



## 2007 AAAS/Subaru Essay Writing Competition for K-12 Educators, Finalist Essay



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### Out of the Box Technology

LABRATS (Learning **AB**out **R**esearch **AN**d **T**echnology through **S**cience) After-School Project began over five years ago as a way to provide meaningful activities that would engage students in real-time research and develop knowledge/skills in technology. As a teacher, I saw a void in these areas that needed to be filled. Student work showed poor skills and low interest in doing research; and knowledge about technology was focused on *what it can do* with very limited understanding about *how* or *why* it works. Exploring technology within the limits of classroom time was not enough. I had to find a way to supplement instruction and motivate interest.

The LABRATS After-School Project was developed for this purpose. It meets daily, has a membership of 50 K-8 students, and supports components including Astronomy, Amateur Radio, Aeronautics, and Robotics and Engineering. At any given time, students are engaged in teams to build structures and machines that help them understand how things work. Engineering principles about form and function and how simple machines move make sense as they construct familiar objects using LEGOS®. They build oscillators and crystal radios to understand electricity and wave propagation, and build RC airplanes to understand the forces of flight.

This active construction in the learning process continually reinforces skill development and helps students make real sense out of abstract concepts. Using design challenges that motivate them, students develop explanations, explore designs, make predictions, and develop explanations and understanding that lead to new questions. The after-school hours provide a relaxed environment where students can work without time constraints and have fun. This introduction of technological tools in a casual atmosphere has increased student capabilities and enthusiasm ten-fold. And they are immersed in teamwork and peer mentoring that teaches them the value of collaborative work.

Support from the school and community has established successful mentor partnerships that bring expertise and valuable learning opportunities to the project. Students participate in local astronomy events, several have flown in the Young Eagles Program, and we have licensed eight students and five adults in our Amateur Radio club. The newest addition, Robotics and Engineering, is preparing students for participation in local tournaments.

This project has had a measurable impact on student classroom performance and grades. Students demonstrate more positive confidence in their abilities, are more comfortable raising questions and taking risks in all subject areas, and their enthusiasm has encouraged others. Abstract physical science concepts have become more manageable and have meaning. Participation in LABRATS has demonstrated success in the classrooms for ALL students, and has generated high interest in engineering and technological fields, especially among girls.



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This July, I hosted a Saturday GirlScience program targeting girls in grades 3-8, with the focus on Design and Engineering. This enthusiastic group of 30 students spent over two hours using the EARLY Robotics program to build machinery and sample basic autonomous robotic programming with the help of LABRATS students. Lucien Junkin, NASA /JSC Robotics Development and Testing branch, supplied real-life connections for the girls with his presentation on robotics development for the space program, and stressed the need for more women in the fields of math, science, and engineering. This event also received developmental support from Karen Cohen, University of Houston Coordinator of Robotics Education Program.

Seventh graders this fall will participate in developing a field study to measure the impact of energy consumption on ecosystems. After a proposed nine-week, on-site study of the environment, they will build models for alternative energy technology powered by wind, water, and solar energy.

We also intend to host a teacher workshop this year with students as presenters to share the message of these important learning strategies. They will share their own experiences with innovative programs that integrate engineering, math, science, and technology in a hands-on format to dispel teacher fears and create exciting possibilities for change in classrooms. Demonstrating the powerful impact this program has had on students and learning could inspire others to action. Thinking out of the box is work, but it makes a difference in changing student attitudes and aptitudes in learning.