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H.R. 4030, CONGRESSIONAL MEDAL FOR OUTSTANDING CONTRIBUTIONS IN MATH AND SCIENCE EDUCATION ACT OF 2004

HEARING

BEFORE THE

SUBCOMMITTEE ON RESEARCH

COMMITTEE ON SCIENCE

HOUSE OF REPRESENTATIVES

ONE HUNDRED EIGHTH CONGRESS

SECOND SESSION

MARCH 30, 2004

Serial No. 108–52

Printed for the use of the Committee on Science

Available via the World Wide Web: http://www.house.gov/science

U.S. GOVERNMENT PRINTING OFFICE

92–756PS WASHINGTON : 2004

For sale by the Superintendent of Documents, U.S. Government Printing Office
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H.R. 4030, CONGRESSIONAL MEDAL FOR OUTSTANDING CONTRIBUTIONS IN MATH AND SCIENCE EDUCATION ACT OF 2004

TUESDAY, MARCH 30, 2004

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON RESEARCH,
COMMITTEE ON SCIENCE,
Washington, DC.

The Subcommittee met, pursuant to other business, at 10:20 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Nick Smith [Chairman of the Subcommittee] presiding.

SUBCOMMITTEE ON RESEARCH
COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

H.R. 4030, the Congressional Medal for Outstanding Contributions in Math and Science Education Act of 2004

Tuesday, March 30, 2004
10:00 a.m. – 12:00 p.m.
2318 Rayburn House Office Building (WEBCAST)

Witness List

Dr. Judith Ramaley
Assistant Director, Education and Human Resources Directorate
National Science Foundation

Mr. Jay Engeln
Resident Practitioner for Business-School Partnerships
National Association of Secondary School Principals

Mr. Torrence Robinson
Director, Federal Affairs
Texas Instruments

Ms. Antoinette Bailey
Vice President, Community and Education Relations
Boeing Company

Mr. Gus Krudwig
Co-Founder, The Glou Factory

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HEARING CHARTER

SUBCOMMITTEE ON RESEARCH
COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

H.R. 4030, Congressional Medal for Outstanding Contributions in Math and Science Education Act of 2004

TUESDAY, MARCH 30, 2004
10:00 A.M.—12:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

1. Purpose

On Tuesday, March 30, 2004, the Research Subcommittee of the Committee on Science of the House of Representatives will hold a hearing to examine the benefits of business involvement in math and science education and to consider H.R. 4030, legislation to establish the "Congressional Medal for Outstanding Contributions in Math and Science Education" program. The legislation seeks to recognize private entities for their outstanding contributions to K–12 science, technology, engineering and mathematics education.

2. Witnesses

Dr. Judith Ramaley is the Assistant Director of the Education and Human Resources Directorate at the National Science Foundation (NSF). Prior to joining NSF in 2001, Dr. Ramaley was President of the University of Vermont, and, before that, Portland State University. At both universities, she held a full professorship in biology.

Mr. Jay Engeln is the Resident Practitioner for Business-School Partnerships at the National Association of Secondary School Principals. Mr. Engeln has nearly thirty years of experience in public education in various positions at Colorado high schools, including as principal of William J. Palmer High School in Colorado Springs, where he initiated partnerships with more than 100 businesses. Mr. Engeln also was a finalist for Colorado Teacher of the Year and a recipient of the prestigious Kappa Delta Pi Award for outstanding contributions to education programs.

Mr. Torrence Robinson is the Director of Public Affairs for Texas Instruments, where he is responsible for developing and implementing education initiatives. In addition to his responsibilities at Texas Instruments, Mr. Robinson serves as Chair of the Texas Technology Workforce Development Program Advisory Committee, a committee of the Texas Higher Education Coordinating Board, and is a member of the Greater Dallas Chamber's Education Taskforce

Ms. Antoinette Bailey is the Vice President of Community and Education Relations at Boeing Company, where she is responsible for corporate charitable contributions, employee contributions, volunteerism, and external education funding and initiatives. Prior to the merger of Boeing and McDonnell Douglas, Ms. Bailey served as Vice President of Community Relations of McDonnell Douglas and President of the McDonnell Douglas Foundation.

Mr. Gus Krudwig is the co-founder of the Glou Factory in Jackson, Michigan. Established in 2000, the Glou Factory supports after-school, weekend, and summer enrichment programs for students in areas ranging from computer technology to woodworking.

3. Overarching Questions

The hearing will address the following overarching questions:

- What is the Administration's position on H.R. 4030, the *Congressional Medal for Outstanding Contributions in Math and Science Education Act of 2004?*

- Why should businesses get involved in education? And what role can they play in ensuring that all students receive a high quality, world-class education?
- What are the results and benefits of business involvement in math and science education for the employer and its employees, the school, teachers and their students, and the community as a whole?
- What are the hallmarks of a successful partnership between schools and businesses? How is that success measured? And how are those successes shared with other schools and businesses?

4. H.R. 4030, the Congressional Medal for Outstanding Contributions in Math and Science Education Act of 2004

Congress, school administrators and teachers have grown to embrace private sector involvement in education, especially as it relates to math and science achievement. For that reason, there have been a number of initiatives at NSF to encourage private sector involvement in education. For instance, until recently, 15 percent (approximately $35 million) of H–1B user fees were used to support K–12 activities involving private-public partnerships in education, including materials development, student externships, and math and science teacher professional development. In addition, the Math and Science Partnerships Program created by the *National Science Foundation Authorization Act of 2002* (P.L. 107–296) sought to require at least half of all partnerships funded under the program to involve businesses.

On March 25, 2004, Representative Nick Smith introduced H.R. 4030, the *Congressional Medal for Outstanding Contributions in Math and Science Education.* The legislation seeks to recognize the outstanding contributions of private sector entities in improving math and science achievement by establishing an award program at the National Science Foundation.

5. Background

According to a 2000 study by the National Association of Partners in Education, Inc., the number and scope of school-business partnerships has increased significantly in the past 12 years. Today, nearly 70 percent of all school districts now engage in some form of business partnership—an increase of 35 percent science 1990—with businesses contributing an estimated $2.4 billion and 109 million volunteer hours.

Student Achievement

The 2000 National Assessment of Educational Progress (NAEP) showed that large numbers of U.S. students demonstrate a mastery of only rudimentary mathematics. For example, 31 percent of 4th graders, 34 percent of 8th graders and 35 percent of 12th graders scored below "basic," meaning that the student failed to demonstrate even partial mastery of the knowledge and skills that are fundamental for proficient work at each grade level. Worse, the achievement gap in NAEP math scores between white and minority students has remained relatively unchanged since 1990, with 68 percent of African-American 8th graders scoring below the basic level, compared to 23 percent of white students.

On international assessments, U.S. performance relative to other nations actually declines with increased schooling. According to the most recent (1999) Third International Mathematics and Science Study (TIMSS), an assessment that evaluates the math and science performance of 4th, 8th and 12th grade students from 42 different countries, most U.S. children score above average in elementary school, but those in 12th grade—including our most advanced students—rank among the lowest of all participating countries, outperformed by nearly every industrialized nation and ahead of only Cyprus and South Africa.

Although many parents and students believe that a high school diploma provides adequate preparation for higher education and the world of work, recent surveys found that most college students must take at least one remedial English or math class before beginning standard coursework. And many employers rated the skills of high school graduates in grammar, spelling writing and basic math as only "fair" or "poor." Combined with the flat or declining enrollments of U.S. students in science and engineering majors, many are concerned that too many of our students enter the workforce with a low level of skills, making them most vulnerable to fluctuations in our knowledge-based economy and putting U.S. companies at a competitive disadvantage.

Workforce Projections

In February 2004, the Bureau of Labor Statistics (BLS) projected that by 2012, the number of professional and high-skilled jobs will constitute 62 percent of all

jobs. This is not surprising, as nine of the 10 fastest growing occupations are in the health and information technology industries.

Moreover, individuals, companies, and society in general benefit when all students achieve challenging math and science standards. For example:

- One study at the University of Pennsylvania showed that a 10 percent (or about one year) increase in the education level of a company's workforce increased productivity by 8.6 percent, while a comparable increase in capital equipment increased productivity by 3.4 percent. For non-manufacturing companies, the result was even higher—11 percent.
- A new study reports that math and science proficiency boosts earning power by a remarkable margin. BLS figures show that, on average, 28-year-old workers who tested in the top quartile of math skills on the National Assessment of Educational Progress earn 37 percent more than those in lower quartiles. A comparable advantage goes to those who test well in science.

In addition, one assessment of skills found that among the new basics for entry level workers at Intel are one year each of chemistry, physics, and electronics, plus a firm grasp of basic science. An entry-level automobile worker, according to an industry-wide standard, needs to be able to apply formulas from physics to properly wire the electrical circuits of a car. And janitors at a hospital often have to understand bio-hazardous materials waste management. Yet, as noted by a 1998 report authored by Representative Vernon Ehlers entitled, *Unlocking Our Future,* "There appears to be a serious incongruity between the perceived utility of a degree in science and engineering by potential students in the U.S. and the present and future need for those with training in our society."

Business Involvement in Education

Many businesses first decide to get involved in education primarily for philanthropic reasons, but they soon recognize a variety of distinct benefits from a meaningful relationship with a school or district. Although many businesses continue to fund programs and donate equipment, many more are becoming to get involved in activities ranging from tutoring and employee involvement programs to reform activities at the national, state and local level.

These relationships can boost student test scores, contribute to overall student achievement and enhance the student experience. For businesses, there are many different strategies they can employ. Some communicate workplace academic skill requirements to schools, parents and students through guest lectures, involvement on the school board or mentoring and tutoring programs for students. Others create opportunities to expose students to the world of work through internship or job shadowing programs. And still others encourage their employees, especially those who are parents, to increase their involvement with local schools by providing release time to allow them to volunteer or to attend parent-teacher conferences.

From a human capital perspective, these relationships between a corporation and a school can boost employee morale, earning the employer and its employees recognition as a "good neighbor." In turn, this can improve overall employee satisfaction and proving employee satisfaction and productivity.

From a financial and community perspective, these relationships can provide a revenue stream to schools while also building customer loyalty for the business. In addition, school improvement can contribute to the economic health of the community. And the quality of a local school is, according to *Money* magazine, one of the most important criteria considered by potential employees when considering whether to accept a job offer in a new city.

APPENDIX

SECTION-BY-SECTION ANALYSIS OF H.R. 4030, THE CONGRESSIONAL MEDAL FOR OUTSTANDING CONTRIBUTIONS IN MATH AND SCIENCE EDUCATION ACT OF 2004

Sec. 1. Short Title.

"Congressional Medal for Outstanding Contributions in Math and Science Education Act of 2004."

Sec. 2. Definitions.

Defines terms used in the text.

Sec. 3. Establishment of Program.

Requires the Director to establish a Congressional Medal for Outstanding Contributions in Math and Science Education program, which shall be designed to:

(1) recognize private entities for outstanding efforts supporting elementary and secondary schools in improving student achievement in science, technology, engineering, and mathematics;

(2) encourage private entities to support elementary and secondary schools to improve and underscore the importance of science, technology, engineering, and mathematics education; and

(3) distribute information about the gold medal recipients available to schools, institutions of higher education, educators, parents, administrators, policy-makers, researchers, public and private entities, and the general public.

Sec. 4. Medals.

(a) Requires, within two years of enactment, the Director to annually name finalists according to the following criteria:

(1) not more than 20 private entities with more than 500 employees; and

(2) not more than 20 private entities with 500 or fewer employees.

Specifies that each finalist shall receive a citation describing the basis for the entity achieving status as a finalist.

(b) Requires, within two years of enactment, the Director to annually award medals to employers who are among the finalists in (a) according to the following criteria

(1) not more than five private entities with more than 500 employees; and

(2) not more than five private entities with 500 or fewer employees.

(c) Distribution of Information.

(1) Requires the Director to distribute information about the Congressional Medal recipients to schools, institutions of higher education, educators, parents, administrators, policy-makers, researchers, public and private entities, and the general public.

(2) Allows any entity that is a finalist or receives a medal to use such information for advertising or other publicity purposes.

Sec. 5. Eligibility.

Makes any private entity that has, either alone or in partnership with for-profit and/or non-profit entities, assisted students, teachers, administrators, or other support staff in improving student achievement in science, technology, engineering, and mathematics in a school or community eligible to receive a medal. Requires the entity to be involved in a sustained manner for at least two years with at least one elementary or secondary school.

Sec. 6. Application.

Requires the Director to establish a system for accepting applications from entities seeking to be considered for the medal. Requires applications to include at least two letters of support, which may come from teachers, support staff, administrators, professional or business organizations, local, county, or State Departments of Education, and any other categories of persons or organizations as designated by the Director.

Sec. 7. Selection.

Requires the Director to give priority consideration to evidence of improved student achievement in selecting entities to receive medals. Requires the Director to consider, in addition to any other criteria the Director may establish:

(1) Evidence of innovative approaches to increase interest by students in science, technology, engineering, and mathematics such as an increase in the number of students enrolled in advanced courses related to such fields;

(2) Evidence of employee interaction with students or teachers to support and improve mathematics and science learning;

(3) Evidence of success in positively influencing student attitudes and promoting education and career opportunities in science, technology, engineering, and mathematics;

(4) Evidence of successful outreach to students, parents, and the community regarding the importance of mathematics and science education to the Nation's prosperity, job creation, and standard of living, as well as future earning potential for the individual; and

(5) Evidence of a strong and sustained commitment to the students and schools.

Sec. 8. Authorization of Appropriations.

For each of fiscal years 2005 through 2007, authorizes such sums as are necessary for carrying out this act, to be derived from amounts authorized by the National Science Foundation Authorization Act of 2002.

Chairman SMITH. We will now proceed with the witnesses on the bill.

Last year, during the consideration of legislation to authorize the Math and Science Partnership program, I asked our witnesses to consider how we encourage better math and science performance in our students from kindergarten through the 12th grade. Some of the—I said, to the extent that learning throughout your life, and especially in math and science and engineering, is maybe more the lighting of a fire than it is filling a container with knowledge, when is the fire, if you will, started or lit with these young students? Some suggested maybe it was when they were four years old, before they came to school. Some suggested maybe it was in kindergarten or the third grade. Some said even if that fire is lit and the excitement is there, the flame can go out if you don't have the kind of qualified, good teachers in later years from seventh grade through high school.

It seems to me that we need to do a better job of encouraging and training students in science and math so that they, and the United States, can be successful in the highly competitive job market that is emerging. And the way to maintain and increase our standard of living is through innovation, technological advancement, and I add to that, hard work.

I just returned from China last month, and where I think we average maybe six hours and 52 minutes a day workday, they are averaging 10 hours and 35 minutes in their workday. We sat down with the Chinese that are now pushing science and math education like they have seen accomplished in countries like India and Pakistan, where it becomes a priority, almost for every student. And as we have seen with the results from the recent Third International Math and Science Study, as well as evidence that we have seen in our schools, it demonstrates in stark terms the need to improve math and science achievement for all students.

And while the U.S. students are nearly first in the world in science and above the international average in mathematics in grade four, this predominance is short-lived. In fact, the longer U.S. students are in school, the further they fall behind. By 12th grade, U.S. students rank among the lowest of all participating countries, only ahead of countries like Cypress and South Africa.

In response to this data, President Bush proposed the Math and Science Partnership program as part of his comprehensive education reform initiative. This program was created to support partnerships between colleges and universities and elementary and secondary schools, but it also sought to challenge long held practice and support innovative projects in math and science.

However, universities and colleges aren't the only organizations that partner with schools to improve K through 12 math and science education, as our witnesses today will comment on. And in those communities where business and industry have been more aggressive in supporting their schools and helping with math and science education to stimulate the sparking of the fire and to make sure that that flame continues, there is significant difference with those students and the achievement of those students.

As I mentioned before the markup, H.R. 4030 creates a Congressional Medal for private entities for outstanding contributions to

math and science education at the K through 12 schools. In addition to recognizing these efforts, the legislation requires the National Science Foundation to make information about award winners publicly available so that examples of techniques and strategies can be used around the country.

[The prepared statement of Chairman Smith follows:]

PREPARED STATEMENT OF CHAIRMAN NICK SMITH

I'd like to welcome all of you here today for this Research Subcommittee hearing on H.R. 4030, the *Congressional Medal for Outstanding Contributions in Math and Science Education Act of 2004,* which Ranking Member Johnson and I introduced last week.

Last year, during the consideration of legislation to authorize the Math and Science Partnership Program, I asked our witnesses to consider the following question: if education is more the lighting of a fire than filling a container with facts, when is that fire lit for math and science and how do we keep it kindled?

They all had different answers. Some said third grade. Others said kindergarten. Yet they all agreed that our greatest failure—and our greatest challenge—was that too many children failed to experience the spark at all. As a result, too few received the math and science education they deserved.

We need to do a better job of encouraging and training students in science and math so that they and the United States can be successful in the highly competitive job market that is emerging. The way to maintain and increase our standard of living is through innovation, technological advancement and hard work. Unfortunately, our schools aren't producing enough young people with the math and science skills necessary to meet demand.

Results from the most recent Third International Math and Science Study (TIMSS)—as well as evidence all around us—demonstrate in stark terms the need to improve math and science achievement for all students. While U.S. students are nearly first in the world in science and above the international average in mathematics in grade four, this predominance is short-lived. In fact, the longer U.S. students are in school, the farther they fall. By l2th grade, U.S. students rank among the lowest of all participating countries and ahead of only Cyprus and South Africa.

In response to this data, President Bush proposed the Math and Science Partnership Program as part of his comprehensive education reform initiative. This program was created to support partnerships between colleges and universities and elementary and secondary schools but it also sought to challenge long held practices and to support innovative projects in math and science.

However, universities and colleges aren't the only organizations that partner with schools to improve K–12 math and science education. As we will hear from our witnesses, businesses and other private entities understand the importance of investing in math and science education today to produce a quality workforce in the future. Private entities work with schools to improve education in a variety of ways.

As I mentioned before the markup, H.R. 4030 creates a Congressional Medal for private entities for outstanding contributions to math and science education at K–12 schools. In addition to recognizing these efforts, the legislation requires the National Science Foundation to make information about award winners publicly available so that examples of techniques and strategies can be utilized around the country.

Chairman SMITH. In a moment, I will introduce our witnesses, but now I will recognize Ranking Member Johnson for five minutes to make her opening statement.

Ms. JOHNSON. Again, thank you, Mr. Chairman.

As the cosponsor of the legislation, I speak in support of its favorable consideration by the Research Subcommittee today. It is very important that we meet to recognize the important contributions made by these individuals. Teachers improve the lives of children and their families and strive to give voice to their legitimate professional, economic, and social aspirations to strengthen the institutions in which we work, to improve the quality of the services we provide, to bring together all members to assist and support one

another, and to promote democracy, human rights, and freedom in our union, in our nation, and throughout the world.

I believe that education must be our number one national priority. In fact, during my almost 30 years as a legislator, I have fought to ensure that education is on top of the legislative agenda. In 1974, Mr. Chairman, I carried my first legislation encouraging more participation in the math and science by minorities and women, and we are still struggling. Now it needs to be everyone.

I want to thank you for bringing H.R. 4030 before the Subcommittee for its consideration today, and I am pleased to recommend the bill to my colleagues and seek their approval for a favorable report of the legislation to the Full Committee.

Thank you very much, and I look forward to hearing the witnesses.

[The prepared statement of Mr. Honda follows:]

PREPARED STATEMENT OF REPRESENTATIVE MICHAEL HONDA

I thank Chairman Smith and Ranking Member Johnson for introducing this legislation and holding this hearing and markup today.

In Silicon Valley, we have been fortunate to have companies involved in K–12 education in a variety of ways for many years. Contributions vary widely, ranging from the employees of individual companies such as Xilinx who donate stock options to schools to consortia of many companies and groups.

Industry Initiatives for Science and Math Education (IISME) was founded by a consortium of Bay Area industries in partnership with the University of California at Berkeley. IISME seeks to transform teaching and learning through industry-education partnerships by focusing on teachers as the primary agents for effecting change and offering a number of professional development opportunities for professional development for K–12 teachers.

Workforce Silicon Valley has brought together leading Silicon Valley employers, represented by the Silicon Valley Manufacturing Group (SVMG), with local K–12 districts, colleges and training organizations, employers, parents, and community members, to narrow the gap between the skills of Silicon Valley youth and the needs of high-performance organizations.

The Resource Area for Teachers provides thousands of Bay Area teachers and community groups with a wide range of interactive learning materials, enhancing math, science, and technology programs. Materials are surplus items donated by over 1,000 local businesses.

These examples represent only a small piece of the wide range of ways that private sector entities can help to improve our K–12 science education programs. All of these private entities have reasons to engage in this activity, primarily philanthropy but often because they recognize that it provides a benefit to them, in a more well-prepared future workforce. I don't know that the recognition of a medal is going to encourage more participation in such programs.

Current efforts are certainly worthy of commendation, but I wonder whether it might be a better use of federal resources to work on improving the K–12 system so that such programs would not be necessary. However, if the medals program will successfully distribute information about the efforts going on nationwide and help generate more efforts like this, it may be worth the effort. At this hearing and markup, I hope the witnesses will enlighten us on whether these medals will actually encourage more of this kind of effort.

Chairman SMITH. Thank you.

And Congresswoman Johnson, we are going to have you introduce our Texas guests, but I will—going down the line, let me start with Ms. Bailey.

Ms. Antoinette Bailey is the Vice President of Community and Education Relations at the Boeing Company where she is responsible for corporate charitable contributions, employee contributions, volunteerism, external education funding and initiatives, and prior to the merging of Boeing and McDonnell Douglas, Ms. Bailey

served as Vice President of Community Relations of McDonnell Douglas and President of the McDonnell Douglas Foundation. So Ms. Bailey, welcome, and thank you for being here.

And our second witness, Mr. Engeln, is the Resident Practitioner for Business-School Partnerships at the National Association of Secondary School Principals. Mr. Engeln has nearly 30 years of experience in public education in various positions at Colorado high schools, including as principal of the William J. Palmer High School in Colorado Springs, where he initiated partnerships with more than 100 businesses. Mr. Engeln also was a finalist for Colorado Teacher of the Year and a recipient of the prestigious Kappa Delta Pi Award for outstanding contributions to education programs.

And now for your introduction, Ms. Johnson.

Ms. JOHNSON. Thank you very much, Mr. Chairman.

It is my pleasure to introduce our invited guest from Texas Instruments, Mr. Torrence Robinson. Mr. Robinson is a Director of Public Affairs for Texas Instruments where he has focused on creating, promoting, and driving many of the company's education initiatives. After college, Mr. Robinson entered the information technology industry in the area of sales and marketing. He currently serves as Chair of the Texas Technology Workforce Development Program Advisory Committee, a committee of the Texas Higher Education Coordinating Board, and is a member of the Greater Dallas Chamber's Education Taskforce. He holds a Bachelor of Science degree in Computer Science from the University of Maryland, and he was the recipient of the National Black Engineer of the Year Award in the category of Corporate Promotion of Education of 2001 and is cofounder and advisor to the Infinity Project, a national early college math and science based engineering and technology initiative based at Southern Methodist University. I thank him for agreeing to testify today, and we look forward to his testimony.

Thank you, Mr. Chairman.

Chairman SMITH. Thank you. Our next witness is a dear friend of this Committee, Dr. Judith Ramaley. And as I read through some of your qualifications, I think it is good to note that the reason—one of the reasons, I think, that the National Science Foundation has been so successful and such a good leader in our efforts for research and improving what we are doing in the efficient manner that we do is people with the kind of qualifications that you have, Dr. Ramaley. Dr. Ramaley is the Assistant Director of the Education and Human Resource Directorate at NSF. And prior to joining NSF in 2001, Dr. Ramaley was President of the University of Vermont, and before that, Portland State University. At both universities, she also held a full professorship in biology. So welcome, Dr. Ramaley.

The fifth witness today is Mr. Gus Krudwig, a good friend from Jackson, Michigan. He is the founder of the Glou Factory in Jackson, Michigan, established in the year 2000. The Glou Factory supports after-school, weekend, and summer enrichment programs for students in areas ranging from computer technology to woodworking, and has been successful at bringing in companies and businesses to support that effort.

So ladies, gentlemen, welcome. And your total testimony will be included in the record, and try to keep your testimony in the range of five or six minutes. We will start with you, Ms. Bailey.

STATEMENT OF MS. ANTOINETTE M. BAILEY, VICE PRESIDENT, COMMUNITY AND EDUCATION RELATIONS, BOEING COMPANY

Ms. BAILEY. Thank you, and good morning, Mr. Chairman and Members of the Committee. I am delighted to have the opportunity to speak with you this morning.

As was repeated earlier, my name is Antoinette Bailey, and I am the Vice-President of Community and Education Relations for the Boeing Company. I am pleased to share with you some insights on the important issue of math and science education to the Boeing Company.

As you are aware, and have well articulated in your presentation, a skilled workforce is critical to not only the success of technology companies, like the Boeing Company, but is just as critical to the success of the U.S. economy into the future. As the global economy has transformed over time from a rapid industrial expansion to the Cold War era, to the information age, and to what many now refer to as the knowledge age, it is imperative that our educational system is aligned to meet that challenge of producing qualified workers.

In the aviation industry, the desired attributes of our workers have dramatically transformed. Boeing and other companies need people with great math, science, reading, and communication skills as well as a desire to constantly expand their horizons. We have moved beyond the vocational and basic technical skills to systems integration, working together, and leadership as the most important qualifications for our employees. The Nation's entire educational system has to work together to ensure that our future workforce is ready to work and the existing workforce has the opportunity to add new skills as necessary.

Boeing has long been committed to early childhood and K through 12 education. Last year, we worked with education experts from across the country to determine the most effective strategies for our involvement in education. We took several deliberate steps before refining our education strategy. Initially, we conducted an environmental scan. What is really going on in the world of early learning and K through 12 education and what are the facts, not merely anecdotal stories? What are the experts telling us?

We consulted with not only academic experts, but also with others, such as people who are affiliated with the authorship of "No Child Left Behind." Here is what we heard, and this is critical information for us. There are actually two boxes that we paid attention to. The first had to do with the Boeing Company. One, we needed to be introspective. We needed to understand our own strengths and capabilities as a company. The other thing that was important for us is we needed to begin to leverage our resources. While spreading dollars and spreading employee involvement tends to put the smile on the faces of communities, it does very little in really making a significant impact in education. We also needed to collaborate. It is impossible for us, as an industry and as a com-

pany, to singularly make the impact necessary in order to move our educational system forward.

The second thing that we learned was in the other box, and that had to do with what was important in terms of our investments. Our investments needed to demonstrate that they were of extreme quality and that they were measurable. They also needed to be scalable. Being successful in one school or in one school district is not enough. We need to be able to replicate success. And of course, it needs to be sustainable. Once again, one time is not nearly sufficient.

Our strategy is to align and leverage our resources to support systemic and continuous improvement in school systems and learning environments, concentrating on teacher effectiveness in literacy, math, and science. Our company's involvement in this strategy begins with our leadership and includes every segment of our employee population, no matter their professional role. We support initiatives that fit this strategy across the country where our employees live and work.

I brought with me today an example of one of these programs, and if you will look either to your left or to your right, you will see the new wallpapering for your office here, and those are our "Forces of Flight" posters. Also attached is a teacher's guide in front of you. This unique program was developed with collaborative efforts, and it is really fortuitous the development, which says to us, as businesses, that opportunities are all around us for impacting student engagement in math and science. We actually have leadership who are going into our school systems in various communities and taking with them a variety of things, but with minimal educational value.

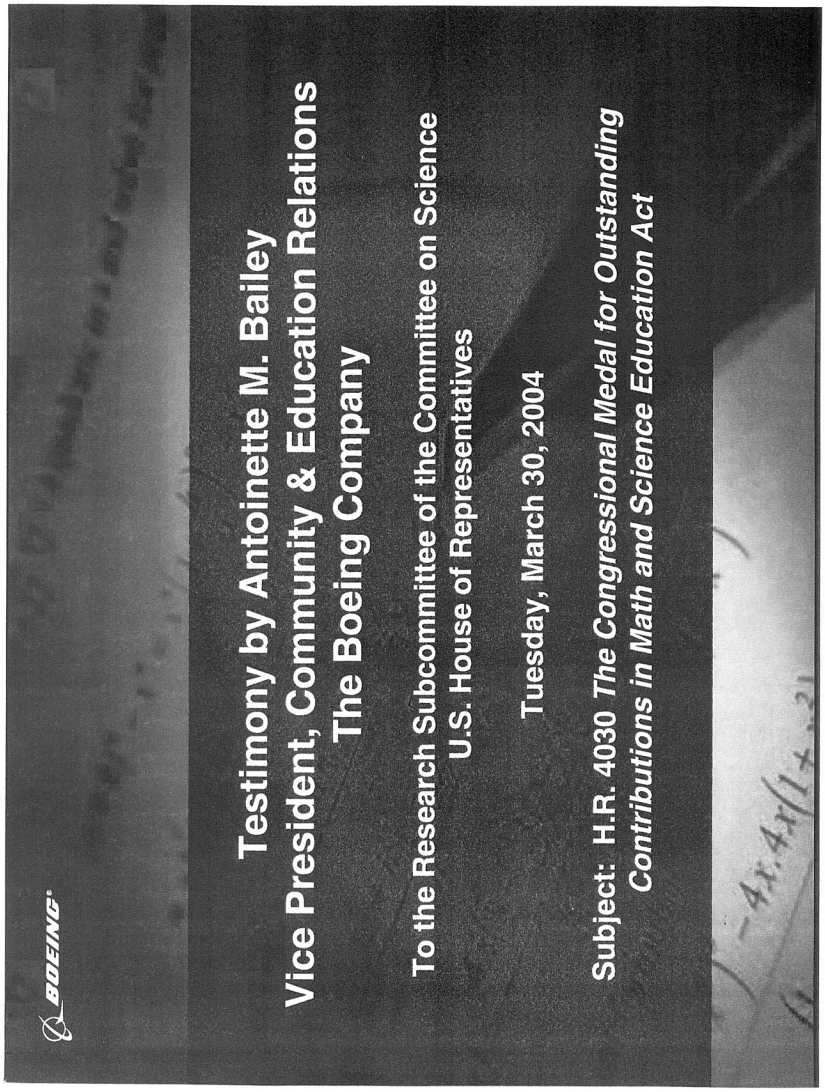
Coming back to the table and taking a look at what could we do as we were visiting classrooms, we were able to develop, along with our engineers and the educational experts, what you see in front of you, which is a series of posters that engage students and excite them about the mystery of flight itself. This unique program, again, was developed collaboratively with our engineers and with the educational professionals. And more than 20,000 of these posters, along with the teacher's guides, have been distributed to schools in the U.S. and in some international locations. It is designed to meet the federal and multi-state standards in math and science while teaching the students the marvels of flight.

This is just one program we are supporting at Boeing that, we believe, enhances the math and science skills so very important to the next generation of workers. One of our former leaders has well articulated the requirement. Workers must be able to draw on a solid core of knowledge and skills. They must be well grounded in math and science, able to read and comprehend complex text, and capable of writing clearly and cogently. This mastery is essential to our future.

We applaud the efforts of all of those here today that are working innovatively to improve and highlight the importance of math and science education in our nation's schools. We are all reliant on the future workforce to ensure our company's success and ensure not only our country is competitive, but a leader in the global economy.

Once again, I would like to thank you for the opportunity to speak here today.

[The prepared statement of Ms. Bailey follows:]



The Transforming Economy

Rapid Industrial Expansion

- "Vocational" orientation
- Limited mathematics
- Emphases on:
  - data gathering
  - problem solving
  - design (and drafting)
  - manufacturing

Transform from Agrarian to Manufacturing Economy

Cold War Era

- Emphasis on technical knowledge
- Emphasis on theory and mathematics
- Decreasing emphasis on design and manufacturing
- "Publish or perish"

Big science, rapid technological advances, international perspective

Information Age

- Retain strengths in math and physics
- Enhanced IT emphasis
- Emphasis on design and manufacturing
- Emphases on breadth, context, and process:
  - Economics, business, project management
  - Environmental and societal issues
  - Teamwork and communication skills
  - Career-long learning

Emerging post-Cold War global economy, enabled by transportation and communications technology

Knowledge Age

- Adding "Knowledge Management" to the Information Age

The ability to quickly retrieve, synthesize and apply data for an integrated solution

1900 — 1950 — 2000

"Desired Attributes of an Engineer" for Boeing

- **A good understanding of engineering science fundamentals**
  - Mathematics (including statistics)
  - Physical and life sciences
  - Information technology (far more than "computer literacy")
- **A good understanding of design and manufacturing processes** (i.e. understands engineering)
- **A multi-disciplinary, systems perspective**
- **A basic understanding of the context in which engineering is practiced**
  - Economics (including business practice)
  - History
  - The environment
  - Customer and societal needs

http://www.boeing.com/companyoffices/pwu/attributes/attributes.html

- **Good communication skills**
  - Written
  - Oral
  - Graphic
  - Listening
- **High ethical standards**
- **An ability to think both critically and creatively - independently and cooperatively**
- **Flexibility - the ability and self-confidence to adapt to rapid or major change**
- **Curiosity and a desire to learn for life**
- **A profound understanding of the importance of teamwork**

- *This is a list, begun in 1994, of basic durable attributes into which can be mapped specific skills reflecting the diversity of the overall engineering environment in which we in professional practice operate.*
- *This current version of the list can be viewed on the Boeing web site as a basic message to those seeking advice from the company on the topic. Its contents are also included (for the most part) in ABET EC 2000.*

The state of TEACHER PREPARATION and K-12 Student Performance in the United States

- 50% of high school physical science 27% of mathematics courses, are taught by teachers who don't have backgrounds in those fields. The proportions are even higher in high-poverty schools and in lower track classes. (National Council for Accreditation of Teacher Education – NCATE)
- Students have increasingly spent more time in math and science classes each day, yet their achievement in the past 30 years has remained unchanged (US Department of Education)
- U.S. high school seniors ranked 19th out of 21 industrialized nations in math testing and 16th in science. (Third International Math and Science Study – TIMSS)
- Teachers earn substantially less than other professionals, including accountants, sales representatives, and engineers.
- Out-of field teachers are more common in physical science than any other regular subject in both middle and high school grades. (The Condition of Education 2003)
- More than 12 percent of all newly hired teachers enter the workforce without any professional teacher licensing. (NCATE)
- Researchers have explored and proven that teachers' knowledge and ability are associated with student learning. Students learn more from math teachers who majored in math than from teachers who did not. And more from math and science teachers who studied teaching methods in the subject they teach than from those who did not (Mon 1994; Goldhaber and Brewer 1997)
- Fewer than 75 percent of all teachers have studied child development, learning, and teaching methods; have degrees in their subject area; and have passed state licensing requirements. (National Center for Education Statistics)

Boeing: Why get involved?
Our Core Beliefs

- **There is a direct link between a healthy and productive business and an educated community**
- **People are our competitive advantage**
- **Employees need skills to effectively compete in the Information and Knowledge Ages**
- **The educational capacity of our workforce, particularly in math, science and communication skills, is critical**

Boeing Concerns with Former Early Childhood and K-12 Education Strategy

- **Investments had questionable impact on improving student performance**

- **Many programs were**
  - **Not able to demonstrate measurable improvement in student performance**
  - **Not necessarily aligned to student performance goals**
  - **Too diffused with limited cash resources**
  - **Not addressing the most pressing needs required by No Child Left Behind**
    - **Qualified teachers**
    - **Performance to standards**

- **Internally, guidelines for Boeing involvement were often vague**

ACTION: In 2003 Boeing worked with national experts to refine its strategy

Environmental Scan

What the data is saying:

- Growing number of minority and immigrant students
- Low expectations and poor school leadership inhibit high performance
- Differences in achievement and performance among students
- Differences in teaching quality
- Poor college preparation
- Middle school students lag behind their international peers
- Acute shortage of math & science teachers in the next 10 years
- Poor teacher quality, especially in middle school
- Quality of instruction is biggest determinant in quality of education
- School systems now being held accountable for performance to standards

Environmental Scan:

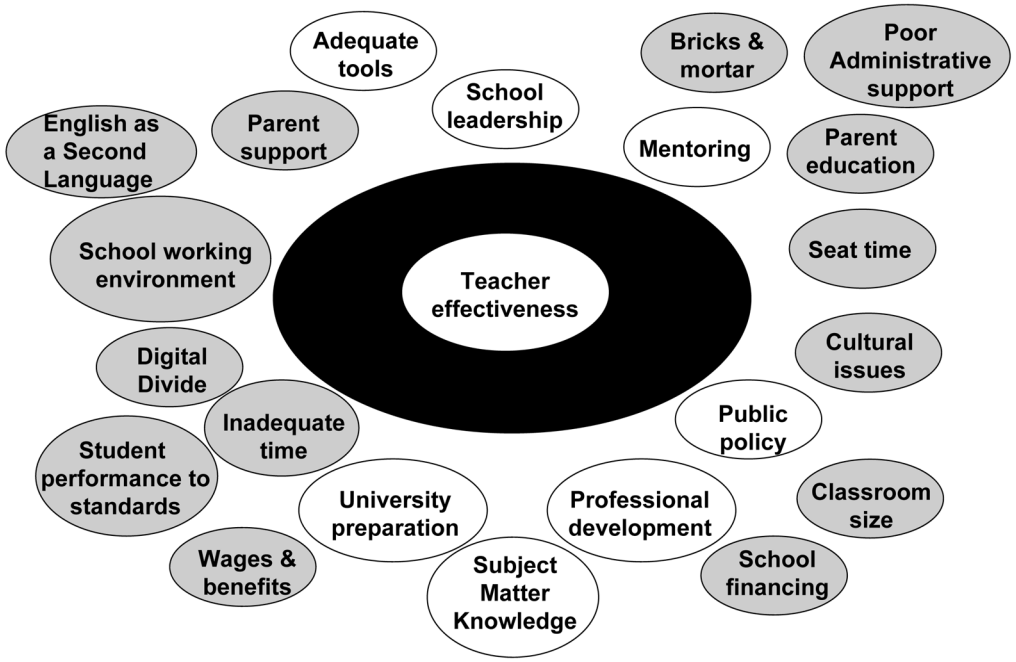
Federal Legislation (No Child Left Behind)

- **Federal mandate authorizes the Elementary and Secondary Education Act**
- **Requires states to implement state-wide accountability systems covering all public schools and students**
  - Challenging state standards in reading, math & science
  - Annual testing for all students
    - Reading & Math– grades 3 through 8
    - Science – sometime during each of the following: elementary, middle & high school
  - Annual statewide progress objectives ensuring all students reach proficiency within 12 years
- **More choices for parents & students of failing schools**
- **Greater flexibility for states, school districts & schools in the use of Federal education funds**
- **Quality teaching in every classroom by 2006**

Environmental Scan: Experts

- **What education system experts are telling Boeing:**
  - Be a leader in education public policy
  - Develop the capacity of teachers & school leadership
  - Get more focused
  - Define conditions for investing resources
    - Quality
    - Scalability
    - Sustainability
  - Leverage your strengths to impact the system
  - Collaborate/partner with others – Boeing can't do it by itself

Leading Factors that Affect Teacher Effectiveness <u>and Align to Boeing Strengths</u>



The Boeing Early Learning and K–12 Education Goals

- **Align and leverage all resources to support systemic and continuous improvement in public school systems**
- **Focus on teacher effectiveness in Early Learning and K-12 public education**
- **Target math, science and literacy**
- **Enable all children to succeed in a technological and global society**

The Boeing Early Learning and K-12 Education Strategy

Boeing will align and leverage its resources to support systemic and continuous improvement in school systems and learning environments, concentrating on teacher* effectiveness in math, science and literacy. We will utilize:

- Leadership engagement
- Employee involvement
- Cash and in-kind resources
- Core competencies:
  - Leadership
  - Human resource development
  - Large-scale systems integration
  - Math, Science and Literacy

*** "Teacher" in early learning is broadly defined as parent or primary caregiver**

Investment Highlights: Leadership Engagement

- **Achieve, Inc.: Independent coalition of corporate leaders and governors to raise academic standards, improve assessments and strengthen accountability in schools**

- **New Leaders for New Schools: Senior executives mentoring principals-in-training**

Investment Highlights: Employee Involvement

- **Educator Enrichment Day: Provides new ideas to elementary and middle school teachers to make math and science lessons more exciting and tangible for students**

- **Software for Success: Boeing employees tutor children via a web-based program developed by reading specialists to improve literacy**

Other Investment Highlights:

- **Education is the priority funding area for Boeing**
- **Forces of Flight: Collaboratively designed educational posters with teacher guides and experiments to explore the forces of flight**
- **Chicago Public Education Fund: Focused on programs aimed at recruitment, retention and effectiveness of teachers and principals**
- **Project LASER: State-wide effort to assist school districts in developing and implementing plans to improve K-8 teacher training**
- **Foundation for Early Learning: Improved public awareness on the importance of providing quality early learning opportunities**

Outcome Measures are Essential

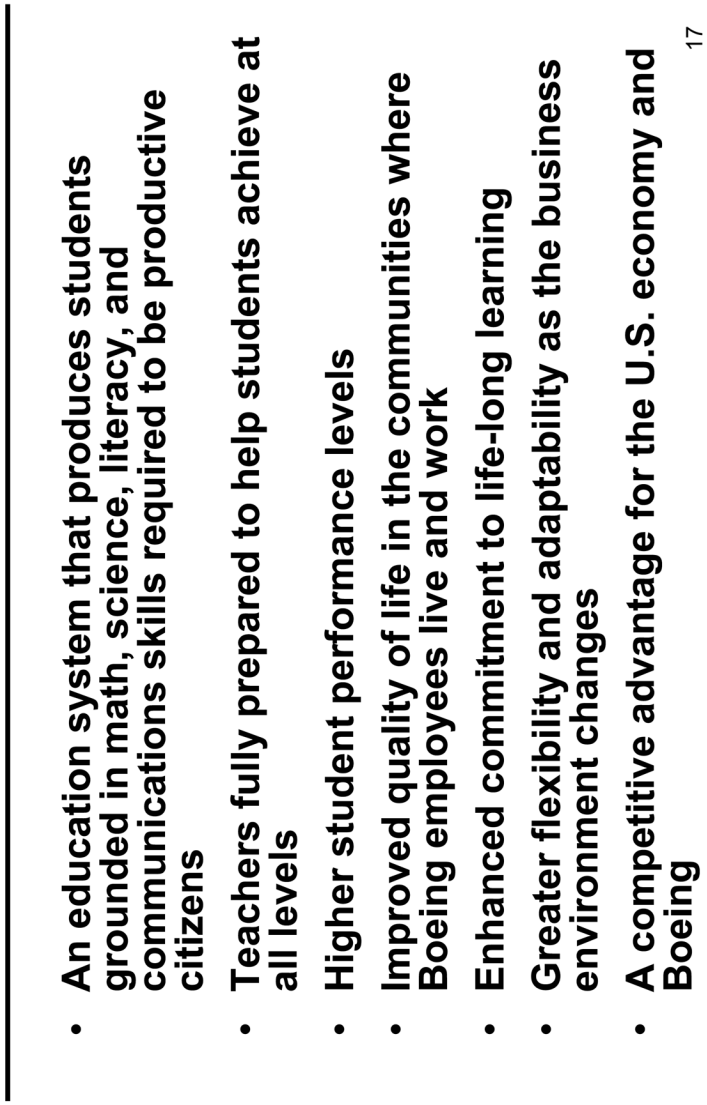
Selected measures being initiated by Boeing

Early Learning

- Number of teachers & parents trained in the basics of early childhood education
- Pre and post test results of training based on verbal and quantitative skills of students
- Changes in teacher and caregiver behavior assessed by outside experts as a result of training
- Quality of family child care provider performance based on *Educare* model
- Longitudinal analysis of middle school performance for students in quality early learning environment vs. students in non-educational childcare

K-12

- Number of superintendents, principals, and teachers attending professional development workshops
- Pre and post workshop analyses of attendee comprehension
- Changes in student performance on district level assessments
- Longitudinal analysis of student academic performance in math, science and literacy



BIOGRAPHY FOR ANTOINETTE M. BAILEY

Toni Bailey is responsible for all community and education relation's activities at The Boeing Company, including corporate charitable contributions, employee contributions, volunteerism and external education funding and initiatives.

Prior to the merger of Boeing and McDonnell Douglas in 1997, Bailey was Vice President–Community Relations of McDonnell Douglas and President–McDonnell Douglas Foundation. She previously served as Human Resource Division Director for McDonnell Douglas Aerospace–East.

Bailey joined McDonnell Douglas in 1984 as an EEO representative and later led the function. She then had increasing responsibilities that included human resource management, employment, training and development. She later became the Division Director for Human Resources and during her tenure in that discipline; she was also

an adjunct professor at Florissant Valley Community College. Prior to joining McDonnell Douglas, she worked as a counselor for the Hearing-Impaired for the State of Missouri from 1980 to 1984.

Bailey received a Bachelor's degree in philosophy from Southern Illinois University–Carbondale and a Master's degree in guidance and counseling at Michigan State University–East Lansing. She also completed post-graduate doctoral work in the field of rehabilitation counseling at Michigan State University from 1973 to 1975. She was a National Institute of Mental Health Fellow while attending Michigan State University and has attended executive training at The Wharton School. She has also been an executive in residence at Seattle University.

Bailey is President of the Board of Directors of the YWCA of Metropolitan St. Louis, board member of The Chicago Foundation for Women, past Chairman of the Contributions Committee of the Conference Board and a member of the Advisory Council to the College of Business & Technology at Webster University. She is also a member of the International Women's Forum, the Missouri Women's Forum and the St. Louis Gateway Links.

Ms. Bailey has made numerous presentations nationally and internationally on the subject of Corporate Citizenship and strategic philanthropy.

Antoinette M. Bailey
Vice President
Community &
Education Relations

The Boeing Company
100 N Riverside MC 5002-6450
Chicago, IL 60606-1596

March 31, 2004

BOEING

The Honorable Nick Smith
Chairman, Research Subcommittee
2320 Rayburn Office Building
Washington, DC 20515

Dear Congressman Smith:

Thank you for the invitation to testify before the U.S. House of Representatives Committee on Science on March 30th for the hearing entitled *The Business of Math and Science Education: H.R. 4030*. In accordance with the Rules Governing Testimony, this letter serves as formal notice that The Boeing Company received no federal funding directly supporting the subject matter on which I testified, in the current fiscal year or either of the two proceeding fiscal years.

Sincerely,

Antoinette M. Bailey

Antoinette M. Bailey

cc: Brian Wagner

Chairman SMITH. Thank you.
Mr. Engeln.

STATEMENT OF MR. JAY T. ENGELN, RESIDENT PRACTITIONER FOR BUSINESS-SCHOOL PARTNERSHIPS, NATIONAL ASSOCIATION OF SECONDARY SCHOOL PRINCIPALS

Mr. ENGELN. Thank you.

Across the Nation, from the smallest towns to the largest cities, the quality of virtually every community is defined by the strength of its public schools. While the most important "stakeholders" in these schools are students and their parents, local employers and national businesses have a vested interest in the success of schools as well. School-business partnerships do not guarantee success. Partnerships do, however, provide additional resources that support teachers in doing what they do best. They can enhance the educational experience for students and afford learning opportunities that might not otherwise be available.

As Senator Lamar Alexander stated, "Partnerships between businesses and schools can significantly enhance the quality of education we are able to provide." Statistics show that successful school-business partnerships promote improved student achievement, reduce self-defeating behaviors amongst students, create better school environments, build stronger communities, and enhance property values. School-business partnerships do help support programs that positively impact student achievement.

I couldn't help but notice the quote on the wall behind you: "Where there is no vision, the people perish." Well, Henry Ford also stated, "Vision without funding is just a hallucination." And as I look at business partnerships, they are so critical in helping schools see their educational vision become a reality.

School-business partnerships at William J. Palmer High School in Colorado Springs directly related to math and science achievement involved companies and organizations, such as Texas Instruments, the American Cancer Society, Memorial Hospital, Colorado College, Pikes Peak Medical Society, the American Red Cross, Richard Lightle Architects, Colorado Springs Utilities, Six Flags Amusement Parks, Colorado Interstate Gas, The Coca-Cola Company, and the U.S. Forest Service to name a few. Partnership involvement included mentor programs, internships, guest speakers, tutors, volunteers, motivational incentive programs, financial support for school programs, textbooks, equipment, supplies, on-site professional development for staff, resources to send staff and students to conferences and workshops, support for extracurricular activities, and programs for at-risk students are also benefits realized from the partnership relationships.

In addition to the partnership benefits just mentioned, science, math, and engineering related contributions included partnering with companies on science fair projects, donations of lab equipment that exceeded what the school could afford to buy, support for students to attend national and international science fair competitions, use of sophisticated lab equipment for experiments, items such as electron microscope, x-ray machines, gas chromatographs, things we just don't typically have in a high school, field studies and opportunities for both students and teachers to attend semi-

nars or workshops on math and science related topics held at local companies and colleges or universities.

Partnership relationships also provided students with an opportunity to better understand possible career options related to science, math, and engineering. Seeing the relevancy of what is done in school and applications to the world of work is a strong motivator for students. Students actively explored career pathways and selected courses of study accordingly, oftentimes with input from mentors in their chosen field. There is clearly a need for a well-educated workforce, and partnerships can, and do, help in meeting this need.

I want to share with you some information from William J. Palmer High School relative to what happened at our school over a five-year period when we had over 110 business partnerships involved with the school. First of all, our dropout percentage rate decreased from 8.4 percent to 3.4 percent. Specifically, with minority populations, the Hispanic dropout rate declined from 14.6 to five percent, for Black students, from 12.9 to 3.9 percent. We also saw behaviors change with students. We had over 3,000 referrals and 698 suspensions in '95/'96. That dropped to 855 and 122. And during this time period, as the students wanted to attend our school, enrollments increased. We actually went from 1,080 students to 2,017. So we almost doubled in size and still had that decrease in referrals and suspensions. The honor roll also saw a significant increase, and this wasn't an inflated statistic, because we also saw that our test scores on the ACT and the SAT as well as state assessments went up accordingly.

A recent study done in October of last year by the Search Foundation also correlates with the data from Palmer High School and also, I think, leads into some of the things that Ms. Bailey stated about leadership being important, etc. What we saw is that self-defeating behaviors decreased. I won't go into detail on this. If you just glance at this, the column on the right where it is high—or on the left, high exposure means there is more involvement in business partnership activity. Low exposure, less involvement. But we saw a decrease in what are called risk behavior patterns, but more importantly, if you go down here to the very bottom row and look at the increase in the thriving outcomes on leadership, also value and diversity and maintaining health, we also saw increases in those areas.

And finally, when we get to the specifics of math and science and reading, again, if you look at the column, the third one from the right, that has to do with the high exposure to partnerships. We saw improved reading, about 20 percent higher. Reading scores in those not exposed to partnerships. Improved writing and improved math skills. So the data—and this is very preliminary data. It is the only research out there at this time showing that correlation between school-business partnerships and involvement in partnership activities and academics.

Teachers also felt more appreciated for their efforts. Having additional resources available to them for programs that helped students was a plus. The business community becoming more involved in our school fostered a positive atmosphere that carried over be-

yond the classroom walls. Teachers were energized by the community's support for their educational endeavors.

Specifically related to science and math achievement, Palmer High School saw improved test scores in math and science-related areas. For the general student populations, students dominated local, regional, and state science and math fair competitions, sending several students to national and international events. Test scores on the ACT and SAT went up. And also, scholarships for students going on to college increased significantly.

Ultimately, the bottom line is the better educated and prepared students are for the future, the better it is for businesses and our country. School-business partnerships in the areas of science, math, and engineering can have a positive impact on the academic achievement of students and provide them with the skills necessary to meet the challenges of the future. Working together, schools and businesses can achieve the extraordinary.

Thank you.

[The prepared statement of Mr. Engeln follows:]

PREPARED STATEMENT OF JAY T. ENGELN

Across the Nation, from the smallest towns to the largest cities, the quality of virtually every community is defined by the strength of its public schools. While the most important "stakeholders" in these schools are students and their parents, local employers and other businesses have a vested interest in the success of schools as well. Challenged by budget shortfalls in the face of efforts to have all students meet high standards, and recognizing the link between good schools, student achievement and a prosperous economy, schools and businesses are now more ambitious and creative than ever before in their efforts to work together.

1. Why did William J. Palmer High School choose to initiate partnerships with businesses in Colorado?

William J. Palmer High School is located in middle of downtown Colorado Springs. The school was facing a multitude of problems including declining enrollment, poor image in the community, high dropout rates, a failure rate of 49 percent in the ninth grade, dated facilities, high numbers of discipline referrals and suspensions, and a lack programs that demonstrated a clear relationship to future career opportunities. If you purchased a home in the Palmer High School attendance area it was not uncommon for realtors to share with potential buyers information about how they could get a permit to attend a school other than Palmer. Virtually every store in the downtown area had a sign in the window stating, "No more than two Palmer students allowed in store at one time."

In addition to the above challenges, the school district had not been successful in passing a bond issue in support of public schools for more than 25 years. The school district and William J. Palmer High School were facing touch financial times resulting in the elimination of programs and lack of resources to provide the best possible educational opportunities for student. During this same time period the downtown business community was also experiencing an economic slump. Business was slow and many stores were closing. People did not go downtown for shopping or dining.

In light of these problems, the staff members, students, parents, alumni and the business community (especially the downtown businesses) were committed to supporting the school and providing resources that had a positive impact on student achievement. We felt the school was a part of the downtown community and the community was also a part of the school. Working together we saw many positive changes take place in the school and in the downtown business community. In fact there was an article in the *Denver Post* describing the truly symbiotic relationship between Palmer High School and the downtown businesses and highlighted the unique role the school played in the renaissance of the downtown area as well as the impact the business community had on the many positive changes in the school. School/business partnerships were indeed a key element school's transformation. As a direct result of support from the many business partners, the school was able to keep programs in place that had a positive impact on student achievement.

2. How did your partners contribute to education, and math and science achievement in particular? What were the benefits of this involvement in education for your school, your teachers and your students? Did these partnerships have broader community impacts?

Partners Contribution to Education

As principal at William J. Palmer High School, both my staff and I initiated partnerships with Colorado College, the University of Colorado, Pikes Peak Community College, non-profit organizations and Colorado Springs business entities resulting in strong community support for educational and extra-curricular activities. More than 100 businesses and/or organizations were in place as partners with the school. A unique aspect of the school's involvement with the local business community was working with the Board of Directors of Downtown Colorado Springs, Inc., a consortium of Colorado Springs businesses that were committed to improving the downtown environment. Partnership involvement included mentor programs, internships, guest speakers, tutors, senior volunteers, motivational/incentive programs and financial support for the school's programs. Textbooks, equipment, supplies, on-site professional development for staff, resources to send staff and students to conferences and workshops, support for extra-curricular activities and programs for at-risk students are just a few of the benefits realized from partnership relationships.

Partnerships directly related to math and science achievement involved companies and organizations such as Hewlett Packard, Texas Instruments, The American Cancer Society, Memorial Hospital, Penrose Hospital, the Pikes Peak Medical Society, The American Red Cross, Richard Lightle Architects, Colorado Springs Utilities, Six Flags, Colorado Interstate Gas, the Colorado Springs Automobile Dealers Association, The Coca-Cola Company and the U.S. Forest Service. In addition to the partnership benefits mentioned above science/math/engineering related contributions included partnering with companies on science fair projects, donations of lab equipment that exceeded what the school could afford to buy, support for students to attend national and international science fair competitions, use of sophisticated lab equipment for experiments (ire. electron microscope, x-ray machine, gas chromatographs), and opportunities for both students and teachers to attend seminars/workshops and science related topics held at local companies and colleges/universities.

Benefits for School, Teachers and Students

School/business partnerships do not guarantee success. Partnerships do however provide additional resources that support teachers in doing what they do best. As Senator Lamar Alexander stated, "Partnerships between business and schools can significantly enhance the quality of education we are able to provide." Statistics show that successful school/business partnerships can:

Promote improved student achievement

Reduce self-defeating behaviors amongst students

Create better school environments

Build stronger communities

Enhance property values

School/Business partnerships do help support programs that positively impact student achievement.

As documented in the accompanying graphs covering a five-year period, the overall benefits for Palmer High School were significant. Instead of a declining enrollment, the school grew from 1,080 students to 2,017. The dropout rate decreased (14.6 percent to five percent for Hispanic students, 12.9 percent to 3.9 percent for Black students), the number of discipline referrals decreased from 3,157 to 855, the number of suspensions decreased from 699 to 122, and the number of students on the honor roll (3.25 GPA or higher) increased from 29.8 percent to 45.6 percent.

Teachers felt more appreciated for their efforts. Having additional resources available to them for programs that helped students was a plus. The business community becoming more involved in our school as well as our school becoming more involved in the community fostered a positive atmosphere that carried over beyond the classroom walls. Teachers were energized by the community support for their educational endeavors with students.

Students likewise appreciated the business involvement. They felt that people cared about them as individuals. Feeling embraced by the community impacted their behavior and their academic achievement. The entire atmosphere of the school and the downtown community began to change. Within a year all of the signs limiting the number of Palmer students allowed in a store came down.

Specifically related to science and math achievement, Palmer High School dominated local, regional and state science fair and math competitions, sending several students to national and international events. The school's test scores were consistently among the highest of any public or private school in southern Colorado and the amount of scholarship dollars for students going on to college increased significantly.

Broader Community Impact

Across the Nation, the quality of virtually every community is defined by the strength of its public schools. As mentioned earlier in this document, the impact of partnerships on the local community was noteworthy. The downtown business community began to flourish and the overall atmosphere changed for the better. The community's image of Palmer students and the school changed for the better. Students were now welcomed into business establishments.

Not only did the environment improve but the Board of Realtors reported the largest increase in property values for the Colorado Springs region was the attendance area served by Palmer High School. Not only were the partnerships good for the school, they were also good for business and property owners. Better schools do contribute to the economic health of a community.

3. What are the hallmarks of a successful partnership between schools and businesses? How do you measure that success? And how are those successes shared with other schools and businesses?

Hallmarks of Successful Partnerships

The Council of Corporate and School Partnerships conducted research with the National Association of Partners in Education to gather data from the field. Seeking out individuals currently engaged in business and school partnerships, more than 300 school administrators were interviewed, as well as business executives at more than 50 companies. These individuals helped identify what worked for them, what was important to them, and challenges they faced.

The Council then translated the findings into four themes and then ultimately into the eight Guiding Principles for School and Business Partnerships. Using the research data, the *Guiding Principles for Business and School Partnerships* were developed to help partners work together. A copy of the *Guiding Principles for Business and School Partnerships* booklet is provided for the members of the committee.

The *Guiding Principles for Business and School Partnerships* are designed to help educators and business leaders face educational challenges be developing relationships that support mutual goals, and offer long-term, sustainable benefits for students and schools. Recognizing that the needs and interests of various businesses are as widely diverse as the needs of small, large, urban, suburban and rural schools and school systems, the Guiding Principles were developed to be a framework for structuring partnerships, as opposed to a prescription for partnership particulars.

The eight guiding principles are:

1) School-Business partnerships must be built on shared values and philosophies.
2) Partnerships should be defined by mutually beneficial goals and objectives.
3) Partnership activities should be integrated into the school and business cultures.
4) Partnerships should be driven by a clear management process and structure.
5) Partnerships should define specific, measurable outcomes.
6) Partnerships should have support at the highest level within the business and school and concurrence at all levels.
7) Partnerships should include internal and external communication plans, which clearly illustrate expectations of all parties.
8) Partnerships should be developed with clear definitions of success for all parties.

Measures of Success

The success of a partnership can be evaluated in a multitude of ways. The goals and the objectives developed as part of the partnership process should be the focus of assessment. Partnerships should be guided by a collaborative agreement on outcomes, benchmarks and measures of progress. The partners should communicate regularly about the intended and actual outcomes of all partnership activities. There is already data collected at the school and/or district level for state and national ac-

countability needs. Use of this information whenever possible eliminates the need to duplicate efforts. Also data used for tracking student attendance and discipline referrals can be used. The are other partnerships assessment tools available on the Council for Corporate and School Partnerships website at *www.corpschoolpartners.org* and the National Association of Secondary School Principals website *www.principals.org.* A Self-Assessment Tool for Partnership Improvement is also included in the *How-To Guide for School-Business Partnerships* developed by the Council for Corporate and School Partnerships.

Sharing Partnership Success Stories

Schools and businesses must be proactive in sharing their successes relative to school-business partnerships. It is important that superintendents, principals, school board, CEOs and managers share partnerships successes both internally and externally on a regular basis. Allow opportunities for private and public recognition of partnership success. Share the good news!

Sharing Successes With Other School and Businesses

Workshops and/or presentations for school and business leaders are one way to share information about what works and work doesn't work relative to school/business partnerships. Equally important is sharing information about successful partnerships and providing schools and businesses with the tools to help them establish true partnerships—relationships that build upon shared understanding of the values that support mutual needs.

Sharing the *Guiding Principles for Business and School Partnerships* and the *How-To Guide for School-Business Partnerships* with educational and business leaders can serve as a foundation upon which to build relationships that support mutual goals and offer long-term, sustainable benefits for students, schools and communities. Through the development of school-business partnerships, communities would see added value to their school environment and ultimately additional support for the educational mission of the school.

4. How can we encourage more businesses and their employees to partner successfully with struggling schools? How would a national recognition and information dissemination program, as envisioned by H.R. XXXX, help?

Encourage Partnering With Struggling Schools

Recent research conducted by the National Association of Partners in Education in conjunction with the Search Institute shows a positive relationship between student involvement in partnerships activities and success in school. Not only does the research show a trend toward improved achievement, but also a reduction in "Risk Behaviors" such as alcohol use and discipline problems at school. An increase in "Thriving Outcomes" was also noted in behaviors related to health habits, valuing diversity and demonstrating leadership. The data from Palmer High School mirrors the results of the Search Institute.

Improved student achievement, reduction in self-defeating behaviors and an increase in positive outcomes should be incentive for increased business involvement. Ultimately, the bottom line is the better educated and prepared students are the better it is for businesses and our country. Working together we can achieve the extraordinary!

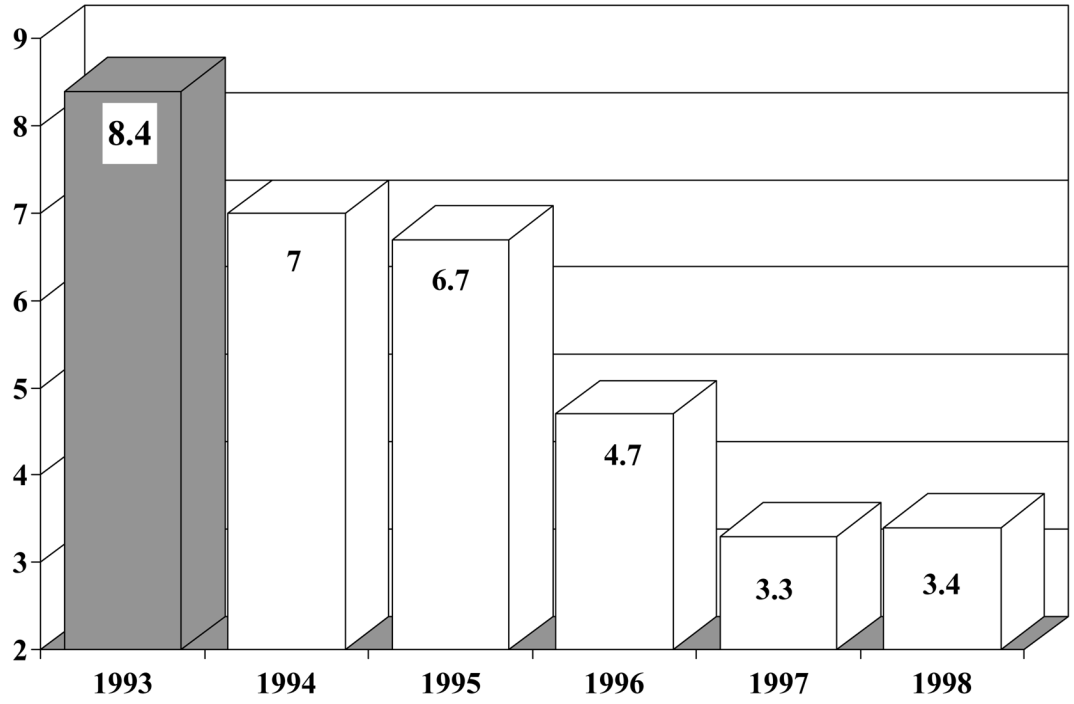
National Recognition Program

As mentioned earlier, sharing information about successful partnerships helps other schools and businesses see the positive impact of school/business partnerships. Recognition programs do help get the word out to others and gives schools and/or businesses potential models and/or contacts to use in setting up their own partnership programs.

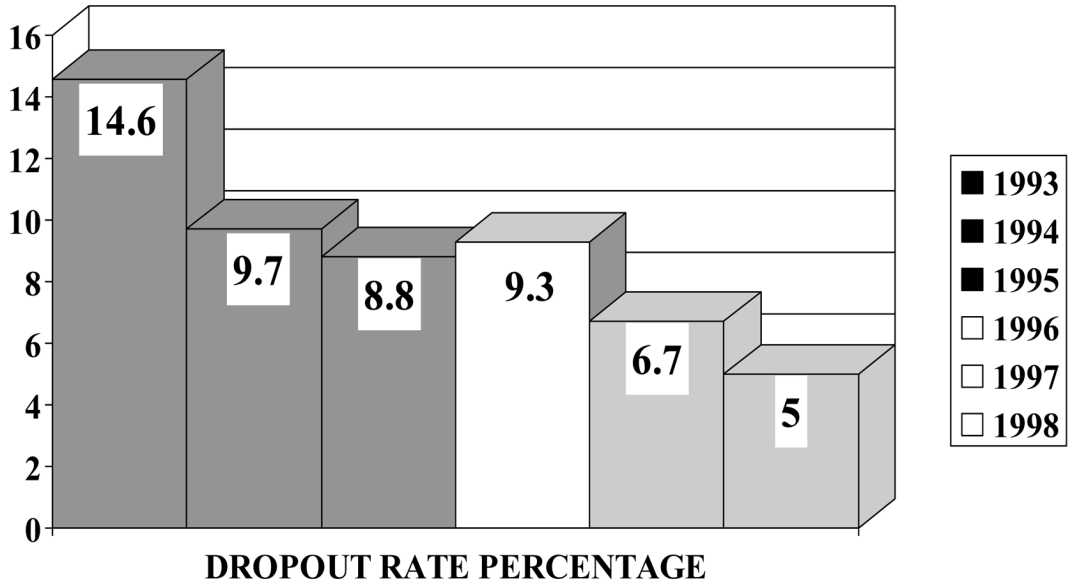
William J. Palmer High School

Student Achievement and Discipline Referral Data

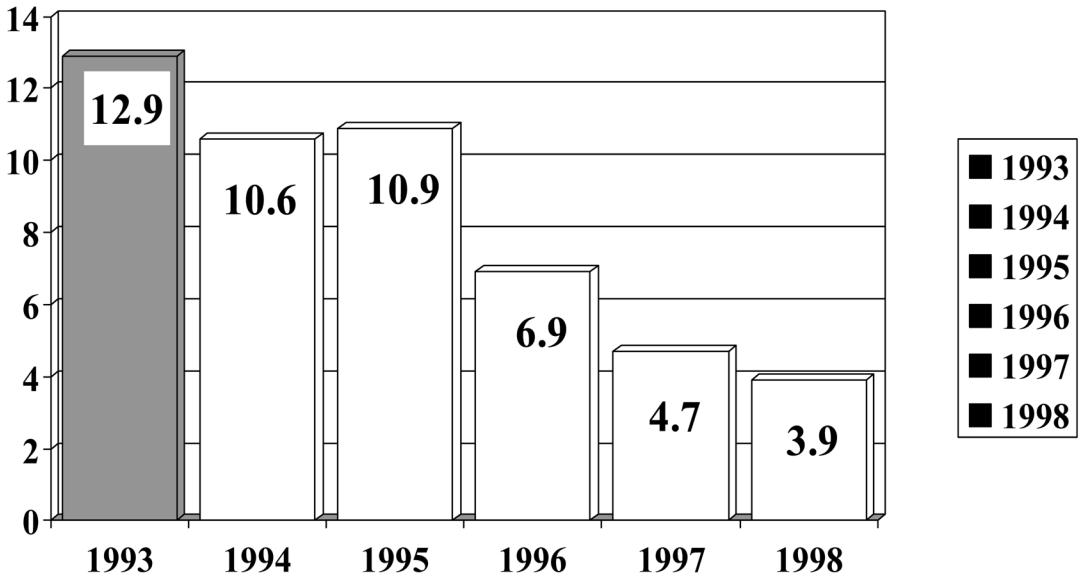
Dropout Percentage Rate



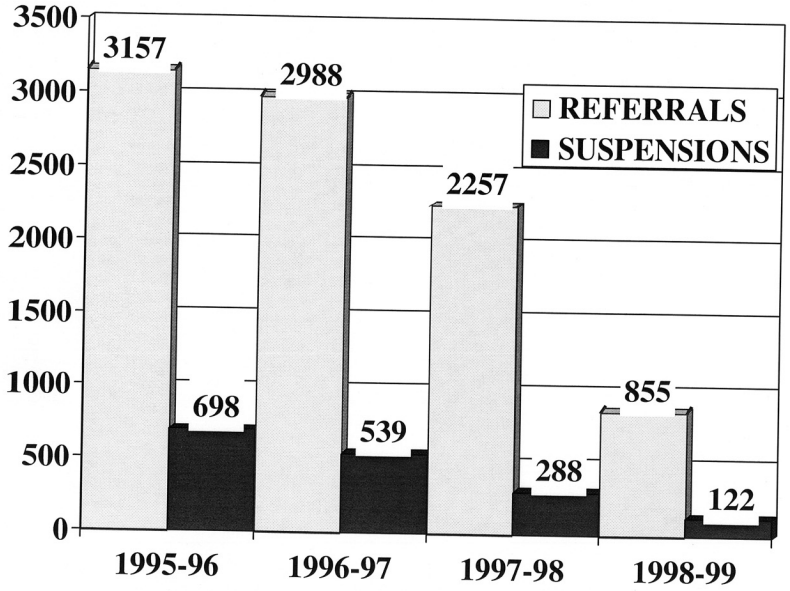
STUDENT DROPOUT RATE
HISPANIC

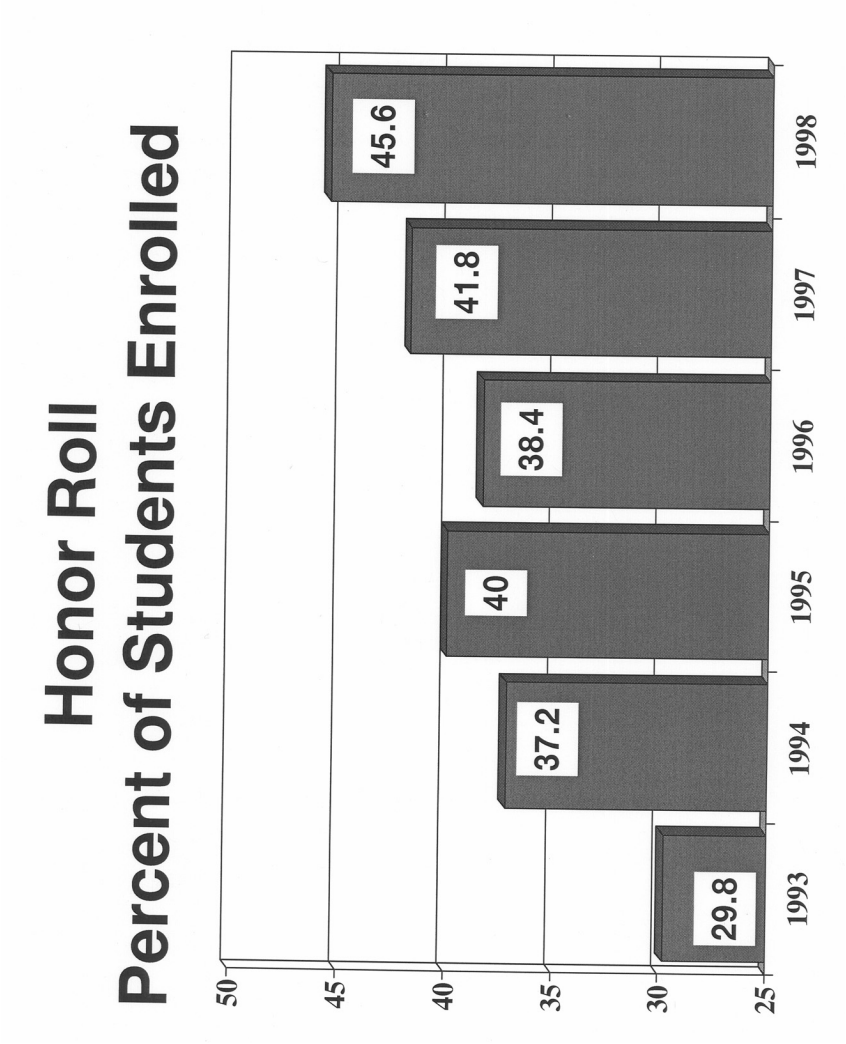


STUDENT DROPOUT RATE - BLACK



Student Discipline Referrals & Suspensions




Honor Roll
Percent of Students Enrolled
50
45
40
35
30
25
29.8
37.2
40
38.4
41.8
45.6
1993
1994
1995
1996
1997
1998

An Exploratory Study of the Relationship of School-Business Partnerships and Developmental Assets to School Success Among Urban High School Students

A Search Institute Report Submitted to the National Association of Partners in Education (NAPE)

Proportion of Students Reporting Risk Behavior Patterns by Partnership Exposure

	High Exposure	Medium Exposure	Low Exposure
Risk Patterns:			
Alcohol Use	24%	32%	38%
Driving & Alcohol	24%	32%	36%
School problems	9%	22%	22%

Proportion of Students Reporting Thriving Outcomes by Partnership Exposure

Outcomes	High Exposure	Medium Exposure	Low Exposure
School success	21%	10%	5%
Valuing diversity	85%	78%	70%
Maintaining health	52%	47%	36%
Helping others	88%	80%	70%
Exhibiting leadership	79%	70%	51%

Proportion of Students Reporting Positive Outcomes From Partnership Experience by Partnership Exposure

Increased interest - class	212	51	67	51	29
Improved schoolwork	319	77	86	75	66
Improved reading	293	71	77	74	56
Improved writing	299	73	78	77	58
Improved math skills	283	69	77	67	57
Improved decision making	323	78	88	75	68
Creative thinking	319	77	86	76	66
Improved responsibility	343	83	91	85	69

Alternative Assessment Instruments

- Tests of Ability
- Self-Reporting Measures
  - Rating Scales or Ranking scales
  - Diaries and Reports of Critical Incidents
- Observations
- Interviews
- Performance Tests
  - Face-to-face or Telephone Interviews
  - Focus Interviews
- Record and Product Review

BIOGRAPHY FOR JAY T. ENGELN

Jay Engeln of Colorado Springs, Colorado serves as the NASSP Resident Practitioner for Business–School Partnerships. During his twenty-eight years in public education, Engeln served as principal of Mountain Vista High School in Highlands Ranch, Colorado (two years), William J. Palmer High School in Colorado Springs (seven years), and assistant principal at Coronado High School in Colorado Springs (four years). In addition he taught science for fifteen years and coached soccer and hockey. He received the U.S. West Outstanding Teacher Award, was a finalist for Colorado Teacher of the Year and twice nominated by the Colorado Department of Education for the President's Award for Excellence in Teaching Science and Math. He received the Kappa Delta Pi Award from the Colorado College Education Department for outstanding contributions to education programs. In 1999, he was selected as the Colorado Principal of the Year and in 2000 the NASSP/MetLife National Principal of the Year. In addition to achievements in education, Engeln was twice named the Colorado Soccer Coach of the Year and in 1985 selected as the National High School Soccer Coach of the Year.

As principal at William J. Palmer High School, Engeln and his staff initiated partnerships with Colorado College, the University of Colorado, Pikes Peak Community College, and numerous Colorado Springs business entities resulting in strong community support for educational and extra-curricular activities. More than 100 businesses were in place as partners with the school. A unique aspect of Engeln's involvement with the local business community was working with the Board of Directors of Downtown Colorado Springs, Inc., a consortium of Colorado Springs businesses that were committed to improving the downtown environment. Partnership involvement included mentor programs, guest speakers, tutors, senior volunteers, motivational programs and financial support for the school's programs. As a direct result of support from the many business partners, the school was able to keep programs in place that had a positive impact on student achievement. Engeln was invited to speak at the White House Conference on Teenagers to share ideas related to success of business and community involvement in the school.

Engeln recently completed a term as President of the 15,000 member National Soccer Coaches Association of America. His responsibilities focused on facilitating the growth and development of programs supporting soccer coaches of all age groups (youth–collegiate) in the United States. Business partnership programs he personally initiated and implemented, such as the Taos Pueblo Soccer Project and the Santa Fe Indian School Project, have been featured in the *Soccer Journal* as well as televised on the Sports Channel and ESPN.

Engeln feels that the challenges we are facing in education are immense and how we address these critical issues will have a significant impact on our country for years to come. Educators today face some of the most challenging conditions ever encountered in the history of our profession. In light of these many challenges, one thing becomes very clear—schools cannot do it alone.

March 25, 2004

The Honorable Nick Smith
Chairman, Research Subcommittee
2320 Rayburn Office Building
Washington, DC 20515

Dear Congressman Smith:

Thank you for the invitation to testify before the U.S. House of Representatives Committee on Science on March 30th for the hearing related to the *Congressional Medal for Outstanding Contributions in Math and Science Education Act of 2004.*

In accordance with the Rules Governing Testimony, this letter serves as formal notice that I received no federal funding directly supporting the subject matter on which I testified, in the current fiscal year or either of the two proceeding fiscal years.

Sincerely,

Jay T. Engeln
Resident Practitioner: School/ Business Partnerships
National Association of Secondary School Principals
1724 Wood Avenue
Colorado Springs, CO 80907
(719)442-1534

Chairman SMITH. Thank you.
Mr. Robinson.

STATEMENT OF MR. TORRENCE H. ROBINSON, DIRECTOR, FEDERAL AFFAIRS, TEXAS INSTRUMENTS

Mr. ROBINSON. Good morning, Mr. Chairman, Congresswoman Johnson, and Members of the Subcommittee. Again, my name is Torrence Robinson, and I am Director of Public Affairs for Texas Instruments. I am pleased to comment on the legislation to honor outstanding contributions in K–12 math and science education and to talk about TI's perspective on it.

First, I would like to commend the Committee for all its work over the last several years to improve math and science education and to excite more children to embrace these disciplines. America's economic and national security depends upon the future scientists, engineers, and mathematicians that will keep us on the competitive edge.

Texas Instruments supports the Committee's efforts to acknowledge those private entities that provide exemplary contributions to K–12 math and science education. In doing this, you have an excellent opportunity to highlight and disseminate effective programs and also align philanthropic and for-profit efforts toward a common objective. Increasingly, companies are seeking out and supporting programs that are effective and yield real results. This legislation can help push this effort to a higher level.

Now my written testimony includes a few suggestions for narrowing and strengthening the criteria for recognizing programs. We are pleased that the criteria give priority consideration to those programs with evidence of improved student achievement. That must be the ultimate goal.

The importance TI places on K–12 math and science is due in part to our corporate culture and the changing skills and education required of our technical workforce. Today, the majority of TI's investment in higher education is directed to research or the development of a technical workforce in science, technology, engineering, and mathematics. But we also recognize that in order to support long-term growth and improved competitiveness, it is critical that we invest in the K–12 education pipeline. And we have been doing so for many years.

TI hires employees with a variety of skills, but our needs are evolving. Semiconductor manufacturing has migrated from an era of placing a high value on manual dexterity on the assembly line to one of mental dexterity on the clean room floor. We are expecting more knowledge and skills of manufacturing specialists, technicians, and our engineers.

In our K–12 activities, we look to promote educational improvement by developing and supporting programs that yield measurable results and that can be replicated elsewhere. I have highlighted one for discussion today. The Infinity Project is a math and science-rich engineering curriculum for high school students created in collaboration with the Institute for Engineering Education at Southern Methodist University and TI. It is changing student attitudes towards math, science, and engineering by exciting students about real-world technology applications that are relevant to

their lives: applications such as cell phones, MP3 players, the digital special effects that you see in movies, and much more. This full-year curriculum is helping both students and teachers answer that age-old question, "Why do I need to learn this math?" By linking fundamental math concepts found in algebra II to cool applications, students are better prepared and motivated to pursue higher level math and science courses and consider engineering and technical degrees.

A hallmark of the program's early success has been the open communication between Infinity Project staff and classroom teachers in the development and implementation of the curriculum. It is that give and take that has provided a deep understanding of student, teacher, principal, and district administrator needs.

The Infinity Project is in its third year and has been introduced in several schools across Texas and in 19 other states. Early data indicates that 65 percent of the students who complete the course say they are interested in pursuing engineering in the future. But nationally, only two percent of the graduating high school population goes on to receive an engineering degree. We hope that Infinity will help boost those numbers. A more detailed, multi-year assessment of the program and its impact on student achievement and post-secondary technical discipline enrollment rates will begin in the fall of 2004.

Again, I want to commend the Committee for its tireless work in support of math and science excellence, and at the appropriate opportunity, I would be glad to answer any questions that you have.

[The prepared statement of Mr. Robinson follows:]

PREPARED STATEMENT OF TORRENCE H. ROBINSON

Good morning Mr. Chairman, Congresswoman Johnson and Members of the Subcommittee; my name is Torrence Robinson and I am Director of Public Affairs for Texas Instruments. I am pleased to be here today to comment on the *Congressional Medal for Outstanding Contributions in Math and Science Education Act* and to talk about TI's perspective on K–12 math and science education.

First, I'd like to commend this committee for all its work over the last several years to improve math and science education in the United States and to excite more children to embrace and explore these disciplines of study. As you well know, America's economic and national security is inextricably linked to our technological advancement. And that advancement depends on educating the future scientists, engineers and mathematicians that will develop the new tools, designs and manufacturing and information systems that will secure and promote America's competitive edge.

Congressional Medal for Outstanding Contributions to Math and Science

Texas Instruments supports the Committee's efforts to acknowledge those companies and organizations that provide exemplary contributions to K–12 math and science education. In doing this, you have an excellent opportunity not only to highlight and help disseminate effective programs, but also to help align both philanthropic and for-profit efforts toward a common objective. Companies are driven by results in almost everything we do, but when it comes to philanthropic giving, the business community is still in an evolutionary mode. Increasingly companies are trying to seek out and support those programs that are effective and yield real results, while moving away from those programs that may not meet the bar. This legislation can help push that effort to a higher level.

We are very pleased that the proposed legislation contemplates recognizing a small number of programs annually, as we believe that will drive excellence and promote recognition of only the best.

We are also pleased that the selection criteria give priority consideration to those programs with evidence of improved student achievement. That must be the ultimate goal.

We applaud those provisions that require real metrics, such as a demonstration of increased interest by students in science, technology, engineering and mathematics as evidenced by an increase in the number of students enrolled in advanced courses related to such fields. Metrics that merely present numbers of students, teachers or employees who are touched/involved in these disciplines or that focus on "soft outcomes" are not sufficient.

In that vein, we would like to suggest other criteria that we feel would help this program be a catalyst for excellence:

1. Require that the program demonstrate how it supports and/or builds upon state standards in mathematics and/or science. Programs that do not support or enhance state standards can be a distraction to schools trying to comply with the requirements of No Child Left Behind, particularly in low performing schools. Mike Moses, the Superintendent of Schools for the Dallas Independent School District calls unaligned programs "random acts of kindness" that while well-intentioned, do not move the ball any closer to the ultimate goal.
2. Require programs that involve professional development to tie into the No Child Left Behind requirement ensuring that teachers are highly qualified. Study after study demonstrates that teacher quality is a key determinant of student success. Private sector efforts should support that goal.
3. Require that programs be replicable and identify the key elements for successful implementation.
4. Require that the recognized programs show at least three years of sustainable results.
5. Strengthen the criteria around employee interaction with students and teachers to ensure some demonstrable result, i.e., increased test scores, students taking tougher courses, etc.
6. Require that programs that promote career awareness show clear linkages to standards and to demonstrable results.

America is at a crossroads, both in terms of how it responds to the competitive pressures of a worldwide economy and in terms of the focus and priority it gives to ensuring that all students are prepared with the math, science and literacy skills needed to succeed in that economy. Business, government and the academic establishments need to work together, now more than ever, to ensure that we are achieving the right goals and that we are equipping our children with the world-class education they need. This legislation can be an effective tool in aligning private sector resources around this objective.

Texas Instruments and K–12 Education

The importance TI places on K–12 math and science education is due in part to our corporate culture and to the changing skills and levels of education we require of our technical workforce. TI Founders understood the need for highly skilled engineering talent to support the company's growth and competitiveness. As a result they founded what later became the University of Texas at Dallas in 1961 to help supply the North Texas region and the company with Master's level graduates in engineering. Today the vast majority of our investment in higher education is directed toward research or the development of a technical workforce in science, technology, engineering and mathematics.

Our hiring challenges and our involvement in public policy at the local, state and national levels, however, made it clear to us that in order to support long-term growth and improve our competitiveness in a worldwide marketplace it was imperative that we invest in the K–12 education pipeline. And we have been doing so now for many years. In addition to the direct benefit of providing a highly qualified workforce, TI believes that having a high quality education system helps to strengthen the overall quality of life in our plant site communities.

TI hires employees with skills at different levels, but our needs are evolving. Semiconductor manufacturing has migrated from the era of placing a high value on manual dexterity on the assembly line to one of mental dexterity on the clean room floor. A TI manufacturing specialist must have a basic knowledge of math and science skills. Our technicians must have an associates' degree in semiconductor manufacturing technology and pass a comprehensive test that covers basic electronics, applied physics and basic chemistry.

In addition, because of the continuing complexity of the design process and other technological advances, more is expected from engineering graduates in terms of the breadth of their engineering coursework exposure and experiences at all levels of higher education—BS, MS and Ph.D.

In our K–12 activities we look to create opportunities for educational improvement by developing and supporting programs that yield measurable results and that can be replicated elsewhere. I have highlighted two for discussion today:

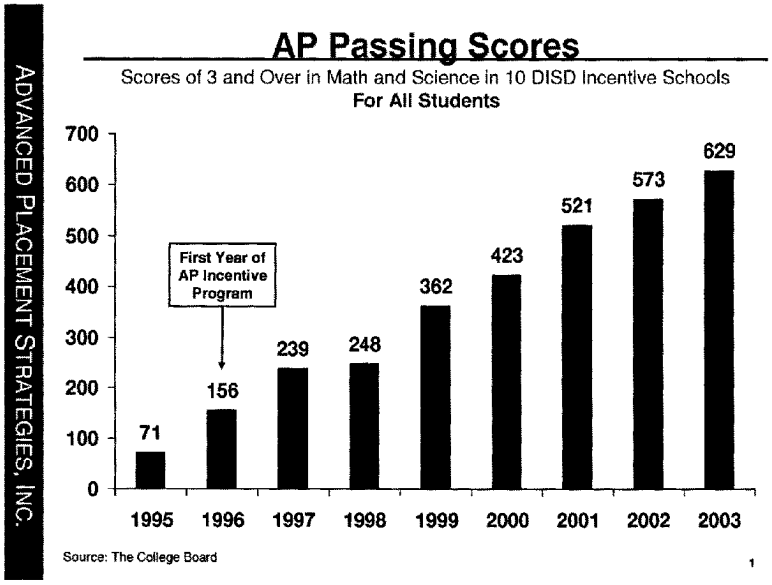
The Infinity Project [SM] is a math and science-rich engineering curriculum for high school students created in collaboration between the Institute for Engineering Education at Southern Methodist University and TI. It is achieving success by helping change student attitudes towards math, science and engineering by exciting students about real world technology applications that are relevant to their lives, such as cell phones, MP3 players, digital special effects in movies and much more. This full-year curriculum is helping both students and teaches answer the age-old question, "Why do I need to learn this math?" By linking fundamental mathematical concepts found in Algebra 2 (like polynomials and matrices) to the fascinating and cool applications, students are better prepared and motivated to pursue higher level math and science courses and to consider pursuing engineering and technical degrees.

A hallmark of the program's early success has been the open communication between the Infinity Project and classroom teachers as the curriculum was developed and as it continues to be implemented. That two-way "give and take" has provided a deep understanding of student, teacher, principal and district administrator needs.

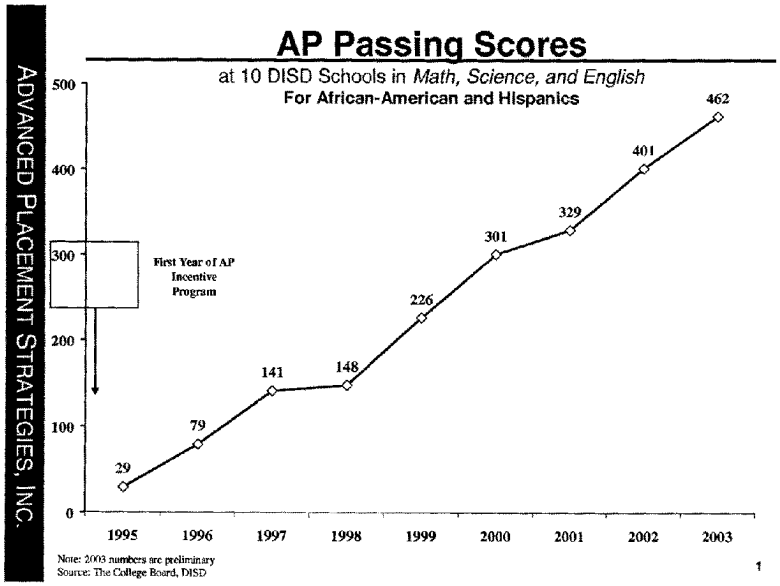
The Infinity Project is in its third year and has been introduced in several schools across Texas and in 19 other states. Early data indicates that 65 percent of the students who complete the course say they are interested in pursuing engineering in the future. Nationally only two percent of the graduating high school population goes on to receive an engineering degree. We hope that Infinity will help boost those numbers. A more detailed, multi-year qualitative assessment of the program and its impact on student achievement and post-secondary technical discipline enrollment rates will begin in the fall 2004.

Advanced Placement Strategies, Inc. is a non-profit organization that works with Texas schools and the private sector to plan and manage Advanced Placement (AP®) and Pre-AP® incentive programs for teachers, students and schools. The program was created by the O'Donnell Foundation and is currently supported by the Texas Instruments Foundation and others. The program is designed to encourage students to take more rigorous college-level course work in high school, which prepares them for success in post-secondary education, as well as high-tech careers. The program provides financial incentives to teachers and students that are based upon achieving academic results, namely passing the AP test. Other program components include Pre-AP teacher preparation and support; student support, including tutoring, prep sessions and summer academies; and student exam fees for AP and PSAT® exams.

As a result of the AP Incentive program operated in the Dallas Independent School District, the 10 DISD Incentive Schools have seen the number of passing scores for all students in math and science grow 786 percent from pre-incentive program levels (from 71 students passing in 1995 to 629 passing in 2003).



In addition the number of passing scores for African-American and Hispanic students in math, science and English has grown 1493 percent from pre-incentive program levels (29 students passing in 1995 to 462 in 2003).



It is no secret which academic coursework is needed to develop the background that good engineers need to compete in the global marketplace. Engineers require extensive K–12 instruction in mathematics, science and technology, in particular,

courses such as Algebra 2, calculus, physics, computer science, English, and if they can find it, an actual course in engineering. It is through these academic experiences that students become proficient in thinking critically, solving problems and communicating effectively.

TI engages in a number of other programs in our communities to advance educational excellence. And our graphing technology business, which is well known in middle and high school classrooms, also gears its professional development activities toward achieving results. The discipline of the No Child Left Behind Act and its requirement for evidence of effectiveness in raising student achievement has been an important tool in focusing schools, teachers, students and businesses on meeting that objective.

Again, I want to commend the Committee for its tireless work in support of math and science excellence. I am happy to answer any questions you might have.

BIOGRAPHY FOR TORRENCE H. ROBINSON

Torrence Robinson is a Director of Public Affairs for Texas Instruments where he is focused on crafting, promoting, and driving many of the company's education initiatives. After receiving his BS degree in computer science from the University of Maryland, College Park, Torrence entered the information technology industry in the area of sales and marketing. Subsequently, his focus migrated toward building programs that impacted engineering education and research as the TI Worldwide Digital Signal Processor (DSP) University Program Manager. He currently serves as Chair of the Texas Technology Workforce Development Program Advisory Committee, a committee of the Texas Higher Education Coordinating Board and is a member of the Greater Dallas Chamber's Education Taskforce. Torrence was recipient of the national Black Engineer of the Year Award in the category of Corporate Promotion of Education in 2001 and is Co-founder and advisor to the Infinity Project—a national early college math- and science-based engineering & technology initiative based at Southern Methodist University.

Texas Instruments Incorporated

TEXAS INSTRUMENTS

1455 Pennsylvania Avenue N.W.
Suite 375
Washington, DC 20004

(202) 628-3133

March 30, 2004

The Honorable Nick Smith
Chairman, Subcommittee on Basic Research
Committee on Science
U.S. House of Representatives
Washington, D.C. 20515

ATTENTION: James Hague

Via Facsimile: 202-225-7815

Dear Chairman Smith:

In compliance with the Memorandum on Rules Governing Testimony, I am notifying you that neither I nor Texas Instruments receives federal funding for the programs and projects related to my testimony of March 30, 2004.

Sincerely,

Torrence H. Robinson
Director
Public Affairs
Texas Instruments Incorporated

Chairman SMITH. Mr. Robinson, thank you.
And Dr. Ramaley.

STATEMENT OF DR. JUDITH A. RAMALEY, ASSISTANT DIRECTOR, EDUCATION AND HUMAN RESOURCES DIRECTORATE, NATIONAL SCIENCE FOUNDATION

Dr. RAMALEY. Thank you, Chairman Smith, Ranking Member Johnson, and distinguished Members of the Subcommittee. I am very pleased to have the opportunity to talk with you today about your proposed legislation.

As you know, the Administration broadly promotes partnerships and collaborations of many kinds across the Federal Government, with the private sector, with other employers, and with community groups. Any actions that would encourage and recognize the importance of these undertakings, some of which you have already had described to you this morning, will be greatly beneficial to our efforts to promote science, technology, engineering, and mathematics education. Alliances that engage broad and diverse sectors of society in promoting student interest and improving achievement and quality of life, as you have heard, can contribute significantly to preparing citizens to fully participate in our democracy and are very important for our progress and our growth.

We would, however, like to recommend some possible changes to the legislation that we believe would strengthen its impact. The first is to expand educational levels beyond K–12. The bill you just marked up focuses on partnerships to improve the achievement of students at K–12 level. We believe it should be broadened to address the whole educational spectrum, from pre-K through higher education, including community colleges. Each educational level offers opportunities and challenges that can be fruitfully addressed by partnerships such as these. In fact, over 70 percent of all high school graduates will now go on to some form of post-secondary education, and the contributions of employers will be critical to their success. It is no longer a question of whether students will go on to some form of college, it is a question of when.

My written testimony provides a number of examples of those promising and successful collaborations at K–12, especially in our Math and Science Partnership program, but also in higher education, with an emphasis on advanced technological education, which I know is of great interest to the Committee.

Our second point is that the Committee consider expanding the types of employers and organizations eligible for this award. H.R. 4030 targets for recognition private entities, their employers, and employees who partner with educational institutions. Broadening the types of entities eligible to be recognized for engaging in productive partnerships would greatly enhance the diversity of the opportunities available. The goals of the program would be promoted by recognizing other employers, such as not-for-profits, local government entities, medical care providers, and the like. Often in smaller communities, especially, these are the major employers and will be asked to play significant roles in both K–12 and post-secondary education.

The third recommendation we have is that while we recognize and applaud the importance of a fact-based mechanism for deter-

mining the impact of these awards, time should be allowed for that impact to be discernible. The Administration feels two years may not be enough time for a collaboration to mature and to demonstrate not only its effectiveness but also its sustainability over time. And we hope you might consider more flexibility in that regard.

Finally, I can not resist saying, since I am from the National Science Foundation and would be asked by you to implement this program, that it is not cost-free. A realistic appraisal of the cost of the program needs to be made. It includes everything from advertising it, reviewing it, designing and paying for the Medals, and publicizing recipients. Based on our experience with the National Medal of Science Award, the National Science Board, which administers that very important award, estimates the program might cost about $750,000 a year and if, as is our habit in other programs, we were to accompany this with additional support to allow for the extension or development of the promising and successful work, the costs would be much higher.

Our proposed next steps, since we believe strongly in the importance of this work, would be to call a workshop together that would consist of people like those on this panel, perhaps even members of this panel, as well as members of our own Corporation and Foundation Alliance, with suggestions from other science-based agencies, who also foster this kind of work, to design the program to work out the important questions we would have about the nature of the award, the activities that would surround it, and so on. We would propose, therefore, to make sure that we work closely with employers in developing the award.

Mr. Chairman and Members of the Committee, I want to thank you again for the opportunity to testify, but also to thank you for your long-standing support for the National Science Foundation, and in particular, the part closest to my heart, education.

Thank you.

[The prepared statement of Dr. Ramaley follows:]

PREPARED STATEMENT OF JUDITH A. RAMALEY

Chairman Smith and distinguished Members of the Subcommittee, I appreciate the opportunity to testify on behalf of the National Science Foundation (NSF) concerning your proposed legislation to establish the Congressional Partners in Education Gold Medal Program.

Mr. Chairman, as you know, the Administration broadly promotes partnerships and collaborations across the Federal Government and with the private sector. Any actions that would encourage and recognize the importance of these undertakings are to be commended, and the Administration appreciates the Chair's interest in and support of collaborations. Alliances that engage broad and diverse sectors of society in promoting student interest and improving achievement in science, technology, engineering and mathematics can contribute significantly to preparing citizens to fully participate in our democracy, and are very important to our nation's progress and growth.

However, there are several issues raised by the draft legislation that should be addressed before a final version of the bill is considered.

1. **Expand educational levels impacted beyond K–12.** The current draft of the bill focuses on partnerships that aim to improve achievement by students at the K–12 level. It should be broadened to address the whole educational spectrum, from pre-K through higher education, including, of course, community colleges. Each educational level offers opportunities and challenges that can be fruitfully addressed by partnerships with sectors of society whose primary activity is not education.

Examples of the broad range of public-private partnerships that support educational excellence in science, technology, engineering and mathematics (STEM):

- While it is still too early to verify the impact on enhanced student learning, several Math and Science Partnership (MSP) projects illustrate the diversity and scope of collaborations that are having considerable impact on brining disparate stakeholders together to enhance STEM education at various levels. For example, the El Paso Collaborative for Academic Excellence is engaging local school districts with scientists, mathematicians and engineers from the University of Texas at El Paso and the El Paso Community College to support the improvement of Pre-K–12 instruction and achievement in mathematics and science for all students. In addition to the core partners, which also include 12 independent school districts, the Region 19 Education Service Center, the El Paso MSP also includes such civic, business and community leaders as the Greater El Paso Chamber of Commerce, the El Paso Hispanic Chamber of Commerce, the El Paso Black Chamber of Commerce, the Texas Business and Education Coalition and the Interreligious Sponsoring Organization, as well as the Mayor of El Paso and the El Paso County Judge. The project focuses on enhancing teacher quality, quantity, and diversity; building the capacity to provide high quality curriculum instruction and assessment; supporting research to inform program design; and promoting institutional change.
- Building for Tomorrow (BFT) is a National Science Foundation funded project under the NSF Advanced Technological Education (ATE) program. The BFT grant is a 2001, three-year, $640,000 award to the New Jersey Center for Advanced Technological Education at Middlesex County College (MCC) in partnership with Johnson and Johnson, the New Jersey Chamber of Commerce, and FIRST Robotics. The key objective of BFT is to increase the number of students (particularly those underserved) in urban school districts participating in national STEM competitions such as FIRST robotics, BOTS robotics, LEGO, Math Olympiad, and Science competitions. Under the grant, BFT is managed by the New Jersey Center for Advanced Technological Education, which has conducted one-week summer workshops in New Jersey, Illinois, Missouri and California with nationwide school attendance. With the aim to empower teachers, the grant funds the attendance of five (5) faculty from up to seven (7) urban district high schools and middle schools. The faculty receive training to build leadership, project management, team development and industry-partnering skills. The faculty teams are challenged to build robots and compete against each other by the end of the workshop. The grant also funds $1000 to each school that enters a national STEM competition after completion of the workshop.
- Bellevue Community College in the State of Washington has teamed with Microsoft Corporation and the American Association of Community Colleges (AACC) to develop the first systematic, nationwide plan for faculty development in the field of information technology (IT). The Working Connections IT Faculty Development Institute aims to provide early training for community college instructors on emerging IT workforce requirements.
- A Regional Center for Nanofabrication Manufacturing Education, supported by NSF's Advanced Technological Education (ATE) program, is a partnership for enhancing nanotechnology education. The partners include the State of Pennsylvania, Penn State University, Pennsylvania's community colleges, the State System of Higher Education, Penn College of Technology, CAMtech, MET Inc., secondary schools, private industry, and other participants. The primary goal of the Center is to use the resources of the Penn State Nanofabrication Facility to develop and support K–12 and post-secondary nanotechnology awareness and education. The Center is dedicated to introducing students to the full range and full impact of nanofabrication applications, including biotechnology, pharmaceuticals, optoelectronics, information storage, materials manufacturing, and many others.
- At National Instruments in Austin, Texas, the company's LabView software is a key component in the successful LEGO RoboLab products and curriculum. More than 10 percent of the company's engineers have gone through training conducted by the college of engineering at the University of Texas-Austin that is intended to make them effective classroom resources for teachers. After training, these practicing engineers serve as mentors, advisors, and collaborators for individual teachers in the community.

2. **Expand types of employers and organizations eligible beyond the private sector.** H.R. 4030 targets for recognition private employers and their employees who partner with educational institutions. Broadening the types of entities that are eligible to be recognized for engaging in productive partnerships would greatly enhance the diversity of opportunities available, the number of participants engaged, and the potential impact of the program. The goals of the program would be promoted by recognizing efforts by a greater diversity of employers, including nonprofits, local government agencies, other federal entities, etc. For example, partnership involving educational institutions at one level working to improve achievement of students at another could also be eligible for recognition (e.g., institutions of higher education partnering with elementary schools to supplement the expertise of K–12 teachers and improve learning by K–12 students, and in complementary fashion, teachers at the K–12 level partnering with higher education institutions to provide enriching experiences for those preparing to be teachers).

   Examples of the involvement of a wide range of employers and community organizations in the enhancement of STEM education:

   - In addition to the project in El Paso previously mentioned, the Math Science Partnership project lead by Hofstra University, which is improving teaching and learning in middle-level mathematics in ten school districts in New York. Its core partners include Hofstra University, the State University of New York at Stony Brook, the New York State Education Department, and ten Long Island school districts. Supporting partners include a local government social service agency (Long Island Family and Children's Association): UCLA Center for Mental Health in Schools: Carolina Biological Supply: Long Island Regional School Support Center: Boards of Cooperative Educational Services: professional teacher associations in science, mathematics, and technology: Brookhaven National Laboratory: and the Eisenhower Regional Alliance for Mathematics and Science Education.
   - The American Association of Community Colleges' Working Connections program and the National Workforce Center for Emerging Technologies with support from NSF's ATE program, offers a fast track to the Security+ certification course through the 2004 Working Connections summer institutes in California, Michigan, North Carolina and Texas. CompTIA, McGraw-Hill Technology Education and LearnKey's OnlineExpert have partnered in this grant providing certification exams, textbooks and courseware. The goals of this course are two-fold: (1) to provide community college faculty the knowledge and practical skills they need to pass the Security+ exam; and (2) to provide faculty with a set of labs that they can implement on their campuses in introductory level network security courses.
   - In Delaware, DuPont has partnered with the Delaware Department of Education, the Delaware Foundation for Science and Mathematics Education, the Delaware Science Coalition, public universities and others in the private sector to provide assistance in achieving the math and science standards adopted in 1995. The success in Delaware has encouraged DuPont to replicate its model in other regions where they have manufacturing facilities, such as Alabama, Tennessee, Pennsylvania, New Jersey and South Carolina. In South Carolina, as in Delaware, private industries have worked closely with the State's Department of Education, the National Science Resource Center, and employees of the partners to embed standards-based, inquiry-driven science teaching and learning into the school system.

3. **Require that partnerships demonstrate achievement and sustainability.** The bill proposes to consider for recognition collaborations that have existed for at least two years. The Administration feels that two years may not be enough time for a collaboration to mature and demonstrate sustainability. Two years is also insufficient time to gather the evidence needed to document improved achievement by students or a meaningful impact on the participating organizations or the community-at-large. It would be more appropriate to consider partnerships that have been in place for a longer period of time, perhaps 4–5 years, while recognizing that some collaborations may be able to demonstrate real educational gains in a shorter period of time.

4. **Costs of program.** A realistic appraisal of the cost of the program needs to be made. In general, this would include the costs to: advertise the program, review nominations; design and pay for the medals, hold an awards ceremony and associated conference to recognize recipients, and publicize the recipients in appro-

priate venues. Based on experience with the National Medal of Science award, the National Science Board estimates that the program would cost approximately $750,000 a year for each of the first 2–3 years and somewhat less per year beyond that. If the award were to be accompanied by additional support to allow for the extension or development of the promising work being recognized, the costs would be much higher.

Proposed Next Steps

In addition to the recommendations contained above, there are a number of issues that would need to be resolved before the Congressional Medal for Outstanding Contributions in Math and Science Education could be put in place. The elements to be resolved include the nature of the award itself (e.g., an actual medal, a plaque, or a well-designed object made of crystal); the activities that might surround the awarding of the medal/plaque and who would participate; the mechanism of reviewing the nominations; the nomination process itself and the criteria to be used in evaluating potential recipients; and expectations regarding publicity both for the program and for the recipients. We believe that these issues should be specifically addressed in the legislation. If H.R. 4030 were to become enacted into law, NSF would collaborate with the Department of Education to identify finalists for the Medal.

NSF would propose to explore the contributions of employers/employees at a workshop on public/private partnerships in support of STEM education to identify lessons learned and best or promising practices. This workshop would also be used to develop a design for the proposed Congressional Partners in Education Gold Medal Program. We would invite participants from some of the most successful collaborations that we have supported, as well as representatives from our Corporate and Foundation Alliance (CFA). The CFA periodically brings together nearly 40 leading corporations and private philanthropic organizations to discuss successful programs, learn about NSF programs and research initiatives, share ideas about effective ways to sponsor change in STEM education, and collaborate with each other and with NSF in addressing areas of vital need.

Mr. Chairman, thank you again for the opportunity to testify. I want to thank you and your Subcommittee for its long-standing support for NSF in general, and for NSF's educational efforts in specific.

I would be pleased to respond to any questions you may have.

BIOGRAPHY FOR JUDITH A. RAMALEY

Dr. Judith A. Ramaley is a nationally recognized leader in science, technology, engineering, and mathematics (STEM) education. As Assistant Director of the National Science Foundation (NSF), she manages the education program portfolio of its Directorate for Education and Human Resources (EHR). Dr. Ramaley is also a presidential professor in biomedical sciences at the University of Maine, Orono, and a fellow at the Margaret Chase Smith Center for Public Policy. Prior to her NSF appointment in August of 2001, she was President of the University of Vermont from 1997 until 2001, and President of Portland State University in Oregon from 1990 until 1997. She held full professorships in biology at both universities.

Since coming to NSF, Dr. Ramaley has sharpened the Foundation's focus on goals and capacity-building strategies to meet the lifelong learning needs of a changing student population and the demands of a science and technology-fueled economy. She brings to NSF her long-time professional interest in workforce development and the role of the higher education institution in community and economic development.

In Vermont, Dr. Ramaley was a Director of the Vermont Business Roundtable, a member of the Human Resources Investment Council (HRIC), a member of the Vermont Commission on Higher Education Funding, a member of the Governor's Council of Economic Advisors, and Co-chair of the Vermont Campus Compact. Under her leadership, the University of Vermont became a member of the Kellogg Commission on the Future of State and Land-Grant Universities which explored the role of research universities in the 21st century.

At Portland State, she led the initiative that established the Portland Educational Network (PEN), which supports collaboration among K–12 schools, community colleges, and public four-year institutions in Washington State and Oregon. During her tenure, Portland received a Kellogg Leadership Award for institutional transformation and a Pew Leadership Award for reforming undergraduate education.

At the national level, Dr. Ramaley currently serves as a member of the Board of the American Association for Higher Education. She is also a trustee of Wilmington

College in Ohio. Previously, she has served as a member of the National School-to-Work Advisory Board and a board member for the Association of American Colleges and Universities (AAC&U). She was also Chair of the AAC&U's Greater Expectations Panel to define and realize quality in 21st century undergraduate education. She was a member of the presidential advisory panel for the Association of Governing Boards (AGB), and Chair of the Subcommittee on College Drinking of the Advisory Council of the National Institute on Alcohol Abuse and Alcoholism.

Dr. Ramaley received her Bachelor's degree from Swarthmore College in 1963 and earned a doctorate from the University of California, Los Angeles, in 1966. She was a post-doctoral fellow at Indiana University, and an American Council on Education fellow at the University of Nebraska Medical Center at Omaha. Dr. Ramaley was the executive vice chancellor at the University of Kansas from 1987 to 1990. From 1982 to 1987, she served as the Chief Academic Officer at the State University of New York (SUNY)–Albany. She has two sons and six grandchildren.

Chairman SMITH. Thank you.

Mr. Krudwig.

STATEMENT OF MR. GUS A. KRUDWIG, CO-FOUNDER, THE GLOU FACTORY

Mr. KRUDWIG. Thank you for giving me the opportunity to speak today.

When the Glou Factory first started about four years ago, we had started talking with some manufacturers, and they recognized the need for youth to develop some very basic skills. They were dealing with kids that could not—that did not know how to read a ruler and did not know how to use hammers, nails, stuff like that. And we started off by recognizing that there are actually four needs in the Jackson community, and we started to develop programs in dealing with those needs.

The first need was for early vocational training and decision-making. Currently, there are very few hands-on, interactive type programs in Jackson County, and whereas they do exist in some schools, they are increasingly being cut back due to budget constraints and other educational and academic priorities. The need for young people to develop life skills to prevent unhealthy behaviors, the skills of problem-solving, critical thinking, conflict resolution. One of the third needs that we identified was the need for a skilled workforce that fulfills employment requirements. Technical skills are most needed in our community. They include a basic use of information technology, manufacturing technology, and skilled trades. Workplace skills that were needed included team building, written and oral communications, planning and organization, and habits of responsible employment. And then one of the fourth things that people identified for us to try to develop something with was community service, which they also felt was important.

So with those factors in mind, the Glou Factory began creating a series of programs for youth to participate in. I am just going to briefly cover one of them. One of the programs that we do most frequently with kids is a birdhouse. And it is a fairly simple statement, but it is not really. It is a fairly complex project for kids to participate in. One of the first things that kids will do at the beginning of the birdhouse is they will actually receive a set of blueprints for each piece of the birdhouse that they are working with. From those blueprints, they will actually begin taking measurements with—we will show them how to use tape measures, how to

use rulers, how to make the critical dimensions, and enter that information on the blueprints that they are actually using.

One of the other steps that we will teach them is about art and how to paint. Kids will complete a landscape painting during the time that they are working with us. And while painting in the landscape, they are actually learning about the mathematics as well. It is kind of the mathematics of art: learning about proportion, ratio, size, depth, and dimension in the painting. So when we created this birdhouse project, it was kind of interdisciplinary. We work with math, science, art, and computers. Once the kids had finished their work with the blueprint reading and so forth, they will actually go to a computer lab, and we will show them how to interact with the computer so that they are doing something other than playing with computer games all of the time. We are showing them how to draw those pieces in a 3–D representation on a computer, to scale, so that they have a better understanding of math and science in that regard, as well.

We work with a lot of organizations in Jackson that come to us and ask us to perform certain projects and programs. Some of them are fairly large scale. Some of them are easy to do. Some of them are funded. Some of them are unfunded. It really depends on the time schedule as to whether or not we are able to accommodate all of the people that come to us with their programs.

What we—what the manufacturers have found is that—and even the schools that we work with, our programs are some of the highest attended programs in Jackson County in any after-school programs. We will work with about 240 kids during the course of a school year. We might lose eight or nine kids during that time. Schools are really pleased with the attendance of our programs and the performance that the kids have. And a lot of the kids that attend our programs do not do well in traditional type sessions, so they will put them in our course, and each week, they have a chance for success. Each week, they improve the skills that they learned the week before. Even with the birdhouse project that they do, if they don't understand the math one way one day, they are going to get it another way on another day, and by the time the project is complete, they will understand it every way.

I believe that is all I have.

[The prepared statement of Mr. Krudwig follows:]

PREPARED STATEMENT OF GUS A. KRUDWIG

The Glou Factory is a non-profit 501c3 youth education center started by Gus Krudwig and Lou Cubille in Jackson, Michigan.

Since its inception in November 2000, the goal of the Glou Factory has been to provide quality programs that educate and mentor our youth so that they can become successful students and future leaders in their community. This goal is being accomplished by providing after-school, Saturday, and summer enrichment programs that develop self-esteem, self-respect, and the ability to work well with others. The success we achieve is due in part to the quality and strength of the programs, smaller class size and dedicated volunteers. Each student is given personal attention so that they understand what is being taught to them.

The Glou Factory has served over 1300 kids in specialized programs in Computer Technology, Woodworking, Cycology (Bike Repair) and Art.

Our programs specifically address four needs in the community:

1. The need for early vocational decision-making and training for Jackson County youth. Currently, there are few interactive hands on programs in Jackson County. While some in-school programs do exist, hands-on, voca-

tional programs are increasingly being cut back due to budget constraints and other academic priorities.

2. The need for young people to develop "life skills" that prevent unhealthy behaviors. These skills include problem-solving, critical thinking, conflict resolution, cooperative learning, developing healthy behaviors, and avoiding behaviors such as drug and alcohol abuse and juvenile crime.
3. The need for a skilled workforce to fulfill employment requirements of area employers that require increasingly sophisticated technical and workplace skills. Technical skills most needed in our community include basic use of information technology, manufacturing technology, and the skilled trades. Workplace skills needed include team building, written and oral communications, planning and organizing, and habits of responsible employment. These skills will lead to a more successful, productive adulthood.
4. The need for youth to develop habits of community service. Communities need citizens who are engaged in civic affairs and voluntary, community service activities.

Additional program outcomes also include asset development and fulfillment of the promises related to the Jackson County Promise to Youth Alliance by offering:

Marketable skills through effective education

Ongoing relationships with caring adults

Safe places and structured activities during non-school hours

Opportunities to give back through community service

Computer Programs 3 programs

Introduction to Computer Technology

Computer Lessons (Ayieko Resource Center)

Digital Film and Computers

Introduction to Computer Technology

Our experience has shown us that children that do not have a computer at home are less likely to interact with computers at school. They have a fear that something they do will cause the computer to crash or become damaged and they do not want to get in trouble. Our program is designed to de-mystify this technology so youth have a basic understanding of how a computer works and the practical use and limitations of computer software.

During this program we take ten working computers into a lower income area of Jackson and give kids an opportunity to take these computers apart, identify their components and put the computers back together in working order.

Youth work with a variety of software and recognize the differences in the types of software. For example the difference between a drawing program and a paint program, open ended vs. closed ended software.

They are also given opportunities to work with a computer that they can talk to and it will respond to their voice commands. For example if they say, "Athos tell me a joke," the computer would then tell them a joke. They can also play a song of their choice, print documents, open, close and quit applications, etc., all through voice commands.

Computer Lessons (Ayieko Resource Center)

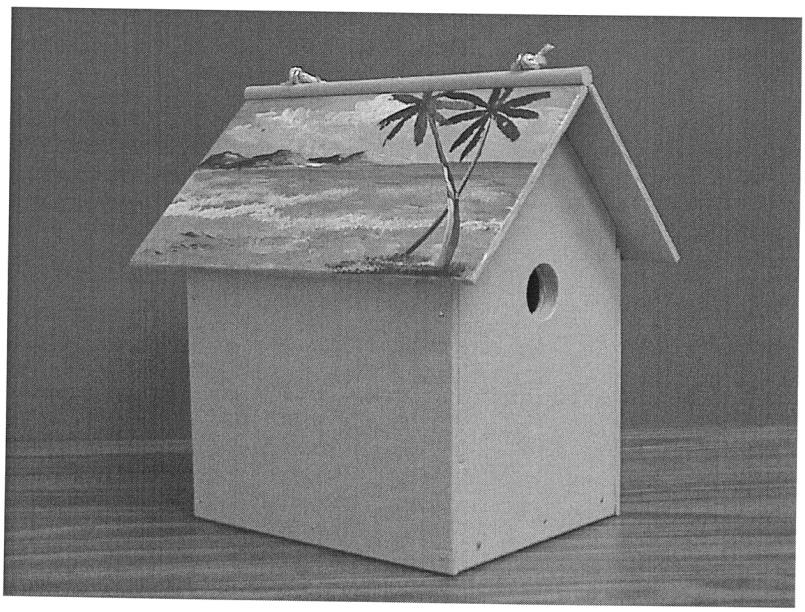
The Ayieko Resource Center is a high-speed Internet computer lab operated by the Jackson Housing Commission, targeting low income residents but, open to the general public in Jackson, Michigan. The Glou Factory assists students and adults that want to improve their computer skills in small-personalized classes. Approximately 95 percent of the people using this lab are from the low-income housing complexes immediately surrounding the center.

Digital Film and Computers

During the program we film and photograph the students. At the conclusion of the program we teach the kids involved how to transfer this information to a computer using title screens, transitions, screen effects, add narration and music and edit it into a completed short film. These films are used for program promotion and to help secure additional funding for future projects.

Woodworking (Birdhouse Project)

This project is what we refer to as an integrated project, incorporating woodworking skills, blueprint reading and measurements, computer design and art. Woodworking skills include sanding, painting, proper use of tools and safety equipment, assembly techniques and craftsmanship. Students are also given a set of blueprints for each piece of their birdhouse without the dimensions. The students then use tape measures to enter the required dimensions. Once the worksheets are complete the students are taken to a computer lab where they learn to draw the pieces in a 3–D representation using the measurements from the blueprint worksheets. Students are also given art instruction and taught how to paint a landscape on the roof panels of their birdhouses. In past summer birdhouse projects, we had access to a commercial grade laser engraver that the students used to engrave their name directly onto the birdhouse furthering the computer skills used in this project.



We have attached a complete detailed nine-week program description (see Appendix).

Cycology 2 programs

Bike Repair
Safe Kids Bike Clinics

Bike Repair

This program is designed to teach kids how to properly inspect and repair bikes. It is open to youth ages 10–14 years old. After fixing three bikes the students are allowed to keep one—the others are donated to youth and adults in Jackson, strengthening the community service aspect of this program. This program involves increased vocational preparation skills, including understanding the mechanics of bicycles, learning how to disassemble, repair and reassemble bicycles, and using appropriate tools properly and safely. Donations of bikes come from the Cascades Civitan Club, City of Jackson Police Department, and the general public.

Safe Kids Bike Clinics

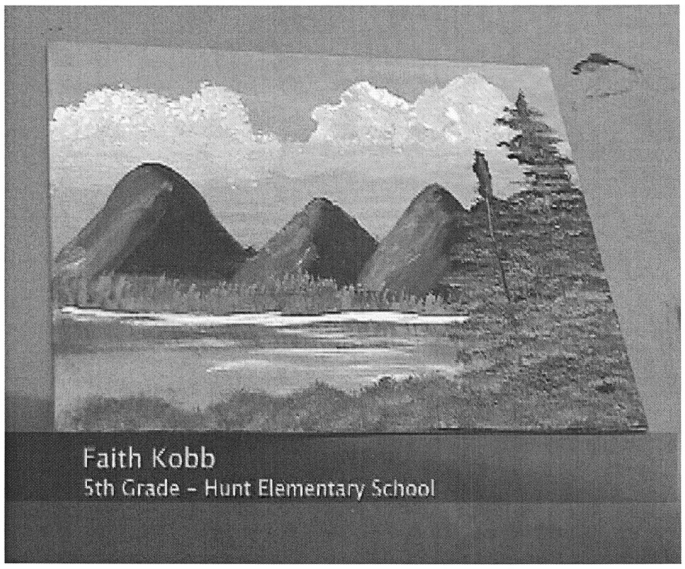
Clinics occur at various locations in Jackson and allow kids the opportunity to have their bikes repaired and licensed. They also receive a free, properly fitted bike helmet and learn bike safety on an approved course. Youth that have participated in our bike repair program assist at these clinics.

Art Programs **2 programs**

Painting
Murals

Painting

The Glou Factory is best known for its art programs because of the results we achieve with youth *with little or no artistic background.* They start by learning about primary and secondary colors and basic shapes. The first painting they do is a simple landscape where they learn step-by-step how to design and compose the space of a blank canvas (8½ inches × 11 inches). They learn how to use and maintain materials properly, blend colors and use different techniques to get desired effects.



This is an example of a painting done by one of our 10 year old students.

(Note: this was her first painting with brush and canvas.)

Murals

Due to its location and changes in the manufacturing arena, the city of Jackson is quickly developing into a community that is becoming more aware of its art and culture. Since the Glou Factory is successful with its art-based youth programs, we get requests for youth to paint murals that will be displayed in schools, churches or on the sides of buildings.

Some of the largest permanent murals we have created have been for the Armory Arts Project, a multi-million dollar project that will turn a vacant unused manufacturing plant into a low-income housing project for working visual and performing artists and their families. Murals for this project were designed to show local Jackson artists performing their art. Since the Armory Arts will not be opened until 2005, these murals will remind the public of future plans for this site.

Mural programs include sessions in conceptual drawing, photography, film, design layout, and final painting. These programs are open to youth ages 14–21.

Measurements of Success

1. Does the project meet the community needs and asset development identified by the Glou Factory?
2. Does it satisfy the high program standards expected from the Glou Factory?
3. Testing—Pre-tests allow us to gauge the current knowledge of the average program participant. Post-tests allow us to gauge how well we achieved our goals. Pre- and post-tests are used extensively during the first year of a program's development. They assist us with the overall program development. We do not use pre- and post-test scores as statistical measures of student achievement.
4. Staff/Volunteer assessments—each segment of the program is evaluated and proposed changes to the program are discussed.
5. Project Quality—Are the students, parents, funders, schools and program partners satisfied with the overall quality of the project.

Current Community Partners

Armory Arts Project
- Enterprise Group
- Artspace

Greater Jackson Chamber of Commerce
Ayieko Resource Center
Jackson Housing Commission
Irish Hills Girl Scout Council
- Camp O the Hills

Jackson Public Schools
- Bennett Elementary
- Hunt Elementary
- Northeast Elementary
- Wilson Elementary
- Parkside Middle School

Amy Firth (Alternative Middle School)
Tomlinson (Alternative High School)
Jackson County Intermediate School District
Columbia Elementary School
Western Middle School
Safe Kids—Jackson Chapter
Jackson City Police Department
Jackson City Fire Department
United Way
Jackson Community Ambulance
Toy House
Jackson Community Corrections Program
St. John's United Church of Christ
North Parma United Methodist Church
Cascades Civitan Club
Diversity Study Circles
Jackson County Community Foundation
Jackson County Youth Advisory Committee
Prevention Partners
COJAX—Cultural Organizations of Jackson
Arts and Cultural Alliance of Jackson County—Design Review Board

Appendix:

Birdhouse Program Notes

****** Birdhouse Program Schedule ******

Session 1	Introduction
	Kit Inspection
	Sanding
Session 2	Measurements
Session 3	Applying a primer coat
Session 4	Painting Landscapes – Canvas
Session 5	Complete Canvas Landscape
	Paint landscape on the Roof panels
Session 6	Painting the Birdhouse 1st coat
	Finish Landscapes on Roof Panels
Session 7	Painting the Birdhouse
	Final Touchup prior to assembly
Session 8	Begin Assembly
Session 9	Final Assembly

Optional Sessions

Computer Design

Session 1 – Introduction

Kit Inspection

Sanding

Materials Needed

Birdhouse Kits (manufactured and produced by the Glou Factory)

Nine birdhouse pieces

Safety Glasses	Sanding blocks	Sandpaper sheets – Course and Fine
Stapler	Staples	Staple Remover
Pencils		

Kit Inspection

Notes:

1. Students begin by inspecting kits and ensuring there are nine pieces. Each kit should have the following color coded pieces

1	Base
1	Front panel
1	Back panel
2	Side panels
2	Roof panels
1	Roof Cap Rod
1	Roof Support Beam.

2. Students place their names or initials on the side of the piece with the color-coding

Sanding

Goal – Proper sanding technique to produce a smooth surface

Painting will raise the surface of the wood. If the wood is rough to begin with it will be even rougher after painting. Proper sanding ensures a smooth surface to paint and a smooth finished surface to the project.

1. The side with the color-coding **does not get sanded.**
2. Students do not need to sand the Roof Cap Rod or the Roof Support Beam.
3. Students must wear safety glasses when sanding.
4. Begin with the coarse sandpaper and finish with the fine sandpaper.
5. Sand with the grain of the wood.
6. Sand back and forth along the length of the edges of the birdhouse. ***Do not sand up and down the length of an edge as it can cause chipping of the edge.***
7. Check each piece for smoothness along all edges and faces.

Session 2 - Measurements

Goal – Students will learn to read and interpret a tape measure properly.

Materials Needed

Birdhouse Kits – Nine pieces **(All nine pieces are used for this session)**

"How to read a 16th inch ruler or tape measure".

Tape Measures – 1 per student

Blue Prints - 1 Grayscale copy per student

Blue Prints - 1 color copy

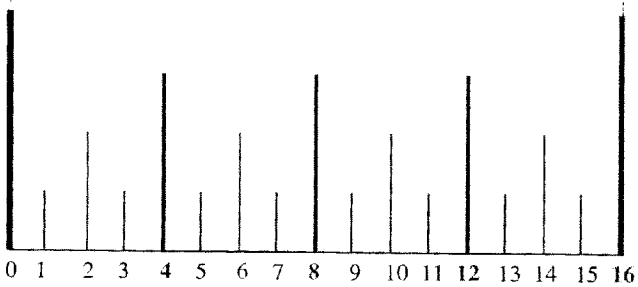
Birdhouse Dimensions Work Sheet – 1 per student

Notes:

1. Explain how to read a tape measure using the document "How to read a 16th inch ruler or tape measure".
2. The students measure all birdhouse pieces.
3. The grayscale and color blueprints are life sized. If students are having difficulty understanding what is to be measured, the piece can be placed directly on top of the blueprint.
4. After students complete a measurement it is entered on the birdhouse dimensions work sheet. This provides verification that the student is completing the assignment correctly

How to read a 16th Ruler or Tape Measure

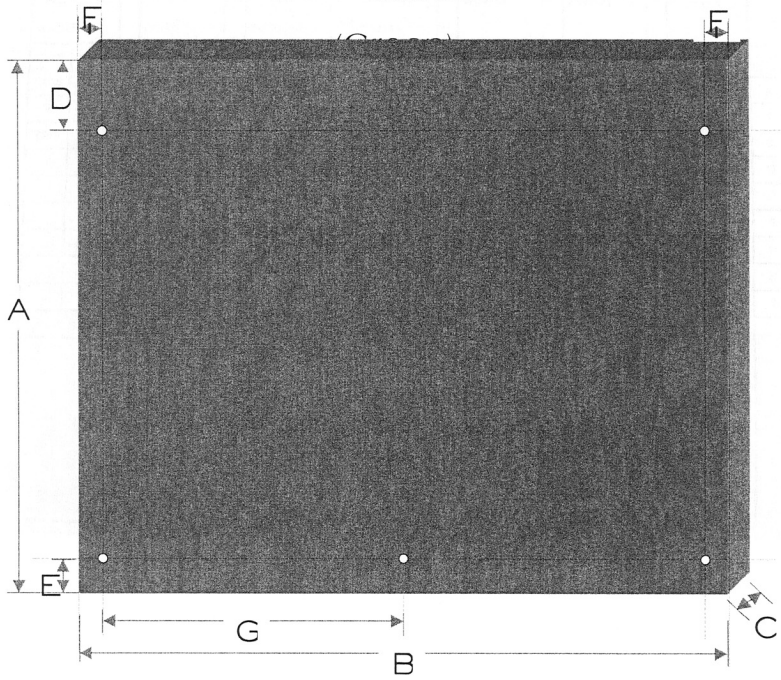
= 1 inch



1	**1/16 (.0625)**		
2	2/16	**1/8 (.125)**	
3	**3/16 (.1875)**		
4	4/16	2/8	**1/4 (.25)**
5	**5/16 (.3125)**		
6	6/16	**3/8 (.375)**	
7	**7/16 (.4375)**		
8	8/16	4/8	**1/2 (.5)**
9	**9/16 (.5625)**		
10	10/16	**5/8 (.625)**	
11	**11/16 (.6875)**		
12	12/16	6/8	**3/4 (.75)**
13	**13/16 (.8125)**		
14	14/16	**7/8 (.875)**	
15	**15/16 (.9375)**		
16	16/16	8/8	**1 (inch mark) (1.0)**

(Each piece of the birdhouse is drawn to scale.)

Side Panel



(The students measure the dimensions and enter the appropriate values)

	Front		Back		Base		Side Panels		Roof Panels		Roof Cap Rod		Support Beam	
	Fraction	Decimal	Fraction	Decimal	Fraction	Decimal	Fraction	Decimal	Fraction	Decimal	Fraction	Decimal	Fraction	Decimal
A	8 7/8"	8.875"	8 7/8"	8.875"	6"	6"	5 3/4"	5.75"	5"	5"	1/4"	0.25"	5/8"	0.625"
B	5 1/2"	5.5"	5 1/2"	5.5"	5 1/2"	5.5"	7"	7"	9"	9"	9"	9"	6"	6"
C	1/2"	0.5"	1/2"	0.5"	3/4"	0.75"	1/4"	0.25"	1/4"	0.25"			5/8"	0.625"
D	6 1/4"	6.25"	6 1/4"	6.25"	3/4"	0.75"	1"	1"	3/4"	0.75"				
E	3/8"	0.375"	3/8"	0.375"	2 3/4"	2.75"	3/8"	0.375"	3"	3"				
F	3/4"	0.75"	3/4"	0.75"	3"	3"	1/4"	0.25"	1 1/4"	1.25"				
G	2 3/4"	2.75"	2 3/4"	2.75"			3 1/2"	3.5"						
H	5/16"	.3125"	5/16"	.3125"										
I	1 1/8"	1.125"												
Special Notes	Through Holes		Through Holes		Through Holes		Through Holes		Through Holes		Through Holes		Special Notes	
	4 Nail	1/16" .0625	4 Nail	1/16" .0625	5 Drain	1/4" .25	4 Nail	1/16" .0625	4 Nail	1/16" .0625	2 Screw Eye	1/8" .125		
	1 Entry	1 1/8" 1.125												

Session 3 - Applying a primer coat

Goal – Students will learn to apply a primer coat of paint to a wood surface and produce a smooth finish.

Materials Needed

Birdhouse Kits – Nine pieces **(Only eight pieces are used for this session)**

Paint Brushes	Paint White (Primer)	Newspapers
Paper Plates (Small)	Cans for water	Painting Support Blocks

Notes:

1. The side with the color-coding and initials **does not get painted.**
2. Students do not need to paint the Roof Support Beam.
3. Visually inspect each piece and apply primer coat to the finished side of the parts.
4. Apply 1st coat of white primer to each of the pieces and allow them to dry to the touch.
5. Visually inspect each piece for runs, drips and globs of paint.
6. Use the painting support blocks after a piece is painted to prevent them from sticking to the newspaper.
7. After all the pieces have been painted and allowed to dry, apply a 2nd coat of white primer to each of the pieces

Session 4 - Art Segment – Canvas Landscape

Goal – Students will learn to paint a landscape on a canvas suitable for framing.

Materials Needed

Canvas	Paints – Art Class supplies	Paint Brushes
Paper Plates	Cans for water	Newspapers

Students with little or no art experience are given a plain white canvas and instructed using a proven step-by-step method to successfully complete a landscape painting. (This same method will be used on the Roof panels of the birdhouse.)

Notes:

1. Have students sign their name, school and date to the back of the painting.
2. Students need to pay attention to the instructions given and not work ahead of the instructors.
3. Separate the class into small groups based on number of instructors and assistants.
4. The main function of the assistants is to monitor the groups' progress and recognize when a student starts to lose control of the painting to prevent major mistakes.
5. Students will work on their canvas painting during sessions 4 and 5.

Session 5 Art Segment – Complete Canvas Landscape

Paint landscape on the Roof panels

Goal – Students will learn to paint a landscape on a canvas suitable for framing.

Materials Needed

Canvas	Roof panels	Paints – Art Class supplies
Paint Brushes	Paper Plates	Cans for water
Newspapers		

Students with little or no art experience are given a plain white canvas and instructed using a proven step-by-step method to successfully complete a landscape painting. (This same method will be used on the Roof panels of the birdhouse.)

Notes:

1. Students need to pay attention to the instructions given and not work ahead of the instructors.
2. Separate the class into the same small groups as session 4.
3. The main function of the assistants is to monitor the groups' progress and recognize when a student starts to lose control of the painting to prevent major mistakes.
4. Students will complete their canvas painting during this session and begin painting a landscape on the Roof panels of the birdhouse using the same steps learned in the canvas painting.
5. Place the Roof panels side by side and paint the landscape as one continuous scene.

Session 6 Art Segment – Complete Painting the Roof panels

Painting the individual birdhouse pieces

Goal – Students will complete the landscape painting.

Materials Needed

Birdhouse Kits – Nine pieces **(Only eight pieces are used for this session)**

Paints – Art Class supplies	Paint Brushes	Paper Plates
Cans for water	Newspapers	Painting Support Blocks

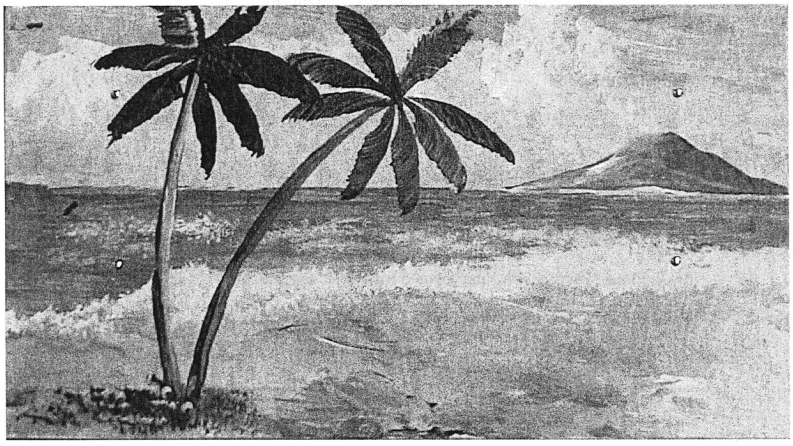
Paint Benjamin Moore Impervex Latex High Gloss

Red	Blue	Green	Yellow

Notes:

1. The side with the color-coding **does not get painted.**
2. Students do not need to paint the Roof Support Beam.
3. Students will finish painting a landscape on the Roof panels of the birdhouse using the same steps learned in the canvas painting.
4. Blue and Green paints cover well and usually only need 2 coats of paint. Red and Yellow will usually need between 2 and 4 coats of paint
5. Visually inspect each piece for runs, drips and globs of paint. Have students smooth these areas before moving to another piece.
6. Use the painting support blocks after a piece is painted to prevent them from sticking to the newspaper.

7. After all the pieces have been painted and allowed to dry, apply a 2nd coat of paint to each of the pieces.



(Finished landscape for the roof panels)

Session 7 Art Segment Complete painting the birdhouse

Goal – Students will learn to apply a coat of paint to a wood surface and produce a quality smooth finish.

This is a built in day for students to complete work they may have fallen behind on due to absences prior to assembling the birdhouse. Students may also need to apply additional coats of paint to produce a quality finish to their birdhouse. Students that are not behind can assist students that have fallen behind or choose to paint a complementary scene on the front, back, and side panels of their birdhouse.

Materials Needed

Birdhouse Kits – Nine pieces **(Only eight pieces are used for this session)**

Paints – Art Class supplies	Paint Brushes	Paper Plates
Cans for water	Newspapers	Painting Support Blocks

Paint Benjamin Moore Impervex Latex High Gloss

Red Blue Green Yellow

Notes:

1. The side with the color-coding **does not get painted.**
2. Students do not need to paint the Roof Support Beam.
3. Visually inspect each piece for runs, drips and globs of paint. Have students smooth these areas before moving onto another piece.
4. Use the painting support blocks after a piece is painted to prevent them from sticking to the newspaper.
5. After all the pieces have been painted and allowed to dry, apply a 2nd coat of paint to each of the pieces

Session 8 Assembly

Goal – Students will learn the proper and safe use of hand tools.

Materials Needed

Safety Glasses

Birdhouse Kits – Nine pieces **(Seven pieces are used during the first day of assembly)**

Hammers

1" Brass Plated Escutcheon Pins (need 8 for Day 1 assembly)

3/4" Brass Plated Escutcheon Pins (need 10 for Day 1 assembly)

Picks Split Screwdriver Tack Puller Needle Nosed Pliers

Notes:

1. **Students must wear safety glasses when assembling the birdhouse.**
2. Students will not use the Roof Cap Rod or the Roof panels during the first day of assembly
3. Students need to pay attention to the instructions given and not work ahead of the instructions given.
4. Each group will receive 2 hammers, 2 Needle nosed pliers, nails, and 1 pick (The picks are used by adult volunteers and Glou Factory staff only)
5. Separate the class into small groups based on number of instructors and assistants.
6. Use the needle nosed pliers to straighten slightly bent nails

Assembly Instructions Day 1:

Front panel

1. Locate the **4** nail holes in the **Front** panel
2. Use the picks to clear them of any paint if needed.
3. Have students nail the **1" Brass Plated Escutcheon Pins (need 4)** into the panel so the nails stand upright. ***(Do not hammer the nails all the way through the panel into the table.)***

Back panel

1. Locate the 4 nail holes in the Back panel
2. Use the picks to clear them of any paint if needed.
3. Have students nail the **1" Brass Plated Escutcheon Pins (need 4)** into the panel so the nails stand upright. ***(Do not hammer the nails all the way through the panel into the table.)***

Attaching the **Front and** Back **panels to the** Base

1. Place the **Front** panel onto the Base. (Check Alignment) Once the alignment is correct nail the bottom three nails into the Base.
2. Repeat the process for the Back panel. (Check Alignment) It will be necessary for the front panel to overlap the table to accommodate the last nail in the front panel.

Attaching the **Front and** Back **panels** to the Roof Support Beam.

1. Place the Roof Support Beam **between** the **Front** and Back panel.

2. Align the Roof Support Beam so that it aligns with the Roof angles of the **Front panel**. Once the alignment is correct, nail the top nail into the Roof Support Beam.
3. Repeat the process for the Back panel. (Check Alignment) Once the alignment is correct nail the top nail into the Roof Support Beam.

Attaching the Side panels

1. Locate the 5 nail holes in each side panel.
2. Use the picks to clear them of any paint if needed.
3. Have students nail the **3/4" Brass Plated Escutcheon Pins (need 5)** into the panel so the nails stand upright. ***(Do not hammer the nails all the way through the panel into the table.)***
4. The side with the 3 nails is the bottom of the piece and should be placed so that the center nail enters the Base of the birdhouse.
5. Place the side panel against the birdhouse between the **Front** and Back panels.
6. (Check Alignment) Due to variances in the wood the side panels may not fit exactly. Distribute the gap or wood overrun as evenly as possible. Once the alignment is correct hammer the lower left nail into place.
7. Hammer the upper right nail into place second. (This ensures the panel will stay in place as the other nails are driven.)
8. The three remaining nails can be driven in any order.
9. Repeat the process for the other Side panel.

END Assembly Instructions Day 1

Session 9 Final Assembly

Goal – Students will learn the proper and safe use of hand tools.

Materials Needed

Safety Glasses

Birdhouse Kits – Two remaining pieces (Roof Panels and **Roof Cap Rod** are used in Day 2)

Hammers 3/4" Brass Plated Escutcheon Pins (need 11 for Day 2)

Brass Small Eye (need 2 / birdhouse) String 15" segments (various colors)

1" Roof Alignment Bars Split Screwdriver Tack Puller Picks

Needle Nosed Pliers Micro Torch (used only by Glou Factory Staff)

Notes:

1. Students must wear safety glasses when assembling the birdhouse.
2. Students need to pay attention to the instructions given and **not work ahead of the instructions given.**
3. Each group will receive 2 hammers, 2 Needle nosed pliers, nails, 2 Roof Alignment Bars, and 1 pick (The picks are used by adult volunteers and Glou Factory staff only)
4. Separate the class into small groups based on number of instructors and assistants.
5. Use the needle nosed pliers to straighten slightly bent nails

Assembly Instructions Day 2:

Attaching the Roof panels

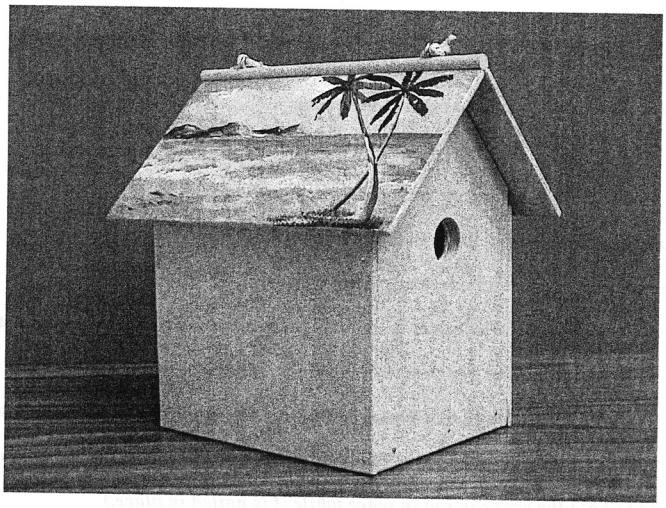
1. Locate the 4 nail holes in each Roof panel.
2. Use the picks to clear them of any paint if needed.
3. Have students nail the **3/4" Brass Plated Escutcheon Pins (need 4)** into the panel so the nails stand upright. ***(Do not hammer the nails all the way through the panel into the table.)***
4. Place a 1" Roof Alignment bar on each end of the Roof panel. (This will ensure that the nails strike the front and back panels in the correct location)
5. (Check Alignment) Due to variances in the wood the Roof panels may not fit exactly. Distribute the gap or wood overrun as evenly as possible. Once the alignment is correct hammer the lower left nail into place.
6. Hammer the upper right nail into place second. (This ensures the panel will stay in place as the other nails are driven.)
7. The two remaining nails can be driven in any order.
8. Repeat the process for the other Roof panel.

Attaching the **Roof Cap Rod**

1. Locate the 2 screw eye holes in the **Roof Cap Rod.**
2. Use the picks to clear them of any paint if needed.
3. (Check Alignment) Due to variances in the wood the **Roof Cap Rod** may not fit exactly. Distribute the gap or wood overrun as evenly as possible.
4. Nail 2 **1" Brass Plated Escutcheon Pins** into screw eye holes so the nails stand upright. ***(Do not hammer the nails all the way through. The pins are only used to hold the roof cap rod in place while it is nailed in place.)***

5. Nail 1 **3/4″ Brass Plated Escutcheon Pins** in the center of the Roof Cap Rod. (This will ensure that the nails strike the roof support beam in the correct location)
6. Nail 1 **3/4″ Brass Plated Escutcheon Pins** to the left and right of the center as close to the screw eye holes of the Roof Cap Rod as possible. (This will ensure that the nails strike the roof support beam in the correct location)
7. Remove the **1″ Brass Plated Escutcheon Pins**
8. Insert the 2 screw eyes into the remaining holes. (Use the picks to assist turning the screw eyes into place.)
9. Attach string – Use Micro Torch (used only by Glou Factory Staff) to trim string to the proper length.

END Assembly Instructions Day 2



Optional Session Computer Drawing

Goal – Students will learn how to draw the pieces of the birdhouse in a 3-D representation using a computer.

Materials Needed

1 Computer per student

Software needed – Microsoft Word (Drawing Tools)

Student completed Birdhouse Dimensions Worksheet

Decimal and 3D size chart

Notes:

1. Students use the completed Birdhouse Dimensions Worksheet.
2. Students begin with a blank new 8 1/2" x 11" document.
3. Set margins to zero – Landscape View
4. Begin with basic shape of piece –

   Select Format Menu

   i. Scroll down to AutoShape

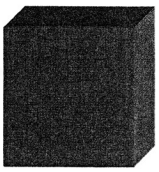
   ii. Select Tab marked Size

      1. Use "A" dimension for height

      2. Use "B" dimension for width

   iii. Center Shape on Page - Select Tab marked Layout

      1. Click "Advanced"

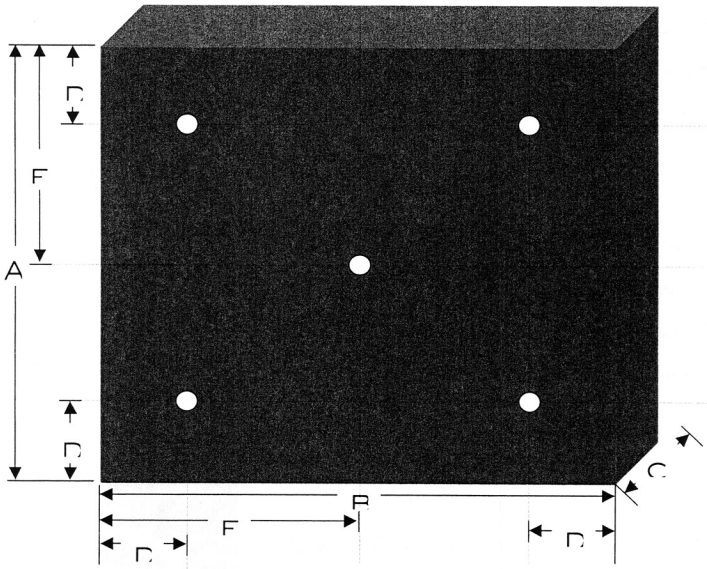


2. Set absolute position ___ to right of page.
3. Set absolute position ___ below page

iv. Set up for 3d values – Click Shape

1. Select 3d depth – enter point value for depth
2. Select 3d color

Repeat process for every detail needed to complete piece – mark dimensions using text boxes



(This is an example of a completed computer drawing)

Project Complete - End of Program Notes

BIOGRAPHY FOR GUS A. KRUDWIG

Gus attended Eastern Michigan University where he studied Criminal Justice. He has a background in law enforcement (Whitmore Lake Police Dept.) and security (University of Michigan Housing Security Department). In 1991 Gus began using his expertise to assist various non-profit organizations and local schools with computer technical support. It was during this time that Gus began working with youth and youth related programs and this provided a foundation for the development of the Glou Factory. In November 2000, Gus Krudwig and Louis Cubille formed the Glou Factory, a youth education facility that teaches students about art, woodworking, computer technology and bicycle repair.

BIOGRAPHY FOR LOUIS CUBILLE

Since moving to Jackson in 1992, Louis has had many accomplishments that have changed the face of Jackson. His biggest accomplishment is being the co-founder of the Glou Factory, a youth education facility that teaches students about art, woodworking, computer technology and bicycle repair.

He designed the art for a water tower welcoming people to the city. He also supervised and assisted local youth and adult artists to paint murals that adorn Casler Hardware, Armory Arts Project, King Center, Amy Firth Middle School, Northeast Elementary, Allen Elementary, Tomlinson High School, St. John's United Church of Christ, and New City Resources. He has taught art to hundreds of Jackson County youth.

A native of Ponce, Puerto Rico, Louis and his family moved to New York when he was seven. Since Spanish and English are spoken at home he is fluent in both languages. He started his art career at the High School of Art and Design and furthered his education at the Fashion Institute of Technology, where he majored in illustration and advertising.

As a commercial artist Louis has worked for some of the largest department stores in New York City and was art director for a major mail order company.

Sunday, March 28, 2004

The Honorable Nick Smith

Chairman, Research Subcommittee

2320 Rayburn Office Building

Washington, DC 20515

Dear Congressman Smith:

Thank you for the invitation to testify before the U.S. House of Representatives Committee on Science on March 30th, for the hearing entitled The Business of Math and Science Education: H.R. 4030. In accordance with the Rules Governing Testimony, this letter serves as formal notice of the Federal funding the Glou Factory currently receives in program support.

The Glou Factory has provided programs to two entities that received federal funds for after school programs. The amount of funding the Glou Factory receives is listed below.

Jackson Public Schools		Amount received
2002 – 2003	Academic School Year	$4,800
2003 – 2004	Academic School Year	$5,000
Jackson County Intermediate School District		
2003 – 2004	Academic School Year	$3,600

Sincerely,

Gus A. Krudwig

The Glou Factory
P.O. Box 1930
Jackson, MI 49204

DISCUSSION

Chairman SMITH. Thank you very much.

When we had—and was it last week or the week before last, we had the award, of course, for the outstanding math and science teachers in the United States? And in talking to those witnesses, it was interesting with one of the witnesses that was dealing with a community where almost 100 percent were eligible for the free hot lunch, a very below-poverty community, and the challenge of exciting, especially math and science in those communities compared to if you happen to live outside of NASA or when you are dealing with a high school where there might be a lot of Boeing employees in that community. So there is a tremendous challenge as we look across the communities and schools in the United States.

I guess my first question would be if we are going to have this as a win-win situation, and whatever is done by business and industry, of course, is a win for the United States, do we just ask on the generosity of companies to improve their local schools where these students might go on to another community or another industry? Can there be some rewards, Ms. Bailey, in terms of your industry, your company working with these students with their more greater familiarity that they are—that there is a chance that they will come back and work for Boeing? My first question is how do we help make this a win-win situation for both America and for the individual companies that are going to be giving up their time? And just briefly go down the row for a quick answer, and Ms. Bailey, starting with you.

Ms. BAILEY. Mr. Chairman, I think collaboration is going to be critical. I mentioned earlier that being engaged with programs and initiatives that are scalable and can be replicated is critical to success. And I think in the case of Boeing, as well as other industries, working collaboratively to address the issues of education is absolutely imperative.

As it relates to whether or not we are in a school district that has the availability to have an advanced science lab versus one that is working at below poverty level because of the socioeconomic group, I think there are many initiatives that you can initiate that would allow both organizations or both schools to be effective.

Mr. ENGELN. Yes, I do see the better educated students are, the better it is for all business. And I think there is almost a need for a third category and that is those businesses that have an outreach to programs where there is not a Boeing Company in town or a Texas Instruments company in town, things of that type.

Chairman SMITH. Mr. Robinson.

Mr. ROBINSON. I would simply say understanding the needs of each constituency, each stakeholder. If it is the students, they want to work with something that is fun. That is what it comes down to for elementary and high school students. Is it fun? Is it relevant? For teachers and administrators, does it move the student achievement needle forward? For businesses and government, does it provide for an adequate workforce? So what——

Chairman SMITH. Why does TI do it?

Mr. ROBINSON. Why does TI do it?

Chairman SMITH. Why are you putting your hundred thousand dollars or so to make this effort with local high schools?

Mr. ROBINSON. Simply because we, as an industry, need a larger pool of science, technology, engineering, and math-rich students that are available to TI and to the industry. It makes the community better when you have an educated populous.

Chairman SMITH. Dr. Ramaley.

Dr. RAMALEY. I am going to quote from a report called "Focusing on Results: a Business Leader's Guide for Optimizing School-to-Career Partnerships". And what they focus on is what is in it for the company. And the answer they give, from a whole range of companies, is that it improves employee morale. It improves loyalty and productivity of the employees. It is a wonderful way to develop mid-level managers as they prepare for greater responsibility, because it finds the collaborations they are dealing with numbers of people and dollars that they won't see in their own company for up to 10 to 15 years, depending on where they are in their careers. It confers recruitment advantages. It reduces training and supervision costs, and it definitely improves public relations. So there already is a considerable incentive for middle-sized and large companies to engage in this work.

For smaller companies, say fewer than 50 employees, which is what you find in most states, actually what is going on there is a mixture of employee-based quality of the community so that they can attract more people to their companies, because the—better and a way to encourage their own employees who are parents or who have children in school to be able to——

Chairman SMITH. Mr. Krudwig.

Mr. KRUDWIG. What we have found is a lot of projects and programs quickly become cost-prohibitive.

Chairman SMITH. A little closer. It is—I can't hear you very well.

Mr. KRUDWIG. What we have found is most of the projects and programs quickly become cost-prohibitive if there was some type of additional funding or something made available to these types of programs. I don't think you are going to be able to depend on, necessarily, businesses by themselves to—at least my experience in Jackson anyway, to be able to fund the substantial costs that these types of programs are going to incur.

Chairman SMITH. I think part of the gold medal award or how we do it, number one, we have left a lot of flexibility in the language so, Dr. Ramaley, the Working Group is a possibility. We have left that flexibility in for NSF to proceed. Part of this, hopefully, will be a brag item. And maybe, like you say, the advertising to be involved can contribute, but also the advertising on the award. And maybe we do the award on the Floor of the House on C–SPAN. I don't know. But we are looking for ideas.

With that, my red light is on, and we will call on Representative Johnson.

Ms. JOHNSON. I listened very closely to the potential costs for this award. If I was going to attempt to make any improvement, I was going to suggest originally that maybe some monetary award be added to it, but I guess that would maybe put it up to the point where it would be discouraged, because of the spending. However, unless there is a way to make this a very meaningful award, I won-

der what kind of incentive it would serve. I would like to have you comment on what you think needs to be done and how we can make it very meaningful for the persons to aspire to achieve it.

Dr. RAMALEY. I can speak a little bit to that, because the National Alliance for Business had a very similar program until two years ago when they merged with another organization, and their agenda took another path. What they did was they held a national meeting. They presented the awards. They then took out advertisements, which were in a number of national meetings, celebrating the achievements of their recipients. And they used several categories. They had a community college of the year. They had a company of the year. They had a state of the year. The last one they gave, by the way, was Virginia. They had a state business coalition and a local business coalition. So they went after a lot of different things. They did not have an additional monetary award. I tried to find out from the woman who used to run the program why they discontinued it, and I believe it is simply a redirection of their agenda. And it has some similar elements in this one. But the incentive appeared to be national recognition.

Ms. JOHNSON. Anyone?

Mr. ROBINSON. I would agree. Recognition would be probably one of the top two, recognition of the entities that have supported the award-winning program. Another element would be if there is a monetary award, that could be significant, because that award could go to whatever the supporting program happened to be, the non-profit, because we wouldn't want, necessarily, I don't think, an award going to a for-profit company, but one of the non-profits that are supported by the award.

Ms. JOHNSON. Anyone else?

Mr. KRUDWIG. All right. I tend to agree. I think Congressional recognition and national recognition, that is significant. I don't doubt that at all.

Ms. JOHNSON. Thank you very much.

Chairman SMITH. Thank you. And in some of the award programs, the businesses themselves contribute, in terms of a fee for the application. We didn't incorporate that in this bill, but the flexibility is there in some cases.

Mr. Gutknecht.

Mr. GUTKNECHT. Well, thank you, Mr. Chairman. And I apologize on behalf of many of my colleagues. Here, in Washington, we tend to pile meetings on top of meetings, and I had to go out even during your testimony, and so I apologize. I didn't hear all of it. But I do want to thank all of you for coming today. I think this is a very important national issue. I think the idea of motivating more young people and teachers in the area of science and math really needs to be a national priority. And I say that, because if you compare where we are in terms of educating new scientists and engineers and people in mathematics, we are doing okay until you start looking at what some of the Asian countries are doing, and then all of a sudden you realize we are falling further and further behind. And I think it is critical to the long-term growth of our economy and the improvement of our lives. And I guess what I would like to—and I don't know if you can comment on this, I happen to believe that success leaves clues. And I think that there are

ways that we can learn from areas where we do see growing interest, particularly among some sectors of our society.

If you look at sports, and I—you know, we hear too many sports analogies, but I think there is room for a comparison here that, you know, in sports, every Friday, the home team plays the cross-town rivals and there is a big write-up in the paper. And they publish the scores, and they have pictures of the kids, and we tend to really elevate sports stars, whether it is at the high school level or now even at the midget level all of the way through, and yet—and now I don't want to say that that is not important, but it seems to me we have got to figure out ways to recognize achievements in math and science. And I think the efforts of some of the companies represented here today are very, very laudable, and we do appreciate them. But are there other ways? Can you think of other ways and—well, let me just throw out one of my ideas, and you can tell me if this is a terrible idea. What I would really like to do is see if we can't figure out a way to take maybe a little bit of federal money, some State money, match that with some corporate money and do something that they do do in sports, and that is that they have in the summer these camps. And it really gives an opportunity for a lot of coaches to, you know, pick up a little extra money. And it also is an opportunity for youngsters who have an interest, whether it be in basketball or volleyball or whatever the sports camp is. I guess my question is is there a way that perhaps we could structure a program, and maybe you can't answer it today, to encourage those kinds of camps to be established around the country so that youngsters who are interested in math and science would—could get together, advance their understanding of the particular science, and also allow science and math teachers a chance to maybe pick up a few extra bucks and do something that is interesting for a couple of weeks in the month of June? Any comments on that?

Dr. RAMALEY. May I comment, Mr. Chair?

Mr. Gutknecht, we support that kind of development through what is called the Informal Science Education Program at the National Science Foundation. And it is built on exactly the story you just gave. There are both summer programs, after school programs, programs that are sponsored by community organizations for kids and families as well as more formal ones, and a wonderful portfolio called Citizen Science where young people and families and community members learn about some topic that will actually be applied to a problem in their own community. So we are doing a lot of this. And I wrote down Gus Krudwig's quote, "If kids don't get the math one way on one day, they will get it another way another day." That is actually a better motto for what we are doing than anything that I have come up with that sounded a little more officious, so I am going to steal your quote. So you had a very good idea, sir, backed by our efforts to help people around the country.

Mr. GUTKNECHT. Mr. Chairman, just one last point, then. I really would like to maybe pursue this discussion as we go forward to figure out how we, on the Science Committee, can do a better job of perhaps being the instigators of these kinds of programs in our own Districts. I mean, I have, you know, at least one of my universities who is very interested in seeing if they couldn't host some

kind of event. Now if we could just find a little bit of state money, a little federal money, and maybe a little corporate money, I think it could be turned into something that would be beneficial to all of the kids.

The other question I might just have and my—I see the yellow light is on. I am particularly concerned about how do we get more minority students interested in math and science? And maybe that is not the right term to use, because if you look at the schools in math and science, even in my own universities, they are heavily dominated by Asian kids. But it is hard to get a lot of other kids involved in math and science. Any—and my red light is already on, and so I am not sure you can answer that, but——

Dr. RAMALEY. A very brief response, sir. That is something we would love to come talk to you about. We have a very big agenda there. Some Members of the Committee have heard about it; some have not. With respect to helping you—anyone who is interested in advancing these in their own Districts, that is something we do regularly. We offer workshops. We do many things. We help people identify resources. But you—the topic you are raising is critical, and we would be happy to come brief you about it.

Mr. ENGELN. Yes, I think it is also important. Schools have an obligation to make sure that they recognize students for science and math achievements just like they would recognize students for athletic achievements. And we saw in our school a big turnaround, and it literally became cool to be smart. Kids would go and watch other students perform at the science fair. And I think that had a lot to do with the recognition that was afforded for all kids in all areas, not just the traditional activities.

Chairman SMITH. Mr. Honda.

Mr. HONDA. Thank you, Mr. Chairman, and Ranking Member Johnson. I appreciate this opportunity.

I have got a bunch of comments and questions for all of you, but I am going to try to be as succinct as possible.

One of the comments I heard that was quoting the saying up there was without a vision, the people will perish or something like that. And your comment was, Mr. Robinson, a vision without funding is illusionary. It was Mr. Engeln. But I think I heard a thread through all of you, and that is—and maybe I am wrong, but a lot of the activities that you are doing are good, and I think that it is helpful. It relates—it makes it relevant, I guess, for a lot of students, but I guess there are a lot of companies that are doing a lot of things throughout this country that are helping youngsters in addressing the issue of kids who don't have enough exposure, issues around equity in schools. I think that that is one issue that we are not facing about equity and funding and teacher quality throughout all of our schools. But let me make a comment on this. Are we focusing on symptoms of the kinds of things that may be amiss in our public school system and not at the causes? And yet all of us probably have a sense that we know where the cause and we are—but we are working really hard on trying to make some corrections and interventions.

The other question I have is probably more geared toward Dr. Ramaley. Cost, I agree. I think there is going to be a tremendous amount of costs and effort in this from the NSF. And it seems like

if we are going to do a program like this for honoring and recognizing folks, it sounds like we are going to have to have a system to sort of process everybody and find out, you know, in what areas are we going to recognize them in. It is going to be in areas, like Mr. Krudwig where, you know, you are taking youngsters that needed some help and encourage them, or are we going to go to Mr. Engeln's position where he is a principal? And I suspect that if you took him out of the picture, a lot of that stuff would have never happened between '93 and '98. So I think that principals have a major role in the success of youngsters and the way schools are run and done.

But the assessing of people who submit their programs will probably seem like it will be just like the Baldridge Award for Quality, you know. Then it will have some standing, I guess, in the community. But I guess to Mr. Engeln, if you wouldn't mind touching on—the achievement between '93 and '98 was great. And I—my question would be if you took the principal out of that picture, would the focus have been there and would the achievement have been there? If so, what are the ingredients that could be replicated throughout this country?

To Mr. Robinson, you know, the high school program, Infinity, it is a good program. I suspect that it has really generated a lot of interest and relevancy for students who don't understand the relevancy or the connection as they move on into math, because someone took the interest and the time to do that. What are some of the strategies that came out of that program that points toward the fourth grade, because fourth grade was mentioned? And then our achievement seems to drop after fourth grade. What are some of those things that could be pointed to fourth grade so that the programs—the Infinity programs—that kind of energy and resources can be, you know, placed in other areas?

The comment about Asians being predominant or noticeable minority, as an Asian American, I just have to make this comment. I appreciate what appears to be a high level of attention towards Asian students, but I have to say that that kind of comment could be very misleading in terms of the kinds of problems we face in the public educational system in that it tends to elevate Asians as if other minorities are not doing anything. That is number one. Number two, if you look at the families that these Asian students come from, there are probably a lot of characteristics that are seen with other families who are successful with their students. So I think that we ought to look at and desegregate the Asian population and see that there are other—the Asian populations are having as much trouble in math and science as any other student that comes from an SES, a socioeconomic status, that are commensurate with other students who are having problems in terms of different neighborhoods. So I think that we need to focus in on those kinds of factors rather than just looking at minority groups, because I think that that does a disservice to all groups.

Chairman SMITH. Mr. Honda, with your permission, I would ask maybe the witnesses to very briefly make a comment and then——

Mr. HONDA. Okay.

Chairman SMITH.—if you would, follow up with a more detailed answer to, I think, a pretty profound part of the question that we somehow have to answer.

Mr. HONDA. Right. And then, Mr. Chairman, if you would just allow me just one last comment.

If public education had something to do with homeland security, and I think it does, because I hear that as a lingering kind of a concern, if it could equate homeland security and public education, then we should probably be looking at a budget for education as we look at the budget for the Department of Defense. And—but I just—I don't want to leave the podium without telling you that as a school teacher, I appreciate the kinds of activities that all of you do, from private industry to community organizations, that you are saving kids. You are saving kids. And you are encouraging them to go on. But I would like to hear from you, also, what you think would be your—in addressing the real problem in public education so that all students can have the equal opportunities that we say we want them to have.

Chairman SMITH. And you want it in less than book form when they—a brief comment, a very brief comment, if you will, and then if you would consider following up with——

Mr. HONDA. Sure.

Chairman SMITH.—some of your other——

Mr. HONDA. Thank you, Mr. Smith.

Chairman SMITH.—thoughts on it to Mr. Honda, through the Committee. Please proceed.

Mr. ENGELN. Two things, very quickly. One of the things we found is when the business community cared, the students responded. And I think that was a big part of the change that happened at Palmer High School. As far as replicating our success, there are two documents that you do have: the Guiding Principles for School-Business Partnerships, which is research-based, and a simple how-to guide for school-business partnerships. And this is based on my experiences as well as principals throughout the country to try to put best practices in place in very easily useable format for schools and businesses.

Mr. HONDA. My question was, though, what role did the principal have?

Mr. ENGELN. The principal does play a huge role, but so do parents, so do students, so do teachers. And if it is a truly community effort involving the businesses, your chances of success are much greater. That is my personal feeling. And I couldn't have done it alone. It truly was a community effort.

Dr. RAMALEY. Mr. Honda, I will pick one piece of that very complex story, and that is there is no magic bullet. There is no one place to intervene. The primary piece of advice given in every document I have seen is look at the whole system. Make sure your intervention is mindful of the rest of it. And then you may get somewhere.

Chairman SMITH. To finish our testimony, I am going to move to Mr. Akin.

Mr. AKIN. Thank you, Mr. Chairman. I am glad—it seems like we are getting it in here at the last minute. That is good.

I just had a couple of thoughts. First of all, I used to teach a thing called Project Business, which is part of junior achievement, a number of years ago. And so I have had some interest in the kinds of things you are doing. It was a business kind of deal where you go in, and in this case, it was a math class. It was about eighth, ninth, and tenth graders and I had a chance to teach them for an hour. And that was quite a learning experience for the teachers, you can imagine. But I am very sympathetic with your interest to try to supplement and help kids to learn and get them through.

First of all, in terms of questions in whether we have some concerns in this country, is there a shortage—or do we find there is a shortage of good math and science students that are educated in America? Are we educating fewer of them now than we did, say, 10 or 15 years ago? And is that a problem, first of all?

Dr. RAMALEY. We have not seen any evidence of fewer. What is happening is that we are raising our expectations. And as a result——

Mr. AKIN. And the number of Bachelor of Science that we are producing——

Dr. RAMALEY. Has remained almost steady.

Mr. AKIN. Fairly steady. But what you are asking those people to do when they come out is——

Dr. RAMALEY. Is higher.

Mr. AKIN.—okay, a little more challenging. Okay.

And then I guess the next question I would say would be in terms of the history of education, I will maybe piggyback on some of the questions that Congressman Honda was talking about. Have you taken a look at any of the assumptions that we build into education? For instance, what was the performance of education in America, say, 200 years ago? Have you looked at that?

Dr. RAMALEY. There have been a number of studies on exactly that. I would be pleased to have someone provide you a——

Mr. AKIN. Do you know what the literacy rate was in America, for instance, in the year 1800?

Dr. RAMALEY. We have those data. I don't have them in my head. It was much less than it is today, but we can get those kinds of figures for you.

Mr. AKIN. That is why I ask the question. One of the things they teach us—I am an engineer by training, but I hang around enough lawyers to have learned some of their tricks. One of their tricks is you don't ask a question unless you know the answer. Jefferson had a study commissioned on American literacy in the year 1800, and that literacy rate came back that of sample populations of 1,000 people, a sample of 1,000 where there were two that could not read and write with a clear handwriting, and good reading skills was an unusually illiterate sample population. So we had 99-plus percent literacy rate in America in 1800. And today, at least in our city schools, do you know what that rate is? It is not very good. It may be half, if we are fortunate. Now that suggests in that—you are all people who come from a technical background and from a well-educated background, doesn't that suggest that we take a look at, from a system's point of view, what has changed? I think there are some fundamental questions that would be good

to ask and to ask ourselves what really works in education and what doesn't.

You are talking about setting up some kinds of projects where people are being recognized so kids get some attention for their performance. Who are the kids most interested in impressing? Have you considered that? And I think that is an interesting question. I am 56. I guess I still act like a kid a lot of times. If you ask me that question, as somebody on the planet Earth, who would you want to impress, I think to me, it is more likely my parents than anybody else. You know. Are we building that into the equation as we are trying to set some of these programs up?

And so I just challenge you to try to take a look at some of those things. Another thing, too, that you might give some thought to and that would be there is an increased number of people who are home schooling. Are any of the programs that you are dealing with available to those kids, because some of those kids are very innovative? And you have an element there that makes education go well, which is heavy parental involvement. You know, no matter what school a kid is in, if the parents are involved, it always seems to work better, and there might be a place where you would find a lot of interest, and they have a much more flexible schedule so they could work on projects and give them more time.

Just a few thoughts. I just wanted to ask you about that just from the basics of what are we doing, how do we tailor the programs to be more effective, and what are the parameters that make a program effective. But I encourage all of you and thank you for the work that you are doing moving from the public into the—I mean private into the public sector that way. Anybody who wants to respond, I am happy to—otherwise, we are going to have to go scoot and vote. Yeah.

Mr. ENGELN. Yes, I could respond, maybe, to the home school piece and that one of the things we see in high schools is a lot of parents that are home schooling their students tend to become more involved with their high schools when they get into upper level science and math classes. So it still is a natural way to bring home schoolers, public school educators, and businesses together.

Mr. AKIN. Yeah. I know in our area that what we have done, at least with our kids, we have gone to the local colleges for our science classes. So when my kids get high school age, we just stick them straight into college classes. So that is one way you can do it, if you live near a college. You know. And you just poach it off as evening school or something like that, and they will let you in. And as long as you are getting good grades and everything, the colleges are happy to have a little extra income.

But thank you for your thought and your good work.

Chairman SMITH. Mr. Akin, I might mention that I completely agree with many of your comments.

Under Section 7 of the bill, we do include, in the entities that will select the Medal and the general criteria, Number 4 is evidence of successful outreach to students, parents, and the community regarding the importance of mathematics and science education and the Nation's prosperity. And what I have said somewhat jokingly, but in some truth, is that if parents knew the circumstances of the unfunded liabilities and the danger of losing

some of their Social Security and depending maybe more significantly on the income from their children, maybe they would encourage that science and math education more aggressively.

I would like to conclude this by maybe each one of you taking a minute of any other thoughts that you would like to pass on. Your testimony and your—the response to questions will be provided to the Full Science Committee. We are planning on taking this bill up in the Full Science Committee next week, so additional thoughts or comments, starting with you, Ms. Bailey.

Ms. BAILEY. Just one last comment, Mr. Chairman. I think it is critically important that we look at this as a systemic issue and that we look at it as a system of systems issue and not take things in isolation, because we will find that many things impact other things. It is one of the strengths that we have identified of systems integration. We need to look at our educational system in the same fashion.

Mr. ENGELN. I think just to summarize with one comment is together you can achieve the extraordinary. And I think businesses and schools, working together, research has shown that it does make a difference in the student achievement levels for students, and it is good for communities.

Chairman SMITH. Thank you, Mr. Engeln.

Mr. Robinson.

Mr. ROBINSON. I want to leave you with a thought from Dr. Mike Moses, who is the superintendent of schools in the Dallas Independent School District. And he uses this phrase when he talks to businesses about some of the great things that they are doing to work with the public schools in the Dallas area. He talks about random acts of kindness. Although many businesses are well intentioned in their efforts with schools, oftentimes it is just not aligned with the priorities. It does not move that needle of student achievement forward. So I wanted to leave with that thought, because as entities, we need to make sure that we are aligned with the priorities of our school districts.

Chairman SMITH. Dr. Ramaley.

Dr. RAMALEY. I would like to pick up on that. What I have enjoyed seeing is the growing appreciation by corporate and employer groups that are the very things you have just heard from the other witnesses. The sophistication, the clarity, the greater knowledge, the greater expectation that there will be a comprehensive response is changing how effective these relationships are and, I think, will benefit all of our young people, our teachers, and communities. And I wanted to thank my fellow panelists for the ways in which they showed you that in their own company programs.

Chairman SMITH. Thank you.

Mr. Krudwig.

Mr. KRUDWIG. I believe that the bill can help businesses and entities and schools all work together. I think it is something that is needed. And if it improves the math and science fields, then—that is it.

Chairman SMITH. Ladies, gentlemen, I thank you again. I hope you will permit us to ask additional questions by mail that you might respond to. Again, thank you very much for taking your time

and making the effort to come today to testify on this issue. We appreciate your ideas and your knowledge very much.

With that, the Subcommittee is adjourned.

[Whereupon, at 11:40 a.m., the Subcommittee was adjourned.]

Appendix 1:

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by Antoinette M. Bailey, Vice President, Community and Education Relations, Boeing Company

Questions submitted by Representative Michael Honda

Q1. Are we focusing on symptoms of the kinds of things that may be amiss in our public school system and not at the causes? That is, are the kinds of programs this medal would honor simply patches filling in holes in our system, and by awarding the patches do we neglect to fix the holes?

A1. Educators, politicians, and business people should agree there is no "silver bullet" fix for our educational system. Section III of the bill outlines the poor performance of U.S. students in the areas of reading, math, and science.

There are a number of other studies that delve into the issues and challenges facing the United States education system as we prepare young people to be fully capable and contributing global citizens: The Koret Task Force on K–12 Education is one such study, but here again, there are many reputable studies. We face a shortage of quality math and science teachers often times those teachers who are least capable of teaching math and science are often assigned to students and schools with the greatest need. The issues facing our educational system are complex and are a part of a larger socio-economic system that can't be addressed simplistically or singularly.

Effective businesses are partnering and strategically aiming their resources and capabilities at specific entry points within that complex system. The Boeing Company, as an example, is focusing on improving the overall quality of math and science instruction by targeting increased capability of teachers and educational leaders. Recognizing the efforts of businesses in addressing this complex system is neither a fix nor a patch; however it can be beneficial if the *recognition leads* to incorporating successful initiatives into the larger integrated system through replication, internalizing, scaling up and sustaining successful interventions.

Q2. What do you think are the real problems in public education that lead to inequality in opportunities for different students and how would you address these?

A2. I must defer to more learned colleagues in taking on this tremendously important and challenging question. I can offer a perspective that the issues of inequality are deeply rooted societal issues and are demonstrated in diluted expectations, inequality of health care access and health care education, limited pre-school educational options affordable for many families living below the poverty line, inequities in the distribution of income, ineffective school leadership, etc. I might direct the questioner to *"Education Next" a Journal of Opinion and Research.* The Spring 2003 issue provides a cornucopia of not only research, but opinions that deserve attentive considerations. Teacher quality can, over time, make a significant difference in the area of inequality. However, there does have to be an infrastructure in place to support quality teachers and enlightened leadership, e.g., adequate pay for performance, leadership development, resource support for quality instruction, etc.

The Boeing Company will continue to support initiatives aligned with our strategy that enhance the learning and capability of the youth of our society and strive to be an active partner in this worthwhile endeavor.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Jay T. Engeln, Resident Practitioner for Business-School Partnerships, National Association of Secondary School Principals

Questions submitted by Representative Michael Honda

Q1. Are we focusing on symptoms of the kinds of things that may be amiss in our public school system and not the causes? That is, are the kinds of programs this medal would honor simply patching in holes in our system, and by awarding patches do we neglect to fix the holes?

A1. Relative to William J. Palmer High School in Colorado Springs, Colorado, the cause of many of our problems was a poor economic situation. The local and state business sector was in a downturn and the school district had not passed a bond issue for 27 years, consequently the funds available for school were very limited. The partnerships established between the school and businesses provided the revenue and human resource support that allowed the school to overcome the limitations of inadequate funding.

I do feel that it is important to recognize businesses that are involved in math and science programs in public schools across the country. Showcasing exemplary programs for other schools, school districts, and businesses to emulate would be a plus. It is also extremely important that funding levels are not reduced because of business involvement. Partnerships provide an opportunity to enhance programs and provide the best possible programs for students. If funding is reduced because of partnership involvement at a school, then we are not only neglecting to fix holes but are creating new ones.

As Senator Hilary Clinton stated repeatedly in the past, "It takes an entire village to raise a child." Business partnerships put into action an essential component of this statement and recognition of the businesses involved is a positive way to share best in class programs that can servers as excellent models for others to emulate. . ..

Q2. What do you think are the real problems in public education that lead to inequality in opportunities to for different students and how would you address these?

A2. In regards the topic of math/science school/business partnership, inequalities can occur based on the location of schools relative to the location of businesses. Businesses tend to be involved with schools that their employees attend or are located in the attendance area of a school or school district. Inner city schools and rural schools are often those with fewer partnership opportunities. Partnerships can help provide resources and/or expertise for schools that might not otherwise have these resources available. Overcoming these obstacles of geography can occur with businesses reaching out to schools in localities that they do not normally serve.

Q3. How important was the principal in implementing your program? If you took the principal out of the picture, would the focus have been there and would the achievement been there? The concern is that if it is all driven by the principal, this program would not be very portable. But is it is not driven solely by a single personality, what are the ingredients that could be replicated throughout the country?

A3. Research repeatedly shows that the principal is an essential component of school reform and school success. Leadership that focuses on the incorporation of best practices in the classroom for all students is critical for continued improvement in student achievement.

In regards to partnerships, the principal does play an important role in driving school/business partnership involvement. The process however, does not have to be limited to an individual principal's style. The process of implementing long-term, sustainable and effective partnerships is portable to other schools and school districts. The *Guiding Principles for Business and School Partnerships* and the *How-To Guide for School/Business Partnerships* are two documents developed by the Council for Corporate and School Partnerships, to assist schools and school districts in working with current and potential business partners. The publications incorporate research based information and examples of how to incorporate "best practices" when implementing school/business partnerships. The ingredients included in the documents are designed to help educators and business leaders maximize the benefits of partnerships and enhance the educational opportunities for all students. Working together, schools and business can make a difference!

ANSWERS TO POST-HEARING QUESTIONS

Responses by Torrence H. Robinson, Director, Federal Affairs, Texas Instruments

Questions submitted by Representative Michael Honda

Q1. Are we focusing on symptoms of the kinds of things that may be amiss in our public school system and not at the causes? That is, are the kinds of programs this medal would honor simply patches filling in holes in our system, and by awarding the patches do we neglect to fix the holes?

A1. The kinds of programs this medal would honor would indeed address key tactical areas in improving math and science education. Tactical areas include: curricular innovation, industrial involvement and interaction with students and teachers to improve student learning, more receptive student attitudes towards science, technology, engineering and math (STEM), parental and community education about the importance of STEM, and effective and sustainable programs.

Q2. What do you think are the real problems in public education that lead to inequality in opportunities for different students and how would you address these?

A2. Attraction and retention of highly qualified teachers, particularly in the math and science disciplines is one of the "real problems" of public education that lead to inequality in student opportunities.

High teacher turnover rates negatively impact all education sectors, but low income public schools are impacted at a greater degree than any other sector of public education, 20 percent vs. the average of 15.7 percent for all education sectors (Unraveling the "Teacher Shortage" Problem: Teacher Retention is the Key, A symposium of the National Commission on Teaching and America's Future and NCTAF State Partners, Aug. 20–22, 2002). Consequently, it is the lowest income students who suffer most from teacher turnover and attrition. The resulting effect is poorer teacher quality and lower student achievement.

Major factors that influence teacher turnover include salaries, working conditions, preparation and mentoring support in the initial years of teaching. I would point Mr. Honda and the Science Committee to my full testimony with regards to the Texas Instruments Foundation investment in programs such as the Advanced Placement Incentive Program which includes a teacher preparation component. Programs such as AP have been proven to work in low-income schools. I recommend broader implementation of similar programs that perfect the abilities, raise the expectations and broaden the experiences of math and science teachers.

Q3. Are there things that were successful with the high school program Infinity that can suggest how other programs might be designed for lower grade levels? The fourth through eighth grade period has been cited as a critical time at which student curiosity is quite high but at which time we often lose a lot of students who had previously been interested in math and science. Is there any data from your program that points to strategies that would allow you to leverage what you have learned at the high school level to improve programs at other grade levels, too?

A3. Strategies incorporated by the Infinity Project that could be used at other grade levels in math and science include making a clearer connection between curriculum and what students find relevant to their lives and making those connections more often. This is a particular challenge of traditional mathematics pedagogy. Too often textbooks and teachers do a poor job in making the connection between mathematical concepts and relevant applications that are interesting to students. During initial and subsequent revisions of the Infinity curriculum, the Infinity team, consisting of university faculty and technologists with doctoral degrees in engineering, physics and education, made it a point to consult with master secondary math and science educators. Their focus was to help bridge the gap between their content expertise and the real-world of the high school classroom, thereby ensuring that the content was not only accurate, but would integrate effectively within the practicalities and expectations of the high school classroom. This idea was particularly important because there are essentially few high school "engineering" instructors, therefore, the challenge that was successfully met by Infinity was to help math and science instructors translate their math and science content knowledge and pedagogical expertise into fun and relevant math and science-based engineering instruction.

Another factor that is not unique to Infinity but is nevertheless critically important is access to qualified, properly trained and motivated teachers. The Infinity Project requires that teacher applicants are certified in math, science or technology. The Infinity Project Professional Development Institutes, which prepare instructors for teaching the Infinity material, consistently receive high ratings from its participants. A comment such as "this is the best professional development I have ever had" is a common reaction. The Infinity staff concludes that the positive outcome is due to the professionalism and enthusiasm of its instructors, the well-organized training materials, the experiential (i.e., hands-on) nature of the course and the customer-centered approach by the staff.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Judith A. Ramaley, Assistant Director, Education and Human Resources Directorate, National Science Foundation

Questions submitted by Representative Michael Honda

Q1. Are we focusing on symptoms of the kinds of things that may be amiss in our public school system and not at the causes? That is, are the kinds of programs this medal would honor simply patches filling in holes in our system, and by awarding the patches; do we neglect to fix the holes?

A1. If the criteria for the award are defined in such a way that the award is made to programs or individuals who, by their example, create a vision for others of what is possible in public education, then this medal will have served a useful purpose. Enriching the vision for public education has the potential to do more than patch over the holes in our system. It can signify our resolve to seek out and validate those who have been successful in raising expectations for *all* students or who have created the strong academic environments in which innovative ideas and approaches have been nurtured. To the extent that the criteria for awards of this type contribute to a *national vision* of a high quality education for all students, such awards can be meaningful.

Q2. What do you think are the real problems in public education that lead to inequality in opportunities for different students and how would you address these?

A2. The real problems in public education often stem from the lack of a realistic vision about (a) what constitutes a high quality education that can prepare our young people for the future and (b) how to get there. All too often there is neither sufficient understanding of how important academic leadership is in schools and districts nor the resolve to do what it takes to raise the level of academic leadership.

Providing a high quality education that prepares *all* students for the future calls for:

- Challenging curricula, courses, and instructional materials in every school, at every grade level.
- Teachers who are competent in their subject matter, and knowledgeable about student thinking and how to assess student progress on a day-to-day basis in the classroom.
- Guidance counselors, teachers, and administrators who are well prepared to work with parents and students to raise academic expectations, and whose advice and guidance give students a vision of their future beyond what they may see in their immediate environments.
- Strategic allocation of school/district resources that aligns financial and other resources with what is most valued.
- Multiple opportunities—including innovative use of technology and structured experiences for enrichment outside of the regular classroom—that engage students in academic pursuits, expand their horizons of expectation for themselves, validate their accomplishments, and make learning an endeavor that is highly prized.

ANSWERS TO POST-HEARING QUESTIONS

Submitted to Gus A. Krudwig, Co-founder, The Glou Factory

These questions were submitted to the witness, but were not responded to by the time of publication.

Questions submitted by Representative Michael Honda

Q1. Are we focusing on symptoms of the kinds of things that may be amiss in our public school system and not at the causes? That is, are the kinds of programs this medal would honor simply patches filling in holes in our system, and by awarding the patches do we neglect to fix the holes?

Q2. What do you think are the real problems in public education that lead to inequality in opportunities for different students and how would you address these?

Appendix 2:

Additional Material for the Record

I

108TH CONGRESS
2D SESSION

H. R. 4030

To establish the Congressional Medal for Outstanding Contributions in Math and Science Education program to recognize private entities for their outstanding contributions to elementary and secondary science, technology, engineering, and mathematics education.

IN THE HOUSE OF REPRESENTATIVES

MARCH 25, 2004

Mr. SMITH of Michigan (for himself and Ms. EDDIE BERNICE JOHNSON of Texas) introduced the following bill; which was referred to the Committee on Science

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A BILL

To establish the Congressional Medal for Outstanding Contributions in Math and Science Education program to recognize private entities for their outstanding contributions to elementary and secondary science, technology, engineering, and mathematics education.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the ''Congressional Medal for Outstanding Contributions in Math and Science Education Act of 2004''.

SEC. 2. DEFINITIONS.

In this Act:

(1) DIRECTOR.—The term ''Director'' means the Director of the National Science Foundation.

(2) ELEMENTARY SCHOOL AND SECONDARY SCHOOL.—The terms ''elementary school'' and ''secondary school'' have the meaning given those terms in section 9101 of the Elementary and Secondary Education Act of 1965 (20 U.S.C. 7801).

SEC. 3. ESTABLISHMENT OF PROGRAM.

The Director shall establish a Congressional Medal for Outstanding Contributions in Math and Science Education program, which shall be designed to—

(1) recognize private entities for outstanding efforts supporting elementary and secondary schools in improving student achievement in science, technology, engineering, and mathematics;

(2) encourage private entities to support elementary and secondary schools to improve and underscore the importance of science, technology, engineering, and mathematics education; and

(3) make information about medal recipients available to schools, institutions of higher education, educators, parents, administrators, policymakers, researchers, public and private entities, and the general public.

SEC. 4. MEDALS.

(a) FINALISTS.—Beginning not later than 2 years after the date of enactment of this Act, the Director shall annually name as finalists for medals under this Act—

(1) not more than 20 private entities with more than 500 employees; and

(2) not more than 20 private entities with 500 or fewer employees.

Each finalist shall receive a citation describing the basis for the entity achieving status as a finalist.

(b) MEDAL WINNERS.—Beginning not later than 2 years after the date of enactment of this Act, from among finalists named under subsection (a), the Director shall annually award medals under this Act to—

(1) not more than 5 private entities with more than 500 employees; and

(2) not more than 5 private entities with 500 or fewer employees.

(c) DISTRIBUTION OF INFORMATION.—(1) The Director shall distribute information about the Congressional Medal for Outstanding Contributions in Math and Science Education recipients under this Act in a timely and efficient manner (including through the use of a searchable online database) to schools, institutions of higher education, educators, parents, administrators, policymakers,

researchers, public and private entities, and the general public.

(2) An entity that is a finalist or receives a medal under this section may use such information for advertising and other publicity purposes.

SEC. 5. ELIGIBILITY.

Any private entity that has, whether working alone or in partnership with for-profit or nonprofit entities, assisted students, teachers, administrators, or other support staff to improve student achievement in science, technology, engineering, and mathematics in a school or community shall be eligible to receive a medal under section 4. The entity must have been involved in such activities in a sustained manner for at least 2 years with at least one elementary or secondary school.

SEC. 6. APPLICATION.

The Director shall establish a system for accepting applications from entities seeking to be considered for a medal under this Act. Applications shall include at least two letters of support, which may come from teachers, professional support staff, administrators, professional or business organizations, local, county, or State Departments of Education, or any other category of persons as designated by the Director. Letters of support shall describe the reasons the entity deserves the medal.

SEC. 7. SELECTION.

In selecting entities to receive medals under this Act, the Director shall give priority consideration to evidence of improved student achievement in science, technology, engineering, or mathematics. In addition to any other criteria the Director may establish, the Director shall also consider the following:

(1) Evidence of innovative approaches to increase interest by students in science, technology, engineering, and mathematics, such as an increase in the number of students enrolled in advanced courses related to such fields.

(2) Evidence of employee interaction with students or teachers to support and improve mathematics and science learning.

(3) Evidence of success in positively influencing student attitudes and promoting education and career opportunities in science, technology, engineering, and mathematics.

(4) Evidence of successful outreach to students, parents, and the community regarding the importance of mathematics and science education to the Nation's prosperity, job creation, and standard of living, as well as future earning potential for the individual.

(5) Evidence of a strong and sustained commitment to the students and schools.

SEC. 8. AUTHORIZATION OF APPROPRIATIONS.

For each of fiscal years 2005 through 2007, there are authorized to be appropriated to the National Science Foundation such sums as may be necessary for carrying out this Act, to be derived from amounts authorized by the National Science Foundation Authorization Act of 2002.

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