsen and Svennesen plan to use ice as a unifying theme for courses they plan to create.

Greenland's schools are changing their science curriculum to better serve students. One of those changes is a new introductory class covering concepts in biology, geology, chemistry and physics that handles material in a way that Greenlandic students will find culturally relevant. "Ice is a good area for study," said Svennesen, who teaches chemistry and comparative religion. "It can cover all of these fields and meets the cultural requirement. One of these projects should have something to do with ice."

Madsen, who teaches biology in Greenland, agrees that relating material to students' culture can make science more accessible. She plans to use her IceBridge experience to add to a project on the effects of melting ice on Arctic life. "Sometime next year I'll make a theme about climate change," Madsen said. "I'll be able to use some of what I've learned."

Another powerful tool that the teachers plan to use in the future is IceBridge's vast collection of data. The main stumbling block, however, is accessibility they said. The data is available, but in a form not usable by high school students. "They need time-series and map data that are easy to use," Jakobsen said. The National Snow and Ice Data Center is working on a product that will enable that. The other teachers echo the sentiment that having access to scientific data is great, but it is only a first step. "Teachers need to be able to translate scientist language for students," Madsen said. "Science easily becomes abstract and difficult for students to understand."

In addition to the experiences and knowledge they can use in their lesson plans, the teachers gained extra value from working closely with educators from different countries. Many of the group's meals turned into discussions about educational strategies and the challenges they face as teachers. "When teachers are together, we always discuss education and exchange ideas," Gross said. IceBridge personnel also gained from the

experience by interacting with educators. “I had several interesting discussions about possible use of ATM data,” said ATM program manager Jim Yungel.

Just how much an effect the IceBridge experience will have on these teachers in the future remains to be seen. Data from other research experiences show that it takes a few years for substantial changes in teaching to take effect. But with a growing emphasis on including teachers in research experiences, both scientists and educators can hope to improve science education.

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