COSEE BI Wizard

Carrie

WIZARD STEPS

Project Information

Step 1: Audience

Step 2: Budget

Step 3: Activity

Step 4: Project Description

Step 5: Evaluation

Summary

PROJECT INFORMATION

Project: Report Example
Audience: K-12 Teachers
Venue: Classroom
Budget: $10,000
Activity: Work on on- or offline research-based educational materials (curricula or lessons) focusing on your topic

Broader Impact Plan for Report Example Modified May 30th, 2012

The following guidance will help you plan and draft your proposed Broader Impact project. You can share this initial plan with your potential partners.

Audience

I have chosen to work with **K-12 Teachers** because...

Members of my audience often teach photosynthesis using on terrestrial plants. However, it is important for teachers to include phytoplankton when discussing photosynthesis because most of the oxygen in the atmosphere originally came from the activities of photosynthetic organisms in the ocean. Moreover, these primary producers are critical to aquatic food webs. They support entire communities of organisms, including the seafood that we eat, so it is important to understand them. In focusing on satellite images of sea surface temperature and primary production (chlorophyll concentrations), teachers will gain a greater understanding of where the majority of primary production is occurring and how physical factors influence phytoplankton communities.

It is important to work with this group to...

- Foster a scientifically literate population
- Enhance the future workforce
- Increase the ability to solve future challenges (i.e. energy, health, environment, and national security)
- Increase America's global competitiveness

Venue Benefits:

More contact time, deeper understanding, dedicated audience

Venue Challenges:

Needs to fit in with standards and testing (less flexibility), smaller audience

Activity

To work with this audience, I have chosen to Work on on- or offline research-based educational materials (curricula or lessons) focusing on your topic

Suggested Next Steps:

Partners

To further ensure the success of this project, I will work with experienced partners, including COSEE NOW. I have contacted and discussed this project with them and they have agreed to participate.

Objective

The following is my main objective for this activity

Broader Impacts Description

We will partner with Centers for Ocean Science Education Excellence Networked Ocean World (COSEE NOW) for the development and implementation of the following broader impacts activities. We will develop three lesson plans about satellite images on sea surface temperature and primary production. Embedded in these lessons will be information about how to interpret satellite images, how to interpret sea surface temperature and chlorophyll-a images, and how scientists these data in research. Once the lessons are developed, we will prepare and implement a two-day long professional development workshop for 30 teachers at Wizard University focusing on the use of remote technology to study the ocean. COSEE NOW staff will use existing teacher networks to recruit the teacher participants.

After this event, the 30 teachers will be able to interpret sea surface temperature and chlorophyll-a satellite images and will be prepared to deliver the three lessons in their classrooms. The teachers will be required to implement the lesson plans with their students within two months of the professional development workshop. The teachers will be required to gather and report student feedback on the lessons. Once feedback is collected, appropriate revisions will be made to the lessons. The lessons will then be posted to the COSEE NOW website, disseminated through the COSEE Network, and presented to teachers attending a National Marine Educators Association (NMEA) conference through a conference presentation.

Broader Impacts Tasks
As a result of the broader impacts activities funded in conjunction with the proposed research, the team will:
• Develop three lesson plans about satellite images on sea surface temperature and primary production and how scientists these data in research.
• Prepare and implement a two-day long professional development workshop for 30 teachers.
• The teachers will implement the lesson plans with their students within two months of the professional development workshop and gather and report student feedback on the lessons.
• The lessons will be revised based on feedback.
• The lessons will be posted to the COSEE NOW website, disseminated through the COSEE Network, and presented to teachers attending an National Marine Educators Association (NMEA) conference through a conference presentation.

Broader Impacts Objectives
During the school year after the teacher professional development workshop, teachers will:
• Implement a single or multi-period lesson plan that teaches their students about satellite images on sea surface temperature and primary production (how to read images, how to interpret temp and production from images, how scientists use them, how important images, temp and/or primary production are to scientists), and apply the information to a real world question or problem.
• Gather student data generated from the lesson implementation.
• Report their results and perceptions from implementing a data focused lesson in their classroom.

Be sure that your objectives are SMART: Specific, Measurable, Audience-directed, Realistic and Time bound.

Evaluation

To measure the success of this project, I will also perform the following assessments with the help of an external evaluator:

- **Formative evaluation**: Conducted throughout project design and development to guide improvements during piloting/prototyping of something new, or to improve an existing program or project.

- **Summative evaluation**: Conducted at the end to document successes, failures and lessons learned.

Budget

A good rule of thumb is that the BI component should be 5-10% of your total project budget. Of course, a more advanced BI plan will require a larger budget. Remember to include money for logistical support when running a program.

My budget for the broader impact activity will be approximately **$10,000**

The evaluation budget should be 10% of the broader impact portion of your budget, or about **$1,000**.

Final Notes

The steps that you have just completed cover this ground but as a reminder these are questions posed in all solicitations. Be sure to keep these in mind when composing your broader impact statement.

- How well does the activity advance discovery and understanding while promoting teaching, training, and learning?
- How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)?
- To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships?
- Will the results be disseminated broadly to enhance scientific and technological understanding?
- What may be the benefits of the proposed activity to society?

Relevant Literature

For more information on how to meet the needs of the audience you selected, as well as related research on the activity you are planning on pursuing, we suggest reviewing the following references, as you may find some of these helpful to include in your proposal.

1) Bransford, J, Brown, A., and Cocking, R. (1999) *How People Learn: Brain, mind, experience, and school*. Washington, DC: National Academy Press.

Evidence from many branches of science has significantly added to our understanding of what it means to know, from the neural processes that occur during learning to the influence of culture on what people see and absorb. “How People Learn” examines these findings and their implications for what we teach, how we teach it, and how we assess what our children learn. The book uses exemplary teaching to illustrate how approaches based on what we now know result in in-depth learning. This new knowledge calls into question concepts and practices firmly entrenched in our current education system.

2) Wiggins, G.P. and McTighe, J. (2005) *Understanding by Design*. Alexandria, VA: ASCD.

What is understanding and how does it differ from knowledge? How can we determine the big ideas worth understanding? Why is understanding an important teaching goal, and how do we know when students have attained it? How can we create a rigorous and engaging curriculum that focuses on understanding and leads to improved student performance in today’s high-stakes, standards-based environment? Authors Grant Wiggins and Jay

McTighe answer these and many other questions in this second edition of Understanding by Design.

3) Borgman, C. L., Abelson, H., Dirks, L. Johnson, R., Koedinger, K. R., Linn, M. C., et al. (2008) *Fostering learning in the networked world: The cyberlearning opportunity and challenge, A 21st Century Agenda for the National Science Foundation* (Report of the NSF Task Force on Cyberlearning). Washington, D.C.: National Science Foundation http://www.nsf.gov/pubs/2008/nsf08204/nsf08204.pdf

The report identified five recommendations that cut across the strategies for growth and opportunities for action. These recommendations offer initial steps for the NSF to take while complementing existing work at NSF: a) help build a vibrant cyberlearning field by promoting cross-disciplinary communities of cyberlearning researchers and practitioners including technologists, educators, domain scientists, and social scientists; b) instill a "platform perspective"—shared, interoperable designs of hardware, software, and services—into NSF's cyberlearning activities; c) emphasize the transformative power of information and communications technology for learning, from K to grey; d) adopt programs and policies to promote open educational resources; and e) take responsibility for sustaining NSF-sponsored cyberlearning innovations.

4) National Science Foundation. (2010, May) *Preparing the next generation of STEM innovators: Identifying and developing our nation's human capital*. (Publication No. NSB-10-33). http://www.nsf.gov/nsb/publications/2010/nsb1033.pdf

This report contains a series of policy actions, a research agenda, and three key recommendations detailing how our Nation might foster the identification and development of future STEM innovators: a) *Provide opportunities for excellence* – we must offer coordinated, proactive, sustained formal and informal interventions to develop their abilities. Students should learn at a pace, depth, and breadth commensurate with their talents and interests and in a fashion that elicits engagement, intellectual curiosity, and creative problem solving—essential skills for future innovation.; b) *Cast a wide net* – develop and implement appropriate talent assessments at multiple grade levels and prepare educators to recognize potential, particularly among those individuals who have not been given adequate opportunities to transform their potential into academic achievement.; and c) *Foster a supportive ecosystem* – parents/guardians, education professionals, peers, and students themselves must work together to create a culture that expects excellence, encourages creativity, and rewards the successes of all students regardless of their race/ethnicity, gender, socioeconomic status, or geographical locale.

5) Partnership for 21st Century Skills. (2009, December) *P21 Framework Definitions*. http://www.p21.org/documents/P21_Framework_Definitions.pdf

To help practitioners integrate skills into the teaching of core academic subjects, the Partnership developed a unified, collective vision for learning known as the Framework for 21st Century Learning. This Framework describes the skills, knowledge and expertise students must master to succeed in work and life; it is a blend of content knowledge, specific skills, expertise and literacies.

6) National Research Council. (2011) *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Committee on a Conceptual Framework for New K-12 Science Education Standards. Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press. http://www7.nationalacademies.org/bose/Standards_Framework_Homepage.html

A Framework for K-12 Science Education Standards represents the first step in a process to create new standards in K-12 science education. The framework highlights the power of integrating understanding the ideas of science with engagement in the practices of science and is designed to build students' proficiency and appreciation for science over multiple years of school.

7) President's Council of Advisors on Science and Technology. (2010) *Prepare and Inspire: K-12 Education in Science, Technology, Engineering, and Math (STEM) for America's Future*. http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-stem-ed-final.pdf

A report outlining the need to improve STEM education through better preparation and inspiring students, and increase the federal government's strategy for improving K-12 STEM education.

8) Committee on Science, Engineering & Public Policy (2007) *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*. Washington, D. C.: National Academies Press. http://www.nap.edu/catalog.php?record_id=11463

In a world where advanced knowledge is widespread and low-cost labor is readily available, U.S. advantages in the marketplace and in science and technology have begun to erode. A comprehensive and coordinated federal effort is urgently needed to bolster U.S. competitiveness and pre-eminence in these areas. This congressionally requested report by a pre-eminent committee makes four recommendations along with 20 implementation actions that federal policy-makers should take to create high-quality jobs and focus new science and technology efforts on meeting the nation's needs: a) Increase America's talent pool by vastly improving K-12 mathematics and science education; b) Sustain and strengthen the nation's commitment to long-term basic research; c) Develop, recruit, and retain top students, scientists, and engineers from both the U.S. and abroad; and d) Ensure that the United States is the premier place in the world for innovation.

9) National Research Council (2007), *Taking Science to School: Learning and Teaching Science in Grades K-8*. Washington,

DC: National Academy Press. http://www.nap.edu/catalog.php?record_id=11625

What is science for a child? How do children learn about science and how to do science? Drawing on a vast array of work from neuroscience to classroom observation, *Taking Science to School* provides a comprehensive picture of what we know about teaching and learning science from kindergarten through eighth grade. By looking at a broad range of questions, this book provides a basic foundation for guiding science teaching and supporting students in their learning. The book also provides a detailed examination of how we know what we know about children's learning of science, including the role of research and evidence. Taking Science to School answers such questions as:

- When do children begin to learn about science? Are there critical stages in a child's development of such scientific concepts as mass or animate objects?
- What role does nonschool learning play in children's knowledge of science?
- How can science education capitalize on children's natural curiosity?
- What are the best tasks for books, lectures, and hands-on learning?
- How can teachers be taught to teach science?

10) Brown, J.S. & Adler, R.P. (2008). "Minds on fire: Open education, the long tail, and learning 2.0." *Educause Review*, 43(1). http://net.educause.edu/ir/library/pdf/ERM0811.pdf

This document focuses on social learning in virtual environments and peer to peer learning through these environments. The authors emphasize the importance of forming a community of practice so that students can learn the "practices and the norms of established practitioners in that field". Also, this article stresses inquiry in terms of a "demand-pull" model instead of the "traditional supply-push" mode of building up an inventory of knowledge in students' heads." They also mention virtual networking between students and scientists. Finally, the article discusses examples of how scientists have answered student questions using their scientific equipment (i.e. running bugs sent in by the public through an SEM).

Report #20

This site was developed with the support of the National Science Foundation under Grant No. OCE-0730719. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.