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A Systems Approach to Improving K-12 STEM Education

Testimony of

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Introduction

In this country, science and innovation, especially as they relate to human health, will be key to addressing some of our greatest challenges. Multiple trends and cumulative forces have contributed to a looming crisis in science and science education, impacting our ability to compete as an innovative global leader. At the same time, our workforce needs in science, engineering and technology are increasing at a time when fewer U.S. citizens are training for these professions.

Over the past 50 years, U.S. innovation has led global developments in science and technology, simultaneously improving our quality of life and fueling our economy. However, declining investments in science education, declining enrollments in science courses and professional training programs, and a declining level of encouragement from parents for their children to learn science and consider science and technology careers are putting us at increasingly greater risk.

In order to increase the perceived value of science learning in society, increase the level of scientific and technological literacy across that society, and increase the number of young people selecting science and technology career paths, we need to create more opportunities to actively engage the scientific community in education. Without immediate action, we risk losing our ability to find solutions to the challenging global problems that all humanity face in the areas of health, energy, security and the environment.

As a global, broad-based health care company, with scientific expertise and products that span the human life cycle and the continuum of care, Abbott is dependent on an increasingly sophisticated workforce with strong science, technology, engineering, math (STEM), and 21st century skills. Fifty-three percent of our US workforce has a STEM background and are recruited from around the globe. While Abbott values their globally diverse workforce, it would be much to our advantage if we could recruit a higher percentage of these STEM skilled employees from our own research and development communities.

To this end, Abbott has taken the same scientific precision with which we execute our day-to-day research and operations and applied it to our approach to philanthropy and employee engagement in science education. We have taken a strategic approach to science education that capitalizes on Abbott's strengths in science and the strengths of a few strategic partners well-versed in science education. Our investments in science education can be characterized as:

1. **Strategic, Systemic, Sustainable** - working with students and their families throughout the K-12 spectrum
2. **Built Around Strong Partnerships** - working with existing successful organizations and education delivery models
3. **Serving as a Catalyst** - stimulating additional community investment and engagement

Strategic, Systemic, Sustainable

Our focus on STEM education represents an investment along the full K-12 spectrum. This investment is part of Abbott's global science education platform serving students of all ages, with authentic, engaging and developmentally appropriate science learning experiences.

As a research-based company, we rely heavily on scientific evidence and measurable outcomes. Research shows that early investment in a child's education reaps tremendous rewards educationally, economically and socially. According to the National Science Teachers Association, research also indicates that when parents play an active role, children achieve greater success as students, regardless of socioeconomic status, ethnic/racial background, or the parents' own level of education (*NSTA Position Statement on parent*

Involvement in Science Learning, 2008). Couple these factors with programs that are systemic and sustainable and a model for success is created.

For this reason, Abbott has chosen to invest in programs that are strategic, systemic and sustainable. The programs start with young students and continue to provide opportunities through the K-12 educational spectrum.

To reach young children, and encourage greater participation from parents, Abbott has formed a partnership with the non-profit Family Science organization. Together we developed Abbott Family Science, a unique informal educational offering serving elementary school age children and their parents. Abbott Family Science events actively engage families typically underserved in the areas of science education. These programs bring kids, parents, teachers and scientists together for an exciting, hands-on experience focused on fundamental science and 21st century skills (observation, problem-solving, teamwork) and building confidence as life-long science learners. The program is designed to be replicable year after year, forming a strong, sustainable partnership between Abbott scientists and schools in their local community. To date, programs have been launched throughout the US and internationally in Abbott research and development communities.

Abbott has also developed experiences that match the needs of older middle school students. At that age, interest in science often declines, especially in girls. Providing a rich, authentic, real world science experience is a way to introduce those students to the exciting world of scientific exploration and discovery. Abbott's Operation Discovery program is a guided experience at an Abbott facility in which Abbott scientists serve as mentors and role models to the students and facilitate hands-on experiments in small groups introducing the students to some of the very same tools and procedures that Abbott employees use everyday in their work.

At the high school level, Abbott is committed to enrichment experiences that complement in-school learning, thereby optimizing their investment with a systemic approach. By reaching students through after school science programs, both during the school year and the summer, Abbott meets a real need in the community and helps build bridges between formal and informal education. Working with the nationally acclaimed After School Matters (ASM) program, Abbott is actively engaged in increasing the opportunities in science for underserved students in the Chicago area.

In addition to their investment in After School Matters, Abbott supports other Chicago area K-12 enrichment experiences including FIRST Robotics and Project Exploration.

Built Around Strong Partnerships

Developing strong community partnerships ensures that programs evolve based on the interests and needs of the audiences being served, and that they are sustainable and have a lasting impact over time. At Abbott, we believe we can make valuable contributions to science education by providing scientific expertise and access to authentic STEM experiences. We also recognize that to have the strongest impact and make the most efficient use of our own resources, a more strategic approach to providing science education experiences is to partner with educational organizations. Informal science education organizations increasingly are being recognized for their crucial role in providing innovative STEM education (*Learning Science in Informal Environments: People, Places and Pursuits*, National Research Council, 2009).

In recent years, Abbott has increased their focus on partnering with established non-profits and informal STEM providers. In the case of Abbott Family Science, we developed our program in partnership with the Foundation for Family Science, an established non-profit with proven multilingual curriculum materials and program delivery models. We have adapted the program to include Abbott employees, scientists and engineers and are now delivering the program globally. The programs are designed to be sustainable and will continue to grow. To date, programs have been launched in the US in Illinois, California, Ohio, Puerto Rico, as well as internationally in Ireland and Singapore.

In Chicago, we are very proud of our partnership with one of the nation's leading after school initiatives, After School Matters (ASM), to design and launch a science-based after school program for Chicago area teens. Prior to 2007, ASM did not offer science enrichment to the nearly 22,000 teens it serves annually. By investing in an existing, successful informal education delivery model, Abbott has been working with ASM to retool that model to provide innovative science learning opportunities. After school and summer programs provide an opportunity to reach diverse and underserved students, thus potentially increasing both the size and diversity of our future science and engineering workforce.

The result is "science37", a new category of after school programming for Chicago-area youth, named after the original gallery37 arts program initiated

by Chicago's First Lady, Maggie Daley. Abbott's investment is intended to serve as a catalyst to both increase the capacity of ASM and encourage further community engagement and investment in after school science programming.

The science37 program provides teens with hands-on opportunities that expose them to rewarding career opportunities and help them develop marketable job skills that have immediate value in the workplace. This innovative program also offers paid internships to high school students in some of Chicago's most underserved schools.

Abbott's support of this partnership goes far beyond direct program support. As part of Abbott's commitment to after school science, the company provides ASM with expert consultants experienced in innovative science and education program design, implementation and evaluation. To date, Abbott has contributed over \$1.5 million to after school science programs in Chicago, which includes not only direct program support, but also program research, development, evaluation and scientific expertise.

Abbott scientists were directly involved in the design of the partnership and continue to play a major role in the implementation of two of science37's flagship courses in the Bio Sciences. Key components include hands-on laboratory experiments, interaction with guest scientists, visits to Abbott research and development sites, and a culminating project using important 21st Century skills in research, critical-thinking and communication.

Abbott continues to partner with ASM to design, expand and evaluate these innovative science enrichment experiences, and to provide strategic advice and educational expertise for further Science37 program development and implementation.

Understanding the impact of programs is key, and Abbott has implemented a formal evaluation process to measure the impact of the new science37 program. Early indications are that this program is having a positive impact on student attitudes toward science and science careers.

In the first full year of the program, students reported significant changes in their attitudes toward science and science careers:

- o *Before taking a science37 course, only 33% of the students were interested in "pursuing a career in science." In post-course surveys, this number increased to 78%.*

- o *Students' sense of whether "It will be important for me to know about science for my daily life" increased from 47% to 89%.*

Participants in the most recent session of science³⁷ courses reported significantly increased interest in taking additional biology and chemistry courses in school.

While many after school programs have a strong interest in offering science programming, these programs require significant support in order to effectively implement high-quality science learning opportunities (*Coalition for Science After School Market Research Study*, December 2008). Private-public partnerships are critical for leveraging existing effective delivery models, and for providing expertise and innovative science content based on authentic science experiences, interaction with working scientists and exposure to STEM careers.

Serving as a Catalyst

In each of its programs, Abbott's investment is meant to serve as a catalyst. Our investments are designed to increase the capacity of leading informal science education institutions to deliver top-quality K-12 STEM programming; increase the engagement of people, including students, parents, teachers and our own employees in science education; support improvements in STEM education locally and globally; and increase the investment of other private sector corporations in this important effort.

Abbott's investments are generating meaningful progress on a number of fronts. Abbott's investment in ASM has resulted in increased interest and investment from the Chicago area informal science education community, formal education institutions and the corporate sector. ASM's science³⁷ program workshop classes have increased in numbers from two to 24 in just three years. Informal science education institutions across the Chicago area have expressed strong interest in working with ASM to provide additional STEM programming and to incorporate authentic science experiences and practicing scientists into their programming.

Serving as a catalyst can sometimes result in unexpected and refreshingly positive outcomes. In developing an after school science program for Foreman High School in Chicago, we discovered that students were forced to do their lab experiments with just paper and pencil - the teacher was teaching molecular biology with no working laboratory sinks, electricity or gas. Abbott renovated the lab, providing an important resource for both after school students and science students in classes throughout the day. That investment resulted in an additional

investment from Chicago Public Schools, making a full lab renovation possible. This summer the full lab renovation is underway, with a new, contemporary laboratory classroom space to be available to all Foreman students this fall.

As a second example of the catalytic effect, we are now working with Dr. Don Wink, who you will hear from shortly, at the University of Illinois Chicago to create additional authentic research experiences for the high school students enrolled in science³⁷. UIC undergraduate and graduate students will be involved in the program, providing strong role models for the high school students.

In all of Abbott's K-12 science education programs, the company's investment has been a catalyst for increasing the involvement of Abbott volunteers in their community. The introduction of Abbott Family Science in communities has resulted in continuing close relationships between Abbott employees and local elementary schools. Existing volunteer programs at Abbott research and development sites have been reinvigorated by the introduction of Abbott Family Science and Abbott Operation Discovery programs in their communities.

This connection to the community for Abbott employees, scientists and engineers is not insignificant. Scientists crave opportunities that allow them to apply their skills and knowledge in a way that can truly make a difference.

Conclusion

In summary, we have learned a great deal from working with experienced science education professionals to provide science education opportunities to the community. Letting research guide our strategic decisions, investing the full K-12 spectrum, evaluating our impact and seeking continual improvement are all hallmarks of our ongoing platform in science education.

All of these factors have allowed us to be strategic, both internally and externally, in providing programs that are designed to have the greatest possible impact for program participants, our employees, and science education globally.

No single stakeholder can create the improvements we need to address our nation's crisis in STEM education. By serving as a catalyst, we have stimulated new program development and expanded existing programs beyond their initial impact.

As we challenge ourselves as a company every day, we challenge others to invest in those ideas, individuals and organizations that show the greatest promise. Taking a systems approach to improving K-12 STEM education requires that all facets of the system work together and contribute in significant ways. Abbott's science education initiatives are grounded in strategic alliances and best practices that are now reaping measurable rewards. In this spirit, we hope to inspire the next generation of scientists who will deliver the breakthrough, lifesaving medicines needed throughout the world today. We hope our testimony assists the Science Committee as you develop policy and program models in support of K-12 science education. Thank you for the opportunity to share the Abbott Fund's experiences with you today.