



Teacher innovation Grants

Project title: First Lego League (FLL) Robotics Program

ID# (for office use only):

Grades involved: 6-8

students involved: FLL recommends teams of 10 with one adult for each team; proposing 3 teams

teachers/staff involved: Laura Humphrey plus 2 additional resources

Subject area(s): Math/ Science/ Engineering / Technology (STEM)

Total funding requested: \$3,940

Approximately when will the project be conducted? Program starts each September and lasts through February. Hope to start in fall of 2012.

Please describe your program concept (*if applicable, you may include examples of where a similar type of project has been successfully implemented in other school systems*)

The best way to summarize *FIRST* LEGO League is to say that it is a robotics program for 9 to 14 year olds, which is designed to get children excited about science and technology and teach them valuable employment and life skills. *FIRST* LEGO is a pre-existing national program, which usually takes place after school. Ideally, to make this program sustainable in the long-term, I would like to charge a user fee to cover the annual kit updates and teacher time. I am requesting that CEF fund year one's initial start-up costs. The robot kits are reusable from year to year as are the mats they run on. On going costs would include teacher time and yearly program and event registration (includes technical support, challenge specific annual kit updates, and ability to attend one local event). I would like to start with three 4th and 5th grade teams in September. I propose a user fee of \$300 per child that would cover 36 hours of activity time over a 6-month period. The registration fees collected next fall would fund the program in 2013. Once the Deer Hill program is established I would like to come back to the CEF for funds to do the same at the Middle School in 2013 and the High School in 2014. *FIRST* LEGO League encourages teams to build a foundation at the elementary school level, which will seed the later high school programs.



What are the goals of the project? What are you trying to teach?

FIRST LEGO League both teaches and reinforces important math and science skills via an interactive, fun, purposeful, and innovative robotics program. Participants learn that friendly competition and mutual gain are not separate goals. *FIRST* LEGO League also instructs through trial and error, teaching students that making mistakes is an important part of reaching ones goals. The program further reinforces that helping one another is the foundation of teamwork.

Describe briefly what the students will do as they participate in the project:

Teams of up to ten children, with one adult coach, participate in a challenge set up by the First Lego group, which is a non-profit organization. Participants attempt to conquer the challenge by programming an autonomous robot to score points on a themed playing field (Robot Game), developing a solution to a problem they have identified

Why/how would you consider your project/program to be innovative?

The program is innovative because it allows participants to think “outside the box”, to solve a problem by looking at issues such as nanotechnology, climate, quality of life for the handicapped population, and transportation. It forces collaborative efforts, strategic thinking and fun. It supports the concepts they are learning in math, technology, science and EMC currently at the Deer Hill.

In what ways will this project/program enhance the learning of your students?

By designing a robot to accomplish a goal, participants are exposed to potential career paths within the science and math field, in addition to solidifying the STEM principles that naturally come from participating in a robotics program.

How will this project/program be incorporated into the on-going curriculum – for your classroom? In other classrooms (e.g, ready-to-go lesson plans)?

FLL reinforces and builds upon existing STEM curriculum and Massachusetts standards. I also hope that the program builds from year to year, throughout high school – presenting new challenges and new opportunities. There is always the possibility to incorporate the use of the LEGO robotics kits into the classroom from March – June.

Is your project/program collaborative and/or cross-disciplinary in nature? If so, please describe briefly:



See above. Program is definitely cross-disciplinary – directly related to math, science, and technology; indirectly, the theme may incorporate other themes such as world cultures, health and history.

Is there a global component to your project/program?

There is a global component as this is a global program. In 1998 there were 210 groups participating, it has now grown to over 17,000 in 63 different countries. Competitions when applicable are regional, national and world wide. FLL also incorporates global themes. This year's challenge was on keeping food safe from farm to consumption. Many past themes also have a global tilt such as Arctic Impact, Volcanic Panic, Power Puzzle and Climate Connections.

Is there a community outreach component to the program?

We would welcome any members of the community with robotics and engineering experience or interests to join us in this endeavor.

How will you measure success and impact of the program?

We will measure success through students improved knowledge and enthusiasm for math, science and technology, sustainability of the Deer Hill program, and program growth and expansion into the middle and high school level challenges. An additional measure of success comes from the competition itself; having the opportunity to demonstrate what your robot can accomplish is a powerful confidence builder.

Please outline the estimated costs (by category).

Note: Budget should include a stipend for program development = # hours x teacher stipend rate (currently \$35/hour).

- Materials/equipment:
- **FLL Robot Set (\$420 x 3 teams = \$1,260)**
- This essential core set is the recommended package for teams who are newcomers to FIRST® LEGO® League. Reusable year to year, this extensive offering includes all components needed to build and program a robot capable of completing challenge objectives. Complete with 1,000+ parts and special elements including belts, wheels, unique connectors, gears, and additional structural elements this is the ideal package for robotics competition use.
 - NXT Educational Software: The PC- and MAC-compatible software interface has intuitive, icon-based drag and drop environment for “building” programs need to control the robot. Includes 40 interactive tutorials to help the novice programmer get started. This software is complete with a FLL Team license. Requires Windows XP, Vista or MacOS X
 - 1 Intelligent NXT Brick
 - 1 Rechargeable DC Battery



- 1 DC Battery Charger
- 3 Interactive Servo Motors (rotation sensor built in)
- 2 Touch Sensors
- 1 Sound Sensor
- 1 Light Sensor
- 1 Ultrasonic Sensor
- 1 USB Wire for downloading programs onto the Intelligent Brick
- 7 Connection cables of various lengths
- 3 Lamp bricks
- 3 Converter cables
- 1,000+ LEGO elements
- Building Instructions for one model
- 2 Storage Boxes with Sorting Trays for organization

- **FLL Team Registration (\$225 x 3 teams = \$675)**

FLL Team Registration fee includes:

- 1 team membership (up to 10 children, ages 9-14)
- 1 FLL Coaches' Handbook
- 1 *FIRST* Compilation DVD
- 1 FLL Project Training DVD
- 2 FLL Pins for Coaches
- This item is non-refundable
- Customer, technical, and engineering support from *FIRST* Headquarters

- **Field Set Up Kit (\$65 for kit + \$300 materials for table construction – need 1 for all 3 teams)**

EVERY TEAM must have or have access to a Field Setup Kit (kits will begin shipping in early August).

Kit contents change from year to year based on challenge theme.

It consists of:

- Mission Models Set: Exclusive collection of several hundred LEGO elements required to build the models to place on the field mat.
 - Field Mat, 44 3/4" X 92 3/4" roll-out
 - Building instructions on CD
 - This item is nonrefundable
- The field mat needs to be set up on a flat surface with borders around it.
- Table may be used as flat surface if space does not allow for mat setup on the floor of a classroom (uninterrupted for 6 months)



- Teacher time for development: **(\$5,040); however, user fee will cover \$4,000, so \$1,040**
- Assumes 2 hours / week for 24 weeks for each of three teachers
- Assuming 1.5 hours / week with students + .5 hours a week prep / meetings
- Assumes 10 hours of administration time
- Professional development/outside consultants:
 - None known
- Other: **(\$200 x 3 teams = \$600)**
 - Competition entrance fees
- Assumptions:
 - Assuming no charge for space at one of the town schools
 - Assuming we only attend one event
 - Assuming students provide their own transportation to the event
- Issues:
 - Space – is it available?
 - Interest – what happens if more than 30 kids are interested?
 - User fees – what if a family can't afford to pay? I don't want the user fees to prohibit participation. However, the alternative is to find funding for the entire program each year.