Introduction

TRAINERS:

William “Bill” Albert
is the CEO and Founder of STEMfinity, a global STEM Education provider. Bill has spent 13 years promoting the use of hands-on Science, Technology, Engineering, and Math (STEM) curriculum and methodology in after-school settings. His involvement with thousands of 21st CCLC’s, Boys & Girls Clubs, Y’s, Military Youth Programs, Communities in Schools, and many other afterschool organizations throughout the world, has inspired youth to pursue STEM careers. Bill understands the critical role afterschool programs play in engaging K-12 students in STEM. Bill founded STEMfinity to provide today’s youth with project-based tools that will spark an interest and passion in STEM.

Jason Lindsey
STEMfinity has partnered with Hooked on Science and their founder Jason Lindsey to conduct our STEM 101 Trainings. Jason Lindsey is an award-winning science educator and has worked diligently for more than 10 years to take science beyond the classroom window. Each year he performs hands-on science experiments at hundreds of schools and community events throughout the United States. Plus, Jason is a working STEM professional... When he's not in the classroom, you’ll find him providing forecasts for television and radio stations across the nation.

In response to America’s declining proficiency in STEM, STEMfinity was founded to provide project-based educational kits that connect students to real science and exploration...inspiring and motivating them to study and pursue careers in STEM. Currently, STEMfinity offers 10,000 hands-on academic enrichment kits with curriculum to teach PreK-12 students STEM, Robotics, Electronics, Alternative Energy and Beyond! Focusing on the 21st Century Skills 4 C’s: Critical Thinking, Communication, Collaboration & Creativity, STEMfinity’s project-based kits open the channels of inquiry through hands-on practice. Join STEMfinity in its effort to provide afterschool students with project-based tools to spark interest and passion in STEM.

Trainees Intro:

Name: ___________________ School: ___________________ Grade Level: _____________ # of Students: _____
Have you already implemented STEM in your school/program? Yes___ No____
   If yes, tell us what you have done that has excited your students in STEM: _____________________________
What can you do to improve the effectiveness of STEM in your school/program?: __________________________
STEM Education in America – A Crisis

The crisis in STEM education has been with us for years, well before the 2005 publication of Rising Above the Gathering Storm, a National Academy of Engineering report that should have been a wake-up call. The report predicted crises in jobs, innovation, and economic growth if the country did not address the problem.

Yet the recent Global Report Card comparing U.S. schools to their international counterparts shows that not only have we failed to address the problem; we’ve let it get worse. American school districts, even many that are stellar by domestic standards, underperform the average in other developed countries, especially in math.

We know that STEM proficiency will only become more important to the success of US Youth:
- In the next decade, baby boomer retirements will deplete the STEM workforce by 50%
- Workforce projections for 2014 show that 15 of the 10 fastest growing occupations require significant science or mathematics training to successfully compete for a job

STEM skills will also be critical for business in ensuring an equipped and educated workforce:
- 80% of jobs created in the next decade will require some form of math and science skills
- The US needs 400,000 new graduates in STEM fields by 2015.

Education trends suggest US youth are unprepared to take on these challenges:
- Enrollment in undergraduate degree programs in computer sciences is more than 50% lower that it was five years ago.
- In 2008, only 7% of all bachelor degrees awarded in the US were in engineering, mathematics, or the physical sciences.
- 61% of middle school students would rather take out the garbage than do their math homework.

Not preparing students in STEM education and careers threatens the global leadership of the US:
- The US Ranks 20th internationally based on our share of graduate degrees awarded in engineering, computer science, and mathematics.
- China is graduating four times as many engineers as the United States.
Another critical factor is the need to improve access to STEM fields and careers among populations that are currently underrepresented. According to the U.S. Department of Commerce Report Education Supports Racial and Ethnic Equality in STEM, “Non-Hispanic Blacks and Hispanics each account for six percent of all STEM workers, but 11 percent and 14 percent, respectively, of overall employment.”

In another report by the Department of Commerce, focused on the gender gap, it is noted that women make up 48 percent of the workforce but only 24 percent of STEM jobs. This makes it very clear that women and minorities are greatly underrepresented in the STEM fields. Increasing access to and representation of these populations in STEM fields is necessary to increase their opportunities to participate in the modern economy; the nation would also benefit greatly if a larger and more diverse talent pool was to participate in the STEM workforce.

Given a need to improve STEM education in America and increase access to STEM learning opportunities, what steps can be taken to get there? While improvements in formal K-12 education are necessary, children spend less than 20 percent of their waking hours in school. Opportunities lie in all aspects of their education, including enrichment programs that take place during the afterschool hours and the summer.

Afterschool programs are especially well-placed to help close the opportunity gap that many children and youth from underserved and underrepresented communities face. Of the 8.4 million children in afterschool programs, ethnic minority children are more likely than others to participate. 25 percent of Asian, 24 percent of African-American, 21 percent of Hispanic and 16 percent of Native American children attend afterschool programs, compared to the national average of 15 percent. Furthermore, girls attend afterschool programs in equal numbers to boys. These participation data provide evidence that the afterschool setting reaches students from populations that are underrepresented in STEM fields and provides enrichment opportunities that can bring STEM alive for them.

Among students who are fortunate enough to have access to afterschool enrichment opportunities, the benefits of afterschool programs in general are well documented, showing positive impacts on both academic and behavioral development. In addition, outcome and impact data are now emerging from studies of afterschool programs that offer STEM learning and this recent research highlights the unique benefits for youth participating in these afterschool and summer programs.

Research shows that attending high-quality STEM afterschool programs yields STEM-specific benefits that can be organized under three broad categories:

1. improved attitudes toward STEM fields and careers
2. increased STEM knowledge and skills
3. and higher likelihood of graduation and pursuing a STEM career.

Below is a brief overview of these three types of outcomes, followed by specific findings that were common across a number of the evaluations.

1. Improved attitudes toward STEM fields and careers
   a) Increased enrollment and interest in STEM-related courses in school
   b) Continued participation in STEM programs
   c) Increased self-confidence in tackling science classes and projects
   d) Shift in attitude about careers in STEM

2. Increased STEM knowledge and skills
   a) Increased test scores as compared to non-participants
   b) Gains in knowledge about STEM careers
   c) Gains in computer and technology skills
   d) Increased general knowledge of science

3. Gains in 21st century skills, including communication, teamwork and analytical thinking

4. Higher likelihood of graduation and pursuing a STEM career
   a) High rate of high school graduation among participants
   b) Pursuit of college and intention of majoring in STEM fields

While the afterschool community has come a long way with STEM learning, there are challenges to be overcome. Several surveys conducted over the past few years get at “the state of STEM” in afterschool: The “Informal Learning and Science in Afterschool” (ILSA) study, begun in 2006, assessed informal science learning in typical afterschool programs (i.e. not specialized STEM-focused programs); the Coalition for Science After School (CSAS) undertook a market survey in 2008 to determine which afterschool programs are doing science, what they are doing and their needs; more recently, the Afterschool Alliance and the National Afterschool Association teamed up to conduct a survey of the field as part of their Noyce Foundation-funded effort to promote 2011 as the “Year of Science in afterschool.”

Overall, the survey results all point to some common factors. Afterschool program providers think it is extremely important to offer STEM in afterschool programs and offer a wide range of programming. Environmental science and engineering are some of the more common programs, while LEGO robotics clubs, rockety and computers are also very popular. This highlights another positive aspect of the afterschool space in STEM learning: engineering and technology are very popular topics that do not often receive much attention during the school day. But many programs struggle with issues relating to staff capacity and a lack of awareness about existing resources such as freely available high-quality curricula. The most recent survey participants identified insufficient funding, a lack of knowledge about existing curricula, lack of professional development in STEM content areas and partnerships as the most significant hurdles.

Despite these challenges, the impact of high-quality STEM afterschool programs shows tremendous promise for their ability to engage and inspire children and youth. Research studies demonstrate that we understand the key elements needed to achieve success in this setting: a commitment to providing high-quality STEM programming must be backed up by knowledge of existing curricula and programs, resources for staff professional development, partnerships with experts and leadership on the issue.
Project-Based Learning

Evidence suggests that project-based learning improves overall student academic performance. When students engage in project-based learning, their results in mathematics, science and technology are on par with traditional learning. Project-based learning can be aligned with standards-based educational goals to maximize its effectiveness.

Project-based learning can also benefit students by helping them develop higher-level cognitive skills such as:

- Problem solving
- Practical thinking
- Long-term planning
- Application of knowledge to authentic situations
Implementing STEM

With over 10,000 different kits for Grades PreK-12, your school/organization has selected some of our hands-on academic enrichment kits to implement into your school/program.

Like most professional development initiatives, our goal is to help you, the teacher, understand the material that has been purchased so you can better educate today’s youth in STEM Education.

In our training today we will discuss the tools and content you have available and you will learn how to implement STEM in an integrative approach.

To start, please list the STEM material you have at your school/organization:

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Of the material listed above, who is intimidated or has a fear of teaching the curriculum provided with the kit?

Let’s face it, most elementary teachers do not pretend to be experts in any of the STEM topics. In fact, for some teachers, mathematics is a difficult subject to get across to students. For others, science is challenging to teach. For nearly all, technology and engineering are not even on the radar screen – and yet it is being thrust upon them as a major area of emphasis.
STEM Activities

Over the remainder of the day, we will illustrate how to properly use each of the kits that has been purchased. We’ll build several STEM activities and discuss how to incorporate project based learning methods into your school/program.

**Participant Outcomes:** Participants will:
- Learn how to successfully implement Project-Based Learning into your school/program via STEMfinity’s Educational Kits.
- Learn how project based learning methods can improve students Science, Technology, and Math scores.
- Learn how STEMfinity’s Kits focus on 21st Century Skills 4 C’s: Critical thinking and problem solving, Communication, Collaboration, and Creativity.
- Learn how the use of STEMfinity's kits develops new interests and passion in STEM while building strong background knowledge to set the stage for deeper learning.
Resources

STEMfinity relies heavily on our STEM Partners who all share a similar passion to excite students in STEM:

**Free Resources:**
- Hooked on Science: [http://www.hookedonscience.org/](http://www.hookedonscience.org/)
- Afterschool Alliance: [http://www.afterschoolalliance.org/STEM.cfm](http://www.afterschoolalliance.org/STEM.cfm)
- Connect a Million Minds: [http://www.connectamillionminds.com/](http://www.connectamillionminds.com/)
- NASA: [http://teachspacescience.org/cgi-bin/ssrtop.plex](http://teachspacescience.org/cgi-bin/ssrtop.plex)

**Additional Resources:**

Support

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Thanks for Attending STEM 101