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Reclaiming our science center: Youth co-design of the Dr. Katherine Johnson Room



Micaela Balzer

Micaela Balzer

(balzer@impression5.org) is Director of

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*Innovation and Learning at Impression
5 Science Center.*

**Nik McPherson**

*Nik McPherson, PhD,
(mcperson@impression5.org) is
Operations Coordinator at Impression 5
Science Center.*

**Betsy
Mappilaparampil**

*Betsy Mappilaparampil
(mappilaparampil@impression5.org) is
Manager of Operations & Guest
Experience at impression 5 Science
Center.*

**Youth Action
Council members****Angela Calabrese
Barton**

*Angela Calabrese Barton, PhD,
(angiecb@umich.edu) is a professor of
the learning sciences and science
education at the University of Michigan,
School of Education, Ann Arbor,
Michigan.*



Day Greenberg

Day Greenberg, PhD,
(daygr@umich.edu) is Educational
Studies Research Scientist at the
University of Michigan.



Won Jung Kim

Won Jung Kim (kimwon10@msu.edu) is
a formal secondary school science
teacher in South Korea and current
doctoral student in the Curriculum,
Instruction, and Teacher Education
program at Michigan State University.



Sinead Brien

Sinead Brien (briensin@msu.edu) is a
former high school science teacher and

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Educators at **Impression 5 Science Center** in
Lansing, Michigan partnered with youth
representatives across the city and with University
of Michigan STEM learning researchers to re-think

and re-design the Center with a focus on social justice. Together, we embarked on a project we referred to as *Reclaiming the Science Center* (from January 2019 to February 2020). By “reclaim,” we refer to making space for youth to take back power over decisions about how their lives, histories, stories, and communities are represented at the Science Center. As one youth participant, Bella, stated, “Our goal is to reclaim [the Science Center] so that we see ourselves here. We also want to honor the people, like us, who came before us, but whose stories don’t get told.”

In this article, we explore how Science Center educators and youth collaboratively investigated the characteristics of the space that had made some visitors feel less welcome, and how our collaborative worked together to address the issues identified. By bringing to the forefront youth perspectives of their own lives and histories, youth and adults partnered to examine, critique, and re-design the Science Center and challenge historical representations of science. Specifically, the youth participants led the co-design of a new classroom based on the life and work of Dr. Katherine Johnson, a pioneering mathematician profiled as one of NASA’s “hidden figures,” who calculated the orbital mechanics for the first American in space. The youth participants were also essential to the

development of a series of displays and activities about women of color in science. Designing these new features of the Science Center together required the careful development of a new and shared understanding of what the Science Center could be.

Youth-participatory science center design through Youth Action Council

We first formed our group of educators, researchers, designers, and youth leaders back in 2015 in order to understand, design, and implement equitable and transformative informal STEM education. We particularly wanted to work with youth from groups underrepresented in our community, so in our first year together, we also formed a Youth Action Council (YAC) to incorporate youth leadership positions. The YAC, a racially diverse group of about 20 youth ages 9–16, continues to meet each month to critically rethink and redesign areas and programs in the center.

Through our partnership, we have developed a set of guiding commitments in our YAC projects. We pledged to support each other by:

- uncovering systemic injustices manifested in

our practices (e.g., structural racism embedded in programs, curricula, pedagogies, and/or outcomes);

- centering the cultural knowledge and community wisdom youth bring; and
- leveraging/amplifying this knowledge towards humanizing and realizing expansive learning outcomes for youth, adults, and broader institutions.

Why reclaiming space matters

Well-designed science learning spaces can create new and important opportunities for positive, meaningful engagement. However, science learning spaces can cause people to feel unwelcomed through how they are organized. Images, text, and the design and flow of exhibits all send messages about who belongs or is welcomed in the space. How people design and build science learning spaces is shaped by preconceived notions about what science is, who belongs in science, and whose ideas matter.

We wanted to understand how the spaces of the Science Center made our youth participants feel in relation to science. What kinds of stories, ideas, and forms of imagination did our science center facilitate and reinforce as people visited it? Could youth imagine new spatial designs that better

reflected their hopes and desires in science? One thing we talked about during our meetings is that spaces can contain a collision of histories, lives, and cultures. We wanted to critique how white and male imaginations have tended to dominate in science centers. We also wanted to explicitly center the imaginations of the youth of color and girls with whom we collaborated. We view this relationship between spatial representation and social interaction as crucial to promoting greater social justice in science centers.

How did we reclaim the science center?

Below we report six interconnected practices we enacted to highlight the youth participants' spatial imagination as well as practices positioning youth as legitimate critics and reclaimers of science spaces.

1. Conceive the idea as the annual project for reclaiming our science center

We had regular meetings with our partner researchers to brainstorm and plan new annual YAC projects. During a meeting, one of us (Micaela, the Center's Director of Innovations) shared about how the spatial representation of many science spaces

she visited seemed to reinforce *“the injustice of not recognizing female scientists or anybody of color.”* She explained that when she made design considerations, she asked herself, *“Is this the right thing to do?”* She suggested that one way she could address her concerns was by renaming rooms at this science center. Similar to many other science centers around the country, our center’s classrooms were named after famous white, male scientists (e.g., Newton, Galileo, Tesla). We decided to center the YAC project around renaming and designing one of our rooms. Holding these regular meetings created space to share experiences and ideas to draw upon and inform the direction of new projects.

Figure 1. Planning sessions for re-designing aspects of the Science Center.

2. Engage youth in seeing/re-seeing social and spatial representation

We planned and implemented a discussion activity to call youth participants’ attention to how

materials can send messages about who and what counts and is allowed in the space. We focused on our own science center, asking youth to discuss the features of scientists that are represented inside the Science Center, with the following prompt:

The names of the Center's classrooms include Tesla, Einstein, Galileo, Newton. Their contribution to science is foundational and important. Still, we may want to think critically about what these names represent. What does our science center seem to value with these names?

Figure 2. Original room signs, pre-redesign.

Micaela then used herself as an example to support the youth participants in thinking about who was represented in the center itself. She encouraged youth to consider if she, as a Latina, fits in the

representation of the Science Center. She stated, “I might think that there’s no place there for me [or that] there’s a reason I’m not being represented.” She asked youth to think about additional “people like me,” and she asked them to question who might feel like they “don’t belong” or “aren’t good enough” at the Science Center and why.

3. Engage youth in multimodal explorations and critiques of different spaces

We asked youth participants to “hang out” in the different spaces of the Science Center on their own. Some chose classrooms, some exhibits, and some even chose a stairwell. They were encouraged to use iPads to record in written, audio, and/or visual forms “images, the words used, and the people” they observed in those spaces, and to document what they “saw, felt, and heard.” In doing so, we were able to engage youth in the critique and examination of what was present or not present and visible or not visible in our center.

Next, we facilitated youth participants in co-constructing ideas around representation based on what they observed from their explorations. They shared their observations, questions, and comments on who and what was represented and


seemed to “belong” in the center and in STEM.

Statements included:

“When Lia and I walked around the center, we actually began to see it in a new way... Now that I do, we have to do something. We sat down by the Tesla room and just, like, took it all in. Like we were stepping back and seeing it all for the first time.”
(Bella)

“Like, I knew that most places only talk about the accomplishments of white men [in science], like I don’t matter, but by doing this research, it made it, like, something we had the power to change.” (Jazmyn)

“Actually, it wasn’t the names of the room that I was thinking about at all [as I walked around], but the artwork and



things on the walls. I observed actually not many people at all in it. It was just science. So that said something to me. Are people not a part of science? Where are the people?" (Ivy)

Being physically present in these different spaces offered the opportunity to see, hear, feel, and critique the dominance of white, male figures and the absence of others. It also helped the youth participants link those observations to how they felt and how others might feel. The seemingly mundane became pronounced. They were offered the space and power to redefine themselves in the Science Center and in STEM. Co-constructing ideas of representation shifted not only what they saw, but also supported them in shifting and re-defining what is possible in the Science Center in terms of who and what can be represented.

4. Develop social justice-oriented criteria for spatial representation (and apply them)

We engaged youth participants in developing social justice-oriented criteria to inform their spatial

imaginations of who represents and belongs in science center spaces.

First, we asked youth to investigate and propose principles for naming the Science Center's classrooms. They freely navigated online and offline resources individually and in small groups. Then they gathered again to propose criteria and reason why each criterion was important (Figure 3). The criteria included "People who don't get noticed," "People who have credit taken away from them," and "People who inspired other people."

Figure 3. Collaboratively Developing Principles.

Referring to the criteria, we next asked youth individually or as small groups to investigate and choose up to three STEM figures after whom to name Science Center spaces (Figure 4). Each proposed STEM professionals and presented their reasoning for why those professionals should represent *their* science center.

Figure 4. Investigating Women of Color in Science

Then, based on these criteria, the youth participants voted, and Dr. Katherine Johnson won as the new name of the room. They highlighted how Johnson confronted racism and dehumanization while being a human calculator at NASA. By using her name, they hoped to raise visitors' consciousness around issues of race, while also humanizing what it meant to be a person of color in STEM. Their justice-oriented criteria for reclaiming, grounded in perspectives from their lives and histories, led to renaming and redesigning spaces to become inclusive of groups that had been excluded, invisible, and/or unheard in STEM.

5. Co-design and change representations and experiences in the Dr. Katherine Johnson Room

We held co-designing sessions in order to emphasize youth imagination in the design of the new Dr. Katherine Johnson Room. Based on directions given by youth participants during these sessions, the center's construction and design staffs worked on reconstructing the room.

First, we brainstormed design ideas by visiting the

space that would become the future Dr. Katherine Johnson Room. Visiting the room mid-renovation offered youth participants a more authentic sense of creating new material and symbolic reality. We sat around a big table in the room to discuss and negotiate ideas for the design of signage and decorative room features (Figure 5). To facilitate the brainstorming, we used the following prompts:

- What do you think of the room? Are there any changes you would make?
- What kind of information about Katherine Johnson should be shared/known?
- What are some of your ideas for locations or spaces in the room for the sharing of this info?

Figure 5. Visiting the Space of the Future Dr. Katherine Johnson Room

Here are some of the design ideas youth participants suggested:

- Transform the physical challenges of the

room into assets (e.g., using the load-bearing pillar in the room as a showcasing spot) and use them to tell the story of Katherine Johnson's life.

- Include representations of Katherine Johnson's work and how it was important for space travel, such as painting the walls as space-themed and including math equations.
- Make the room and signage relevant to community members who will visit the room in the future.
- Create interactive experiences so that young museum goers can more actively see their lives in science and in connection with Katherine Johnson.
- Include mathematics in the room in ways that celebrate Katherine Johnson but do not intimidate or alienate visitors—including young people—who may not be familiar with the equations.

Science Center staff began work to physically change the space to align with youth imagination. During this process, the oldest YAC member, Bella, took on a leadership role to continue giving directions and feedback in between full-group meetings (Figure 6). With support from the center

educators and staff, she gathered additional


information from each of the YAC members and analyzed it, creating a set of recommendations for what to include about Katherine Johnson's life. From the youth participants' ideas, she recommended creating three storyboards about Johnson's life: her background, sexist and racist barriers, and accomplishments. The room's new design also included new signage, an interactive whiteboard with a prompt that invited people to share their own stories, and an interactive counting activity involving a person-sized calculator and an abacus.

Figure 6. Staff-youth collaborative work in realizing YAC's imaginations.

This process of realizing youths' imaginations involved a collaboration between the YAC, the educators, and the Science Center leadership. To actualize the youths' ideas required financial backing from our Center's board, as well as significant infrastructural work. For example, the Science Center's leadership needed to approve the big scope of work. However, Micaela kept the


leadership involved in on-going conversation about the work, and as a result they completely trusted the youth's vision for change. They also learned more about how and what it meant to reclaim the space. Micaela, as a part of the Center's leadership team, was also able to integrate this work with the Center's general construction goals and budget.

When we prepared a showcase for the Science Center's membership to celebrate the design of the new room and to solicit further input, YAC youth members indicated their feeling of accomplishment, with the following statements:



“Dr. Johnson is literally asking us, as youth, this question [“What inspires you?” written in one of the storyboards]... This interactive display offers the ability to relate to Dr. Johnson, but also to better understand her and [for] us to understand ourselves.” (Bella)

“I feel accomplished because we actually made something happen.” (Gerard)



“We are changing the rules by changing this room.” (Lulu)

6. Apply youth imagination to reclaim additional space


Science Center educators and directors expanded their project to create a new stairwell exhibit of *Women in Science*. This new exhibit ended with a mirror hanging on the wall in the middle of the exhibit, so visitors could see themselves as a person in science (Figure 7).

Figure 7. Stairwell exhibit of Women in Science and the Mirror for Visitors

We drew this innovation on youth ideas that emerged from their exploration of the Center (see Practice 3). As a result of youth participants’ Science Center exploration, they noticed the

Science Center exploration, they noticed the absence of women scholars and recommended that center educators use the stairwell to honor and display women in STEM fields. They also suggested placing a mirror on the wall to convey the message that youth can see themselves in the scientists whose lives have been hidden or devalued due to the prevailing sexism in STEM.

When the educators walked with the YAC through the new exhibit, the female members of YAC noted that the stairwell and mirror project was personal and inspirational:



“There’s the mirror. I was like, ‘HAH! I’m a woman of color! I could be on the wall too!’”
(Jazmyn)

“When you’re walking by, you see all these important scientists that did all this great stuff, and then you see you, and it feels like you just belong; like you’re important too, and you’ve done good things too.”
(Lulu)



This stairwell exhibit is still going on and we look forward to examining the impact this youth-authored and educator-expanded reclamation will have on visitors and the center staff.

Reclaiming the science center as “the most bold move”

The initial vision of the reclaiming project conceived by adults was further developed by the YAC teen members, who suggested new, radical, and caring visions. This joint process supported the development of a community grounded in mutual trust and a commitment to reclaiming, as Micaela said, “the most bold move” of disrupting the prescribed structure and redefining the presentation of the space. This is also the project of reclaiming whose voice matters in the reclaiming process itself.

While our work took place in a science center, we think this work has implications for equity in informal STEM education institutions more broadly. As youth YAC members’ narrative and experiential rendering of Dr. Katherine Johnson’s life took shape

in the new classroom, so too can youth engagement shape how their lives are made

engagement shape how their lives are made present in exhibits and other spaces. The ways youth recreated spaces after disrupting accepted representations of the Science Center reflects not only physical changes in the space, but also youth perceptions and meanings of their own selves and their futures.

► DEAI, Dimensions 2021, Impression 5 Science Center

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