

Public Schools of Hawaii Foundation
GOOD IDEA GRANT APPLICATION 2007 – 2008

3. Specific Objectives:

NXT Robotics in the Classroom will be a continuation of the Mindstorms Lego Robotics program, which was implemented in our Gifted and Talented program this year. The GT students at Ma'ema'e continue to demonstrate an amazing interest in robotic technology, especially following our participation as a novice group of learners (both teacher and students) in the 2006 Hawai'i First Lego League Competition. As specified in Chapter 51, our students demonstrated that this robotics instruction provides for the following:

- Content which is differentiated in breadth, depth, complexity, and pace. It provides opportunities to integrate various curriculum and content areas as well as explore new and changing knowledge and information
- Processes which stress creativity and higher level thinking skills. Students learn methods of investigation common to several disciplines (scientific method, historical research, and mathematical proof)
- Products which are varied and reflect appropriately what students have learned
- Opportunities to meet the Inquiry Standard through discovery, exploration, and investigation

With this in mind, the specific objectives are:

1. 100% of students in the Gifted and Talented (GT) program grades 1-6 will be involved in constructing, programming, and manipulating Lego robots in order to innovatively and creatively use technology. (This includes designing, modifying, and applying technology to effectively and efficiently solve problems.)
2. All GT students will be involved in using technology tools for creating/writing programs which instruct the robots in completing missions on a variety of terrains.
3. 100% of 5th and 6th grade students will be given the opportunity to use robotics skills within participation in the 2007 Hawai'i First Lego League Competition which will allow students to incorporate technology as a tool for productivity. "Students will use technology tools to enhance learning, increase productivity, and promote creativity."

Project Description:

a.) This project will engage students in progressively challenging open-ended activities that encourage collaborative problem solving. Within the guidelines of the Lego experience of robotics, students will be challenged to construct robots, which require innovative use of materials and parts available within the Mindstorm NXT kits, followed by programming and creatively learning to control the robot through the building of computer based manipulation. Students will develop predictions based on their observations, followed up with investigations, which prove or disprove their prediction, and then gather data in order to answer questions related to the lesson's task. Students will be challenged to integrate scientific, mathematical, and technological aspects of learning, along with many aspects of our GLO goals. (Specifically, the focus on the following standards will be addressed: Science: 2.1.1, 2.1.2, 2.1.3, and 5.2.1; Career and Technology: 2.1.1, 5.1.1, and 6.1.1; Math: 1.8.1, 2.4.1, 4.3.2, 4.11.1, and 5.4.3; Social Studies: 1.2.1, 2.2.1, 3.2.1, 6.2.1, and 6.2.2; GLOs 1, 2, 3, 4, 5 and 6.)

b.) What is new and innovative about this project is that it will take our learning to the next level of robotics as the Lego "NXT" format of robotics continues to expand technological advancements. The NXT version includes an intelligent, computer-controlled Lego brick, which has a 32-bit microprocessor. This enables the students to program their robot construction to life as rotation sensors measure its precise movements. The new format also has a Bluetooth capability so programs may be transferred wirelessly, as well as with USB cables. It also has a new toolset with expanded components and an updated software design, which allows early learners to successfully build and program autonomous robots. We began our exploration of the use of the NXT Intelligent Brick this year as the 6th grade GT students were involved in their first year with the Hawaii First Lego League Competition. It allowed our students to effectively work with light, sound, touch, and rotation sensors within robotics and helped these students to place 6th out of 34 schools who competed. The students were challenged to work as a team in order to pursue solutions to real-world problems through robotic design and the research of nanotechnology. Throughout the competition, the students demonstrated their problem-solving skills, creative thinking, teamwork, competitive play, sportsmanship, and sense of community. They joined with other 9-14 year old participants from around the islands. It is our desire to continue participating in the Hawaii First Lego League and bring this experience to a wider range of students in the coming year.

The major activities that will be conducted to implement this project and to meet the project objectives are to expand the use of the NXT version of Lego equipment and technology by including the 5th grade with the 6th grade GT students in the competition, as well as include the innovations of this version of robotics with our first through fourth grade GT

students. The younger students will begin robotic investigations in order to learn the process of construction, programming, and manipulating of the NXT robot, make comparisons to the older "RCX" version of robotics, and learn to compare/contrast the two versions. The older students will be transitioning from the older RCX robot into the higher level technology of the NXT version of technology. This will be completed during classroom gifted and talented sessions, as well as after school during the months of September through November, as the competition moves into full swing. With the help of engineers and scientists from both Oceanit, Inc. and B.A.E. Systems, we hope to continue the community of learners and teachers who helped us to establish ourselves further in the arena of robotics. This year, several volunteers from both of these corporations served as mentors to our Ma'ema'e students and have expressed an interest in helping us again in the school year 2007-2008.

d) The proposed budget items will be used to support project activities by allowing us to add to the two kits we have purchased this year. These additional kits will assist us in learning to adapt to the NXT version of robotics, and help us to complete the building of the missions necessary for competition. This year, parental donations, as well as participation in selling items at our school craft fair, allowed us to purchase two kits. In order to add another group (fifth graders) and prepare our younger students for future competition, more kits are necessary. We also found that our one newer eMac computer and iBook were much more successful in handling the Mindstorm information and that our refurbished PC computers only minimally support the needs of the NXT version of robotics data. If we were to receive the grant from your foundation, we would additionally support our computer requirements by purchasing a MacBook, which would allow us to be able to work from our "mission table" as we program our robots. It also would allow us to transport our information easily to the actual competition in the 2007 event. Additionally, there are several support items, which would enhance our construction of the NXT robots (Special Elements Team Challenge Set, Technology Resource Set) as they would allow us to build and program more sophisticated movements of the robot.

5. Evaluation:

We will be able to validate the success of our project and see that our objectives have been met as students follow through on both formative and summative assessments. Each student will work as a part of a team creating/constructing, programming, refining, and testing a Lego NXT robot. This will be evidenced through the use of journals, and computer podcasts, which will demonstrate successful completion of learning tasks. Using the student-created podcast, students will follow-up on both successes and challenges of the robotics experience by creating a personal website which will include student created digital photos, oral and written reflections, and information learned from the research element of the robotics experience. Following the actual competition, all 5th and 6th grade GT students will participate in sharing of their robotics and research information at both a PTSA meeting, as well as a school-wide assembly. A teacher created website, as well monthly school newsletter columns, will chronicle the progress of the GT students' robotics work.

6. Project Budget:

Proposed items should enable you to meet project objectives and carry out proposed activities. Provide specific information about the quantity and kinds of items to be purchased, where items will be purchased, tax and shipping/handling if applicable, and cost (See table below). Note: If this grant is approved, applicant will be requested to furnish PSHF with an accurate accounting of all funds used and a completed evaluation form at the end of the project.

Item Description	Store/Source	Quantity	Unit Cost	Subtotal
Lego Mindstormms NXT Education Base Set	Lego Education (Online) store	7	\$250	\$1,750
Special Elements Team Challenge Set	Lego Education (Online) Store	1	\$18	\$36
Technology Resource Set	Lego Education (Online) Store	1	\$59	\$59
MacBook	Apple Computers	1	\$1,049	\$1,049
Shipping/Tax				\$106
SUBTOTAL OF EQUIPMENT COSTS: (Must be ≤50% OF TOTAL REQUEST)				\$1,049
TOTAL REQUEST: (Maximum=\$3000)				\$3,000

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MAR 17 2008

Public Schools of Hawaii Foundation
Good Idea Grant Evaluation
2007 – 2008

Name: Diane Koushki
Position: Gifted and Talented Coordinator/Teacher
School: Ma`ema`e Elementary School District: Honolulu
Project Title: NXT Robotics in the Classroom
Amount Funded: \$3,000 Number of Students: 63

1. State your project objectives as indicated in your project request:

NXT Robotics in the Classroom will be a continuation of the Mindstorms Lego Robotics program, which was implemented in our Gifted and Talented program in the year 2006-2007, therefore our objectives are:

1. 100% of students in the Gifted and Talented (GT) program grades 1-6 will be involved in constructing, programming, and manipulating Lego robots in order to innovatively and creatively use technology. (This includes designing, modifying, and applying technology to effectively and efficiently solve problems.)
2. All GT students will be involved in using technology tools for creating/writing programs which instruct the robots in completing missions on a variety of terrains.
3. 100% of 5th and 6th grade students will be given the opportunity to use robotics skills within participation in the 2007 Hawai'i First Lego League Competition which will allow students to incorporate technology as a tool for productivity. "Students will use technology tools to enhance learning, increase productivity, and promote creativity."

2. Were your objective met or not? Please describe.

The three objectives were met as described below:

1. All 63 G.T. students in grades 1-6 were involved in constructing, programming, and manipulating our Lego robots throughout the first and second quarters of the school year. The third quarter of the year included reflective website creation related to the knowledge gained from completing robotics' lessons, missions, and challenges in order to show connections made within the robotic designs, modifications, and application of technology. During the fourth quarter, a continuation of robotics' challenges will be implemented to expose students to further work in building and applications using sensors to complete missions.
2. All 63 G.T. students have been involved in creating and writing programs in order to manipulate their robots toward completion of tasks on a variety of terrains, as well as allow the robots to move mechanical body parts. The use of levers and pulleys allowed the robot to release trigger points on oil rig missions, place mini-solar panels on houses by lifting and placing objects, and other challenges from the Lego competition.
3. The 23 G.T. students from grades 5 and 6 were given the opportunity to use their robotics' knowledge and skills as they participated in the 2007 Hawai'i First Lego League Competition on December 1, 2007. They entered as two teams (the maximum number of students on each team is 10) and effectively used technology to construct and program their NXT robots. In addition, they also used technology to research and prepare an imaginative presentation on Alternative Energy solutions. The teams earned a second place Lego trophy which was awarded for their "Creativity in presenting alternative solutions to

energy concerns" in their world. (NOTE: One student participated in all phases of the preparation of the competition, however, did not attend the actual challenge on 12/1/07 due to religious preference.)

3. Will this project be continued or not? Please check where applicable and provide an explanation for your response.

The project will be continued with our G.T. students as we move forward with robotics' education using the NXT model of the "Intelligent Brick." We intend to enter the competition centered on "global warming" next year with our 5th. grade students only. This is due to the movement of our Ma`ema`e 6th. grade to a middle school location.

4. Can your project/idea be applied at other schools?

Absolutely, although I feel the G.T. coordinator/teacher will need to have support from the school community in order to effectively implement such a program.

Thankfully, the parents, administration, and faculty have supported the program at Ma`ema`e.

5. How did you hear about this grant program?

The grant was advertised through the D.O.E. news. As well, other teachers that I hold in high regard had written and received grants from this program and they encouraged me to apply.

6. Why did you apply to the Public Schools of Hawai'i Foundation for a Good Idea Grant?

It was important for me to look for ways to encourage innovative ideas for teaching these incredible G.T. students, as they seemed so excited to further their robotics' training. I also had a feeling that other students in our school may follow the lead of these students in their excitement of Lego robotics and pursue the formation of other teams outside of school. Several parents and extra-curricular leaders of groups, including Science Invention support classes at our school, are beginning to consider forming teams for future years. (As well, parents of students who are not in G.T. have come to me to ask how they can get robotics kits for their children.)

7. Provide an expenditure report using the project budget you initially proposed and attach all receipts.

Completed.

8. Do you have any suggestions on improving the grant making process?

If notification of the grant recipients were announced before school ended in June, teachers would be able to plan better for the new school year re: the implementation of the grant proposal. In my case, not knowing the results ahead of time meant having a plan B in case the funds were not available. Other than that, I feel the organization of the process and helpful hints, as well as the supportive documents that are shared on your website, were very beneficial in writing a successful grant. Thank you so much for supporting teachers and schools related to this very generous grant.

Date Due: June 30, 2008

Mail to: Public Schools of Hawai'i Foundation

P.O. Box 4148

Honolulu. HI. 96812

Good Idea Grant 2007-2008
Final Budget Report
ACTUAL EXPENDITURES

Item Description (same as list from grant proposal)	Qty	Unit Cost	Subtotal	Purchased from	Receipt attached (X)
Lego Mindstorms NXT Kits	7	250.-	1750.-	Lego Education	X
NXT Resource Kit	1	59.-	59.-	Lego Education	X
Spare Parts (Special Elements - Team Challenge set)	1	14	14.-	Lego Education	X
Shipping Charges			109.38		X
			<u>1932.38</u>		
1 Mac Book	1	1099 less 110 <u>989</u>	989.-	Apple Store	X
• Mac	1	99.95 less 30.00 <u>69.95</u>	69.95	Apple Store	X
tax			49.90		X
TOTAL SPENT:			3,041.23		
TOTAL RECEIVED:			3,000.00		
AMOUNT RETURNED TO P.S.H.F. if applicable:			- 0 -		

Name: Diane Koushki Project Title: NXT Robotics in the Classroom School: Ma'engie El. School