



SHARP  
— Literacy —

## DESIGN THROUGH CODE

2019-20 School Year



## ABOUT THE DESIGN THROUGH CODE PROGRAM

Computing and technology hold the promise of the future for today's youth . . . yet for many students in urban communities, this opportunity lies just outside their reach. SHARP Literacy understands that digital literacy is an essential part of education for today's students and has extended its STEMMY award-winning curriculum to address this critical need.

Design Through Code (DTC 1.0 and 2.0) is SHARP's proprietary program to introduce 4th and 5th grade students to the language of coding. The program introduces students to the process of coding, which taps essential skills such as problem-solving, logic, collaboration, critical thinking and creativity.

As part of the program, SHARP students in Milwaukee take part in educational tours to see technology and design in action. Visits to Milwaukee Institute of Art & Design (MIAD) and Milwaukee School of Engineering (MSOE) campuses help young learners see how college students use art and technology to create solutions to real-world problems. Students in Waukesha schools visit Quad to see how a neighboring company uses technology and graphic design to serve international clients.

The 16 to 18-week program culminates with a Design Challenge – a collaborative project that challenges students to address a need in their school or community. Working in a team environment, students use their knowledge of coding, art and the design process to create a prototype solution to the issue they've identified. After using code to create a digital rendering and a physical prototype, they prepare a group presentation about their project and present to a panel of professionals in STEAM (Science, Technology, Engineering, Art and Math) careers.

To develop the DTC program, SHARP's educational team collaborated with numerous organizations including Northwestern Mutual, Rockwell Automation, Design Fugitives, Quad, UWM's School of Information Studies, MIAD, MSOE, and the Wisconsin Department of Public Instruction. These partners represent Milwaukee's and Waukesha's leaders in technology, engineering, design thinking, art and education. Community support has been instrumental in helping SHARP Literacy's education team develop curriculum, educational tours and assessments for the program.

SHARP's DTC is a breakthrough program for many students, giving them new confidence and opening their minds to new possibilities. Working in partnership with the business community, we can change what engineers, scientists and programmers will look like in the future.

# THE DTC CURRICULUM

## Design Through Code 1.0 Curriculum

- Focus on computational thinking and coding principles including algorithms, debugging and loops
  - Uses artwork by Wisconsin artists and designers as inspiration
- Emphasizes essential life skills including teamwork, communication in a group setting, having the courage to try and persist
  - Introduces students to the design thinking process

## Design Through Code 2.0 Curriculum

- Expands on concepts learned in DTC 1.0 and moves to the next level of coding principles to include conditionals, events, functions and nested loops
- Encourages students to think like an entrepreneur and create their own businesses
  - Introduces students to data science through a market research unit
  - Design and build websites for their businesses using Google Sites



# SUMMER & AFTER-SCHOOL PROGRAMS

## STEAM Big Leaguers

Returning for a second summer, students will explore the technology, math, and art behind baseball. Students will better understand the power of technology and the impact of math and data, while gaining an appreciation for the teamwork and creative problem solving in sports. Playing outside, STEAM Big Leaguers will pitch, hit, and run, all while collecting data. Students will use both low-tech tools like measuring tapes and stop watches and high tech devices and apps like iPads and Blast (Bluetooth Swing trainer) to collect, visualize, and interpret data.

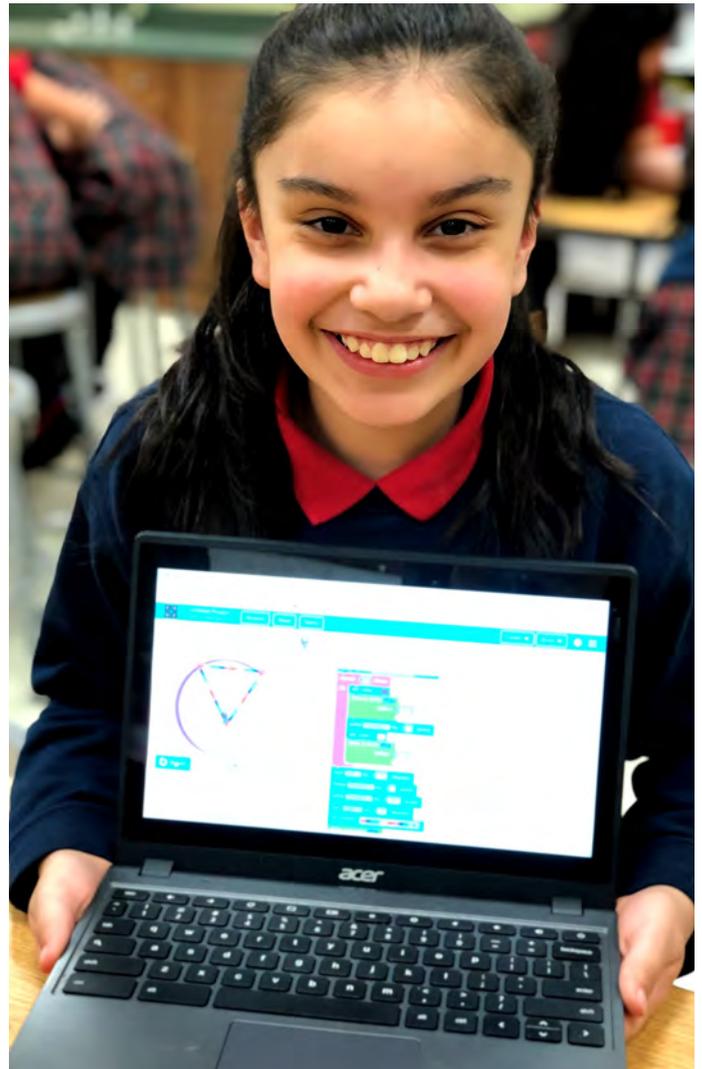
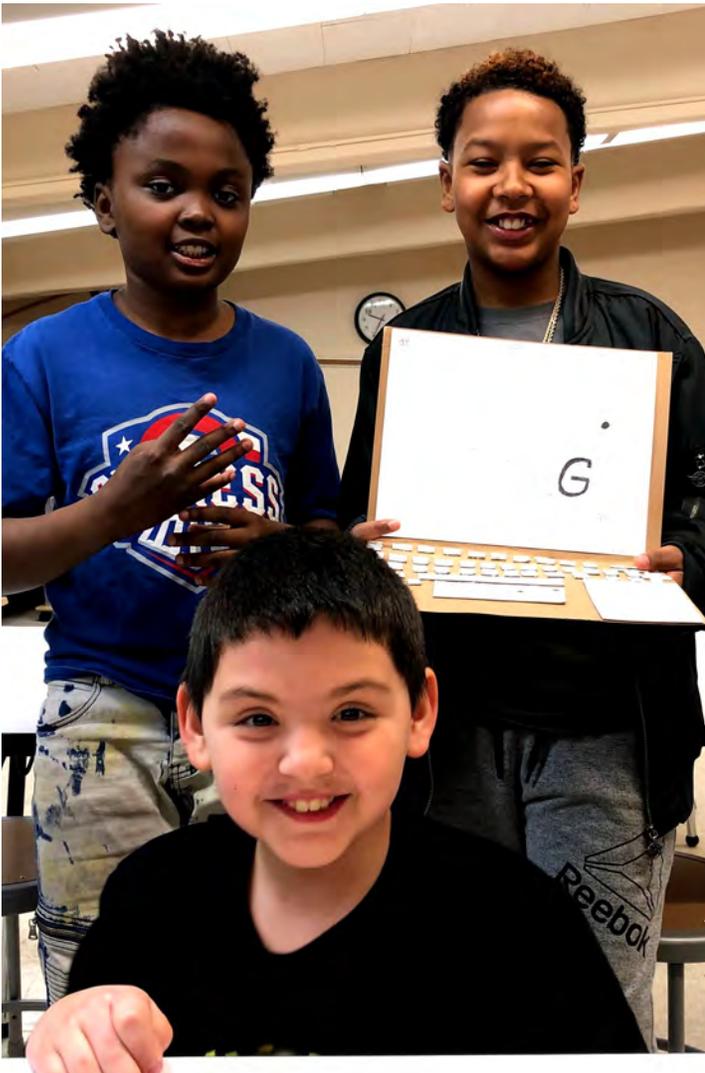
## Urban Techies

Building upon the success of DTC 1.0 and 2.0, Urban Techies focuses on introducing students to the fundamentals of coding and computer science through a fun gardening theme. Students create an indoor vertical garden and track its progress over time in their science journals. Aligned with 3rd grade standards and practices in science, technology and math, the Urban Techies program will be piloted in Summer 2020.



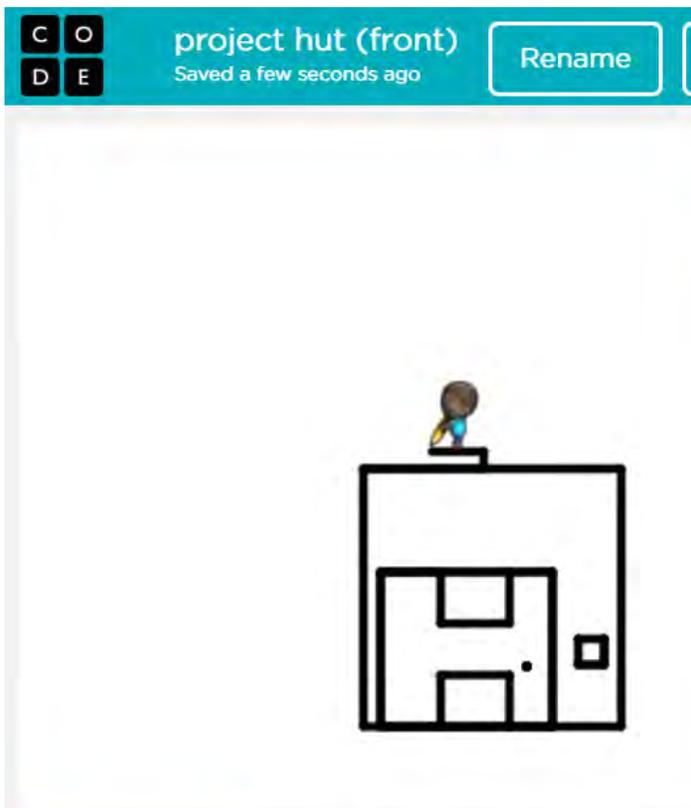
## DTC 1.0—THE DESIGN CHALLENGE

- The DTC 1.0 program culminates in an eight-session long Design Challenge. Students use the design thinking process to identify a problem, brainstorm ideas, develop solutions, and build a prototype.
- The Design Challenge takes place after the educational tour, which helps students see how the design process is used by college students and professionals.
- After students brainstorm solutions to community problems, they create digital renderings of their ideas. Then they budget for and purchase art supplies in order to build small-scale prototypes of their inventions.
- The Design Challenge ends with a presentation in which professionals from a variety of STEAM careers serve as guest judges. Guest judges provide students with more than just feedback. They serve as positive role models for students and help them see the many pathways to success in the future.



## DTC 1.0—DESIGN CHALLENGER WINNERS 2020

- Augustine Prep students William, Esteban and Evelyn designed a “waiting hut.” Their invention is designed for students who have to wait outside during dismissal and helps students to avoid getting frostbite or a sunburn, depending on the season. The solar-powered "waiting hut" is complete with high tech safety features including a card scanner for parents to use when they arrive, preventing potentially dangerous interactions with strangers and students. In addition to their inspiring idea, this group of students was highly motivated and created not just one but four digital renderings—one for each side of the building.
- Escuela Vieau students Aaliyah, Justin, Jonah and Kristian designed a study space for students to use after school. This group of students developed this space because they believe that there is not a space where different students from Milwaukee can do their homework and also play with new students. The after school space is designed to be culturally inclusive and features a library, free healthy food, playrooms, comfy seats and a donation office.
- HAPA students Grace, Megan, Melanie, and Kayleen designed “Sally the Robot” that carries medicine to help out the community with different illnesses. This all girl team also explained that they would design a smartphone app called “Get Better”, which integrates with Sally and makes it easier for patients to have access to their medications.
- Victory students Robert, Yamilet and Maangel focused on the issue of kidnapping and in response to this problem, they designed a chip that can easily fit in a child's shoe. The chip can easily be turned on by a button when a child feels like they are in danger, subsequently triggering a notification to parents and/or law enforcement.



Digital rendering of “Waiting Hut”  
by Aug Prep students



Maangel from Victory working on prototype

## DTC 2.0 -THE DESIGN CHALLENGE

- The DTC 2.0 program culminates in an eleven-session Design Challenge that focuses on the STEM and design side of entrepreneurship. Fifth grade students use the design thinking process to brainstorm ideas to build their own business.
- Working in small groups, students write their own business plans and use Google Forms and Google Sheets to understand how data science and market research is used in the business world to make smart, informed business decisions.
- Classroom teachers lead a lesson on privacy, security and digital citizenship, ensuring that students understand the intricacies of sharing information online.
- With the support of Professor Adam Hudson and his students from UWM's Non-Profit Program at the School of Information Studies, fifth graders then build websites for their businesses using Google Sites.
- In the last session, students "pitch" their ideas to guest judges, a group of business professionals from the community.



# EDUCATIONAL TOURS

## MIAD

The tour showcases areas of the campus such as graphic design and augmented reality where art, design and technology intersect. Students and teachers also learn about the design process, renderings, and prototyping to prepare them for the Design Challenge.

## BRINN LABS

Students learn how to think critically and creatively to solve problems. They do so by building paper robots and recording and reporting their process to the whole group. Students also explore options for career paths in a STEAM field.

## QUAD

Students and teachers learn how technology, engineering and design thinking are used by professionals. The tour also exposes students to a wide array of future college and career paths.

## MSOE

Through hands-on activities with the university's STEM outreach program and CREATE Institute, elementary students learn to think, design and solve problems like an engineer.



## PROGRAM TIMELINE

SCHOOL YEAR

# 2017-18

- Pilot year of the 4th grade program
- 10 sessions
- Three public schools in Milwaukee
- Served 170 students

SUMMER

# 2018

- Partnership with MPS' Summer Academy
- Pilot of new sessions
- Served 25 students

SCHOOL YEAR

# 2018-19

- Curriculum expanded from to 16 sessions
- 5 partner schools in Milwaukee
- New partnership with 3 Waukesha schools
- More than 600 students served

SUMMER

# 2019

- Piloted STEAM Big Leaguers curriculum
- Piloted DTC 2.0 program
- Partnerships at 5 summer school sites
- Served 150 students

SCHOOL YEAR

# 2019-20

- DTC 1.0 curriculum expands to 18 sessions to include financial literacy
- DTC 2.0 program runs at 3 schools
- Partnerships expanded to include 8 Milwaukee schools & 3 Waukesha schools
- Nearly 1,000 4th & 5th grade students participated

MEASURING  
STUDENT SUCCESS  
ON CODE.ORG

15%

STUDENTS ACHIEVING PROFICIENCY ON CODE.ORG WITH A TEACHER  
BUT WITHOUT SHARP LITERACY  
SOURCE: "TOWARDS MEASURING BASIC CODING PROFICIENCY" BY CODE.ORG, MARCH 2017

70%

SHARP LITERACY'S GOAL:  
70% OF STUDENTS ACHIEVING PROFICIENCY ON CODE.ORG

74%

STUDENTS ACHIEVING PROFICIENCY ON CODE.ORG WITH  
SHARP LITERACY'S DESIGN THROUGH CODE PROGRAM IN 2019-20

## MEASURING IMPACT ON ATTITUDES & ESSENTIAL LIFE SKILLS

### PERSISTENCE

↑ 4% POINTS

WHEN SURVEYED ABOUT PERSISTENCE, STUDENTS INCREASED FROM 68% TO 72% YES IN 8 DTC 1.0 SESSIONS

### COLLABORATION

↑ 4% POINTS

WHEN SURVEYED ABOUT COLLABORATION, STUDENTS INCREASED FROM 78% TO 82% YES IN 9 DTC 1.0 SESSIONS

### COMMUNICATION

↑ 10% POINTS

WHEN SURVEYED ABOUT COMMUNICATION, STUDENTS INCREASED FROM 78% TO 88% YES IN 9 DTC 1.0 SESSIONS

### POSITIVE ATTITUDES TOWARDS LEARNING ABOUT STEAM

88%

OF DTC 2.0 STUDENTS (5TH GRADERS, WHO HAVE ALSO COMPLETED THE DTC 1.0 PROGRAM) HAD A POSITIVE ATTITUDE TOWARD LEARNING ABOUT TECHNOLOGY.

THESE SURVEY RESULTS ALSO SHOWED THAT IT WAS THE STUDENTS FAVORITE SUBJECT OUT OF SCIENCE, TECHNOLOGY, ENGINEERING, ART AND MATH.



## DESIGN THROUGH CODE

### 2019-20 OUTCOMES

2019-20 goals for DTC 1.0 and 2.0 are the following:

- Students demonstrate progress in coding fundamentals, web design, data science and formulation of a business plan.
  - 70% of DTC 1.0 students will successfully complete the lessons in Code.org (mid-year and year-end assessment).
  - **GOAL EXCEEDED: 74% of DTC 1.0 students successfully completed lessons in Code.org**
  - 50% of DTC 2.0 students will successfully complete coding lessons, create a website and use data science principles for their business plan.
  - **GOAL MET: 50% of DTC 2.0 students successfully completed lessons in Code.org**
- Students create projects with clear purpose and collaborate effectively in small groups. Outcomes will be measured based on project idea, skills learned, prototype or business plan and presentation.
  - 70% of the students will be deemed proficient in the Design Challenge or Business Plan (year-end assessment).
- Students demonstrate increased engagement through persistence, growth in STEAM knowledge and a positive attitude toward STEAM. This will be measured by the number of levels attempted in code.org or a write-and-rate rubric.
  - 70% of DTC 1.0 students will demonstrate persistence as measured by the number of levels attempted in Code.org (mid-year and year-end assessment).
  - **GOAL EXCEEDED: 72% of students rated themselves as “persistent” in their Lesson 9 self-assessments. On Code.org, 87% of DTC 1.0 students scored as “persistent” on Code.org.**
  - 50% of DTC 2.0 students will demonstrate growth in STEAM knowledge and inclination for STEAM, as measured on a 5-point write-and-rate rubric (for students) based on “I used to think, now I have learned” (year-end assessment).
  - **GOAL EXCEEDED: Surveys asked the students to rate their attitudes towards learning about science, technology, engineering, art and math on a five-point scale. Responses of a three or higher are considered to be a “positive attitude”. Surveys showed the greatest gains in attitudes towards learning about Engineering (70% to 84%), Art (73% to 79%) and Technology (86% to 88%). Technology was the most popular subject with 88% of DTC 2.0 students rating it at a three or higher at the end of the program.**
- Teachers report that they feel sufficiently trained on the classroom software and other technological tools so that they are effectively able to co-teach, along with SHARP educators.
  - 75% of the teachers will report satisfaction with the professional development provided by SHARP and will demonstrate a commitment to upskilling (year-end survey)
  - **NEEDS IMPROVEMENT: Two out of three classroom teachers responded that if it weren't for SHARP's DTC program, they would not teach computer science and/or coding. Teachers were also asked to respond about how they feel during their SHARP DTC workshops with 66% responding as “excited” and “engaged” and 33% responding as “relaxed” when their SHARP educator is present. Without their SHARP educator present, teachers responded that they feel “excited” (50%) but also “overwhelmed” (50%). These responses show that while classroom teachers see the value of teaching the subject, they feel more comfortable and confident when co-teaching the subject with a well-trained educator from SHARP Literacy. SHARP will continue to offer professional development opportunities for classroom teachers and explore avenues for expanding training opportunities for partners in the DTC 1. and 2.0 programs.**

# **DESIGN THROUGH CODE**

PARTNER SCHOOLS IN 2019-20

Escuela Vieau

Forest Home Avenue Elementary

Hmong American Peace Academy

Notre Dame Girls Middle School

Prairie Elementary

Rogers Street Academy

St. Augustine Preparatory Academy

Summit View Elementary

Victory School

Westside Academy

Whittier Elementary

In the 2019-20 school year, nearly 1,000 students from eleven schools participated in the DTC 1.0 and 2.0 programs.

# ST. AUGUSTINE PREPARATORY ACADEMY

PROGRAM PARTNER SINCE

# 2019

CODE.ORG PROFICIENCY RATE

# 91%

NUMBER OF CLASSROOMS SERVED

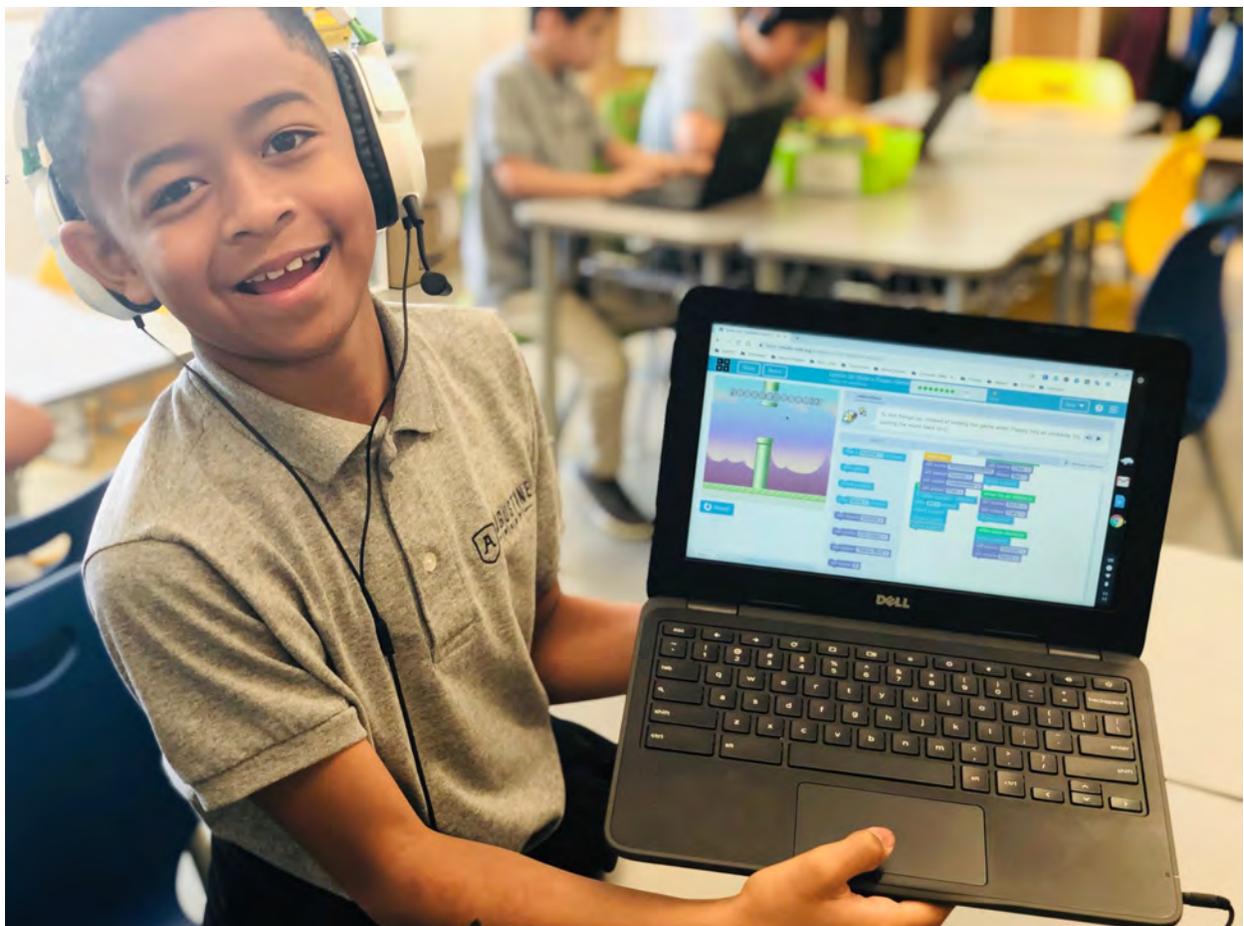
# 4

PROGRAM SPONSORED BY

The logo for Fiserv, featuring the word "fiserv." in a lowercase, orange, sans-serif font.

NUMBER OF STUDENTS SERVED

# 80



# ESCUELA VIEAU

PROGRAM PARTNER SINCE

# 2017

NUMBER OF STUDENTS SERVED

# 100

NUMBER OF CLASSROOMS SERVED

# 3

CODE.ORG PROFICIENCY RATE

# 88%

PROGRAM SPONSORED BY



# Rockwell Automation



Vieau students worked on their Design Challenge projects. Students worked on a variety of problems that included environmental, educational and safety issues like water pollution, study space for students, driving and texting, recycling and homelessness in the Milwaukee area.

# FOREST HOME AVENUE ELEMENTARY

PROGRAM PARTNER SINCE

# 2017

NUMBER OF STUDENTS SERVED

# 145

NUMBER OF CLASSROOMS SERVED

# 6

CODE.ORG PROFICIENCY RATE

# 59%

PROGRAM SPONSORED BY



# Northwestern Mutual®



“What I learned is when you are a coder you can make many types of games and you can chose what you want to put in the game.”

- Milek, Forest Home

# HMONG AMERICAN PEACE ACADEMY

PROGRAM PARTNER SINCE

# 2019

NUMBER OF STUDENTS SERVED

# 150

NUMBER OF CLASSROOMS SERVED

# 4

CODE.ORG PROFICIENCY RATE

# 70%

PROGRAM SPONSORED BY



Founder and CEO of Hmong American Peace Academy, Chris Her-Xiong, was thrilled to be able to finally offer coding classes to their elementary students, thanks to the Design Through Code 1.0. The 4th grade classrooms showcased their Design Challenge projects at their annual spring Science Fair.

# NOTRE DAME GIRLS MIDDLE SCHOOL

PROGRAM PARTNER SINCE

# 2018

NUMBER OF STUDENTS SERVED

# 30

NUMBER OF CLASSROOMS SERVED

# 1

CODE.ORG PROFICIENCY RATE

# 84%

PROGRAM SPONSORED BY



# Northwestern Mutual®



In December 2019, Notre Dame students completed their Design Challenge. The teams focused on topics like pollution and the environment. Projects included robots that clean beaches and personal devices to pick up trash while hiking.

# ROGERS STREET ACADEMY

PROGRAM PARTNER SINCE

# 2018

NUMBER OF STUDENTS SERVED

# 120

NUMBER OF CLASSROOMS SERVED

# 4

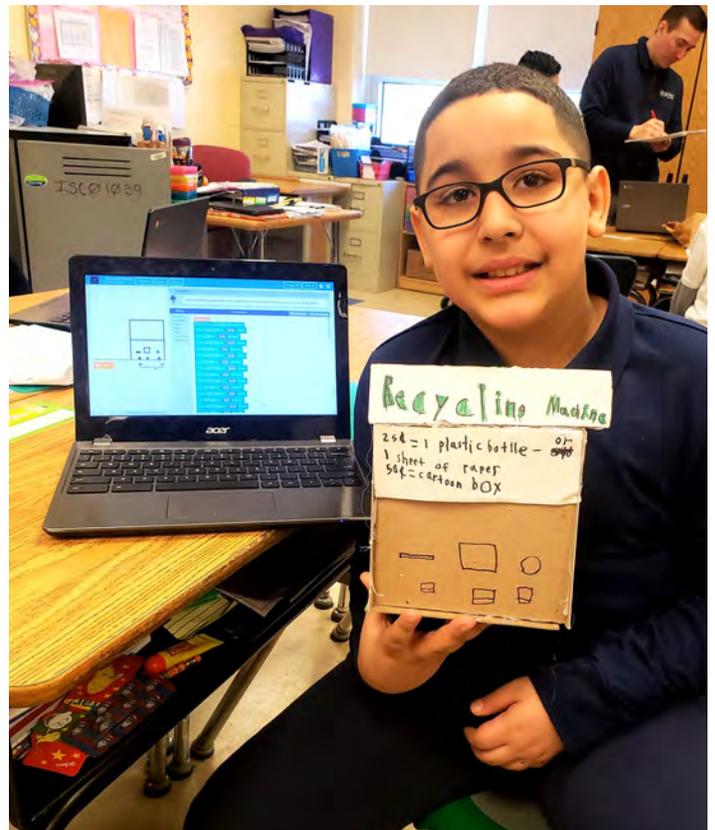
CODE.ORG PROFICIENCY RATE

# 52%

PROGRAM SPONSORED BY



# Rockwell Automation



In December 2019, Notre Dame students completed their Design Challenge. The teams focused on topics like pollution and the environment. Projects included robots that clean beaches and personal devices to pick up trash while hiking.

# VICTORY SCHOOL

PROGRAM PARTNER SINCE

# 2019

CODE.ORG PROFICIENCY RATE

# 74%

NUMBER OF CLASSROOMS SERVED

# 2

PROGRAM SPONSORED BY



NUMBER OF STUDENTS SERVED

# 60



Today I learned that you need to do it over and over until you get it. Or if you weren't successful, you just try again. - Isaac, Victory School



We learned how to make a paper airplane. You just need to follow directions, eliminate the errors and then you will know how to do it. - Swarbay, Victory School

# WESTSIDE ACADEMY

PROGRAM PARTNER SINCE

# 2019

CODE.ORG PROFICIENCY RATE

# 84%

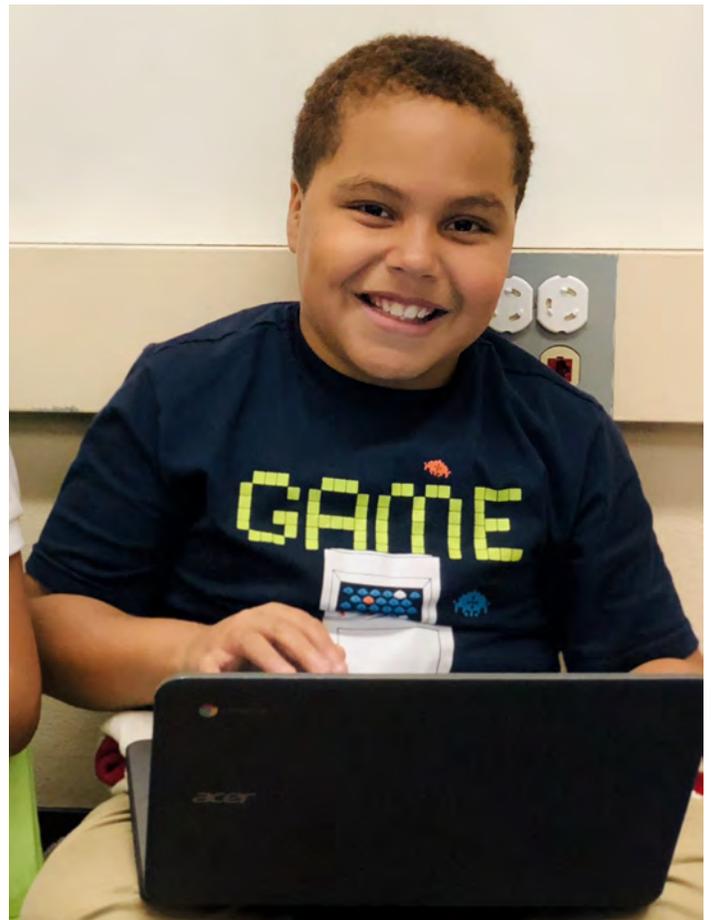
NUMBER OF CLASSROOMS SERVED

# 1

NUMBER OF STUDENTS SERVED

# 30

PROGRAM SPONSORED BY



“You have to do it detail by detail or it won’t work the way you want to. You have to do it an exact way or its not going to function correctly.” - Corjyn, Westside Academy

# SCHOOLS DISTRICT OF WAUKESHA

PROGRAM PARTNER SINCE

# 2018

CODE.ORG PROFICIENCY RATE

# 78%

NUMBER OF CLASSROOMS SERVED

# 8

PARTNER SCHOOLS

# PRAIRIE SUMMIT VIEW WHITTIER

NUMBER OF STUDENTS SERVED

# 170



# GRAPHIC NOVEL WORKSHOPS

- In a series of Young Authors Workshops, students from Notre Dame Girls Middle School and Rogers Street Academy worked with Ian and Amber Corrao on SHARP's next *We Love to Learn* book.
- In the workshops, students learned about how professional authors and illustrators work to develop rich settings and characters in their work and then designed their own.
- The graphic novel style book will align with SHARP's Design Through Code programs and is set to be released to students in January 2021.



## TESTIMONIALS FROM SCHOOL PARTNERS

“We’ve known for a while now that we need to be teaching our students about coding and computer science, but we were just so overwhelmed, we didn’t know where to start. We’re grateful to SHARP Literacy and the Design Through Code program for helping us to fill that need and provide that opportunity to our students.”  
– Chris Her-Xiong, Principal of Hmong American Peace Academy

“The SHARP leaders are awesome to have in our classroom!”  
- Ms. Flessner, Victory School

"This was my second year working with the SHARP DTC program and I really enjoy working them. I love project-based learning and it's been incredible to see how the curriculum has grown and incorporated new concepts each year, like financial literacy."  
- Ms. Bolster, Rogers Street Academy

“Seeing kids do what we do was really incredible. You would think that they would do a smaller scale project, but their vision was so powerful and they are really passionate about using technology to create a better future.”  
- Hazeal, Student at UWM School of Information Studies NonProf-IT



In September 2019, SHARP’s Education Team kicked off the school year with the annual Fall Forum conference at the Milwaukee Art Museum. Manager of Technology & Innovation, Meagan Van Ahn, provided professional development to educators on tools, techniques and best practices in technology integration.



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[sharpliteracy.org](http://sharpliteracy.org)