

## ABSTRACT

Chicago Youth Centers (CYC) is a private, non-profit organization that equalizes access to high quality youth development programs for children living in Chicago's divested communities. By providing innovative early childhood and out-of-school time programs for children ages 3-18, CYC gives youth the resources, and opportunities needed to become engaged, well-rounded adults and to succeed in the 21st century workplace. CYC's Maker Lab programs help students build employable 21st century skills through interactive hands-on educational experiences and by providing access to tools, technologies, and expert facilitation appropriate for productive development.

## Keywords

Makerspaces; Maker Labs; Digital Fabrication; Rapid Prototyping; Project-based learning; Process-based learning; 21<sup>st</sup> Century Skills; Non-cognitive Skills; Employable skills; STEAM; STEM

## DESCRIPTION

In Chicago's most divested communities, poverty and violence are deeply concentrated and connected, creating a cycle of trauma, desolation, and hopelessness. 41% of the city's population lives in areas where the rate of poverty is double that of the remainder of Chicago and where the rate of violent crime is 350% higher than the remainder of Chicago. Schools in these communities perform lower than the rest of the city, commute times are longer, and there are fewer supermarkets and cultural institutions (Field Foundation of Illinois 2017).

These cycles of poverty are hard to break for young people growing up in divested communities. 45% of people who live in poverty for more than half their childhood remain in poverty by age 35. Chronic stress causes absences in school, and many children fall behind. Furthermore, their schools have less access to enrichment tools that would help them learn. A Pew survey found that teachers at schools with mostly low-income students reported more obstacles to using technology in the classroom than their peers at wealthier schools. No matter how hard students work, without resources, they can't close this achievement gap. This is what our youth at CYC are facing.

They're also facing an experience gap. By age 6, youth from wealthy families spend 1,300 more hours than low-income children in places other than their home, day care, or school (UCLA). And this trend continues as they grow. Our youth are incredibly smart, curious and driven, but they don't always know what career opportunities exist or what they should aspire to and work toward.

Finally, our children face a non-cognitive skills gap. The jobs of tomorrow will require young people to be communicators, critical thinkers, and problem solvers. Hart Research Associates showed that C-level executives look to hire young employees who can contribute to workplace innovation, work with diverse teams, and solve complex problems.

These skills are not often taught in the classroom, and their families cannot often afford afterschool and summer enrichment opportunities for their children. Our students miss out on opportunities to build, create, or discover. They miss out on opportunities to see themselves as makers, innovators, artists, and influencers.

This is what we at CYC call the *Maker Gap*. Here's how we went full STEAM ahead to tackle these issues.

### Creating the Maker Lab

We needed to create a space that would help children overcome these gaps. A place for them to build non-cognitive skills, understand career opportunities, and truly discover their potential.

Chicago Youth Centers is a 63-year old organization based in several urban communities within Chicago and our mission is to help children reach their full potential. At our six Centers and additional partner sites on the South and West Sides of the city, we work to reduce the impact of poverty by giving children ages three through eighteen and their families access to the enrichment experiences that help them persist and achieve. Our after-school programs are project-based and intentionally designed so children develop what we call "the Four C's:" critical thinking, creativity, communication, and collaboration.

In 2014, as an organization, we were thinking hard about these gaps our children face and how to help them compete more effectively in a 21st century workforce. The ideals of Makers—creativity, learning from failure, and working together—align with the skills we want to teach our children. And so, the CYC Maker Movement was born.

In fall of 2015, the CYC STEAM Team attended our first World Maker Faire in New York City. We wanted to do the best for our youth, so we traveled to the Faire to do our research. This is where we found two of our key resources- the Makerspace Playbook and The Maker Manual, which we still use as a guide today.

We wanted our youth to have the same opportunities and resources as youth in wealthier communities across the nation, but we didn't rush in and just buy a bunch of things. As any leader in the non-profit industry knows, a main challenge is finding funding. We were very fortunate to find funders who helped us fulfill our vision to upgrade a 100-year-old building to become the new home of a state of the art Maker Lab, which required more than just a fresh coat of paint.

To pick the correct tools to put in our lab, we first gauged our students' interests and mapped a strategy to engage them. At CYC, we believe that student "voice and choice" ignites a spark for deeper learning, curiosity, and exploration. From the beginning, we wanted our youth to take ownership of the space. We also wanted our community to have a stake in the space, so designing the lab was a collaborative project between our children, families, community members, staff and stakeholders. We chose to purchase a vinyl cutter first because we knew our youth wanted to make t-shirts and stickers. We also invested in a 3D printer so they could translate their dreams into tangible models and sculptures.

Now, three and a half years later, our children are using their integrated skillsets to do things like design their own board games and code websites that address violence in Chicago. They are building their own robots and dreaming up creative projects for themselves.

Despite all our success, there were a few initial challenges. Seeking the right staff person for the role was crucial. We needed people who understand both technology and youth development. To fully staff the lab and provide individual attention to our students, we leveraged relationships with educational institutions in our community such as the Illinois Institute of Technology and with organizations like After School Matters and the Chicago Public Library.

We used the *Partnership for 21st Century Learning* to help shape our curricula so that we could fuse these core academic STEAM subjects with the development of applied skills. Our essential formula is Non-Cognitive Skills + STEAM exposure = Success

For example, the first project we did was a unit on game board design. First, our children needed to think critically about what elements make their favorite games fun and exciting: do they have elements of strategy, luck, or exciting characters? Then in teams, they created the stories and ideas for their own games. They designed the game board and pieces using the Shapeoko CNC Machines that use vector and pixel software to engineer two-dimensional renderings into three-dimensional products. They used the 3D printer and vinyl cutter to physically produce the game pieces and the board. Once they had their game, they were already thinking about how they might promote it and sell it, and then they were back in the Lab creating digital ads and filming commercials. In this way, our children are developing practical technical skills, while learning to think as makers, innovators, and designers.

## CONCLUSION

Before the creation of our Maker Labs, our Centers were not fully enrolled, but now we have waiting lists and youth knocking down our doors to join our programs. Two years after the pilot program, we have found that a majority of our youth increased their interest in STEAM projects and STEAM career opportunities.

Furthermore, we surveyed our youth using the Survey of Afterschool Youth Outcomes, which measures non-cognitive skill development, and we found that our children grew in all four C's; they increased their skills in creativity, critical thinking, collaboration and communication.

Beyond, STEM exposure and 21<sup>st</sup> century skill development, this has been an incredible opportunity for youth to amplify their voices, express themselves creatively, and engage deeper with interests of social justice and environmental impact.

### *Youth Expression*

Out of youth interest and surveys, CYC launched a "Making the Future of Fashion" club in the summer of 2018. In this program, teens are able to express themselves through fashion design with a technological twist. Using technology in our Maker Lab, teens design and construct garments, jewelry, and accessories using the digital fabrication process. Teens are also exposed to local business owners and mentors through this program. Through field trips taken to different fashion learning outlets, our youth are exposed to diverse pathways and various forms of knowledge.

Clubs like this truly allow youth to unlock their creativity and express their individuality, while learning applicable STEM skills that can help them in the future. At the end of the Making the Future of Fashion sessions, youth collaborate to organize and document a fashion showcase, sharing their pride and finished projects with members of the community.

Additionally, we've had so much success empowering our youth to think like engineers, scientists and inventors, so we also wanted to give them a chance to start thinking like film makers, photographers and music producers. We surveyed our youth and found out that our students are very interested in filmmaking, photography and music, so we have invested in the creation of a Maker Studio where they can bring those dreams to life.

After gutting a small, underutilized classroom and painting it black, we made room for two new iMacs, cameras, lighting equipment and a twelve-foot green screen. When registration for the first photography class opened up, all of the slots filled up right away. The experiences our youth will have in the Maker Studio will enable self-expression and translate into professional skills that they can use in the real world. Who knows, perhaps the next Jennifer Hudson or Chance the Rapper will emerge from CYC?

### *Youth Voice and the Environment*

In addition to teaching STEM in the Maker Lab, CYC has a robust gardening program. We are able to expand upon STEM concepts learned in the lab and take them outdoors.

Through CYC's Gardening program, youth engage in weekly environmental science learning through urban gardening. They help prepare the soil, plant the seeds, water the plants, compost, pull weeds, harvest produce, and then cook nutritious meals out of their harvest. This has allowed them to truly take ownership of the project and become more involved in environmental education, nutrition, and the creation of green spaces. For example, after learning about microgreens, some of our students took the initiative to begin growing their own at home and taught their parents how to add them to salads for extra nutrients.

During the process, youth have also learned how to compost to reduce organic waste. Our children engage in vermicomposting to keep soil fertile and recycle food waste. This has been an important lesson in waste reduction and the huge impact small changes can have on the environment.

We see more potential for youth to use technology in the Maker Lab to tackle environmental issues.

#### *Youth Voice in Community*

In the Maker Lab, youth also harness the power of technology to engage with community issues and advocate for social justice. After witnessing a shooting after school last year, a group of young boys at our CYC-Sidney Epstein Center in North Lawndale started using technology to spread messages of peace.

The boys talked with CYC youth workers about how they could use the tragedy as a catalyst to change their communities. They realized that many of their favorite superheroes, like Batman and Spiderman, use technology to fight crime and keep citizens safe. Thus, the “Peacemakers” were born. In this project, the children used technology in the CYC Maker Lab such as 3D printers, vinyl cutters, and digital media software, to be neighborhood “superheroes”. They create t-shirts, keychains, public service announcements, podcasts, and digital art projects to spread messages of non-violence.

The boys also learned about restorative justice practices and conflict-resolution, both at CYC-Epstein and through field trips to the DuSable Museum of African American History and the Illinois Holocaust Museum.

Two years after its initial conception, the members of the Peacemakers club are continuing to use their knowledge of STEM and their social-emotional competencies to engage with community issues. Older youth and teens have hosted forums and events at the Center to engage with police officers, a member of the district attorney’s office, and business leaders about community violence, relationships with police, and keeping safe online. In this way, our program is also allowing youth to use their voices and become civically-minded leaders.

The Peacemakers’ commitment to overcoming statistics and inspiring hope within their communities would not have been possible without access to the technology that our Maker Labs offer and the nurturing support of CYC youth workers. We are constantly inspired by our children and look forward to the future messages of hope and justice the Peacemakers will continue to spread.

#### *Youth Voice in Chicago*

This winter, youth began a unit that focuses on Chicago architecture. Youth read “No Small Plans,” a graphic novel by the Chicago Architecture Committee (CAC), that follows the neighborhood adventures of teens in Chicago’s past, present and future as they wrestle with designing the city they want, need, and deserve. After reading the book, teens will use technology in the Maker Lab to envision their own ideal city. They are currently using Sketch UP software to use 3-D models and create a community that reflects their values and ideals.

The book was inspired by the 1911 Wacker’s Manual, which was once used in classrooms to explain Daniel Burnham’s 1909 Plan of Chicago. It is filled with beautiful illustrations and divided into three chapters set in the years 1928, 2017 and 2211. Each chapter ends with a map and a short interlude about Burnham, to give readers insight into the creation of the 1909 Plan and other urban planning challenges. No Small Plans was launched in conjunction with CAC’s 50th anniversary and their new “Meet Your City” initiative, which aims to foster civic engagement.

In this project, youth are thinking critically about urban development and issues of access and equality. With their experience using digital software to create architecture plans and their passion for social justice and community activism, we believe our youth can help build a better Chicago for tomorrow.

All of these amazing outcomes would not have been possible without our partners and funders. We’re incredibly grateful to the supporters who funded these Labs and helped make this experience possible for our children.

We boldly envision a Chicago, and a world, where every child has the resources, experiences, and mentors they need to lead, happy, meaningful lives. By building Maker Labs in Chicago’s most divested communities, we give children the opportunity to learn by doing, build strong 21<sup>st</sup> century skills, amplify their voices, and become tomorrow’s change-makers. Our hope is that tomorrow, our children are empowered to build bright futures for themselves, their families, and our communities.