ETECHNOVATION

HOPE AND AGENCY. Technovation 2020

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GIRLS ARE OUR HOPE FOR A SUSTAINABLE FUTURE.

We have direct evidence from thousands of incredible, courageous Technovation girls who have been creating technology solutions to fight heart-breaking problems like child marriage, domestic violence, and lack of opportunities for girls since the very beginning of Technovation.

However, 2020 was defined by a new challenge -- a global pandemic that has impacts we have yet to understand or process. What we do know is that the COVID-19 pandemic has set vulnerable groups back more than anyone, especially girls and women. For instance, UNESCO estimates that <u>11 million girls are at risk</u> of not returning to school after the pandemic and that's in addition to the 130 million who were already out of school.

Committing to a Better Future

To prevent even further catastrophic fallout from the pandemic, and commit to a better future, we must prioritize educating girls. Prioritizing education, particularly STEM education, for girls is not a new concept. This strategy is proven. Educating girls has demonstrated positive outcomes, such as:

- <u>Directly saving lives</u>
- Being the 6th most effective strategy for reducing C02 emissions (<u>ahead of solar</u> <u>panels and electric cars</u>)
- Through the use of powerful technologies, diversifying the pipeline for emerging jobs
- Strengthening communities

Prioritizing girls' education also addresses six of the <u>UN's seventeen Sustainable</u> <u>Development Goals</u>:

- SDG 4: Providing high quality education
- SDG 5: Working towards gender equality
- SDG 8: Ensuring economic independence (for women)
- SDG 10: Reducing inequalities
- SDG 12: Empowering youth to be responsible consumers
- SDG 13: Working towards climate action

But we must go beyond just providing content knowledge to girls; we must also build their motivation, their capabilities, and their sense of agency.



Building Hope and Agency in 2020

Last year alone ~38,000 girls, mentors and educators registered and participated in Technovation programs. Despite COVID-19 and global lockdown, more than 5,000 girls completed the full 3-month program, developing 1500+ apps and business plans. Over 75% of girls learned how to solve community-based problems, work in teams, and analyze data. More than 60% of girls learned how to start a business and how to code. Of course, COVID-19 affected the program– Technovation's typical impact was reduced, both in the total number of girls finishing the program and the depth of their learning gains. Our analysis of Technovation Girls 2020 is echoed in the <u>2020 UNDP Human Development</u>. <u>Report</u> and across other UN agencies.

With this report, we share lessons and recommendations based on 2020 data and comparisons with previous years in the hope that other education organizations can learn from our experience and accelerate efforts to support girls to thrive in a post-COVID-19 world.

THIS REPORT IS ABOUT WHAT 2020 TAUGHT US, AND WHERE WE GO FROM HERE.

"THIS YEAR WAS THE REAL YEAR OF CHANGE IN MY LIFE! FIRST I GOT TO LEARN SOMETHING NEW, WHICH IS PROGRAMMING! SECOND, I HAVE FOREVER MADE WONDERFUL FRIENDS, AND UNFORGETTABLE MEMORIES. I LEARNED NEW THINGS THAT DEVELOPED MY SKILLS AND COMPLETELY CHANGED MY THINKING. I REALIZED I HAVE ENTERED A NEW, DIFFERENT WORLD. THIS WAS A FUNDAMENTAL CHANGE IN ALL RESPECTS."

-Alzahraa M., Technovation Girls student, Egypt.

Girls Nigeria

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INTRODUCTION

Technovation is a technology education nonprofit with a mission to empower vulnerable groups (especially girls and women) to create technology-based solutions to problems in their communities. Over the past 14 years, Technovation has engaged ~50,000 mentors and educators to support more than 250,000 participants across 100+ countries to tackle pressing problems ranging from climate change to substance abuse—and most recently, COVID-19.

2020 was the 11th year of the Technovation Girls program. COVID-19 significantly impacted program completion and the depth of learning gains compared to prior years. This report analyzes the impact of COVID-19 on Technovation in the hope of being able to prepare for 2021 and 2022 and share our lessons with the broader field, so we can collectively make more progress. Throughout the report, you'll notice several references to the <u>2020 UNDP Human Development Report</u>-a comprehensive annual review of human development by country that quantifies a nation's health, education, standards of living, and environmental output as measures of human progress and impact. In addition to being included in the report, we were struck by the ways their findings mirror ours. To keep girls learning, and to give them the support they need to thrive, we must rapidly mobilize our knowledge, best practices, data, and resources.

EVIDENCE OF TECHNOVATION'S Long-term impact

In 2020, external evaluation firm, WestEd, conducted a long-term impact study to interview and survey the first cohort of Technovation Girls alumnae who participated 9 years ago. They explored two main questions:

- What impact did Technovation have on alumnae career and higher-ed choices/ decisions?
- 2. Is there any connection between alumnae post-survey responses (shared right after participation), and their current decisions/ choices?

Results of this analysis were very heartening. 76% of Technovation alumni are pursuing a STEM degree and 60% of alumni are working in STEM-related positions. These decisions tracked pretty closely to what they expressed in their post survey.

While the sample size is small and not necessarily representative of the girls Technovation is engaging now (we are now more committed to reaching girls from more underserved communities than we were during our earliest years), this is a promising insight that suggests that the positive changes in girls' attitudes and interests at the end of their Technovation experience have a lasting impact on their major life decisions. (Read the full results from WestEd.) To complement the external evaluation led by WestEd, we did an internal analysis of the longterm impact of Technovation with 299 alumnae who participated in Technovation from 2011 to 2020. Survey analysis showed that:

- 97% of alumnae developed skills in computer programming, building and managing businesses, problem solving, communication, and teamwork
- 50% of alumnae influenced their communities (as teachers, colleagues, religious leaders, community leaders, government officials, or members of the media)
- 36% of alumnae took action to improve their communities (improved gender equality, volunteered, shared Technovation with others, helped other students)
- 21% of alumnae demonstrated leadership at school, workplace, religious organization or in their community
- ~10% of alumnae continued to work on their idea

2020 TECHNOVATION IMPACT



WHO PARTICIPATED IN THE 2020 TECHNOVATION SEASON?

The 2020 season of Technovation Girls brought together 20,388 girls from 62 countries, who, with the support of 10,491 mentors, educators, and chapter ambassadors, designed a total of 1,520 tech-based apps addressing problems in their communities. Problems ranged from environmental protection to gender-based violence, to COVID-19. The biggest change year over year was the program completion rate—the number of girls who submitted app prototypes, pitches, and business plans for review. Although we saw a **7% increase in the number of girls who registered for the Technovation Girls program in 2020** overall, program **completion rate dropped by 12% compared to 2019** (Table 1). We attribute this to the COVID-19 pandemic and resulting lockdowns, which limited many girls' access to computers, laptops, internet, data or mentors.

In looking at the completion rate for the top 10 countries where girls submitted in 2020, we saw decreases almost across the board (Figure 1.) The percentage of submissions decreased for all countries between 2019 to 2020 except for Canada and Cambodia, and the biggest decreases were seen in Kenya, Mexico, Nigeria and Uzbekistan.

	2019	2020
Girls Registered	18,993	20,388
No. of Girls who Completed	7,260 students (38%)	5,426 students (26%)
Mentors Registered	6,997	7,064
Educators Registered	3,083	3,427

Table 1. Registration and completion rates for Technovation Girls 2020 season



Completion Rates for Top Countries in 2019 and 2020

Figure 1. Percentage of girls who submitted complete projects across the top participating countries in 2019 and 2020.

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HOW DID TECHNOVATION PARTNERS RESPOND TO COVID-19?

Regional Technovation Chapters adapt the program to their local networks and organizations. In 2020, that local adaptability resulted in incredible stories of resilience and creative problem solving. In conversations with ~70 Technovation Chapter Ambassadors from 30 countries (56% of our 150 Chapter Ambassadors from 53 countries), we learned that:

- Most countries navigated a lack of computers by using cellphones, messaging tools like WhatsApp, and lending USB keys and laptops
- If teams met in-person before COVID-19 lockdowns started, they were more likely to continue and finish the entire program

- Technovation Student Ambassadors helped provide technical support to girls, helping them troubleshoot their coding problems
- Having strong local corporate partners really made a difference for Chapters in Albania, Canada, India, and Venezuela. Corporate partners provided crucial resources including devices, access to the internet, and mentors

Students in Maudrai, India benefitted from in-person programs supported by volunteers and corporate partners to overcome a lack of access to digital devices before COVID-19 lockdowns began.



CHAPTER SPOTLIGHT: CAMBODIA

Cambodia had a 72% completion rate in 2020,

the second highest rate of any country. This high completion rate was due in large part to the quick thinking of Voneat, the Technovation Chapter Ambassador.

Voneat was a two-time mentor before she was nominated to become a Chapter Ambassador. Three weeks into her first season leading her region, the COVID-19 pandemic shut everything down. But Voneat and her fellow Technovation Cambodia volunteers were quick to act!

- Voneat immediately sought permission from education authorities to allow the girls to borrow laptops from their schools, which meant they had access to the technology they needed.
- The network of mentors hopped into high gear to support the girls. Mentors regularly checked-in with the girls to make sure they were okay and to keep them inspired.
- Voneat checked in with the girls to understand what they needed. For many girls in rural areas, the challenges were extreme, including both technical and language barriers.

Ultimately, the Technovation Cambodia community pulled together, and with her fellow mentors and volunteers Voneat successfully guided 60 teams to submission and held Cambodia's first-ever virtual national pitch. (Watch Voneat share her 2020 story!)



"I NEVER LEAD, BUT NOW I HAVE DONE IT. I HATE TO THINK, BUT NOW CODING MAKES ME A HAPPY THINKER... I LOVED HIDING MYSELF, BUT NOW I LOVED SHOWING AND SPEAKING TO PEOPLE!"

-Vathna S., Student from Cambodia.

WHAT IMPACT DOES TECHNOVATION HAVE ON GIRLS AND MENTORS?

WE ANALYZED POST-SURVEYS FROM OVER 700 STUDENTS AND 200 MENTORS TO DETERMINE THE IMPACT OF TECHNOVATION ON THEIR SKILLS AND ATTITUDES IN 2020.

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2020 TECHNOVATION IMPACT ON GIRLS: LOWER THAN 2019, BUT STILL POWERFUL AND LIFE-CHANGING

Although Technovation Girls' participants reported a lower depth of learning gains in 2020, the program still had a significant impact on their skills. Post-survey results illustrate the depth and breadth of real-world, problem solving and teamwork skills that the Technovation experience provides, which is far beyond just learning how to code. "I ENTERED TECHNOVATION NEVER IMAGINING THAT IT WOULD CHANGE MY LIFE SO DRASTICALLY. I HAD TO PUSH PAST MY BOUNDARIES, GOING ABOVE AND BEYOND. I AM SO GRATEFUL THAT I ENTERED."

-Gyaan M., UK

Students were least confident in programming and building a business.

Students' confidence in these areas also dropped year over year. We believe this drop is most likely due to the absence of sufficient technical mentoring and troubleshooting—a result of COVID-19 lockdowns. In a typical year, many Chapter Ambassadors organize in-person events to support students with technical skill-development and troubleshooting, but such events were not possible in 2020.

93%

of students indicated increased teamwork and collaboration skills.



of girls reported improvements in their project management skills.



of girls indicated behaviors demonstrating increased persistence after Technovation.



of girls reported improvements in coding ability.

See appendix for a detailed breakdown of post-survey results.



of girls indicated increased data science skills, including data analysis, making datainformed decisions, and visualizing data.



Figure 2. Students expressed most confidence in their teamwork and general science and math skills, but showed less confidence with managing a business and programming.



Based on student responses we will be updating our curriculum to include more robust coding tutorials that help students apply key programming principles to real-world problems. Such tutorials may include lessons on how to access and use databases (which will help teams who develop apps that help communities better distribute resources) as well as lessons on how to integrate maps and location-based data into student projects.

Planning for the Future: Student's Post-Technovation Plans

Almost 90% of students indicated they planned to attend college or university. Computer science and engineering were the most popular selections for likely degrees.

Students also expressed great interest in business and technology pursuits.

- Nearly 70% of girls are interested in starting their own company after Technovation
- 55% of girls are specifically interested in starting a technology company
- 52% of girls expressed interest in becoming a computer scientist or engineer

COVID-19's Impact: How the pandemic affected students' learning gains

While students made learning gains in 2020, these gains were significantly lower in 2020 compared to 2019. These year over year decreases were particularly evident in areas such as learning how to code, working in teams, and persisting through the full 3-month program. This was most likely due to the fact that teams were not able to meet in person to collaborate or receive additional in-person technical help and mentoring.

	2019	2020	
I know how to code or program.	4.12	3.83	p<0.05
I know how to start a business.	3.97	3.86	ns
I know how to choose a problem to solve in the community.	4.45	4.36	ns
I know the best way to solve a problem.	4.10	4.03	ns
I know how to work together as a team.	4.62	4.37	p<0.05
I know how to complete a project from start to finish.	4.63	4.34	p<0.01
I know how to break down a problem into smaller, more manageable parts.	4.32	4.30	ns

Table 2. Average post-survey Likert Scores (1-5). Learning gains in all categories were lower in 2020 than in 2019, with the largest decreases in students' knowledge of coding and programming, and ability to work together as a team.



Fields of Study

Figure 3. From 537 responses, nearly half of surveyed students indicated interest in pursuing a degree or career in computer science. Engineering, artificial intelligence, data science, and business administration were also popular areas of interest.

Comparison of Students' Learning Gains (2015 - 2020)

To better understand the full impact of COVID-19 on student learning gains, we also compared the 2019 and 2020 post-survey results with impact results from the previous four years.* In context of our five-year impact, it is clear that while there was a decrease in learning gains between 2019 and 2020, the learning gains students reported in 2020 were comparable to learning gains they reported in earlier years of the program. This resilience in 2020 is primarily due to the strong local infrastructure and support that the Technovation Chapter Ambassadors and mentors were able to mobilize to support the girls.

* 2017 data was not available for some analyses due to changes that we made to the survey tool so that we could make program operational changes. The survey did not include questions about learning gains that could fairly be compared to our other annual surveys. "IT IS VERY HARD TO EXPLAIN BUT IT CHANGED ME AND THE WAY I THINK...I'VE EXPERIENCED MANY THINGS THROUGH TECHNOVATION AND THE FRIENDS I MET DURING THIS CHALLENGE MADE ME HAVE A LITTLE CONFIDENCE IN MYSELF."

-Maria Dumbuya, Student from The Gambia



Percentage in agreement

Figure 4. Multiyear comparison of students' confidence in their skills, persistence, and interest in careers related to business or technology (2015-2020). 2017 data was not available for some analyses due to changes that we made to the survey tool so that we could make program operational changes. The survey did not include questions about learning gains that could fairly be compared to our other annual surveys.

We compared several measures of program impact on students—their confidence in the skills they had developed in the program, indicators of persistence, and interest in careers related to business and technology.

Confidence in skills

Students expressed the greatest confidence in their ability to apply their skills in 2016 with 78.4% of students expressing confidence. On average, 72% of students have confidence in applying their skills after participating in Technovation Girls.

Persistence

The average score of students' persistence is 78.5% (across available years), with a lowest average score of 61.6% in 2016.

Career interests

The average score of students' interest in careers related to technology or business across all years is 62.2%, with the highest average score of 72.9% in 2016 and lowest average score of 50.8% in 2015.

HOWEVER, WE BELIEVE THAT OUR DATA DOES NOT TELL THE WHOLE STORY.

	Registration	Completion	Pre-survey	Post-survey	% registered	% completed
2015	4,115	1,235	2,970	953	23%	77%
2016	5,841	3,024	1,099	1,088	19%	36%
2017	11,114	3,549	1,747	1,053	9%	30%
2018	19,125	5,652	4,037	1,076	6%	19%
2019	18,993	7,260	1,192	896	5%	12%
2020	20,388	5,426	1,408	736	4%	14%

Table 3. Number of girls registering and completing the full program and pre and post surveys from 2015-2020. As registration increased every year, the number of pre-surveys and post-survey completion rates both decreased.

OUR COMMITMENT TO REACHING EVERYONE

The deeper realization from this multi-year comparison was that we are missing a lot of girls in our analysis. The percentage of girls completing the post-program surveys has decreased significantly—from 23% in 2015 to 4% in 2020. Even though registration increased every year, both pre- and post- survey completion rates decreased. This means that our data tells only one part of the story, particularly for 2020.



The girls who fill out the post-survey (and complete the program) are most likely girls with access to the internet and necessary devices, as well as sufficient support from families or teachers. Our data is not capturing 96% of the girls who registered in 2020, but didn't finish the full program due to so many reasons beyond their control. We hypothesize that this missing data would show a more significant decrease in learning gains for 2020 than what we are seeing. On average, we are missing post-surveys from 93% of girls who register but don't complete the program each year. That information would help us understand why they are not able to finish and point us towards better ways to support them.

Improving our data collection tools will be an area of investment and effort for us in 2021 and beyond. We are also making concerted efforts to better support more under-resourced communities moving forward (see our conclusion for more details).



Quality of submissions, as measured by judges' scores

In addition to the impacts on depth of student learning, we saw the effect of COVID-19 on the quality of the prototypes the girls submitted.

On average scores were lower than those awarded in 2019.

Additionally, judges who participated in both 2019 and 2020 gave scores that were 16 points lower on average in 2020, suggesting that either 2020 events or changes in the rubric affected the scoring.

TECHNOVATION MENTORS IN 2020

Mentors have always been a critical part of the Technovation program, and they played an even more pivotal role during 2020.

- In 2020, over 90% of the teams who completed the program had a mentor.
- Almost 70% of students reported receiving a great deal of mentor support

(See Figure 14, appendix).

In turn, over 75% of 2020 mentors felt they performed their mentoring duties well.

- 87.8% of mentors felt they established strong relationships built on trust
- 85% of mentors felt they helped teams set project goals
- 81.5% of mentors felt they provided constructive feedback .

(See Figure 16, appendix)

2020 Technovation Impact on Mentors

Mentors reported improvements on their own key skills after participating. (See Figure 15, appendix.)

- 75% of mentors felt they developed teambuilding skills
- 75% of mentors felt they developed their ability to break down complex problems
- 72% of mentors felt they improved their communication skills

98% of mentors indicated that the skills they developed as Technovation mentors are skills they use in their professional work.

LESSONS FOR 2021 AND BEYOND

HOW CAN WE HELP GIRLS BUILD THEIR MOTIVATION, CAPABILITIES AND AGENCY?

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Key themes that emerged from Technovation's 2020 impact analysis are eloquently echoed in the <u>UNDP Human Development Report</u>: vulnerable populations have been hardest hit by global shocks, structural inequalities have deepened, runaway globalization needs to be tempered by local capacity building...and that there is hope—in education and youth activism. To realize this hope, education needs to move beyond content knowledge and tap into what motivates students and what will help them build agency. We need to educate and equip our youth to navigate complex, real-world problems and systems, and we need to have bolder metrics of success that include capacity building and resilience at all levels.

HERE ARE OUR KEY LESSONS FROM ANALYZING OUR 2020 DATA AND OUR BIG-PICTURE RECOMMENDATIONS FOR EVERYONE INVOLVED IN EDUCATING AND SUPPORTING GIRLS.



LESSON 1:

LEARNING LOSSES ARE REAL FOR GIRLS

An estimated ~2,300 fewer girls were able to complete the full Technovation program in 2020. Those who did complete the program had lower learning gains than prior years.

- Girls showed smaller gains when it came to learning how to code, working in a team, and persisting through challenging projects than they had in 2019.
- Judges scored submissions several points (16 points on average) lower than they had in 2019, suggesting that COVID-19 impacted the quality of the prototypes girls submitted.

Both of these measures suggest that although these girls had access to technology, devices, and content, it was not enough.

What needs to be done

Education organizations (schools, nonprofits, and government entities) need to dedicate extra resources to find girls who are dropping out of the education system and then work together to support all girls to make up for their learning losses.

Four concrete steps we can take to make sure we are not setting back decades of progress:

Fund Communities:

Vulnerable communities and NGOs working to support girls need direct funding to provide the right tools and cover basic needs. The girls who were able to complete the full Technovation program were only able to do so because of supportive, agile, on-the-ground champions and ambassadors who mobilized the right resources for the girls as the COVID-19 crisis deepened. That level of volunteer effort cannot be sustained for such long periods of time. We need to make sure that these communities receive more financial support so they can build back after the pandemic.



Build Capacity:

Lessons from the Ebola crisis show us that it is not enough to provide free access to curriculum and tools. Education organizations need to work closely with teachers and other community leaders to build their capacity, and to raise their awareness on the importance of girls' education as a critical part of COVID-19 recovery.

Support and train parents:

Technovation's work over the past 15 years closely mirrors <u>UNICEF's research findings</u> that parents are the main gatekeepers of opportunities for girls. If we are to make longlasting change in a girls' life, then we have to engage and train her parents too. Parents also need to be made aware of the importance of investing in their daughters, and ways to tangibly support their learning. For instance, during the pandemic, girls have taken on increased household responsibilities, leaving them with little time to learn—parents can prevent this learning loss by more equitably dividing household chores between children of all genders, instead of relying only on girls.

Create multi-year investments:

Justine Sass, Chief of the Section of Education for Inclusion and Gender Equality at UNESCO emphasizes that education organizations need to collect data on the extent of the learning losses-with particular emphasis on those girls who have dropped out of schools or learning environments. This data collection will provide a better understanding of what is happening on the ground, and allow girls to share their experiences in their own words. Understanding these losses will enable us to truly meet the needs of girls. This deliberate approach requires multi-year commitments from organizations and multi-year investments from funders to adequately address the shock these communities have experienced.

LESSON 2:

DEVICES ARE NOT ENOUGH. Mentors motivate.

Access to online education remains a serious infrastructural issue—<u>GSMA reports that</u> almost 4 billion people do not have access to the internet. **But access alone isn't enough.** Distributing tablets preloaded with content doesn't guarantee children will learn the material. We must also support them as they learn, whether it's support for helping them digest the material or support in helping ensure they have time to learn and stay motivated and engaged. Addressing those problems at large scale may not be technologically possible, but it is possible through people-centric solutions—through recruiting and empowering local mentors. This approach will be harder and slower to implement than a purely technological solution, but it will be more localized, and more sustainable.

We can learn from economists Esther Duflo and Abhijit Bannerjee and their book <u>Good</u> <u>Economics for Hard Times</u>. "The frugal engineering world is littered with many similar disasters, from the \$100 laptop to educate the world (which actually costs \$200 and has been shown to have no impact on what children actually learn), to cleaner cookstoves that nobody wanted, to various <u>water-filter</u> technologies and innovative latrines. A lot of the problem seems to be that these innovations take place in a void, insufficiently connected to the lives they wish to change".



Volunteer support from partners like HSBC was critical in 2020. Over 7,100 volunteer mentors from around the world aided teams during the 2020 season. In 2020 we saw <u>a huge upswing in interest</u> in self-directed learning platforms and initiatives to rush devices and technology to students. From our own data, we saw that it was not enough for girls to have access to online curriculum, devices, and the internet. They also needed thick social support networks with educators, parents, and mentors working together to motivate and inspire them to continue learning. **Over 90% of teams who successfully completed the program had a mentor,** and 70% of the Technovation girls who completed the post survey shared that they were helped a lot by their mentors.

What needs to be done

Research shows that access to diverse forms of social capital is key to helping a community recover from shocks and become more resilient. COVID-19 has intensified structural inequalities, but it has also pushed people to become more comfortable with virtual connections, including virtual volunteering. Some of the strongest and most effective types of social connections are those that bridge geographies, race, class, and educational levels. These connections can help individuals access new learning, development, and employment opportunities. As governments and the private sector move to provide internet to communities around the world, we need to make sure we are not forgetting the equally critical piece of building social capital and mentorship for girls.

LESSON 3:

GIRLS ARE READY TO TACKLE REAL-WORLD PROBLEMS. WE CAN GIVE THEM BETTER TOOLS.

In 2020, we found that Technovation girls were grateful for a platform to make their voices heard; to share their ideas for community improvement, world change; and to work on making them real. A survey showed that 17% of our alumnae are told that girls and women cannot change the world, and fewer than 30% of girls are encouraged to be changemakers. But we know that's not true. We have 11 years worth of examples showing that girls care about the same issues as world leaders—they develop apps to address <u>access to healthcare</u>, to <u>protect the environment</u>, to <u>reduce social</u> <u>inequalities</u>, and to help <u>ensure peace</u>.

Girls are ready to solve big problems! We must make sure they have the tools, resources, and critical thinking skills to do their best. In addition to teaching content, we also have to help build their motivation, capabilities, and agency, as well as their understanding of complex systems.

"THIS PROJECT STARTED OUT AS A PROBLEM THAT DID NOT DIRECTLY IMPACT ME OR GIVE ME A STRONG CONNECTION. BUT THE MORE I LISTENED AND DID INTERVIEWS, READ ARTICLES AND SAW THE EXTENT OF THIS PROBLEM, I ENDED UP VOLUNTEERING, TRYING TO START A CLUB AND AM CURRENTLY DEBATING IF I SHOULD REGISTER [MY BUSINESS] AS AN OFFICIAL CHARITY AFTER TECHNOVATION GIRLS. TECHNOVATION HELPED ME DEVELOP A PASSION FOR THE ENVIRONMENT, BUILD CONFIDENCE, AND MOST OF ALL, MAKE NEW FRIENDS WHO HAD THE SAME PASSION FOR LEARNING AND TRYING NEW THINGS LIKE I DO."

-Diya M., Canada



What needs to be done

Teaching Girls how to solve Complex, Real-World Problems

Most real-world problems, like COVID-19 or the climate crisis, are complex and ill-defined, operate at multiple scales across different disciplines in dynamic ways, and may not have a clear end. To prepare young people to face these challenges, we need to better support them. This includes having them practice realworld complex problem solving and helping them understand the feedback loops between human behaviour and the natural environment.

Early in 2020, Technovation created a video series called Solve-It, and put together an initial checklist for educators, based on Donna Meadows' primer on Thinking in Systems. We worked with an attorney from Hogan Lovells to apply the checklist to a real example of a complex problem Technovation Girls teams frequently address-domestic violence. The video walks through the process of brainstorming and developing solutions that can help protect survivors of domestic abuse by exploring different potential effects of the solution on those who use it. This helps students consider the different systems that domestic violence is situated within, rather than approaching it as a stand-alone issue.

We need to continue developing resources that will help students better understand how different systems affect the problems they choose to solve and how their solutions affect different stakeholders.

Agency is at the heart of Sustainable Development

Amartya Sen (a Nobel Prize winner and welfare economist) says that we must recognize people's agency as a central tenet of sustainable development that allows both people and the planet to thrive. This approach puts people at the center of each intervention, and recognizes their freedoms and their capacity to be change agents.

The most successful component of Technovation's model is that girls are empowered to identify problems in their community that they care about, thus increasing their agency. This is even more relevant today, when we are trying to build back better after COVID-19 while also ensuring sustainable development for all.

As we work to get girls back into school and to improve what and how we teach, we must also make sure that they are directing our efforts and we are actually meeting their needs, not just what we believe to be their needs.

LESSON 4:

COUNTING VIDEO VIEWS ISN'T Enough to measure impact.

Overall, organizations need to re-evaluate whether the ways we measure impact actually measure meaningful change. Straightforward metrics (like web traffic, video views, and students reached) might seem to tell a clear story of success, but that story isn't a full one..

What needs to be done

Re-evaluating our evaluation tools

We can set bolder goals than curriculum usage, website traffic, and program registrations and instead measure tangible increases in motivation, real-world problem solving capabilities, voice, influence, and agency for girls. We can also strive to measure how effective programs are at connecting girls to additional resources. Prof. Nalia Kabeer, at the Department of Gender Studies, London School of Economics, <u>offers the following framework</u> that measures increases in:

- Resources: Increased access to material, human, and social resources
- Agency: Increased abilities, participation, voice, and influence in the family, workplace, school, community
- Achievements: Meaningful improvements in well-being and life outcomes that result from increasing agency and education.

Building a foundation of support for girls

In addition to defining and measuring more meaningful metrics, education organizations need to understand and address environmental and community barriers that girls face. By intentionally engaging the girl's family and community, education organizations can lay the foundation of more sustainable support for the girl, but also the foundation for a more resilient community. Research shows that communities can be strengthened through:

- Increasing social capital (people and networks) for under-resourced communities by connecting them to trained, virtual mentors from different industries
- Increasing access to technology skills training for both adults and children
- Increasing community open-mindedness and ability to accept change through exposure to instances of young people, girls, women, and minorities as technology innovators, entrepreneurs, leaders, and lifelong learners
- Increasing volunteerism and <u>civic</u>
 <u>engagement</u>
- Increasing the number of <u>young people</u> working in the community

HOW TECHNOVATION WILL APPLY WHAT WE'VE LEARNED

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Technovation's mission is to build capacity in underserved communities—especially as we build back after COVID-19. Over the last year we developed a **three-step process to ensure we actually reach and serve underserved communities:**

- Find a global index that would go beyond just income levels to measure well-being. We chose the <u>UNDP Human Development Index</u> (<u>HDI</u>) because it measures life expectancy and education, as well as per capita income, all of which are relevant to the way we want to evaluate access to key resources.
- 2. Document the Human Development Indices for the top ten countries we operate in and use that as a baseline measurement of how well our programs reach under-served communities currently.
- 3. Use the baseline to set goals to increase the number of under-served communities we support.

Out of 150 indicators of life expectancy, education, and income, we identified and compared 17 indicators that are particularly applicable to Technovation: 5 indicators of the type of educational support available to students, particularly girls; 6 indicators of gender equality (to gauge the level of support Technovation Girls participants would have); and 6 indicators of poverty levels including access to mobile phones and internet. We compared these indicators across the top 10 countries Technovation worked in in 2020 (Figure 6).





Poverty Indicators from 2020 UNDP Human Development Indices for Top 10 Technovation Countries

Education Indicators from 2020 UNDP Human Development Indices for Top 10 Technovation Countries



Figure 6. Our 10-country comparison of key indicators, broken into 3 broad categories: poverty, education, and gender equality.



Gender Equality Indicators from 2020 UNDP Human Development Indices for Top 10 Technovation Countries

Figure 6. Our 10-country comparison of key indicators, broken into 3 broad categories: poverty, education, and gender equality.

These graphs provide a baseline understanding of how well-resourced the communities we support are. We also crossreferenced these graphs with the <u>UNDP Human</u> <u>Development Indices (HDI)</u> for our top-10 countries.

- 3 of our top 10 countries—US, Canada, and Spain—have an HDI above 0.85
- The 2020 average HDI for Techonvation's top 10 countries is 0.76, slightly higher than the 2019 average HDI of 0.755

We attribute most of this shift to reduced participation in Technovation from Kenya (overall HDI = 0.579), which was particularly hard-hit by COVID-19 but is frequently in our top 10 countries. Keeping the above findings in perspective, a key performance indicator for Technovation in 2021 and beyond will be building capacity in underserved communities. **Our goal is for 71% of community partners receiving program grants from Technovation to serve underserved communities, and for at least 23% of girls at each site to finish the program.**

Although this completion rate seems low, it will be difficult to achieve, considering the huge tolls COVID-19 has taken on all our physical, mental, and intellectual energies, and especially for communities of color. To avoid adding additional stress to these communities, we will dedicate more effort and care to build trust in these communities, providing tangible, financial, and social capital, as well as plenty of time and patience to co-create programs that make sense to the communities.

In the US in particular, we will focus on states that have a high percentage of communities of color living in poverty, and few tech-based opportunities (Figures 7 and 8).



% Population in Poverty 2019

Figure 7. <u>Charting the unemployment rate in February 2021</u> (highest unemployment being in Hawaii and lowest in Pennsylvania), population percentage in poverty in 2019 (highest in Mississippi and lowest in New Hampshire) and the <u>percentage of total</u>. <u>Gross Regional product that technology accounts</u> for in each state.



Figure 8. Percentage of African Americans in poverty as compared to the total percentage of individuals in poverty.

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Based on the above data, we will work with national partners, such as <u>STEM Next</u>, to identify local organizations, communities, and educators in states that are particularly vulnerable with a large percentage of communities of color living in poverty. We will co-create and implement programs over the next few years in these regions, with a particular emphasis on making sure that support systems are in place to retain girls through the full 12week Technovation program. In addition to working closely with local organizations and communities and supporting them to adapt Technovation programs and resources to their unique needs, we will also continue to partner with individuals and organizations to improve our curriculum and resources. We will build on the resources we developed in 2020 that focus on complex systems thinking and ensure our curriculum better supports girls to develop problem-solving skills drawn from their real-world experience.



CONCLUSION



The data presented in this report is sobering and hopeful at the same time. The challenges and gaps are immense, but we are also seeing that the people in the Technovation community continue to drive real change and impact for girls worldwide. We need to work harder to keep students—especially girls—engaged not just in learning, but learning the skills they will need to thrive in a post-COVID-19 world.



The good news is that programs like Technovation help girls gain valuable skills and social capital that will enable them to thrive as leaders well beyond their time in the program. This long-term impact tells us that broadening our approach beyond just coding and content knowledge, and including a serious focus on helping girls develop real-world problem solving and complex systems thinking skills works. The United Nations Human Development Report of 2020 emphasizes that our collective education efforts need to move beyond basic content knowledge, and should include ways to help young people develop and harness their motivation, capabilities, and agency. We are reassured that that has been the focus of our work for so many years, and proud we can bring 15 years of experience and a successful program model to the table, as we rebuild through and after COVID-19 as a global community.

COLLECTIVELY, WE WOULD DO WELL TO MAKE SURE THAT WE KEEP PEOPLE, NOT JUST TECHNOLOGY, AT THE HEART OF ALL OUR PLANS.

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PROGRAM REACH

	2019		2020	
1	United States	1042	Spain	890
2	Spain	976	United States	736
3	Canada	561	Mexico	691
4	Mexico	508	Brazil	596
5	Brazil	478	Canada	446
6	India	391	Nigeria	442
7	Nigeria	283	India	437
8	Kenya	242	Kenya	256
9	Kazakhstan	197	Uzbekistan	211
10	Uzbekistan	182	Kazakhstan	181

Table 4: Comparison: Mentor participation in top 10 countries

	2019		2020	
1	United States	24	United States	25
2	Mexico	12	Mexico	13
3	Canada	n	Canada	n
4	Spain	9	Spain	9
5	India	6	India	7
6	Kazakhstan	5	Kazakhstan	6
7	Nigeria	5	Nigeria	5
8	Cameroon	4	China	4
9	China	4	Kenya	4
10	Kenya	4	Germany	4

Table 5: Comparison: Chapter Ambassador participation in top 10 countries

	2019		2020	
1	United States	2663	Spain	2505
2	Spain	2635	United States	2330
3	Canada	1237	Nigeria	1859
4	Brazil	1226	Mexico	1206
5	Nigeria	1162	Brazil	1127
6	Mexico	1006	Canada	1020
7	India	664	Kyrgyzstan	832
8	Uzbekistan	556	India	782
9	Kenya	557	Cambodia	672
10	Kazakhstan	502	Kazakhstan	626

Table 6: Comparison: Top 10 countries by registration, 2019 v. 2020. Compared to 2019, 8 countries remain in the top 10 with the replacement of Uzbekistan and Kenya with Kyrgyzstan and Cambodia.

PROGRAM IMPACT

Student Post-Survey Results: Details

2020 Student Learning Gains



Figure 9. Approximately 80% of girls indicated increased ability to break down problems into manageable parts, persevering on projects, working in teams, problem solving, starting a business and coding.

2020 Student Persistence



Figure 10. Approximately 84% of girls indicated behaviors demonstrating increased persistence after Technovation.

2020 Student Teamwork & Collaboration Skills



Figure 11. Approximately 93% of students indicated increased teamwork and collaboration skills.

2020 Student data analysis skills



Figure 12. Approximately 81% of girls indicated increased skills in creating hypotheses for problem solving, using data to make decisions, graphing data and using data to form conclusions.

2020 Student confidence in communication skills



Figure 13. Students were confident in their ability to solve problems and communicate with their mentors, but less confident in their ability to express their ideas via public speaking, persuading others, and explaining business models.

Mentor Impact

How much support did you get from your mentors?



Figure 14. Nearly 70% of students reported receiving a great deal of support from their mentors.

Mentor Impact



Percentage showing improvement

Figure 15. The majority of mentors reported that working with Technovation students improved their skills, especially in working with complex problems (75%) and communicating with other mentors and adults (72.9%).

Mentor Impact



Figure 16. Over 75% of mentors felt that they had a positive impact on their teams' learning and development. Areas with the greatest reported impact were establishing strong relationships built on trust (87.8%), working with their teams to set project goals (85%), and providing constructive feedback (81.5%).

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