Portable Inspiration: The Necessity of STEM Outreach Investment

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Student outreach team with PI package.

Running a successful technology education lab and delivering curriculum in today's educational environment can be busy, misunderstood, and downright exhausting. Keeping up with growing and emerging technologies, educating the school and community on what your program is really all about, and running after-school technology and engineering clubs leaves precious little time for anything else. On top of all of that, investing in a STEM outreach program isn't even close to feasible, right? Even if it's far more feasible than one might think, to suggest that such a program is a "necessity" is downright foolish, isn't it? Not in our opinion. In fact, Pennsylvania Standard 3.8.12 mandates that students "apply the use of ingenuity and technological resources to solve specific societal needs and improve the quality of life," (Pennsylvania Department of Education, 2002). Further, *Standards for Technological Literacy* (*STL*) Standards 4, 5, 6, and 13 all relate to the impacts of technology on the environment and society in general (ITEA, 2000/2002/2007). Whether through a school's technology education curriculum, through a cocurricular STEM-related club, or a combination of both, it would seem that investment in an outreach program is a compelling way to address perhaps the most important standard charged to technology educators across the commonwealth today.

Our Example, But By No Means Our Idea

Originally developed as an extension of the Lower Merion High School Technology & Engineering Club's FIRST Robotics Competition (FRC) Team in October of 2007, *Portable Inspiration* was designed to expose students, educators, and communities to the experience of engineering and the design process. The program is fueled by a passion to provide others with opportunities to learn about the excitement and benefits of STEM, robotics education, and competition through hands-on experiences. There are also clear benefits for those LMHS students

who spend time planning and executing these outreach events in our community and others. Students in our club are developing leadership and communication skills while engaging in meaningful and relevant community service.

While *Portable Inspiration* was born and planned for at Lower Merion, the idea to perform outreach is something we cannot take any credit for. As a participant in FIRST (For Inspiration and Recognition of Science & Technology), the national nonprofit that operates FRC, we've been encouraged to spread the word of STEM and FIRST's ideals of *Coopertition* and *Gracious Professionalism*, two terms that promote the coexistence of cooperation and competition while emphasizing acting with integrity. Veteran FIRST participants learn to focus upon the ultimate goal of transforming the culture in ways that will inspire greater levels of respect and honor for science and technology. At Lower Merion we've broadened that effort to include all students in our Technology & Engineering Club whether they are affiliated with FIRST, VEX, TSA, or all three. With a strong ethos behind the effort, we then planned for and developed the *Portable Inspiration* package by consulting STEM-focused clubs and robotics programs that conduct similar outreach in VA, PA, DE, and as far away as Ontario, Canada. From there, we took the best of what each example had to offer while considering what would best meet the needs of our community.

Creating Win-Win Scenarios

From the onset, when creating our outreach program, we realized that we needed to conserve resources (especially time and human capital, as these are always scarce) as well as keeping an eye on cost—both initial and recurring. In short, we needed a very engaging concept that was flexible and portable for varying audiences and environments that didn't cost a lot or take a tremendous amount of time to create or maintain. With creating "win-win" scenarios for participants and student presenters/experts in mind, we settled upon the use of the VEX Robotics Design System rather quickly because of its price point and for the fact we were already invested in VEX in both the Tech Ed curriculum and with our after-school competitive robotics efforts. We then developed a robotics game called *Pyramid Mania* that utilizes an inexpensive PVC field and tennis balls for game objects that fit in a single container and set up in mere moments. This basic outreach package fits into five small totes; four VEX starter kits and "SquareBots" and one tote for the game field and objects. With this basic package we have run hands-on demonstrations for hundreds of visitors and younger siblings who attend local high school robotics events and competitions, for cub scouts at a pack meeting,

Club members work with a student with special needs.

and for high school students with special needs. We've also adapted the use of the *Portable Inspiration* Package to include more in-depth workshops and learning experiences for high school and elementary school students.

Thus far these workshops have proven to be productive and meaningful for students in Grades K-3 in two separate school districts and in one private school as well. In a half-day's time our high school students engage every student in an entire grade level as champions of engineering and design as well as acting as community role models. In addition to controlling a robot in *Pyramid Mania*, young students learn about simple machines, robots in the world, teamwork, and more. Teachers even get the opportunity to drive a large FIRST robot and leave with classroom materials. Now, in Year Two of the program, demand is really growing. A supportive administration has afforded us the time to conduct the workshops, and we involve many of our students so that exposure is maximized and lost class time during the school day is minimized.

The STEM Outreach Recipe—Key Ingredients

Creating your own STEM outreach program and package isn't really all that difficult. In the end, all you really need is the desire to make the investment of time and resources because you see this as worthwhile for the students, community, and staff. Selecting a target audience and choosing your "tools" to deliver the STEM message are

Club members give elementary students a tour of competition robot "Deuce."

certainly at the forefront. In our case, we initially wanted to reach out to a special needs population in our own building, and things "mushroomed" from there. From the start we knew that the idea might grow, so we kept the words "flexible" and "portable" in mind. Alongside those two key words was a third word: "engaging." No matter who your outreach target audience is, you need to be sure that they are engaged in a way that makes them say "wow." Robotics is one way to do this, but there are others as well. The bottom line is, once you have the audience's interest, it becomes very easy for you and your students to deliver a message in a meaningful and lasting way.

Think hard about the strengths of your program and how they might be leveraged to create an outreach program. Naturally, budget is always a consideration. The *Portable Inspiration* package initial cost was about $1,500 worth of VEX and associated equipment, which we had already budgeted for between curriculum and our robotics team. That price could easily be cut in half by using two robots instead of the four we have. Get creative to meet your needs and constraints. Our additional workshop materials were all created in-house for under $100 total. Later, we received a donation that helped us upgrade our simple machines station. Once you've built from your own program strength and have a package that's flexible and portable, promote these activities just like you would promote any student's or program accomplishment. Leverage the existing relationships you have with school administration, webmasters, parent/community groups, local business, and local media outlets. Once the ball starts rolling, more support of some kind is sure to follow. Just like the rest of your work, this will never be a perfect endeavor, but if you are willing to make this investment, the dividends could have a deeper and more lasting impact upon your students and community than you could have ever imagined.

The Unintended, Yet Delightful Consequences of Saying "Yes"

We're all keenly aware of what happens when excited students come to a classroom teacher with an "idea" for a project—it takes precious time and energy. In our case, however, it's proving to be more than worth it. As our students now take the initiative looking for opportunities to utilize the outreach package to expose, excite, and teach others about the wonders of technology and engineering, many are realizing unintended benefits. In addition to our stated goals, the outreach program has led to an Eagle Scout project, new robotics team members, and an invitation to be part of the international Ulster Project. Our high school students have even been asked to sign autographs for younger students in workshops. It's becoming obvious that these experiences, the ones that we cannot control or predict, are some of the most meaningful of all. What we can do intentionally, though, is create an atmosphere where

VEX Robotics Design System.

Guiding an elementary student driving "Square bot."

creative deployment of STEM outreach is encouraged and expected.

Going One Extra Step to Start Someone Else's Journey

Once you develop your own outreach program based on your program strengths, go the small extra step to share what you do. All of it. The only way we'll ever come close to achieving a world where people "apply the use of ingenuity and technological resources to solve specific societal needs and improve the quality of life" on a grand scale is if we all utilize today's modern communication tools to share what we do—openly and without reservation. Proudly, all of LMHS' *Portable Inspiration* and associated files are available via a popular competitive robotics education message board at: www.chiefdelphi.com/media/papers/2052. For the small amount of time this took to share, if it helps inspire just one other program somewhere, it's well-invested time.

Yes, being a technology educator is indeed too busy a profession for anyone to fairly ask you to create and operate a STEM outreach program through curriculum, clubs, or both. Yet, it just may be a very critical component in our mission to meet important education standards and, ultimately, to help produce the kind of students who will utilize skills, knowledge, and technology for the greater good, share those success stories and methods openly with others, and consciously help create a stronger, healthier global society.

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