WiSTEM²D

A Commitment to Catalyzing Change

Case Studies of WiSTEM²D Implementation in 2019

fhi360
THE SCIENCE OF IMPROVING LIVES

Acknowledgements

Caitlin Rose Dailey served as the primary author of this report. The author would like to thank the following colleagues for conducting the site visits and collecting the data that form the basis of this report: Pamela Carter, Safal Khatri, and Lisa Johnson. Thanks to the following reviewers for their careful editorial insights: Pamela Carter, Safal Khatri, Lisa Johnson, Amanda McMahon, and Lisa Suits. We would also like to thank the Johnson & Johnson volunteers, partners, and students at each of the sites for their generous participation in the interviews and observations and fact checking of early drafts. Thanks to FHI 360 Design Lab, and senior designer Whitney Jackson, for design. This publication was made possible by support from Johnson & Johnson. The views expressed in this report are solely the responsibility of the author. Lastly, we would like to share our appreciation and support for the millions of women and girls WiSTEM²D has the privilege of serving.

About FHI 360

FHI 360 is a nonprofit human development organization dedicated to improving lives in lasting ways by advancing integrated, locally driven solutions. Our staff includes experts in health, education, nutrition, environment, economic development, civil society, gender, youth, research, technology, communication and social marketing — creating a unique mix of capabilities to address today's interrelated development challenges. FHI 360 serves more than 70 countries and all U.S. states and territories.

FHI 360 staff members provide management support for WiSTEM²D and develop and disseminate resources to the partners. A separate team of FHI 360 researchers conducts the ongoing formative evaluation of WiSTEM²D. This report presents evaluation findings from 2019.

Table of Contents

A Spark of **Inspiration** 3

Fostering **Motivation** 8

Forging **Connection** 12

Finding **Meaning** 18

WiSTEMD²D By the Numbers 22

WiSTEM²D in **Action** Site Spotlight: Shanghai, China 24

WiSTEM²D in **Action** Site Spotlight: Cork, Ireland 26

WiSTEM²D in **Action** Site Spotlight: Mexico City, Mexico 28

WiSTEM²D in **Action** Site Spotlight: Panama City, Panama 30

WiSTEM²D in **Action** Site Spotlight:
Cape Town and Johannesburg, South Africa 32

WiSTEM2D in **Action** Site Spotlight:
Piscataway, New Jersey, United States 34

References 36

A Spark of Inspiration

One spark can catalyze a movement, a metamorphosis, the momentum for change.

Women in...

- Science
- Technology
- Engineering
- Math
- Manufacturing
- Design

At Johnson & Johnson, where leaders have been committed to championing women and girls for over a century, a new spark in 2015 helped to stoke the embers of change. That year the company launched the WiSTEM²D initiative to empower women and girls in STEM²D.

A change is sorely needed. Global demand for STEM²D talent is only growing: between 2014 and 2024, the number of STEM jobs is projected to grow by 17 percent, compared to only 12 percent for other jobs.[i] These jobs often pay well, with STEM workers[ii] earning 21 percent more in 2012 than non-STEM workers. And yet, as it stands, women and girls reap only limited benefits from this boom because there is a lack of gender diversity in STEM²D fields. In the United States, for example, women comprised 57 percent of professional workers in 2015 but only 25 percent of computer and math professionals and 15 percent of engineering and architecture professionals.[iii] Meanwhile in China, over half of Bachelor's graduates are women but only one in 20 members of the Chinese Academy of Sciences is a woman.[iv] It is time to plug this leaky pipeline.

Inspiring the next generation of technical talent reflects Johnson & Johnson's enduring commitment to workplace diversity. Just as important, broadening the talent pipeline in STEM²D enriches the knowledge and idea base in these fields and spurs innovation. WiSTEM²D's potential to catalyze change for women and girls in STEM²D is virtually boundless; all it takes is a spark.

The work of WiSTEM²D is organized into **three pillars**, supporting women and girls as they move through their educational and professional careers and sparking inspiration along the way:

Youth programs

encourage creative, inquiry-driven learning and play that can spark a passion for STEM²D in young minds.

University programs

inspire women to pursue undergraduate STEM²D degrees and advanced academic study in technical fields to broaden the pipeline of STEM²D talent.

Professional programs

reimagine recruitment and retention of female professionals to diversify perspectives and inspire innovation.

Complementing the three programmatic pillars is the crucial fourth partnership pillar. Johnson & Johnson partners with global nonprofit organizations–FHI 360, Girl Scouts of America, JA Worldwide, and Smithsonian Science Education Center–to manage and implement WiSTEM²D in each of its four regions. In communities around the globe, employees of Johnson & Johnson local operating companies volunteer their time to manage WiSTEM²D along with local schools and higher education institutions,nonprofit partners, and even government agencies.

BY THE NUMBERS: CASE STUDY FAST FACTS

FHI 360 researchers collected data for the case studies.--

4 Regions

6 Countries

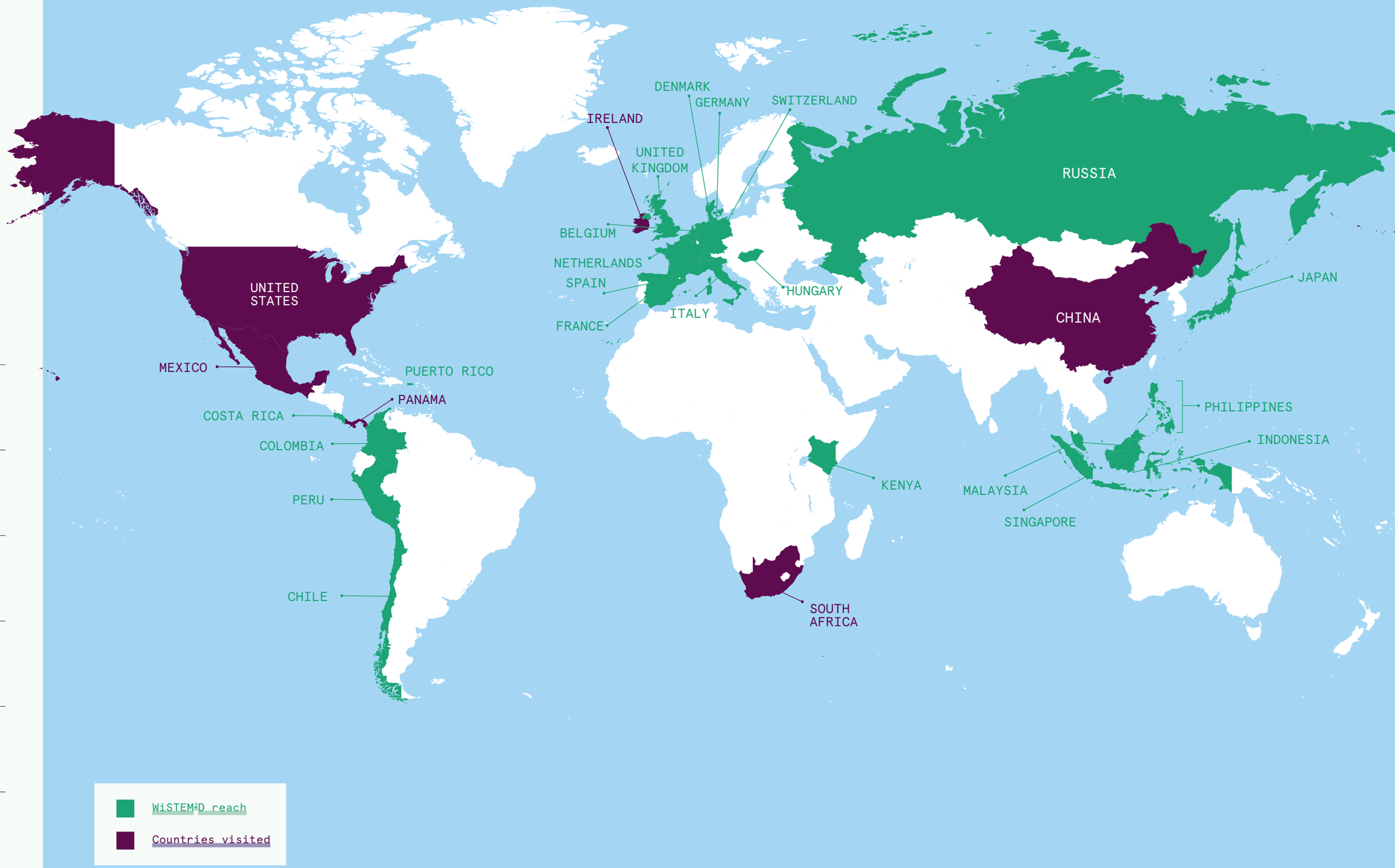
7 Communities

25 Johnson & Johnson volunteers interviewed

15 partner representatives interviewed

25 educators interviewed

40+ students in focus groups



Together these partners advance the key WiSTEM²D goal:

To REACH

One million girls by 2020

Next, WiSTEM²D aims to ENGAGE girls in creative problem solving and IMPACT the number of women and girls choosing to pursue higher education and careers in STEM²D.

In 2019, Johnson & Johnson volunteers and their partners in 31 countries sparked STEM²D inspiration for women and girls in their communities. FHI 360 visited communities in six countries and four regions to observe WiSTEM²D youth programs in action and gather accounts of the initiative's impact.

We asked volunteers, partners, educators, and—most importantly—young women and girls about how and why WiSTEM²D made a difference for them. We share here their stories of triumph and challenge, of inspiration found and fought for, of success achieved through community.

These are the stories of WiSTEM²D.

Fostering Motivation

Positive role models, mentoring and support inspire women and girls to persevere in STEM²D.

"So many girls are so intelligent, and they have so much potential to create the best drug out there, to save millions upon millions of lives. We don't want these small drawbacks or fears to hold them back from what they could potentially be."

-A WiSTEM²D scholar in Cork

Female role models can be crucial to girls' persistence in STEM²D pathways and mentoring and peer support continue to be important as girls progress in education and careers.[v] Promoting women in STEM²D professions as role models raises awareness of the possibilities for girls—and provides a template for what it looks like when promise is realized. After a career panel and *Lean In Circle* in Mexico City, one volunteer, a professional well into her own STEM²D career reflected, "It is our responsibility to encourage these women, to prove to them that it is possible to achieve your dreams. It is possible to succeed. It is possible to study a career where mainly men usually succeed."

In some cases, participating in WiSTEM²D even addressed a still-lingering stigma that STEM²D simply is not for girls. In Shanghai, said partners, WiSTEM²D can help "break the cycle of parents stereotyping that girls aren't or can't be in tech." As for the younger generation, the girls this partner sees in schools? "I'm so impressed by the way...they are so engaged, and have less stereotypes, and no barriers in their hearts."

"I have seen a good impact on teachers and students of the inquiry-based teaching methods. I've seen it most in natural science, Spanish, and art."

-Educator in Panama City

Drilling down in Panama City, Panama

In Panama City, science is not required in primary school curricula. So WiSTEM²D relies on a network of partners near and far to support hands-on, inquiry-driven instruction in area classrooms. After Johnson & Johnson helped link up the National Secretariat of Science, Technology and Innovation to the Smithsonian Science Education Center, WiSTEM²D leaders in Panama selected the Center's hands-on classroom unit on rocks and minerals with sustainability in mind: rocks don't need to be replaced every year.

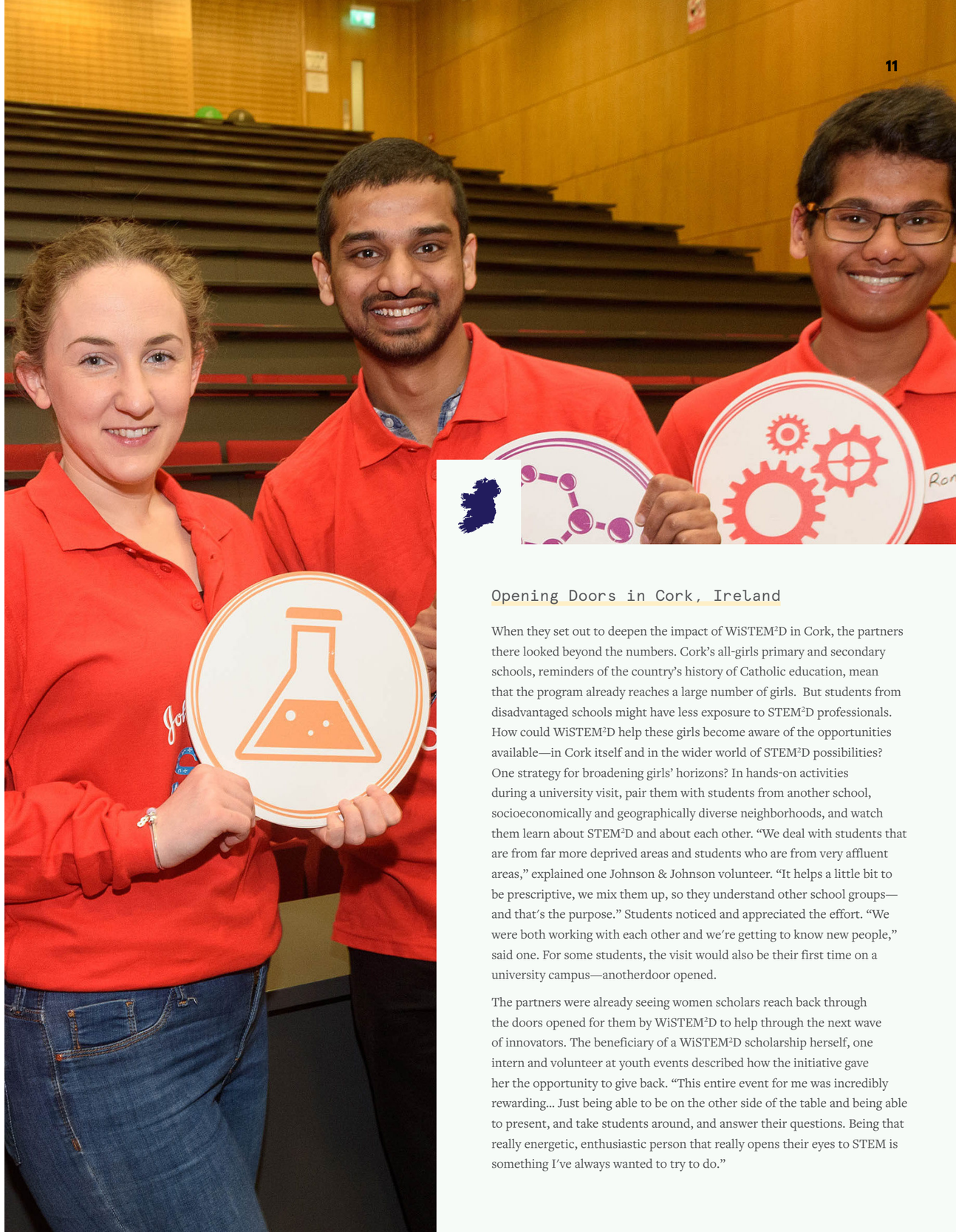
In Let's Make Science, 4th grade teachers who want to bring science into their classrooms deliver the Smithsonian rocks and minerals unit (additional units are also available). Sometimes they do it with the support of local Johnson & Johnson volunteers who visit the classrooms to circulate and offer support during hands-on learning. Teachers also lean on the support of mentor teachers who have received dedicated science training through WiSTEM²D. They valued the development because, said one teacher, "it is important to continuously be trained about new strategies and new methods."

Teachers soon started to see a decrease in failure rates in their classrooms, and not just in science. Teachers in Panama City said they would like to see the program expanded to more grades and classrooms to give more students the opportunity.

Johnson & Johnson employees themselves are motivated to volunteer for WiSTEM²D by a desire to give back, a passion for innovation in their technical fields, and an effort to share with girls and young women what they wish they knew when embarking on their STEM²D paths. Key among STEM²D professionals' insights was the breadth of STEM²D careers and the diversity of backgrounds and trajectories that can lead to success. In South Africa, STEM²D professionals share their own career stories with secondary students just before students make the crucial choice about their next educational step. Said one partner, we "hear a lot of negative attitudes about pure math," from students, but when students learn that successful STEM²D professionals struggled with negative attitudes themselves and persevered, it can open eyes.

As for staying engaged in WiSTEM²D? Once volunteers see the spark in their students, they feel inspired to keep tending the flame. Remembered one volunteer, "Regardless of if it's a girl or a boy, [seeing this young] person thinking about their future is what was impressive for me...their eyes just opened and started to shine. Like they were saying, 'Yes, it is possible. Yes, I can do it.'"

Students confirmed that exposure to Johnson & Johnson and WiSTEM²D mentors helped them understand the broad universe of STEM²D careers. One scholar reflected, "After seeing the women speak about their wonderful life journeys, and their learning experiences, and who they are today, I realized that a degree in STEM is a degree where you can use all your skills and all your passions... You can evolve all of these skills that you love practicing on a day-to-day basis in different areas of your STEM degree." A younger student, more succinctly, summed up her impression of STEM²D fields after a series of career talks: "Well, they all worked in similar places, but then they had loads of different types of jobs."



Opening Doors in Cork, Ireland

When they set out to deepen the impact of WiSTEM²D in Cork, the partners there looked beyond the numbers. Cork's all-girls primary and secondary schools, reminders of the country's history of Catholic education, mean that the program already reaches a large number of girls. But students from disadvantaged schools might have less exposure to STEM²D professionals. How could WiSTEM²D help these girls become aware of the opportunities available—in Cork itself and in the wider world of STEM²D possibilities? One strategy for broadening girls' horizons? In hands-on activities during a university visit, pair them with students from another school, socioeconomically and geographically diverse neighborhoods, and watch them learn about STEM²D and about each other. "We deal with students that are from far more deprived areas and students who are from very affluent areas," explained one Johnson & Johnson volunteer. "It helps a little bit to be prescriptive, we mix them up, so they understand other school groups—and that's the purpose." Students noticed and appreciated the effort. "We were both working with each other and we're getting to know new people," said one. For some students, the visit would also be their first time on a university campus—another door opened.

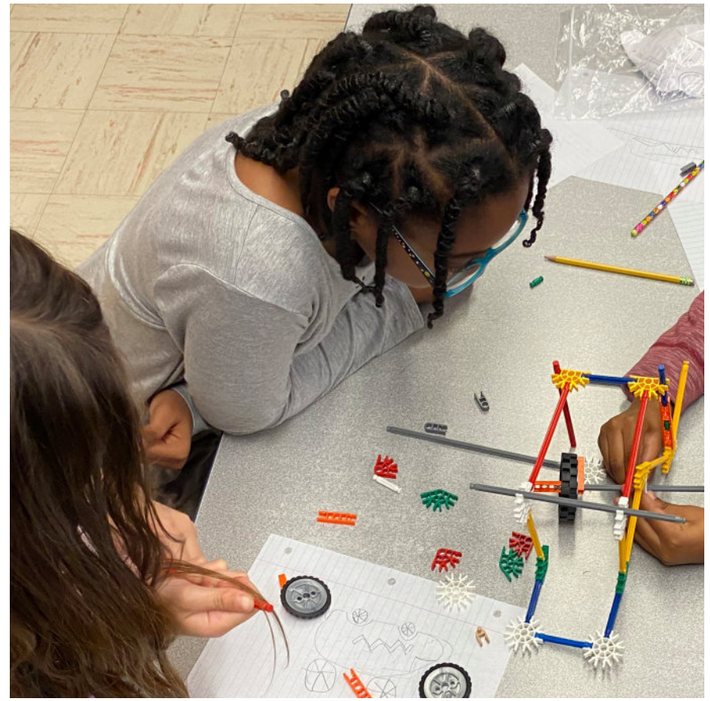
The partners were already seeing women scholars reach back through the doors opened for them by WiSTEM²D to help through the next wave of innovators. The beneficiary of a WiSTEM²D scholarship herself, one intern and volunteer at youth events described how the initiative gave her the opportunity to give back. "This entire event for me was incredibly rewarding... Just being able to be on the other side of the table and being able to present, and take students around, and answer their questions. Being that really energetic, enthusiastic person that really opens their eyes to STEM is something I've always wanted to try to do."

Forging Connection

Success in WiSTEM²D hinges on unique contributions from each partner—and the special chemistry catalyzed by their collaboration.

"We really work to partner with people to make sure that we're offering the right program or the experience that [schools are] looking for."

-A Johnson & Johnson volunteer in Piscataway



Johnson & Johnson local operating companies lead WiSTEM²D efforts in 31 countries. At each site, employee volunteers engage additional partners— from the multinational to the hyperlocal—depending on their site-specific goals and strategies. Partners typically include local, regional, and/or multinational nonprofits and local schools and higher education institutions. Less often, governmental and quasi-governmental agencies engage with planning and delivering WiSTEM²D. In Panama, for example, the National Secretariat of Science, Technology and Innovation and Ministry of Education work closely with Johnson & Johnson and the Smithsonian Science Education Center to bring opportunities to Panama's teachers and students.

In many cases, the successes of WiSTEM²D rest on a foundation of longstanding partnerships and a track record of fruitful collaboration. In Ireland, for example, where Johnson & Johnson has a years-long, nationwide partnership with Junior Achievement, the partners collaborate to choose the most engaging and appropriate WiSTEM²D activity from their respective portfolios for each school visit. JA Worldwide in South Africa likewise works side by side with Johnson & Johnson, providing a conduit into the local schools and a crucial backup for busy STEM²D professionals. In a newer but equally synergistic partnership in China, designers and engineers from both Johnson & Johnson and HandsOn China, an NGO partner, volunteer hand in hand to bring prosthetics to Shanghai classrooms and communities. For Hands On, says one partner, Johnson & Johnson is "the perfect match."

These conscientious efforts at building relationships are important for their own sake. They also serve the practical purpose of maximizing the respective expertise of each partner to build more effective programs. For all the partners involved, "You want to do it right when you're doing it," said a volunteer. "There are teachers in there for a reason. There are scientists for a reason. If you're going to put it together, there probably needs to be a collaboration and not just one trying to do it all."

WiSTEM²D leaders also sought to build understanding among girls from different backgrounds—and show them that STEM²D has a place for them all—deliberately and thoughtfully at several sites. In Mexico City for example, explained a partner, "It was a positive to join girls from public schools and girls from private schools and tell them that the situation, the gender gaps, are still in our country—and it doesn't matter where you come from."

WiSTEM²D partners have wide latitude in deciding *how* they are going to inspire girls. In each community, the partners use this freedom to develop programs tailored to their strengths and students' needs. With this breadth of possibilities, WiSTEM²D partners implemented activities featuring:

Collaboration and teamwork give young people the opportunity to work with others. In Piscataway, for example, young people worked in teams to design, build, and test model cars in a classroom lesson. While one team combined ideas to make their car faster, another struggled with who would be "the boss."

Hands-on, minds-on learning allows students to physically manipulate objects and engage with challenging ideas. In Cork, when students modeled the development of a new drug with colored Legos, they struggled with the constraints of designing a workable medication; they also grappled with the revelation that few new drug ideas ultimately make it to market.

Inquiry-based investigation poses questions and allows girls to explore, reflect, and apply their learning in new contexts. In Panama City, 4th grade students who attended a classroom-based unit on rocks and minerals were encouraged to explore outside of school for rocks and minerals in their own environments.

Project-based work that has real life applications requires young people to apply critical thinking, and develop new knowledge and skills, to address complex problems. When girls in Shanghai helped assemble prosthetic limbs for their rural peers, the technical complexity was evident; the real-life benefit was even more clear.

The opportunity to build confidence comes from appreciating one's own abilities and receiving positive feedback. Students attending *Lean In Circles* emerged with the confidence that, while their struggles may not be unique, they have the talent and perseverance to succeed–and they have the role models to prove it can be done.

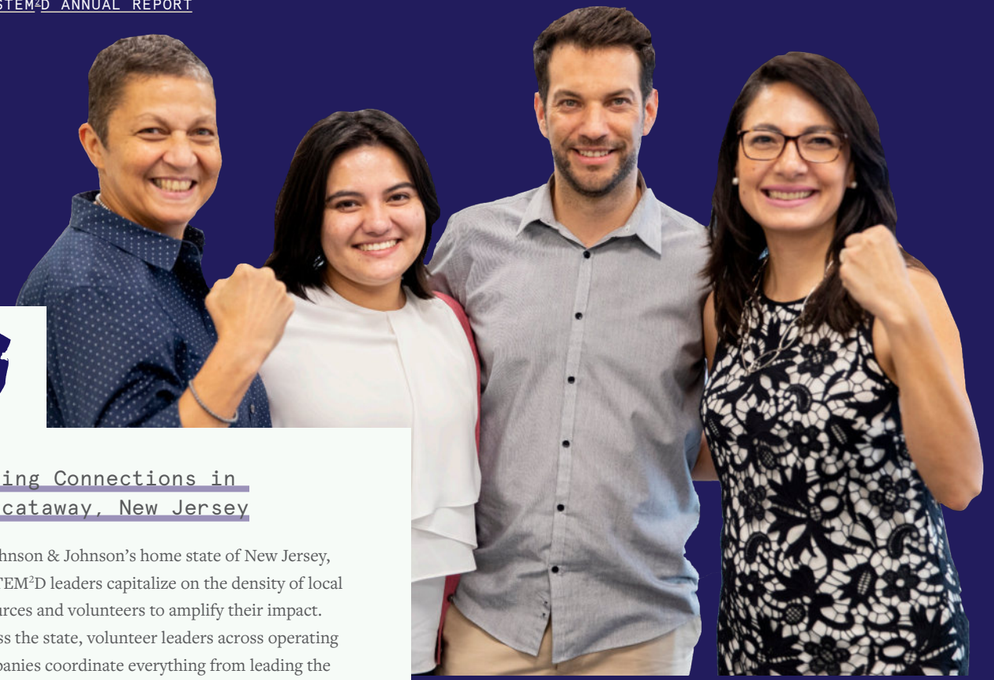
Exposure to diverse role models sends a powerful message to young women and girls about their own potential. In hiring facilitators and filling volunteer slots for WiSTEM²D in South Africa, partner FutureMe ensures that adult role models reflect the ethnic, cultural, and socioeconomic diversity of South African society–including volunteer STEM²D professionals whose backgrounds mirror students' own.

Leaning in in Mexico City, Mexico

In Mexico, modeling WiSTEM²D leadership comes from the top. With the support and participation of high-powered women executives, the Mexico City partners hosted a series of *Lean In Circles*. A moderated panel would introduce girls to STEM²D career paths and to successful role models in those careers. They would finish up with an opportunity to share mutual frustrations and support in smaller groups. As one volunteer explained with purpose, "Today we're going to inspire all these little girls from 12 to 18 years old."

As the panel got underway, one student in the audience knew only that it was meant to be "something about science and that it's about girls." The student looked on as one panelist, an orthopedic surgeon, shared a powerful story of a male student being referred to as "Doctor," while she, a doctor herself, was referred to simply as "Miss." Instead of reacting with the anger she initially felt, this doctor decided, "I have a leading role. Instead of having an angry moment, there's also potential for positive, because you are also educating patients with gender bias."

The surgeon's message of perseverance and positivity resonated with women and girls in the audience, whether they were still students or professionals and parents themselves. Another partner reflected, "I felt every testimonial that they gave. I am not a doctor, but I felt myself connected with everything that they said." And our student? After the panel she said, "I loved the facts they told us— and the activity at the end, where we saw that we are always together. No matter what."



Making Connections in Piscataway, New Jersey

In Johnson & Johnson's home state of New Jersey, WiSTEM²D leaders capitalize on the density of local resources and volunteers to amplify their impact. Across the state, volunteer leaders across operating companies coordinate everything from leading the events, to overseeing the deployments, to engaging volunteers, letting everyone play a major role.

That spirit of collaboration extends to their relationships with local schools. WiSTEM²D and school leaders put their heads together to identify which of the many WiSTEM²D resources will serve each school best. Often that means drawing on another connection—with the Smithsonian Science Education Center—to bring STEM²D activity kits to New Jersey classrooms. Johnson & Johnson volunteers visit classrooms to administer the kits, which have content pegged to specific age groups, STEM²D sub-fields, and learning standards.

Careful teamwork continued in the classroom between volunteers and teachers and, with encouragement, among the students too. "In my class," reflected one teacher, "we worked as a team basically. I made sure I took care of…organization and structure. That way, [the volunteers…] went around to different groups and just encouraged them. We all did that together." The students, after working together to design and construct a model car with creative building toys, reflected on "how they worked together to improve their car." And what did the students and teachers have to say to the volunteers after their classroom visit? "Come back!"

> "We want to engage at all levels. This is an initiative that everyone should take a part in, right? So the way we view it, is we want– we need –as many people as we can. And if that means reaching outside of this company, outside of our regular partnerships…then that's what we're going to do, because that only increases our reach…The message is larger than what we do [individually]."
>
> -A Johnson & Johnson volunteer in Piscataway

Lending a Hand in Shanghai, China

For WiSTEM²D partners in China, a serendipitous TEDx Talk was the spark. The spark motivated a newly discovered passion for volunteerism and a lifelong commitment to giving back. And that spark inspired a complex operation to deliver much-needed, 3D printed prosthetics to children in rural areas, all while introducing girls in Shanghai schools to hands-on, minds-on learning opportunities.

When a local sponsor for TEDxShanghai hosted a speaker from Singapore who turned a procurement job into a passion for prosthetics, his thoughts turned to how he could leverage his own skills to help. "Pro bono [work] is becoming a movement in China and this movement is a motivation for me."

With decades of technical experience in 3D printing and a leadership role in incubating innovation for Johnson & Johnson in Asia Pacific, this volunteer set about making connections and making it happen. After connecting Johnson & Johnson with Hands On, an NGO focused on 3D printing for youth, WiSTEM²D embarked on an ambitious effort to engage employees in the prosthetic design and assembly process *and* bring the last steps of the process to local schools. There, guided by volunteers, girls get their hands on the prosthetic limb and pitch in to complete the project. They experience engaging, authentic work with a tangible benefit while picking up the enduring lesson of empathy.

Finding Meaning

WiSTEM²D builds relationships that resonate—they help volunteers find fulfillment and inspire girls to imagine themselves as members of a global STEM²D community.

"Volunteering, working with children, is a self-healing process as well. It's very beneficial to yourself, as much as you are giving a benefit to children. Being who you truly are, and speaking from your heart, it gives you the opportunity of releasing whatever negativity was in your own life in the past and turning it into something positive."

-A Johnson & Johnson volunteer in Cape Town

Giving back is built into Johnson & Johnson's culture, but finding time for meaningful commitments can be challenging. That commitment is worth it for volunteers in the sense of fulfillment and purpose they find in empowering girls. As one volunteer in Piscataway reflected, "I think anyone that works at this company can admire the mission, and what it stands for... We hear a lot of, 'Wow, I love to work at this company, and I didn't even know we were making strides in women in leadership."

The imperative is clear to women in STEM²D careers. In Mexico City, busy executives at Johnson & Johnson made time to serve as panelists because, "We have a lot of facts that say that women are in a less competitive role in relation with STEM careers. We want to improve this, and we want to make this visible to girls. And we have many leaders in the company that can inspire people to get better and to let them know that they can do it."

Beyond a sense of personal satisfaction, volunteering for WiSTEM²D often served as a professional learning experience for Johnson & Johnson employees. At times, this might be a nerve-wracking experience for technical employees unaccustomed to working with youth. On one school visit, "I think at the start, they [volunteers] were a bit nervous," said one student, "but then they kind of settled down and realized we weren't going to eat their heads off." Stretching to teach students helped volunteers develop skills in facilitating, public speaking, and—especially crucial for youth, but an important communication skill for any audience—tailoring messaging and adapting service delivery for the audience. For Johnson & Johnson employees, reflected one leader, WiSTEM²D was "confidence building" and "great to take back to their manager."

Johnson & Johnson's Credo

…We are responsible to our employees who work with us throughout the world. We must provide an inclusive work environment where each person must be considered an individual. We must respect their diversity and dignity and recognize their merit. They must have a sense of security, fulfillment and purpose in their jobs…[vi]

I think that's a great thing, that sometimes you just do things because you like them; then you turn around and there's someone that's looking at you and saying that it's possible. It's a really nice thing to be able to show to other people that women do have these roles in male-driven [professions]. It's not like it's supposed to be [male-driven] like that."

-A Johnson & Johnson volunteer in Mexico City

"The young kids, it's great to see how their minds work…They're brilliant. They really are, and honestly, it's been fantastic because I've met so many wonderful people."

-A Johnson & Johnson volunteer in Cork

Participating in WiSTEM²D also helped educators and students connect to a wider STEM²D and regional community. Building networks among Johnson & Johnson local operating companies, schools, and nonprofit partners can expand students' horizons and bring them into new environments like labs, offices, and higher education campuses. For teachers in South Africa, "Most importantly, we're willing to do anything that impacts the learners to develop them, makes them better people. Because of our limits [in schools], they are not much exposed to all those [professional] things." WiSTEM²D offers exposure to the STEM²D professional world and reinforces big dreams with intentional support.

For some scholars and interns, that intentional support means a direct personal and professional relationship with a Johnson & Johnson mentor. For one scholar, her mentoring relationship was helping her step into the future with confidence: "My mentor, she's a wonderful guide for me. When it comes to any questions that I have about being a woman in STEM and different things that I can achieve with my job, different areas that I can work in my degree, she's just a wonderful person to ask. And she's also actually become a friend to me these past few months."

Authentic learning opportunities, mentoring, and peer support hold great promise for plugging the leaky STEM²D pipeline. In communities around the globe, Johnson & Johnson and partners play out these strategies in unique ways, drawing on resources and relationships near and far.

Seeing the Future in South Africa

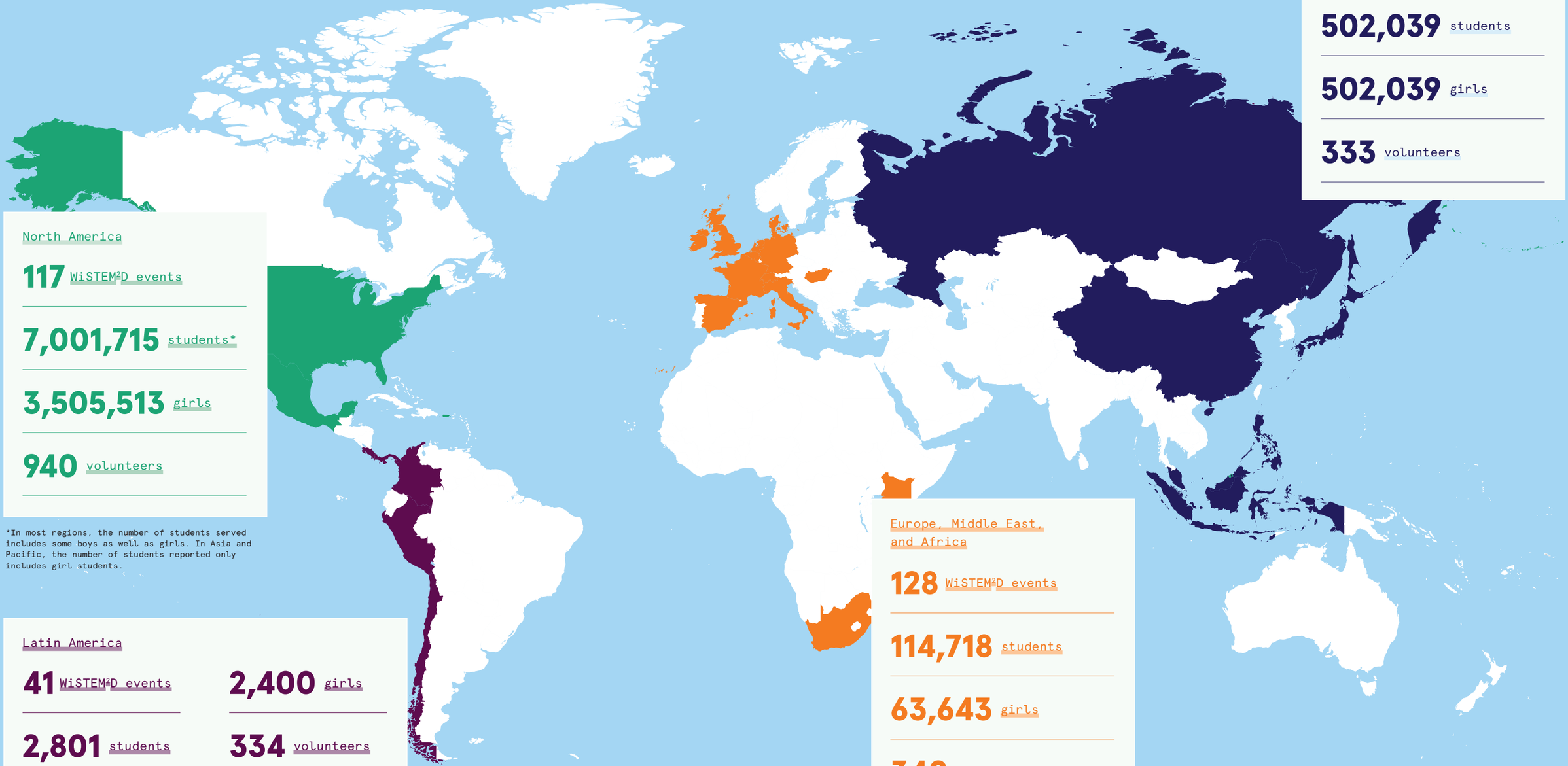
In Cape Town and Johannesburg, WiSTEM²D was broadening its reach to learners by providing dedicated training for the people who influence learners everyday: teachers. The WiSTEM²D team, along with partner FutureMe, host secondary teachers for a day of career exploration and awareness. The goal? Help teachers help learners make informed decisions about their future career paths. The means? A series of career profiles from Johnson & Johnson employees, highlighting their diverse roads to success—and the difficulties they overcame along the way.

Career profiles help teachers understand—and pass on to their learners—that successful STEM²D professionals can come from any background. Said a partner, "What I find very valuable is that these learners see themselves boxed in; they don't see a future for themselves... and a lot of the volunteers come in and they've been in the same predicament. They were at the same school. [The volunteers say] 'We've been where the students are, and look at me now. I managed to get myself out of that.' The students start to think, 'Maybe I can do this too?'."

In these South Africa communities, where girls and boys alike face barriers to higher education, WiSTEM²D aims to reach all the learners taught by the newly trained teachers. The complementary FutureMe online tool helps learners build a robust CV—and envision their professional futures— on their way out of secondary school.

WiSTEM²D BY THE NUMBERS

WiSTEM²D's reach in Johnson & Johnson's four regions.



North America

117 WiSTEM²D events

7,001,715 students*

3,505,513 girls

940 volunteers

*In most regions, the number of students served includes some boys as well as girls. In Asia and Pacific, the number of students reported only includes girl students.

Latin America

41 WiSTEM²D events

2,400 girls

2,801 students

334 volunteers

Asia and Pacific

22 WiSTEM²D events

502,039 students

502,039 girls

333 volunteers

Europe, Middle East, and Africa

128 WiSTEM²D events

114,718 students

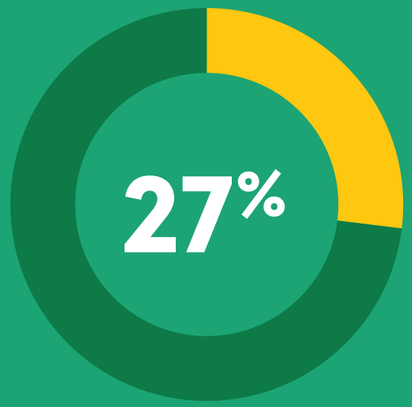
63,643 girls

340 volunteers

BY THE NUMBERS

WiSTEM²D in Action Site Spotlight: Shanghai, China

of Bachelor's graduates in China are women



of research and development personnel are women

1 IN 20

members of the Chinese Academy of Sciences and Chinese Academy of Engineering is a woman

Source: Xueyan, Yang & Gao, Chenzhuo. (2019). Missing Women in STEM in China: An Empirical Study from the Viewpoint of Achievement Motivation and Gender Socialization. Research in Science Education. 10.1007/s11165-019-9833-0.

Partners

- Johnson & Johnson China
- Johnson & Johnson Medical Shanghai
- Shanghai Johnson & Johnson Pharmaceuticals
- HandsOn China
- Horizon Corporate Volunteer Consultancy
- Secondary schools

WiSTEM²D is inspiring change at many levels in Shanghai. For Johnson & Johnson volunteers, engagement with the NGO sector and pro bono work can prompt reflection and lead to a newly found commitment to service. For girls in Shanghai schools, assembling prosthetics in teams represents a real-world, hands-on learning opportunity. For children in rural China who receive the newly assembled limbs, the change is nothing less than transformational.

Activities

The primary focus of WiSTEM²D in China is Johnson & Johnson's collaboration with HandsOn producing 3D printed prosthetics for physically impaired children.

- **Project-based work that has real life applications.** 3D printing allows girls to learn new technology under the guidance of Johnson & Johnson volunteers, who leverage their technical expertise. The real-world application: affordable mechanical prosthetics for children under 14 in rural areas.

WiSTEM²D China supplements the 3D printing workshops with less intensive activities like family days and STEM clubs in local schools. The early successes of the Shanghai WiSTEM²D effort have already inspired Johnson & Johnson local operating companies in additional Chinese cities to take up the cause. As the program expands, they are also investing in cost-effectiveness and sustainability. Leveraging their research and development experience in medical and consumer devices, engineers are working to streamline and foolproof the prosthetic design and assembly process to improve timeliness and cost efficiency.

"We are responsible to local communities, and making a commitment means we shall never quit from the community means that we shall never quit from the community as a principle."

-Johnson & Johnson volunteer

"We want to build a long-term relationship and have the volunteers keep coming back."

-Partner representative

WiSTEM²D in Action Site Spotlight: Cork, Ireland

1 IN 4

of 120,000 STEM workers in Ireland is a woman

3:1

ratio of male to female students in physics at the end of secondary school

DEGREES

37%

of Bachelor's graduates in STEM are women

DEGREES

18%

of Engineering/ Manufacturing Bachelor's Degrees go to women

Source: FHI 360. (2019). Market Insights: Ireland.

Partners

- Janssen Sciences Ireland UC
- Janssen Pharmaceutical Sciences
- DePuy Synthes
- Junior Achievement Ireland
- University College Cork
- Primary and secondary schools

With dozens of top pharmaceutical and technology companies boasting campuses in Ireland, the competition for a qualified STEM²D workforce is stiff. Johnson & Johnson's local operating companies in Dublin, Limerick, and Cork are not resting on their laurels. All three sites implement the three pillars of WiSTEM²D—youth, university, and professional—with an eye towards supporting and retaining top talent and broadening the STEM²D pipeline in Ireland. Employee volunteers across local operating companies in the three locations collaborate to maximize their impact, borrowing and improving liberally on one another's ideas and activities. They do this in close concert with Junior Achievement Ireland, a longtime partner.

"Thanks for like, letting us actually experiment! 'Cause people can tell us these things, but [usually] we can't actually experiment and try to help."

-Student

Activities

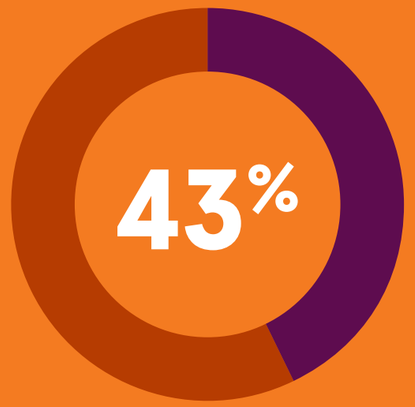
WiSTEM²D youth activities in Cork included:

- **Collaboration and teamwork and hands-on, minds-on learning.** Volunteers visit local primary schools to offer hands-on science lessons. Students appreciate the time and, if anything, would like more hands-on opportunities.
- **The opportunity to build confidence and exposure to diverse role models.** WiSTEM²D partners support the I WISH Conference, exposing thousands of visiting potential scholars to STEM²D at University College Cork and University College Dublin. On a smaller scale, Bring Your Child to Work Day reaches hundreds of employees' children. During campus visits, primary and secondary school girls spend time with WiSTEM²D scholars, who in turn collaborate with Janssen employees hired out of the university, connecting all three WiSTEM²D pillars.
- **Inquiry-based investigation.** Science fairs and design challenges promote asking and investigating tough questions.

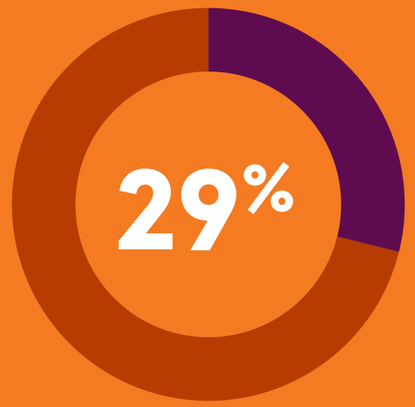
WiSTEM²D in Action Site Spotlight: Mexico City, Mexico

5 IN 10

university students in Mexico are women



of Bachelor's graduates in STEM are women



of working STEM researchers are women

DEGREES

of Engineering/ Manufacturing Bachelor's Degrees go to women

Source: FHI 360. (2019). Market Insights: Mexico.

Partners

- Johnson & Johnson Mexico
- Mexico Metropolitan Autonomous University
- FHI 360
- Secondary schools

Mexico City's WiSTEM²D partners focus on inspiring and motivating girls in secondary schools to study and stay in STEM²D fields. They designed a series of career awareness events to provide motivation and support for persevering along STEM²D pathways through the lens of STEM²D professional women's stories–including the adversities they faced.

For the partners in Mexico City, said one volunteer, diversity among the team implementing WiSTEM²D is "one of the most important parts." For representation on career awareness panels, organizers sought out professional panelists with varying fields of expertise, from different branches of the company, and with diverse experiences in their own careers.

Activities

WiSTEM²D youth activities in Mexico City included:

- **Collaboration and teamwork and hands-on, minds-on learning.** With Metropolitan Autonomous University, volunteers bring engaging WiSTEM²D activities to area classrooms. They partner with the FHI 360-managed Bridge to Employment initiative to reach students.
- **Exposure to diverse role models.** In career panels, STEM²D professional women share hard-earned wisdom from their own careers. Afterwards, in smaller *Lean In Circles*, adult mentors and girls toss a ball of yarn back and forth across the circle each time they identify a shared struggle. The web that results, they say, makes obvious that "we are all connected and we can support each other."

As the WiSTEM²D initiative matures, the partners in Mexico City hope to work more closely with higher education partners.

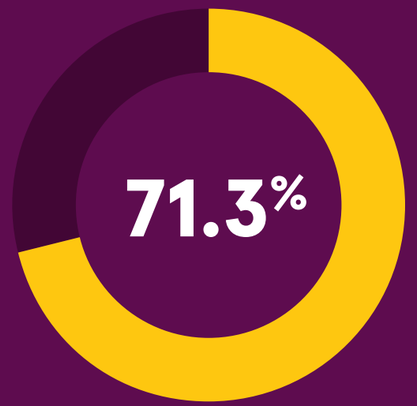
"They did it all in a team.It was not only me.I placed an idea and many other people worked together to accomplish this [event]."

-Johnson & Johnson volunteer

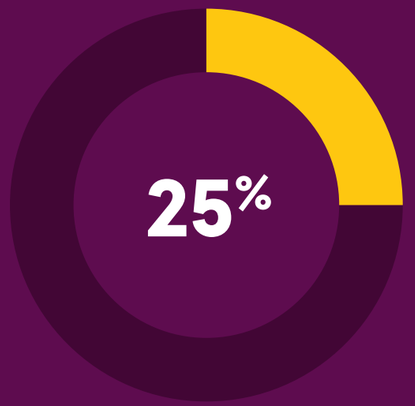
"As we let the [students] know you're not alone, and these are STEM careers, and what STEM careers there are…in the end, we were able to connect to them. That was the most powerful thing for us, seeing that we really connected with them."

-Johnson & Johnson volunteer

WiSTEM²D in Action Site Spotlight: Panama City, Panama



of girls are still enrolled in school by secondary school



of Panama's scientific community are women

<1%

of women pursue education at the Doctoral level

7%

of girls express interest in obtaining a degree in STEM

Source: FHI 360. (2019). Market Insights: Panama.

Partners

- Johnson & Johnson Panama
- Smithsonian Science Education Center
- Ministry of Education
- National Secretariat of Science, Technology and Innovation (SENACYT)
- Primary and secondary schools and districts

WiSTEM²D in Panama embraces collaboration as the foundation for its success. The country's National Secretariat of Science Technology and Innovation reached out to build bridges between Johnson & Johnson, Smithsonian, and Panama schools. With approval from the Country's Ministry of Education, the partners brought *Let's Make Science* to 4th grade classrooms—where otherwise, students might not receive any instruction on science content and methods. The program is not limited to Panama City either; volunteers and partners sometimes travel for hours to bring science to more remote classrooms.

Activities

WiSTEM²D youth activities in Panama City included:

- **Collaboration and teamwork.** WiSTEM²D partners collaborate to deliver science professional development to mentor teachers, who in turn train their educator colleagues back at the school.
- **Hands-on, minds-on learning and inquiry-based investigation.** The toolkits and lessons from Smithsonian make hands-on learning accessible and fun for young students. The field assignment to explore rocks outside of school was a "totally new" element for the students, said a teacher. Educators would like easier access to the accompanying videos.

With the program now established in 4th grade, the partners are looking to next year and pondering how best to serve 5th grade students. They'll be looking for 5th grade students to demonstrate their new learning at the schoolwide science fair.

"There are a lot of schools that need this kind of program. The opportunity to make this program bigger and reach… other schools and teachers [would be beneficial]. Because they are eager to know about this kind of program. How [else] can you make a broader impact? It was a privilege to be a part of the program."

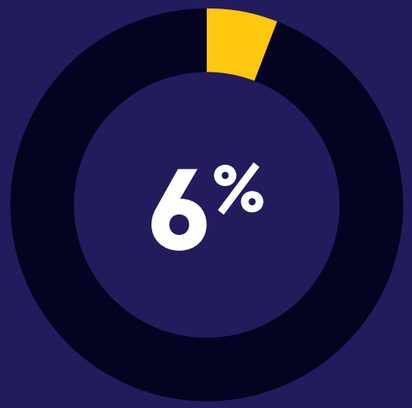
-Educator

"Right now, this is our best science class ever."

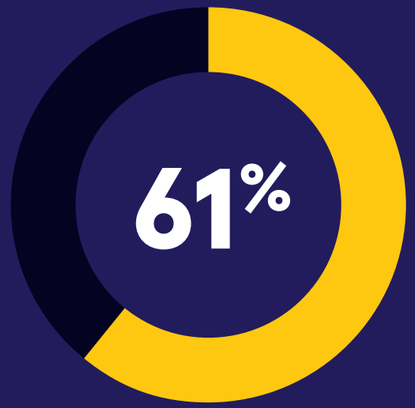
-Student

BY THE NUMBERS

WiSTEM²D in Action Site Spotlight: Cape Town and Johannesburg, South Africa



of 25 to 34-year-olds in South Africa have pursued tertiary education



of Bachelor's graduates are women

45% of Doctoral candidates are women

30% of engineering candidates are women

Source: FHI 360. (2019). Market Insights: South Africa.

Partners

- Johnson & Johnson Consumer (Cape Town)
- Janssen (Cape Town and Johannesburg)
- Johnson & Johnson Medical (Cape Town and Johannesburg)
- JA Worldwide
- FutureMe
- Primary and secondary schools

WiSTEM²D in South Africa aims to reach the broadest possible audience of young people who need to hear the message that STEM²D can have a place for them. Working closely with nonprofit partners, the program serves some of the most disadvantaged schools in Cape Town and Johannesburg—and not just the girls in these schools. Recognizing the barriers to entry in tertiary education and professional careers confronted by many young men in South African communities, WiSTEM²D in South Africa is explicitly for everyone.

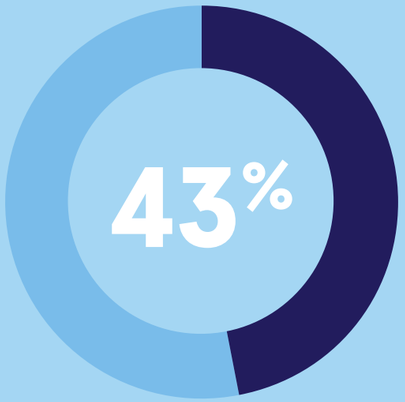
Activities

- **Hands-on, minds-on learning.** Partners and volunteers visit secondary classrooms to deliver WiSTEM²D activities.
- **Collaboration and teamwork and exposure to diverse role models.** With FutureMe, the partners train teachers on STEM²D pathways and offer visions of future careers. Teachers and students value the varied perspectives and would like to see offerings expand to explore skills-based career pathways in addition to degree pathways.

"I'm always passionate about giving back… [When I was young] there was an initiative that…was trying to get girls exposed to industries… So that way I was exposed, so I was fortunate. I just remember that feeling of sheer motivation and encouragement that I felt…So when [I heard about WiSTEM²D], immediately I knew that, if I can just help to spark that same interest and motivation that I felt, I would like to do it."

-Johnson & Johnson volunteer

WiSTEM²D in Action Site Spotlight: Piscataway, New Jersey, United States



of science professionals in the U.S. are women

PROFESSIONALS

16%

of engineering and architecture professionals are women

10%

of the advanced manufacturing workforce is women

Source: FHI 360. (2016). Spark WiSTEM²D: A Resource for WiSTEM²D Volunteers.

Partners

- Johnson & Johnson
- Smithsonian Science Education Center
- Piscataway Township Schools

In Johnson & Johnson's home state of New Jersey, local operating companies and volunteers are plentiful but careful collaboration and calibration among the various partners is needed to manage the complex moving parts of WiSTEM²D. This balancing act takes careful management by Johnson & Johnson employee leaders in the state. They coordinate within and across Johnson & Johnson operating companies, pool and split resources within and across local regions and the state and work closely with area schools to understand their needs.

The close collaboration means that WiSTEM²D activities dovetail with the schools' own priorities and plans for student learning. In science, the volunteers' visits to deliver hands-on lessons acts as a jumping off point for the elementary school class "to go more into depth with the science of it, talking about friction and gravity. This [classroom visit] was the front end of it." Even beyond science, the thank you letters that students write to volunteers align with some teachers' writing lesson plans.

Activities

- **Collaboration and teamwork and hands-on, minds-on learning.** Hands-on WiSTEM²D units dovetail with New Jersey schools' curriculum to address required content standards. Volunteers bring the resources and share their time in New Jersey classrooms.

For educators, having STEM²D professionals deliver the units "lends credence to the facts of what we're doing [in the classroom]. Kids actually get an opportunity to see [STEM²D] matters. And we are giving them tools to do this."

"We definitely do a lot of communication [with volunteers], and it's kind of a ramp up. And we make room for [flexibility]. We know that there may be people that may have commitments and still we try to make sure that we have a good buffer. We know exactly how many volunteers [we need] and we're resourcing the right amount of people to ensure that we're not letting the school down either."

-Johnson & Johnson volunteer

"I was expecting to do some kind of science project, but they asked us to make a car. I was very excited to make a car."

-Student

References

i. Change the Equation. (2015, February). Solving the Diversity Dilemma: Changing the Face of the STEM Workforce. *Vital Signs*.

ii. Rothwell, J. (2014, July 1). Still Searching for Job Vacancies and STEM Skills (Rep.). Washington, DC: Brookings Metropolitan Policy Program.

iii. Change the Equation. (2015, February). Solving the Diversity Dilemma: Changing the Face of the STEM Workforce. *Vital Signs.*

iv. Xueyan, Yang & Gao, Chenzhuo. (2019). Missing Women in STEM in China: An Empirical Study from the Viewpoint of Achievement Motivation and Gender Socialization. Research in Science Education. 10.1007/s11165-019-9833-0.

v. Sarah D. Herrmann, Robert Mark Adelman, Jessica E. Bodford, Oliver Graudejus, Morris A. Okun & Virginia S. Y. Kwan (2016) The Effects of a Female Role Model on Academic Performance and Persistence of Women in STEM Courses, Basic and Applied Social Psychology, 38:5, 258-268, DOI: 10.1080/01973533.2016.1209757

vi. Johnson & Johnson. (n.d.). Our Credo. https://www.jnj.com/credo/.