

ExCEL Program Proposal

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Two unique local educational organizations, **Noisebridge** and **Teach Me To Make**, are working together to create a single unified proposal. The histories, knowledge, and experience of each organization are being combined to create a greater offering.

Our organizations are eager to offer hands-on technical programs through ExCEL. The sample lesson plans shown below only scratch the surface of the kinds of programs we can deliver. We are anxious to work with ExCEL and the SFUSD to provide programs that best meet the needs of individual schools and the interests of students. We are passionate about these subjects and enjoy inspiring this passion in the younger generation.



We understand that different schools have different needs in terms of class size, schedule, frequency, and subject matter. We are flexible and will work with each school to provide the services that best meet their needs and wishes.

We would especially like to make these programs accessible to students who might initially be reluctant to try these subjects, especially girls and children of color.

We would like to work with SFUSD to bring projects based on our programs to the Bay Area Science Fair.

Similarly, most of our members are very involved in the Maker Faire. A wonderful outcome of this program would be projects which the children can bring to Maker Faire. The Maker Faire organization is extremely interested in showcasing student projects that help inspire and encourage other students.

We encourage you to look at our current programs at:
<https://www.noisebridge.net> and <http://www.teachmetomake.com/>

I.1 Briefly describe your organizations history and mission in working with diverse groups of children and in providing training for adults.

Noisebridge is a 501(c)(3) educational non-profit corporation with a rich history working with children and adults in the local community.

The Noisebridge facility, located ½ block from 16th St BART station in the Mission provides collaboration opportunities for people interested in a vast array of subjects including physics, chemistry, mathematics, computer programming, hardware hacking, photography, security, robotics, linguistics, electronics, and cooking. Through talks, workshops, and projects we encourage knowledge exchange, learning, and mentoring. As a space for artistic collaboration and experimentation, we are open to all types of art - with a special emphasis on the crossover of art and technology.



The Noisebridge organization consists of more than 200 members, a portion of which are occasional mentors. The teachers available for teaching in the ExCEL program currently consists of 7 of these members.

There are a number of active programs going on at the Noisebridge Facility. Each class is generally composed of 1-3 mentor-instructors and 8-25 students. This week at Noisebridge the following classes took place (taken from our class listing)

- **Monday** Circuit Hacking Mondays - Weekly workshop to solder stuff! Learn how to solder from some of the best out there.
- **Wednesday** Machine Learning - Weekly get-together about Machine Learning.
- **Thursday** Professional VFX Compositing With Adobe After Effects - Learn how to create photo realistic visual effects composites using After Effects. 7-10pm
- **Thursday** Science, Engineering & Design Huddle - Weekly group to discuss design approach, share techniques, and solve any problem you may be having with your project(s). 7pm
- **Friday** Mandarin Corner - Weekly study group to practice Chinese language (and eat Chinese food).
- **Friday** CrazyCryptoCnight - Weekly night starting at 6pm for discussing cryptography. Novices and experts welcome alike!
- **Saturday** - DIYbio Salon: Do it Yourself Biology, a place to learn and share about biotech in the Bay area.
- **Sunday** Cyborg Group - 11AM (sorry) weekly gathering to work on projects like artificial senses (just go click the link)

Formed in 2006, Teach Me to Make provides science workshops and classes for all ages. Our popular electronics and mechanics workshops for children encourage tinkering: taking things apart; building whimsical contraptions using salvaged components, recycled

objects and inexpensive supplies; and re purposing mechanisms and components to different needs. Using both an artistic and technical approach, each child is guided and encouraged in the way best suited to their way of thinking. Our bilingual instructors are further able to engage and mentor children of varied backgrounds.

Teach Me to Make created Make Play Day, the best attended workshop at Make magazine's Maker Faire. During this event, Teach Me to Make taught thousands of children of all ages about science by showing them how to build electromechanical contraptions.

Teach Me to Make created a series of electrical and electronic classes with the San Jose Tech Museum of Innovation, designed to teach children advanced electrical and electronic principles using hands-on techniques.

Teach Me to Make worked with Make magazine's Mobile Make outreach program, bringing art and technology education through hands on projects to children of the greater Bay Area, from Sonoma to San Mateo. A variety of socio-economic backgrounds communities were served, including many Special Needs students. We worked especially closely with the special need students to make sure they participated fully in the project and achieved the same sense of accomplishment as their fellow students.

II.2 Highlight one of your most successful programs and support your successes with evaluation data.

One of the most successful programs at Noisebridge is called “Circuit Hacking Mondays”. Each week the program introduces about 5 new students to electronics and soldering. The program is mentored by Noisebridge co-founder Mitch Altman and taught by Mitch and various members. The program is brought to a large group at Maker Faire in San Mateo each year with the “Huge Hardware Hacking Area” program. 20 mentor-instructors teach approximately 100 students in this open enrollment, weekend-long program.

One of the workshops Teach Me To Make leads as part of the Make Magazine outreach program was at Redwood High School, which is a continuation high school. Continuation high schools were established to serve those students in need of more flexibility and attention than is possible in the regular high school program.



Some of the issues the school deals with are teen parents, orphans, English as a second language, and learning disabilities. The school teaches parenting, jobs skills, and practical and basic skills for graduation. As was typical of high school students, their initial response to the project (Bottle Rockets) was quite indifferent. Their first question was usually “are we going to be tested on this?”. However, once we started the lesson and demonstrated the rockets, the students became enthusiastic

and involved in the project. We discussed the basic physics while setting up the launcher. We designed the class to be fun, educational and engaging. We taught 6 classes/periods and several students stayed additional hours and came back at the end of the day with their babies to let us know how much they enjoyed it.

II.3 Include any work done with ExCEL After School Programs (or similar programs).

Teach Me To Make, as part of Make magazine's outreach program, taught workshops at Sonoma Boys and Girls Club, Redwood High School, Sanchez Elementary School, Bessie Carmichael Elementary School, Westmoor High School, ASCEND School (Oakland), Creative Arts Charter School, Bret Harte (Oakland), and Berkeley Arts Magnet. A number of these, such as Sanchez Elementary School and Bessie Carmichael Elementary School participate in the ExCEL program.

Experience working with and training adults

Teach Me To Make works with and trains adults through a variety of venues. At The Crucible, we teach electronics and mechanics to teachers, artists, architects, and designers, as well as the curious lay person. At the Make Play Day workshop we teach adults as well as children, although children are the primary focus.

III. Sample Lesson Plans

Sample Lesson Plan 1: 4th Grade Electric Circuits

Supplies per student: 1 LED, 1 coin cell battery, 2' wire, 2 clothes pins

Additional Supplies: clear tape

This lesson plan addresses California State Standard Grade Four Physical Sciences 1.a and 1.g

Subjects covered: batteries, light emitting diodes, electrical circuits, switches, electrical polarity. Advanced topics include parallel and series switches and logic

Each student is given a coin cell battery and LED.

- Discuss that a battery provides electric potential and how it has polarity
- Discuss what an LED does, paying attention to the polar nature of LEDs.

Have students put the LED and battery together in various ways.

- Sometimes the LED will light up, sometimes not because of the polar nature of LEDs.
- Remind students of the operation so that all of the students' LEDs light up.
- Have the students reverse the LEDs. Talk about a diode as a one-way gate.

Ask the students to let contact between the LED and battery fail.

- Discuss how this is a switch and how they can turn the LED on as they see fit.
- Discuss how this switch is similar to other electrical switches

Have the students use a clothes pin to attach a length of wire and the LED to the battery

- Have the students use the wire to make and break electrical contact with the LED.
- Discuss how the electricity is going through the wire.
- Discuss what a short circuit is and how it should be avoided

Have the students make a switch using the second clothes pin, wire and clear tape.

- Show the students how they can now flash the LED at will.

Optional topics for further exploration:

- make an interactive diorama with the lights on foam core
- LEDs in parallel
- switches in series and parallel (introduces binary logic)

Sample Lesson Plan 2:

Introduction to Programming and Microcontrollers with Arduino

Prerequisites:

Basic electronics

Supplies per student:

Arduino (\$30)
 solderless breadboard (\$5)
 10 LEDs (\$.10)
 5 clothespin switches (\$.50)
 Material for DIY sensors (\$2)

Additional Requirements:

Computer Lab, Arduino IDE installed (free)

Additional Supplies:

Wire, 100' = \$20. Each student needs about 2'.

Subjects covered:

Programming
 Microcontrollers
 Breadboarding principles

Advanced topics include:

Binary arithmetic
 Logic
 Heat dissipation and ability to sink/source current
 Transistor theory



Lecture:

- Display (computer and projector required) Arduino schematic
- Discuss how individual outputs can be controlled
- Discuss basic programming principles (shampoo instructions)
- Display program to turn on LED
- Discuss program
- Discuss compiling and downloading

Lab: Each student is given an Arduino and access to a computer with the Arduino IDE

- Walk students through
 - Opening IDE
 - Opening LED program
 - Compiling and Downloading
 - Each student observes pin13 LED illuminating

Lecture:

- Display program to blink LED
- Discuss loops and timing

Lab:

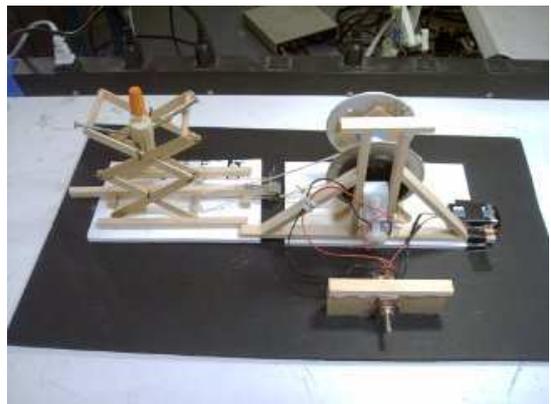
- Each student programs LED to blink, by modifying the first program themselves

Lecture:

- Display schematic
- Discuss connector
- Show how LED can be connected to pin13 and ground

Lab:

- Each student reproduces the above
- Students move LED to different pin
- Walk students through how to modify program to use other pin
 - Add second LED
 - Blink both at same time
 - Blink both at opposite times



Lecture:

- Display schematic
- Discuss input
- Display program to read input

Lab:

- Each student builds switch, connects to input,
 - modifies program to blink LED only when switch is activated

A possible 16 week program might include:

2 lessons per week, 2 hours per lesson, 30 students

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2-3 lessons basic circuit projects

2-3 lessons electromagnetic projects

1 lesson soldering

2-3 lessons diodes and transistors

2-3 lessons intro to circuit diagrams, building more complex circuit

- take home project: Flashlight that sucks power from dead batteries

5 lessons integrated circuits

- LED blinker

- oscillator

- light sensitive Theremin

- LED dimmer and motor speed control

10 lessons digital electronics, programming, microcontrollers

Some of our programs have greater initial material costs than other organizations programs, but overall cost remains very low over the long term due to intelligent component and project selection. For example, in our sample lesson plan for the "Joule Thief", each student builds and takes home their project, a flashlight that runs on seemingly dead batteries, for \$2 per student. At the advanced level, the Microcontroller program uses an Arduino programmable board for each student. While more expensive, this is reused and thus the per-student per-program price is kept low.

IV. Proposed Instructional Personnel

1. Describe your agency's staff hiring and training requirements

Our organizations include a great many members covering a wide range of skills, experiences, and areas of expertise. While many may participate in the ExCEL program as guest speakers, a much smaller subset will be the formal instructional personnel.

Teachers are chosen on the basis of knowledge, interpersonal skills, and the ability to impart their knowledge to students in a clear, easy-to-follow manner. To participate in this program, teachers must show sensitivity to the needs and understanding of different students, and must be able to explain concepts in alternate ways appropriate to each students. Teachers must be patient, good listeners, and respectful.

2. Delineate how your organization ensures the staff's ability to manage student behavior and provide high quality instruction.

Our staff keeps up to date with current best practices in student behavior and effective instructional methods. Our staff attend many professional development conferences, both as attendees and as speakers. The organization members welcome and invite frequent feedback and creative criticism, ensuring consistently high quality teachers.

3. Indicate how you plan to monitor staff attendance, instructional performance, and evaluation in the program, and how substitute arrangements will be handled when regularly assigned staff is unavailable.

Many of our classes will be lead by multiple teachers, such as a head teacher and a secondary teacher, who might be an assistant, guest speaker, or other. At the end of each class, each teacher will provide feedback to the program managers who will evaluate the program, teachers, and curriculum, making modifications as required. The members of our organization have an excellent commitment to responsible behavior. The large number of committed members in our combined organizations assures us of a large pool of qualified substitute staff. Every class will have an assigned backup substitute teacher, who can be called in on short notice. Members of our organization also communicate often and effectively using many electronic means, assuring ample notice of potential substitute requirements.

