

# Innovative Teacher Mini-Grant Application



## Contact Information

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School	RUHS	

## Grant Overview



Grant Title	<b>Laptop computers to support Vernier Logger Pro Probeware sampling equipment</b>
One sentence that clearly describes your project	Laptop computers will facilitate the ability of students to use scientific sampling Vernier Logger Pro Probeware to gather and analyze data for courses in the science department.

## Requested Funding

- \$1,000 – Individual teacher (elementary or secondary)  
 \$3,000 – Collaborative team (up to three teachers or a grade level, elementary)  
 \$5,000 – Secondary department (middle or high school)

## Agreement and Signatures

I (We) understand our complete and signed application must be submitted by email to [danielle@rbef.org](mailto:danielle@rbef.org) no later than 5:00 p.m. on November 2, 2012. I (We) agree to fulfill the requirement to submit paid receipts for expenditures, to inventory all purchased equipment and materials with the Redondo Beach Unified School District (RBUSD) and to send in a one-page impact report by the designated date. I (We) understand that all major equipment and/or instructional materials purchased with this grant are the property of and must remain in the RBUSD.

	Signature	Date
Lead Teacher		31 Oct 2012
Supervisor/Principal		10/30/12

## Office Use Only

Date Received	
Grant Number	

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The grant selection process will be anonymous. Your application will be identified by a grant number only. Please do not include your name(s) or the name of your school in the body of your application.

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## Student Population

Number of students involved	<b>Several hundred annually, ongoing (non-consumable)</b>
Student grade level(s)	Nine through twelve
Briefly describe the student population including any special needs or interests this project will address.	Students in most science classes would benefit from the use of these computers in conjunction with but not limited to the use of the Vernier Logger Pro sampling tools and software to gather and analyze data from experiments and environmental monitoring. Students in most science classes would benefit from the use of the computers, on an on-going basis, serving many hundreds of students annually (biology, chemistry, physics, AP courses). All students take biology, many sections of which have high percentages of special population designated students. The use of hands-on sampling equipment in conjunction with computers will benefit all learners, particularly those in special populations (special needs, ADD, ELL, gifted).

## Project Description

<b>Objective</b> What is the objective of your project and what problem or need does it	<b>The science department has Vernier Logger Pro sampling devices and software but lacks a set of computers to collect, analyze and share data on. The objective is to purchase one laptop computer to work with each set of Probeware. This will permit students to work in collaborate groups to collect data from samples (water, soil,</b>
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**Grant Number:**

address?

other environments) as they would in college science courses, analyze the data and share it with other groups, the teacher, and societal applications (i.e.: water quality data shared with Algalita Marine Research and Surfrider Foundation). Data analysis can include generating tables, graphs, sharing data with other groups electronically, and comparing their results to information they locate doing research on the internet. They can even tabulate and track data over time, allowing them to monitor environmental changes over time to draw conclusions about these changes. These are the same techniques using the same tools found in college courses and in industry (sanitation department, field monitoring, etc.), which will provide students with authentic experiences in data collection, sampling and analysis that could translate into college success and job mastery. For example, compare using Probeware with a computer to using *pH paper*: there is no comparison. Additionally, no one in the real world uses pH paper anymore. Universities are clamoring for students with critical thinking and problem solving skills; tools such as these computers used in conjunction with the Probeware could give students an additional edge and allow them to be more competitive in this area with their peers. Students in the 21<sup>st</sup> century need to graduate high school with the skills, confidence and critical thinking ability to enter into and succeed in college or enter into the workforce; using antiquated "technologies" (such as pH paper) will not prepare our students for this modern, technologically-driven age. Since this equipment is not consumable, students will benefit from them for many years to come.

**Process**

Describe the nature of the project and what will be done (include instructional methods, procedures, or activities).

Students will work in collaborative groups to use the computers to facilitate data collection, analysis, reporting and sharing by using Vernier Logger Pro Probeware and other data collection methods. Students can compile, share, tabulate, graph and analyze data to solve problems and draw meaningful conclusions from experiments and investigations they conduct. Students will also be able to take notes, do research, and report their results to other interested parties. For example, all students in biology class conduct an ecology experiment on intraspecific competition among plants. There are many variables associated with this experiment that students currently are unable to monitor, such as pH and soil temperature. Laptop computers would allow students to use Probeware to collect this useful data and to determine the effects on experimental

results. They could then tabulate and graph it, analyze it and report it to their peer groups prior to generating conclusions. This is the nature of science. This will help take students away from “cookbook” science and move them towards authentic, inquiry-based investigations. This will provide them with a more authentic experience, and to better prepare them for college and/or a scientific career (i.e.: an aquarist who monitors water quality). Many students in special populations (special needs, gifted, ELL, autistic), have difficulty interacting verbally with their peers, but excel at using tools and electronics; these students could benefit greatly from having access to the computer and associated tools, and would then have an active and more important role in their groups. This would also provide them with the opportunity to increase their focus, confidence and success in science class.

### **System Requirements for LoggerPro**

#### **Windows**

- Windows<sup>®</sup> XP / Vista (32 or 64-bit) / 7 (32 or 64-bit) / Provisional support for 8 (32-bit or 64-bit)
- Pentium<sup>®</sup> processor or equivalent running at 500 MHz or faster
- 512 MB total minimum RAM
- 200 MB of hard disk space for a minimum installation
- Available USB port

#### **Logistics**

Who will be involved and where and when will the project take place?

The Science Department: two sets of Probeware were previously purchased through grants. The use of these systems would be greatly facilitated and enhanced by the addition of the computers, allowing science teachers and students to use the systems to their full capacity. Two of our science teachers are well-acquainted with this system and would be willing to assist other teachers in learning how to implement it in their classes. Implementation of these three additional systems will occur as soon as the systems are ordered and received, and the software is loaded onto the computers (RBUSD technology department, SRS company). It is completely feasible that the systems will be in use in the classroom by second semester 2013. The products come with technical support for those teachers who require extra support and training. They are

basically plug-and-play once the software is installed. Students are quite skilled at mastering new technology and electronics, so it will be relatively easy to teach students how to use the system.

The computers to support the Probewear and other scientific applications can be used in any science class, and it can be used to address all State and District standards for the courses in which it is implemented. It can help students increase knowledge of the standards, motivation to learn them, motivation to succeed in high school and after high school, and in retention and mastery of the content standards. It can be used at all grade levels and for all types of learners, including special populations (special education, ELL and gifted students). It can be used for any content area course offered at the high school: biology, chemistry, physics, physiology, AP courses, PLTW pathways (Project Lead the Way).

Biology: 1. The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells.; 6. Stability in an ecosystem is a balance between competing effects.; 9. As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment.

Physics: 2. Law of conservation of energy and momentum; 3. Energy cannot be created or destroyed, although in many processes energy is transferred to the environment as heat.

Chemistry: 2. Biological, chemical, and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules.; 3. The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants.; 4. The kinetic molecular theory describes the motion of atoms and molecules and explains the properties of gases.; 5. Acids, bases, and salts are three classes of compounds that form ions in water solutions.; 6. Solutions are homogeneous mixtures of two or more substances.; 7. Energy is exchanged or transformed in all chemical reactions and physical changes of

### **Standards**

What standards (CA content and/or common core) will this project address, support, or extend?

matter.; 8. Chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules.; 9. Chemical equilibrium is a dynamic process at the molecular level.

Investigation and Experimentation (all science courses): 1. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations.

A.P. Environmental Science and A.P. Biology: Standard 1. Students will demonstrate their understanding of the importance of curiosity, honesty, open-mindedness, and skepticism in their own efforts to understand how and why universal phenomena exist and occur.; Standard 3. Students will be familiar with the character of scientific knowledge and inquiry and how it is achieved.; Standard 4. Students will be able to select and use tools and instruments to conduct scientific activities.; Standard 5. Students will understand and demonstrate the ideas of system, model, change, and scale in exploring scientific and technological matters.

RBUSD and RUHS have several goals that are supported by computer and Probeware technology: to increase the number of students who are prepared for college, to increase the success of students in high school and college, to expose students to current technologies to prepare them for the 21<sup>st</sup> century, and to provide relevant instruction to increase student success in this new century.

Computers used with advanced measuring technological devices also address standards for the teaching profession: standard one, engaging and supporting all students in learning; standard two, creating and maintaining an effective environment for student learning; standard four, planning instruction and designing learning experiences for all students; and standard five, assessing student learning.

## Project Innovation

Explain why you believe your project is innovative. Include your rationale for selecting/designing the new or creative approach or program you plan to implement.

Students rarely have access to the same tools used in college and industry while in high school. They are also generally not exposed to software programs that they will use in those same venues, such as Excel, Access, and PowerPoint. Surprisingly few of the students at the high school are comfortable with all of these programs, and they really need to be. Many of them also encounter great difficulty when they are faced with the need to generate a data table or graph. The computers with associated software and tools could help bridge this learning gap; as students collect data, they will compile it and analyze it during these programs. This will be an authentic experience; the same as they would experience in college or at work. These are basic skills students need to master, along with the ability to draw conclusions and think critically. The computers would facilitate this. There is currently only one computer lab on campus to serve the students, which is woefully inadequate. There are some iPod's available, but again that will not be sufficient for data collection and analysis in conjunction with Probeware use and field sampling. The set of computers for the class to be shared by the science teachers would be an enormous technological advance.

## Alignment with College Readiness Focus

Describe how your project supports the RBUSD Kinder to College initiative. Specifically, how will your project promote a college-going culture and/or build your students' interest, knowledge, skills and readiness for college.

One of the greatest concerns among the teachers of the science department is to prepare students to meet the technological demands of college in the 21<sup>st</sup> century. The students need writing, graphing, and critical thinking skills, as well as basic software programs like Excel and PowerPoint. Having the students collect, compile and analyze data using a computer and common software applications will assist them in college entrance and success (as well as workplace entry and retention). The science department is dedicated to college-readiness for the students of RUHS. One of the challenges we face at the high school is convincing students to take four years of science (recommended for UC entrance). We are focused on STEM education, and have begun implementing new strategies and technologies to assist them in improving the skills and motivation through science necessary to enter into and succeed in college and university and beyond. The workplace is changing; the workforce must be prepared to meet these changes. ★

## Plan for Evaluating and Documenting Impact

<p><b>Evaluation</b> What student outcomes do you expect and how will you measure success?</p>	<p><b>Students will become more comfortable with the use of the computer and associated software programs, increasing their success at using them and at analyzing and presenting data. Collaboration skills will improve as a result of students working together in a group with one computer to sample, record and share data, research and analyze data. Students will be able to share data easily, allowing them to compile and compare their data to that of other groups, facilitating problem solving. Test scores should improve as a result of improved analysis and critical thinking skills, as measured on CST tests, AP exams and in grade distributions. The ability to use authentic tools to gather authentic data will enable them to share this data with the community, resulting in increased collaboration and integration with community partners (i.e.: Surfrider and Algulita Marine Research).</b></p>
<p><b>Documentation</b> What evidence (photos, work samples, assessments, etc.) will you gather during the project to document the grant's impact?</p>	<p>Test scores on semester exams should rise over the previous year, as students are more able to master concepts with the improved technology and motivation. CST, AP and other standardized test scores, as well as students' writing skills should also improve. Studies indicate that the use of laptop computers help students improve grades, writing, and test scores (Gulek and Demirtas, 2005). Laboratory reports will show improved quality, in terms of writing, type and amount of data collected, data analysis including graphs and tables, and conclusions (demonstrating critical thinking skills). Photos of students in the field sampling as well as working on the computers analyzing data will show confident, happier and more successful students. Attendance may improve as a result of an increased motivation to use these tools and to learn new and exciting information.</p> <p><b>Bibliography</b></p> <p>Gulek, James Cengiz., and Demirtas, Hakan. (2005). Learning With Technology: The Impact of Laptop Use on Student Achievement. The Journal of Technology, Learning and Assessment.</p>



## Budget Detail

Item Description	Amount
Lenovo <u>ThinkPad Edge E430</u>	\$4761 (9@ \$529.00 each)
Shipping	\$239
TOTAL	<b>\$5000</b>

