



Broader Impacts

From a K-12 Educator's Viewpoint

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National Science Board in 1997 instituted the following:

- **Two merit review criteria**
 - **Intellectual merit**
 - **Broader Impacts**



Intellectual Merit

- **Advance knowledge and understanding**
- **A qualified PI**
- **Explore creative, original or potentially transformative concepts**
- **A well organized and conceived proposal**
- **Sufficient access to resources**



Broader Impacts

- **Promote teaching, training and learning**
- **Broaden the participation of underrepresented groups**
- **Enhance the infrastructure for research and education**
- **Disseminate results broadly**
- **Benefit society**



Broader Impact slides

- Will describe some effective activities for both teachers and students in **K- 12** education
- Will provide NSF award numbers in ()
- Will show some photos from NSF 2010 Highlights



Promote teaching, training and learning

- **Effective for K-12 Teachers**
 - **RET that produces curriculum (#0968859)**
 - **Professional development in content (#0643713)**
 - **Professional development in lab procedures to promote inquiry (#0643830)**
 - **Use developed materials**



Promote teaching, training and learning

- **K-12 students**
 - **Participate in actual research**
 - **In their class (#0817787)**
 - **In researcher's lab**
 - **As mentees on science fair projects (#0347124)**
 - **Make data available for student use**
 - **Participate in summer camps (#0746796)**
 - **Participate in field trips (#0315200)**



Enhance Infrastructure for Research and Education

- **K-12 Teachers**

- **Training in the use of lab equipment with the ability to borrow equipment for use in their own classroom**

- **Example: Trained in Use of Atomic Force Microscope – traveling model sent to school**

- **Example: Train elementary teachers how to use microscopes – send out kits for them to use (# 0746142)**



Broad dissemination

- **Partner with museums, nature centers, science centers to develop exhibits (#00641362)**
- **Publish in diverse media (#0543833 – MIT website)**



What really works?

Teacher Education

- **Workshops**
 - **Multiple days**
 - **Summer opportunities**
 - **Compensation / Graduate Credit**
 - **Follow up meetings**
 - **Built in opportunities and time for teacher collaboration**
 - **Lab knowledge**
 - **Technique**
 - **process**
 - **Content knowledge**
 - **Relevant content**
 - **STEM careers**



What really works?

Teacher Education

- **Resources**
 - **Availability of equipment**
 - **Insight into cutting edge science research / discoveries**
- **Research Experience for Teachers**
 - **Require a curricular activity for the classroom**
 - **Groups of teachers**
 - **Built in opportunities and time for teacher collaboration**
 - **Meaningful experiences**
 - **Opportunities for building lab skill sets**
 - **Recommendations for relevant content-based reading**
 - **Interactions with the PI and research community**

What really works?


Student Education

- **PI Classroom Visits**
 - **Appropriate**
 - **Attention to Grade level (developmentally appropriate)**
 - **Reasonable content**
 - **Level of detail/sophistication**
 - **Hands-on experiences**
 - **Work with the classroom teacher**
 - **Science in Society**
 - **Meaningful, relevant presentation**
 - **Career mapping**
 - **Excitement about science**
 - **New / emerging careers**



What is not as effective?

- RET that does not require curriculum development (pure research)
- Single RET in a research lab with no collaboration of other teachers
- One day workshops
- Bringing in individual middle or high school students to the lab
- *Lecturing* in a classroom by the researcher
- Site visits to lab for recruitment of high school students



Including *effective* K-12 Outreach as part of your Broader Impacts can work and be beneficial to the future of science!