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The science of this project:

This project focuses on the Cretaceous-Paleogene boundary – about 65.5 million years ago. That's when dinosaurs went extinct, and it's also when a lot of ocean life disappeared from the Earth as well. We work with the International Ocean Drilling Program (IODP) to collect cores from the bottom of the ocean to figure out what the ocean conditions were like at the time, which may have resulted in the extinction of marine life. For example, could it have been caused by lower oxygen levels in the water?

The Broader Impacts component of this project:

We wanted to capitalize on student interest in dinosaurs, correct any misconceptions, and create a data analysis project from our ocean drilling observations. We worked with the School of Rock (a teacher training program sponsored by the IODP) to find an educational coordinator who would create academic materials for secondary school students. In the end, we hired Edward Cohen (who goes by Eddie), an earth science teacher from Quibbletown Middle School in New Jersey.

AUDIENCE:

What audience have you targeted with the BI activities in this project?

First, we targeted elementary and middle school kids. Eddie created a game of memory for them. Each PowerPoint slide showed a different step in our scientific process, and the kids were asked to put them in the right order.

Second, we're going after high school students. We gave them data that's similar to what we collect and measure, and asked them to analyze it and connect different observations. We were trying to teach the students how to look at data. Usually, data aren't nice and neat and packaged like they tend to be in textbooks. The real world is messier, and we wanted the students to appreciate that.

What are the benefits of working with this audience?

Now more than ever, scientists need to find a way to convey the importance of what we do to a broader audience. I mean, some of the polls of the voting public's perceptions of science are shocking. One of the benefits of our project is to reach voters early – before they can vote! We want to introduce our students to science as a process, and help them understand both what science is and what it isn't. We're hoping to create a more science-literate electorate.

And the challenges?

One big challenge is that I'm not trained to work with this age group. But through this project, I've learned about how middle and high school students learn, how to use technology effectively in the classroom, and how COSEE and the School of Rock educate students.

My other big challenge is finding the time. I've really benefited from having Eddie, our educational coordinator, onboard. And COSEE and the School of Rock have facilitated this project tremendously. They've made sure that what we're doing is educationally sound.

How do you deconstruct your science to reach non-expert audiences?

It's difficult to deconstruct my science because I deal with things that can't be seen with the naked eye. I can't just show people an oxygen atom. I've been trying to explain how much oxygen in the water matters to life on Earth – past and present, and how we can estimate past oxygen levels by measuring nitrogen in sediments. But sometimes I end up confusing people more than I intend to. It's something I'm working on.

What have you learned about your audience from doing your BI project?

It's been a long time since I was in middle school. So I think that I give the students too much credit for knowing some things and not enough credit for knowing other things. Middle and high school students are very comfortable with facts. They're less comfortable with the scientific method and applying the facts to creating a research plan.

PARTNERSHIPS:

Who were the members of your support team?

I worked on my BI statement with Janice McDonnell at Rutgers University. She helped me focus on what I was trying to achieve and who I needed to work with to do it. I also received suggestions and a letter of collaboration from Leslie Peart at the School of Rock. She helped advise me on how to advertise for and then hire an educational coordinator. Obviously, Eddie Cohen – who we eventually hired – has been an invaluable part of the team.

How did you go about designing this project and setting up your partnerships?

My main contact for designing the BI and connecting with the School of Rock was Janice. She helped me create something that was detailed and solid. She took my idea in the proposal – to enhance my science with an educational component – and turned it into something coherent with all the right language and citations.

How do you balance your research with your BI activities?

That's something I don't always do as well as I would like! As a pre-tenure assistant professor, I have a lot of other responsibilities. Hiring the educational coordinator was a big help. Eddie worked on the outreach even when I didn't have the time. He helped create something good for the students, and I didn't have to put in all of that time to create it myself. It sounds like I'm cheating the system! I prefer to think of it that everybody's happy – I got a strong result for my project, and it was done by somebody who knew what he was doing.

EVALUATION:

Did you use a project evaluator or gather evidence on your own?

We haven't gathered any evaluation data yet. But Eddie is developing a list of evaluation assessment questions (e.g., where do students get hung up? and how can we improve our approach?) that we can send for approval from the institutional review board.

BUDGET:

In your budget planning process, how much did you allocate for your BI activities and why?

We allocated about $8000 over 2 years. The money primarily covers the educational coordinator's salary and incidentals. We identified 4 important milestones in the execution of this project. Each time he hits one of those milestones, he sends in an invoice and gets paid.

FINAL THOUGHTS:

Has participation in BI projects influenced your ability to communicate more effectively?

Just working and talking with Janice, Leslie and Eddie has given me lots of new teaching techniques and education ideas. I don't work with high school students, but I do teach an intro class on physical geology. Some of those students are freshmen, so they're right out of high school and they're not that different from high schoolers. I've used some of my new techniques to connect with my students through discussion-based lessons and by incorporating demos. I feel like I'm becoming a better teacher.

In addition, each time that I talk with my collaborators on this project, I have to think about how to explain the science stuff that I just take for granted. They're all well educated in science, but they don't know about the details of my work.

What are some overall lessons that you've learned from your BI activities?

I've learned a lot from my experience serving on an NSF proposal review panel. BI statements aren't necessarily a major thing that the panel is looking for, but when it's solid, we note it. And when it's poor, we also note that. A good BI statement is just one more arrow in your quiver when you're trying to get your grant funded.

In addition, the scientists serving on NSF review panels are getting wiser about BIs. They like concrete, specific plans. And they like it when scientists rely on outside experts to improve the quality and efficacy of a BI. That's what collaboration is all about. Just like you develop collaborative partnerships in science, it's beneficial to set up collaborations on the BI side as well.

Do you have a story related to your BI activities that really touched you or meant smth to you?

I've been astounded learning about the School of Rock, and how much of an impact they have on the teachers they work with. I love learning about how these teachers then take what they learn and pass it on to their students.

ABOUT ME:

What is your research interest?

I study aquatic environments that existed on Earth millions of years ago. Right now, my research focuses on using nitrogen isotopes to determine how much oxygen was in the ocean over the last 200 million years to understand past environmental and climate conditions.