

## **Pacific Library Partnership 2015-16 Grant Program**

**Due Friday, October 30, 2015 by 5:00 p.m.**

Please provide the following information in a Microsoft Word document. Please email the completed form to Wendy Cao at [caow@plsinfo.org](mailto:caow@plsinfo.org).

1. Title of Project: STEAM Powered Robots and Beyond
2. Category (A or B): A
3. Library applying for funding: Santa Clara County Library District (SCCLD)  
Name: Chris Brown  
Email: [cbrown@sccl.org](mailto:cbrown@sccl.org)  
Mailing Address 1370 Dell Avenue, Campbell, CA 95008-6604
4. Amount of funding requested: \$15,000

### **PLP Innovation and Technology Opportunity Grant Program**

1. One paragraph project summary.

Fortunately, libraries are making STEAM-based robotics learning increasingly common. With STEAM Powered Robots and Beyond SCCLD proposes to take this learning model to the next stage of skill development and curriculum support. Through a partnership with the Gilroy Unified School District's (GUSD) Power School program, SCCLD plans to provide learning opportunities, utilizing the Carnegie Mellon Robotics Academy curriculum through the Gilroy Library. This curriculum provides students with concrete, contextualized, and immediate curriculum-based feedback. GUSD does not currently offer a robotics program. The Library will utilize a distinct two-phase model that will allow for an introduction to robotics and programming philosophy, as well as a second phase of robust robotics programming and an introduction to programming language. The curriculum will build 21st Century skills, allowing participants to work collaboratively, experiment, and take risks. The Library will pilot and evaluate the effectiveness of the program at the Gilroy Library with the potential to expand the program to our 7 community libraries, as well as demonstrate the curriculum to neighboring library PLP and CLA members.

2. Explain how this project fits with the library's strategic directions.

As with many libraries, SCCLD creates value for the community through youth education support. The Library plays a tremendous role supplementing and supporting schools, providing access to resources, research assistance, homework help, free computers, other technology, and safe places for individual and group study. The Library has also made a commitment to be a leader in the area of technology, fostering a community where residents continuously discover and learn about new technology through the Library.

A curriculum-based robotics program will allow the Library to offer learning activities that support two key areas of value the Library provides: youth education and quality of life programming. The Library has committed to ambitious outreach and programming goals that center on reaching underserved and unserved residents. Offering a robotics program in an economically challenged area of the County will allow the Library to introduce science learning into the lives of youth whom do not have a robotics program in their own school district.

SCCLD has also made a commitment to seeing 85% of residents have active library cards by July 2017. To reach this ambitious goal the Library needs to offer clearly valuable learning opportunities that incentivize library card membership, especially for the historically underserved and underperforming schools.

Additionally, the Institute of Museum and Library Services (2009) has highlighted 21<sup>st</sup> century skills as essential for success in our globally connected world, and have identified libraries as a key player in their development:

Competencies like critical thinking, global awareness, and media literacy are no longer simply desirable—they are necessary. If 21st century skills are the new design specifications for national and individual success, our nation's libraries and museums are well-positioned to respond to this need (6).

Robotics (Khanlari, 2013, 26) offer an ideal platform to teach these 21st century skills, as they can be used as an effective tool to improve a host of skills including, creativity, collaboration, self-direction, and social responsibilities. Additionally robotics teach STEAM learning concepts, engaging students in hands-on learning experience while delivering education in key areas such as mathematics, design engineering, and computer science.

3. A description of the proposed project including the population served and the demographics of that population.

During the summer of 2015 Gilroy Library participated in Make Media's Maker Camp with an overall aim to introduce STEAM-focused learning in a fun and play-centric environment. When delivering Maker Camp there was a wide disparity in the skills and knowledge of the participants. Most participants commented that they had little exposure to the simple STEAM learning concepts that were being introduced. Additionally, no school in the Gilroy Unified School District is offering robotics programming.

The Library has selected two robotics tracks. The first, called *Dash and Dot*, will allow library staff to deliver single session introductions to robots and base programming to older students for whom robotics programming is a new concept. It will be a fully portable program that can be used as an outreach tool. The second will use *Lego Mindstorms EV3 Robotics* platform to present programming that not only engages the imagination of tweens and teens, but also presents a hands-on action-based learning initiative that is solidly grounded in Common Core standards. To ensure that education and learning are the foundation for the program Librarians will utilize programming and lesson plans from the Carnegie Mellon University (CMU) Robotics Academy. This provides an activity, problem, and project based curriculum. The curriculum is research-based, aligns with Common Core standards, and focuses on the development of 21st century skill sets.

The Carnegie Mellon Robotics Academy's curriculum overview states that robotics activities are concrete, contextualized, and provide immediate feedback, which are important in satisfying a student's desire for success, and creating motivation for learning. The curriculum addresses competencies in the following Common Core Standards:

- Common Core Mathematics Practices
- Common Core Mathematics Content
- Common Core English Language Arts
- Next Generation Science Standards (NGSS)
- Computer Science Principles Framework (CSP)

### Phase 1 Robotics, grades K – 5

Librarians will utilize the *Dash and Dot* robot platform to deliver workshops to Gilroy children in grades K – 5. *Dash and Dot* robots provide a good introduction to the field of robotics, and a standards-aligned curricula in core subject areas, such as math, science, English language arts (ELA), and coding. Through the workshops librarians will have access to 21 lesson plans that are pretested, and directly tied to Common Core standards.

Librarians will also have access to an online community with a continuing evolution of new lesson plans that are engaging and meet educational goals. These will allow librarians to keep content fresh, relevant, and learning oriented. The Phase 1 program can be tailored to different ability levels, ensuring that younger children can learn through play and experimentation. More capable students will be able to take on the challenge of learning basic code structure, and computational thinking.

Gilroy Library intends to use this in an outreach during summer with Gilroy's Power School. Power School is GUSD's afterschool and summer program. Students in Grades 2-8 are recruited to participate in Power School based on academic need. The program's mission is to support students through expanded learning opportunities that build confidence, self-sufficiency, academic success, and social responsibility. Current enrollment in Power School is approximately 1000 students from K-12. The introduction of the *Dash and Dot* robotics platform will allow library staff to deliver an interactive and exciting learning experience directly at the school sites over summer.

### Phase 2 Robotics, grades 6 – 12

The Library has chosen *Lego Mindstorms EV3* for Phase 2 as it presents a flexible robotics model that is ideal for participants with no previous experience in robotics. The library will use the EV3-G programming software for introductory lessons and Robot C, an industry standard C programming language, for more advanced lessons aimed at high school students. The EV3 platform will give the library a flexible base to grow the program as it has capability to be 'upgraded' with Tetrrix robotics additions to present an advanced program for upper High School age participants.

Programming will consist of short course modules focused on the building and programming of one robot type and use real world problems to give focus to the learning goals. The goal with this method is to keep the teens engaged with short programming and prevent class dropout attrition, as well as allow for greater program availability to Gilroy middle and high school students.

Staff training will be an integral part of this project. CMU Robotics Academy offers an onsite training course for the EV3 robots and Robot C, which will ensure that staff can instruct students on how to use robotics as a method of teaching CS-STEM (Computer Science, Science, Technology, Engineering, and Mathematics) concepts. This is an intensive, 5 day training that will teach not only the skills needed to build and program the EV3 robots, but also how to organize a class and deliver programs that meet educational needs. The course will provide librarians with full access to lesson plans, which are directly tied to Common Core standards. The librarians will also recruit and train adult volunteers to assist with the learning modules.

The Gilroy Library is located in the southernmost portion of Santa Clara County. The City of Gilroy is a diverse, family-oriented city with a growing population of 51,701 which is 59% Hispanic and 30% White. According to NICHE 71.2% of GUSD students are Hispanic, 19.3% are white, and 5% are Asian. The Gilroy Unified School District (GUSD) is one of a few school districts in the County of Santa Clara that continues to grow. Over the last 19 years, the student population numbers have risen from 8,448, K-12 students in 1993-1994 to more than 11,000 students today. Of the students enrolled in GUSD, 23% or 2611 are in Middle School. There are 5,043 K-5 students currently enrolled and an estimated 5,000 more, under 5 years old. Gilroy Unified School District has 16 schools in grades K-12.

#### 4. Goals and objectives of the project.

Goal: Enhance youth education through a fun and engaging robotics program that is grounded in Common Core standards and curriculum aligned.

#### Objectives:

- 80% of participants will report a greater understanding of robotics
- 80% of participants will report that STEAM and curriculum learning was fun
- 80% of participants will report increased familiarity with STEAM and curriculum

Goal: Gilroy Children, Tweens and Teens are given the opportunity to further develop 21<sup>st</sup> century skill sets.

- 80% of participants will complete a collaborative building project, putting into practice the skill set of teamwork and collaboration
- 80% of participants will successfully program a robot to perform a “real world” task, putting into practice the skill set of design engineering, computer science, teamwork, and communication
- 50% will show an increased interest in STEAM based careers

Goal: Offer educational and recreational programming to low-income, at-risk youth through summer programs delivered in partnership with Power School

- A minimum of 300 Gilroy students will have the opportunity to participate

## 5. Project timeline (activities).

January/February 2016

- Purchase of equipment

March 2016

- Staff Training for *Dash and Dot*
- Planning of initial Phase Robotics 1 program modules
- Design of marketing material
- Design Evaluation materials

April/May 2016

- Phase 1 Robotics program trial implemented

June 2016

- Partner with Power School to deliver Phase 1 Summer Robotics program for K-5 onsite
- Training of staff for Phase 2 Robotics, Carnegie Mellon University Robotics Academy

July 2016

- Continue to deliver Summer Robotics program in partnership with Power School
- Trial Phase 1 introductory model with middle school students in the library
- Design Phase 2 modules based on CMU Robotics Academy curriculum.

August 2016

- Recruit and train adult volunteers to assist with Phase 2 robotics program
- Promote and recruit initial participants for Phase 2 robotics program

September 2016

- Implement initial Phase 2 robotics program.

December 2016

- Project Evaluation

January 2017

- Changes implemented to programming based on evaluation findings (if needed)
- Ongoing programming for Phase 1 and 2 Robotics program

## 6. Evaluation of the project.

To assist in evaluation of the project we will track a number of milestones as the programs progress. Library staff will gauge the level of participant engagement in the program, alongside learning for each participant, in order to ensure that the program is on target and meeting stated goals and objectives.

For Phase 1 of the robotics program staff will use very simple entry and exit questions to assess knowledge at the beginning of the program and then compare learning progress. Ideally an app will be used to deliver the questions in a simple, interactive method via the iPads used to control the robots.

For Phase 2 of the robotics program we will use reflection and entry/exit questions to assess the student's level of understanding of the concepts covered in each robot module. Staff will also use the assessment rubrics that come with the CMU Robotics Academy curriculum to assess participants in key areas, namely working habits, robotics, design, workplace competencies.

Use of staff checklists will ensure that programs are curriculum-aligned and working towards Common Core standards goals. Staff will complete checklists after each Phase 2 robotics program to identify learning goals achieved.

Library staff will evaluate the Phase 1 robotics programs after initial implementation to ensure that the program is meeting goals and objectives. An evaluation of the project as a whole will take place in December 2016 and will be used to inform any changes to the program.

## 7. Project budget.

Lego Mindstorm EV3 Core + Expansion Set for 24 students	\$6,318
Robot C perpetual classroom license	\$599
Laptops for phase 2 x 10 @ \$250 each (tax not included)	\$2,500
Onsite training subscription for 2 at CMU Robotics Academy	\$2,000
<i>Dash and Dot</i> \$200 each x6 @ (tax not included)	\$1,200
iPad Mini x6 @ \$299 each (tax not included)	\$1,794
Shockproof cases for iPad x6 @ 25 each	\$150
<b>Total</b>	<b>\$14,561</b>

In-Kind Budget

Librarian hours for 1st year (logistics, training, teaching) est. 230 hrs @ 52.75 an hour	\$12,132
Supervising Librarian hours for 1st year (training, teaching) est. 20 hrs @ 71.17 an hour	\$1,423
Flight and Accommodation Costs for on-site training estimate	\$3,000
Storage/Transportation Boxes	\$400
<b>Total In-Kind Budget:</b>	<b>\$16,955</b>

## References

- Carnegie Mellon University Robotics Academy. (2014). *Introduction to programming Lego Mindstorms EV3: Teachers guide*. Retrieved from <http://www.education.rec.ri.cmu.edu/content/lego/ev3/files/EV3%20teachers%20guideWEB.pdf>
- Institute of Museum and Library Services. (2009). *Museums, libraries, and 21st century skills* (IMLS-2009- NAI-01). Washington, D.C.
- Khanlari, A. (2013). Effects of robotics on 21st century skills. *European Scientific Journal*, 9(27), 26-36. Retrieved from <http://eujournal.org/index.php/esj/article/download/1805/1795>
- Santa Clara County Library (2013). *Enhancing education, information access, and quality of life: Santa Clara County Library District's community return on investment*. Retrieved from [https://www.sccl.org/SCCL/media/About/executive\\_summary\\_for\\_web\\_2013\\_0729.pdf](https://www.sccl.org/SCCL/media/About/executive_summary_for_web_2013_0729.pdf)



October 29, 2015

To Whom It May Concern,

Gilroy Unified School District's Power School and Super Power Summer Camp expanded learning programs are provided in collaboration with YMCA, Youth Alliance and Cal-SOAP providing management of programs on sites and staffing. These expanded learning programs have continued to benefit from additional local partnerships including the Gilroy Library. Participants in the expanded learning programs have received library cards, field trips to the library and site visits from librarians bringing information to the students, in addition to participation in the Gilroy Libraries Summer Reading Program.

Power School serves 1,200 students after school daily and Super Power Summer Camp serves 700 students for a 6 week full day program in the summer. Both programs are designed to target socio-economically disadvantaged and at-risk youth. As evidenced in the table below, Power School has been successful at recruiting target students, with GUSD total unduplicated (per LCFF) rate being 58% and Power School being 79%.

Target Population	GUSD	Power School
Socio-Economically Disadvantaged	51%	74%
English Language Learners	27%	45%
McKinney-Vento Homeless	0.50%	0.80%
Foster Care	0.60%	1.85%
Unduplicated (per LCAP and LCFF)	58%	79%
Hispanic or Latino	71%	82%

Power School curriculum is designed around College, Career and Community and a robotics program would fit very well with our curriculum; however we do not currently have such a program. We look forward to being able to expand our collaboration with the Gilroy Library further by coordinating multiple opportunities for our students to participate in their exciting, hands-on "STEAM Powered Robots and Beyond: Curriculum-based Robotics."

Thanks,

Mandy Reedy

Program Administrator, Power School After School Programs  
Gilroy Unified School District