Curriculum Funding Project

Funding Agency:

Funding Request: $177,000 for 8 years

Principal Investigator: Esther Dabagyan

Co-Investigators: Maria Elena Rico and fellow science teachers at Helen Bernstein High School yet to be hired.

Project Name: Project Lead the Way Engineering Academy

Investigator Credentials: See following page
Proposers

**Esther Dabagyan, Science Teacher**
Esther Dabagyan received a Bachelor’s degree in Biology and a Bachelors degree in Comparative Literature from the University of California, Irvine. Her interests predominantly center on evolutionary biology and genetics. She spent time working on DNA sequencing in a laboratory at UC Irvine that contributed to the completion of the Human Genome Project. Ms. Dabagyan earned her teaching credential while working as a teacher at San Joaquin Valley College, where she taught English, math, integrated science, microbiology, and anatomy and physiology. Esther is currently an eighth grade physical science teacher at Le Conte Middle School, where she has taught for five years, been elected as co-chairperson of the science department, and served on several committees. She is currently working on a Masters in Science Education at CSU Northridge and will teach high school science at Helen Bernstein High School in the 2008-2009 school year.

**Maria Elena Rico-Aguilera, Helen Bernstein High School Complex Principal**
Maria Elena Rico received her Bachelor’s degree in Political Science and her Masters degree in Curriculum and Instruction from the University of San Diego. She has ten years of classroom experience in Social Studies and English as a second language at the secondary level, as well as ten years of administrative experience at a variety of levels. Mrs. Rico-Aguilera has vast professional development expertise as an Institute for Educational Leadership fellow, a member of the National School Reform Faculty, and successfully completed the National Staff Development Council Academy training. Maria Elena helped plan and implement the state’s Distinguished Educator’s Initiative, facilitated Critical Friends Group coaches training for the Los Angeles Annenberg Metropolitan Project, designed and implemented a trainer certification program for district advisors and coordinators, and served as an external coach to the National Council of La Raza Early College High School initiative.
Problem Statement

An Academy of Engineering is very important to the students of central Los Angeles, not only do they have a sincere interest in engineering and science, but there is no similar program in the region. Surveys of students’ career interests, along with the needs of the community, led to the decision to pursue an Academy of Engineering. Data from the student surveys indicate that 42% of students have a strong interest (1st, 2nd, or 3rd choice) in the Medical Sciences, 34% have a strong interest in Technology/Engineering, and 26% have a strong interest in Science/Technical Arts. Informal surveys of Hollywood business and educational community leaders support these findings, and community members have communicated a strong desire to support career pathways in engineering.

Los Angeles is the second most populous city in the nation with almost four million residents. This metropolitan area spans 470 square miles, 11.5% of the Los Angeles County, and contains 38.8% of the population of the County of Los Angeles. The city and its surrounding urban areas continue to experience growth in population and economic diversity. Los Angeles County is a leader in national manufacturing of products such as aircraft, aircraft equipment, dental equipment, toys, gas transmission and distribution equipment, guided missiles, space vehicles and propulsion units. The City of Los Angeles has a historic unemployment rate that is higher than that of the County, the State, or the Nation.

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of L.A.</td>
<td>6.4%</td>
<td>7.7%</td>
<td>7.9%</td>
<td>7.4%</td>
<td>6.0%</td>
</tr>
<tr>
<td>County of L.A.</td>
<td>5.7%</td>
<td>6.8%</td>
<td>7.0%</td>
<td>6.5%</td>
<td>5.3%</td>
</tr>
<tr>
<td>State of CA</td>
<td>5.4%</td>
<td>6.7%</td>
<td>6.8%</td>
<td>6.2%</td>
<td>5.4%</td>
</tr>
<tr>
<td>United States</td>
<td>4.7%</td>
<td>5.8%</td>
<td>6.0%</td>
<td>5.5%</td>
<td>5.1%</td>
</tr>
</tbody>
</table>

Source: California Employment Development Department, Labor Market Information Division for the State and County, U.S. Bureau of Labor, Department of Labor Statistics for the U.S.

The community of Hollywood is reflective of urban Los Angeles as a whole with an ethnically diverse population of approximately 222,695 people, including 10,138 fifteen to nineteen year-olds (2005 estimated census data). This socioeconomic and demographic microcosm of Los Angeles includes a significant number of individuals living below poverty line and lacking adequate access to the educational opportunities crucial for successful postsecondary options. In this community, 28% of sixteen to nineteen year-olds are out of school, 20.5% dropped out of school, and 72.3% are jobless. In addition, 24.8% of eighteen to twenty-four year-olds do not possess a high school diploma and 39.5% are unemployed (One Out of Five, 2004). The economic prosperity of the City of Los Angeles depends on a developed a trained work force.

Projections data from the National Employment Matrix indicate excellent employment opportunities for several engineering careers that would benefit the city of Los Angeles. According to the U.S. Department of Labor, the job outlook for science and engineering careers is excellent, and several areas of employment are in high demand. In particular, environmental engineers and biomedical engineers are expected to have a much faster growth than average, 25% and 21% respectively.
As stated earlier in this proposal, the city of Los Angeles has a high unemployment rate in comparison to the County and the State. Research indicates that when students are engaged in relevant and contextualized learning environments their academic performance improves. We can increase student achievement at Helen Bernstein High School by providing relevant technical training that naturally engages students and strengthens the connections between academic coursework and career preparation. The interests and needs of students and local community organizations align with a positive job outlook for the future of Los Angeles. According to the U.S. Department of Labor, the job outlook for science and engineering careers is excellent, with jobs in environmental and biomedical engineering expected to grow much faster than average, 25% and 21% respectively. An Academy of engineering will allow students to explore careers projected to be in high demand. The Project Lead The Way curriculum aligns with the career and college preparatory pathways within the Science, Technology, Engineering, and Mathematics SLC. Our school can improve the quality of life in our community by producing students who are career and college ready. The Project Lead the Way curriculum consists of year long courses that students take starting freshman year of high school until they graduate.

Finally, the right people are in place to build a successful Academy of Engineering at Helen Bernstein High School in Hollywood, California. The teachers on the Academy planning team are committed and caring educators with experience in designing rigorous, relevant, and engaging curriculum. The Principal of Bernstein campus, Maria Elena Rico, has expertise in professional development focused on high school reform and transforming low performing schools. Catherine Devine, Academy Director, has expertise in professional development for science teachers and over twenty years of experience as a science educator. The Academy design team consists of dedicated and experienced educators committed to ensuring that all students achieve at high levels and get the opportunity to achieve their full potential. To paraphrase Collins’ (2001) business philosophy for great companies, we have the “right people on the bus” with the right attitude to create success. The Academy’s goal is to prepare young adults to enter into the highly technical and profitable field of engineering.

<table>
<thead>
<tr>
<th>Occupational Title</th>
<th>Employment, 2006</th>
<th>Projected Employment, 2016</th>
<th>% Change</th>
</tr>
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<tbody>
<tr>
<td>Biomedical engineers</td>
<td>14,000</td>
<td>17,000</td>
<td>21</td>
</tr>
<tr>
<td>Civil engineers</td>
<td>256,000</td>
<td>302,000</td>
<td>18</td>
</tr>
<tr>
<td>Environmental engineers</td>
<td>54,000</td>
<td>68,000</td>
<td>25</td>
</tr>
<tr>
<td>Industrial engineers</td>
<td>201,000</td>
<td>242,000</td>
<td>20</td>
</tr>
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Activities and Timeline

Before the start of each year:

Prior to the beginning of the school year, students from incoming middle schools that feed into Helen Bernstein High School will be sorted according to interest in an engineering program and math proficiency. Teachers will be trained to teach an accelerated summer math program that can prepare the students who desire to enroll in an engineering program at Bernstein but are not proficient in algebra. The math program will last 3 weeks and a pre and post test will be used to track their progress and readiness for the math intensive engineering courses during their freshman year.

Year One (2008-2009):

Four teachers will be sent to San Diego during the summer to attend the Project Lead the Way training for teaching the following engineering courses:

- **Introduction to Engineering Design™**—uses a design development process while enriching problem solving skills; students create and analyze models using specialized computer software.

- **Principles Of Engineering™**—explores technology systems and manufacturing processes; addresses the social and political consequences of technological change.

Two teachers will be training in the first course and the other two in the second. The training lasts 2 weeks and teachers experience many of the same activities that their students will experience. After the training, necessary software and materials will be purchased.

Principles of Engineering will be taught according to the Project Lead the Way (PLTW) curriculum. The PLTW classes are modeled after introductory engineering courses taught at the university level. Students gain firsthand experience in different facets of engineering and discover where their strengths lie. In Principles of Engineering students design and build various structures and models. Students will be required to solve problems, participate as part of a team, lead teams, speak to a public audience, conduct research, understand real-world impacts, analyze data, and learn outside the classroom. Students will conduct project based learning and guided inquiry through all their PLTW courses. The National Science Education Standards (National Research Council, 1996) stress that students must become scientifically literate and they recommend an inquiry approach at the means for achieving this goal.

A report written by Third International Mathematics and Science Study attributes the weakness of US students in science when compared to other nations to the over-abundance of curricula in the United States. The report compares per capita spending on science instruction, and while it finds that other nations spend less than the United States, they are able to achieve better results because they have decided to teach less (O’Neill and Polman, 2004, p. 236). The PLTW curriculum has far more depth than width. Project based learning (PBS) as implemented by PLTW is one way to focus deeply upon a central idea while linking the understanding of students across different scientific domains. PBL can also foster the skills that have become increasingly necessary to function in the modern day world. An
increasing number of industry spokesmen complain of the lack of adaptability and problem solving skills in their new hires. PLTW teaches students how to deal with failure, redesign and excellent problem solving skills. The projects that are constructed by students will be graded holistically with portfolios and students’ progress will be tracked from year to year for retention and progression of difficulty in their projects.

Year Two:

Incoming 9th graders will be taught Principles of Engineering while the 10th graders will take Introduction to Design. During the summer, 4 additional teachers will be trained in the two foundation courses taken in the 9th and 10th grades. Alternatively, the four teachers from the previous year will exchange courses so that all teachers are trained in the two foundational courses that the freshman and sophomores take. Student projects will be graded and added to their portfolios. Students will be asked to conduct one presentation where they describe two projects of their choice to the community, including parents, teachers, and industry partners.

Year Three:

The 11th graders will have an option of either taking the Aerospace course, Civil Engineering or Biotechnology depending on the career path they have chosen. By 11th grade, students will be expected to have some idea as to what field they would like to pursue when exiting high school. Students will be asked to conduct two presentation where they describe two projects of their choice to the community, including parents, teachers, and industry partners.

During the summer before 11th grade, 4 teachers will be trained in these courses. Two will be trained in Civil Engineering, one in Biotechnology and another in Aerospace Engineering. Descriptions of these courses follow:

- **Aerospace Engineering™**—expands horizons with Projects developed with NASA- aerodynamics, astronautics, space-life sciences, and systems engineering.

- **Biotechnical Engineering™**—hones more advanced skills in biology, physics, technology, and mathematics and applies them to real-world biotech fields.

- **Civil Engineering and Architecture™**—introduces students to the interdependent fields of civil engineering and architecture; students learn project planning, site planning, and building design.

Student projects that are created in these courses will be evaluated during their presentations and added to their portfolios.

Year Four:

In the summer before year four, 4 teachers will attend the PLTW training. Three teachers will be trained in the Engineering Design and Development course and one will be trained in a year three course depending on the needs and interests of the student population. Students will be encouraged to go off-campus to nearby California State University Los Angeles, or an industry partner to either take courses or acquire an internship or job. By year four, students will be expected to conduct a capstone project as described below.

- **Engineering Design and Development™** is a research course that requires students to formulate the solution to an open-ended engineering question. With a community mentor and skills
gained in their previous courses, students create written reports on their applications, defend the reports, and submit them to a panel of outside reviewers at the end of the school year.

As a means of assessing the success of the program, student retention will be tracked throughout all four years. Also, students’ pursuits after high school will be tracked also to assess whether PLTW has any influence in their choice of major at a university or college and/or their occupation. In additional to the assessment methods outlines in the activities section, PLTW has its own high school certification process as outlined on the web page: [http://www.pltw.org/Assessment-Evaluation/School-Certification.cfm](http://www.pltw.org/Assessment-Evaluation/School-Certification.cfm). This certification will be pursued by Academy of Engineering at Helen Bernstein High School.

### Years One through Four Summary of Courses:

<table>
<thead>
<tr>
<th>Year</th>
<th>Course</th>
<th>Course</th>
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<tbody>
<tr>
<td>9</td>
<td>Principles of Engineering PLTW 1</td>
<td>Principles Engineering PLTW 1</td>
</tr>
<tr>
<td>10</td>
<td>Intro Design PLTW 2* (fine art &quot;f&quot;)</td>
<td>Intro Design PLTW 2* (fine art &quot;f&quot;)</td>
</tr>
<tr>
<td>11</td>
<td>Aerospace/ Civil Engineer PLTW 3</td>
<td>Biotechnology PLTW 3</td>
</tr>
<tr>
<td>12</td>
<td>Capstone/ Senior Portfolio PLTW 4</td>
<td>Capstone/ Senior Portfolio PLTW 4</td>
</tr>
</tbody>
</table>

### Year Five and Beyond:

After the fourth year when the academy graduates its first class that has completed four years of PLTW course work, the program will be reassessed to gauge whether additional specialization courses are needed. In the next four years, we will continue to keep track of what the PLTW students choose to do after high school. We will also track retention rates, CST and CASHEE scores to see if PLTW has any effect on them. The following specialization courses will be considered as additions to the program:

- **Digital Electronics™**—teaches applied logic through work with electronic circuitry, which students also construct and test for functionality.
- **Computer Integrated Manufacturing™**—enhances computer modeling skills by applying principles of robotics and automation to the creation of models of three-dimensional designs.

### Distribution and Continuation

The results of the study will be shared at the end of the 8 years with the Project Lead the Way organization. PLTW already has several studies in the works and publishes them on their website. We also plan to present our study at the National Science Teachers’ Association conference. The program itself will be publicized through annual career fairs the high school and at the middle school that feeds into the high school.
At the conclusion of 8 years, if the program is successful we plan to sustain the funding through industry partners. We also plan on supplementing this funding through additional grant applications.

Budget and Justification

PLTW  Travel Conference Expense -- $2,800.00 (per person)
PLTW  Training Rate- Certificated (10 days @ $150 per day) -- $1,500.00

Total for PLTW= $17,200  for 4 teachers per year times 4 years = $68,800
$8,600 for 2 years per year times 4 years = $34,400

Group planning time for trained teachers during the summer:
1 week - $750.00 per teacher times 4 teachers = $3000 times 8 years = $24,000

Summer Math Program
Stipend for one teacher for a 3 week program = $2,250 times 8 years = $18,000

Final:  68,800 + 34,400 + 24,000 + 18,000 = $145,200 for 8 years

$15,000 will be used for materials. A full list of recommended materials for each class will be sent as requested.

$16,000 indirect costs from the district
Esther Dabagyan

Objective
Teacher at secondary level of Biology.

Experience

2003, July – Present           Le Conte Middle School          Los Angeles, CA
Physical Science Teacher
• Teach 3 periods of 8th grade physical science and 2 period of honors 8th grade physical science
• Department Chair for one year and co-chair for 2 years.
• Science Lead Teacher

2003, January – June          Centennial High School          Bakersfield, CA
Student Teacher
• Taught 5 periods of college preparatory Biology.

2001, September – 2003, January          San Joaquin Valley College          Bakersfield, CA
General Education Instructor
• Taught Natural Science, Arithmetic, Pre-Algebra, Microbiology, Chemistry, Anatomy & Physiology and English.
• Provided tutoring for students of all ages who are struggling.
• Prepared 5 week accelerated lesson plans intended for 10 week courses.
• Adapted course material to suit students with varying skill levels and diverse backgrounds.

2000, June - 2001, June          University of California Irvine          Irvine, CA
Staff Research Associate I
• Lab assistant in Human Genome Project, duties included:
  • Gel-electrophoresis
  • DNA sequencing on the ABI 377 machine

January 1998-June 1999          Humanities Out There (H.O.T.)          Irvine, CA
Tutor (College Class)
• Tutored four, fourteen, sixteen and seventeen year-olds.
• Evaluated class performance and individual performance with recommendations for improvement.
• Helped them with their writing, reading and grammatical skills.
• Introduced and reinforced critical thinking.

1994 -1995          Bravo Medical Magnet H.S.          Los Angeles, CA
Teacher’s Assistant

- Entered grades using Macintosh spreadsheet.
- Mixed and made solutions for labs (Chemistry teacher).

Education

2006-2008           California State University, Northridge
- Master’s in Science Education
- Completed research on science notebook effectiveness

2001-2003           California State University, Bakersfield
- Preliminary Secondary Single Subject CLAD Credential in Biology
- Preliminary supplemental in Literature

1995 – 2001          University of California Irvine, Irvine, CA
- BS in Biology and a BA in Comparative Literature

Interests and Miscellany

I am currently a member of the California Science Teachers Association and make an effort at staying current in my field. My experience with the program titled H.O.T. (Humanities Out There) has enabled me to develop and appreciate the skills of efficient communication and teaching. I immensely enjoy teaching children of all ages and would like to teach high school students. I have extensive knowledge of IBM PC, IBM Compatible, Windows (3.x, 95, 98, 2000, and XP), Macintosh, Excel, and communications programs. I fluently speak English and Armenian. I also speak and read some Spanish. I enjoy playing the piano and reading.

References

Sharon Tomback, Le Conte Middle Schoo, 1316 N Bronson Ave, Los Angeles, CA 90028, 323-308-1700.

Jack Foote, Le Conte Middle School, 1316 N Bronson Ave, Los Angeles, CA 90028, (323) 308-1700

Vanessa Cross, San Joaquin Valley College, 201 New Stine Rd., Bakersfield, CA 93309, 661-834-0126.

Robert K Moyzis, University of California, 128, 131 Plumwood House, Irvine, CA 92697 (949) 824-1849, ext. 1870.

Professor Julia Lupton, University of California Irvine, Humanities Instructional Building 307, Irvine CA 92697, 949-824-6716

Michael A Morgan, Bravo Medical Magnet H.S., 1200 N. Cornwell St. Los Angeles, CA 213-342-0428 ext. 503