



LEARNING AND IMPACT:

Participants' Reflections
on Active Learning Spaces

A REPORT BY LYNNE SCHRUM, PHD



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**These opportunities have
changed my life for the better.”**

During two weeks in the spring of 2019, a researcher traveled throughout Allegheny County, Pennsylvania to observe and interview learners as they worked, played, and created in 18 active learning spaces located in schools, libraries, and community venues.

She found that the transformed spaces were just part of the story; school schedules were transformed to allow more time for students to

explore, curriculum was transformed in favor of depth over breadth and classroom practice was transformed such that educators were guides and students, explorers. She found noisy, bustling learning spaces and busy, focused, and enthusiastic learners.



Hearing from High School Students.



... and then we began to wonder..."

High school is regarded as a time for students to prepare to pursue their life goals. Active learning spaces are especially equipped to support this preparation. Active learning spaces allow students to pursue their interests, guide their experiences, inspire curricular design, and explore.

Learner-guided experiences.

During a high-school elective course, students examined a local challenge and proposed solutions to address it. Students looked across their communities, examined theirs and their neighbors' lives in ways they likely never had before and, as a group, decided to address the challenge of plastic waste proposing a recycling campaign as a solution. This one-semester course stretched into a year-long commitment on the part of many members of the class. One student explained, "We had to study about the overall issue of waste management and recycling first, and then we gathered information on our county. That took some time but convinced us that something needed to be done." Another student added, "Sure, I thought it [rethinking recycling] was a good idea for the school and our community, but then some of us realized how much was needed in the county. We found a way to get a truck [school personnel secured a truck with a grant from an education innovation intermediary] to use to collect recyclables from the community too, and then we began to wonder what we could do with the things [that were] collected." A third student explained how they investigated options for disposal of recyclables: "When we found out about the process of extrusion [when plastic is melted and formed into pellets that are used to create other products], which we had never even heard of, we thought that might be a perfect idea for another elective so we could continue this project." The school secured an extrusion

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machine, and students learned to use it. The plastic was recycled to make jewelry, siding for doghouses and sheds, filling for stuffed animals, and a duck house which sits near the school. The experience had profound impact on these learners. One learner described: "I never saw myself as being involved in engineering or technology at all. I thought I would end up working at McDonald's, to be honest. But next year, I'll go to community college and then transfer to a four-year school to get my degree. I hope to come back home and continue finding solutions to waste management."

Not ten miles away, another district offers a before-school club that is responsible for preparing and broadcasting daily news, weather, and sports updates for the K-12 school building. This club is open to students from seventh through 12th grades and members take turns writing news copy, designing graphics, running the teleprompter, and broadcasting using a green screen. Several young women described what they learned from participating and why they came back every day. "I joined because it is really fun, and I have learned so many things. I am excited to be a part of this team. I never wanted to be on camera, but then I tried it, and it is really wonderful. I see myself going into journalism or digital editing as a career. I really like writing the stories; it is good practice to get my stories on the air." Another student added, "I plan to be part of this [media club] throughout middle and high school because I really now think this is a path I want to take for my profession. I joined [the club] because my best friend did, but I have learned so much and really love it." As students become more adept at production, the curriculum becomes more advanced. Participating students may take a journalism elective offered in high school for which they earn credit from the local community college.

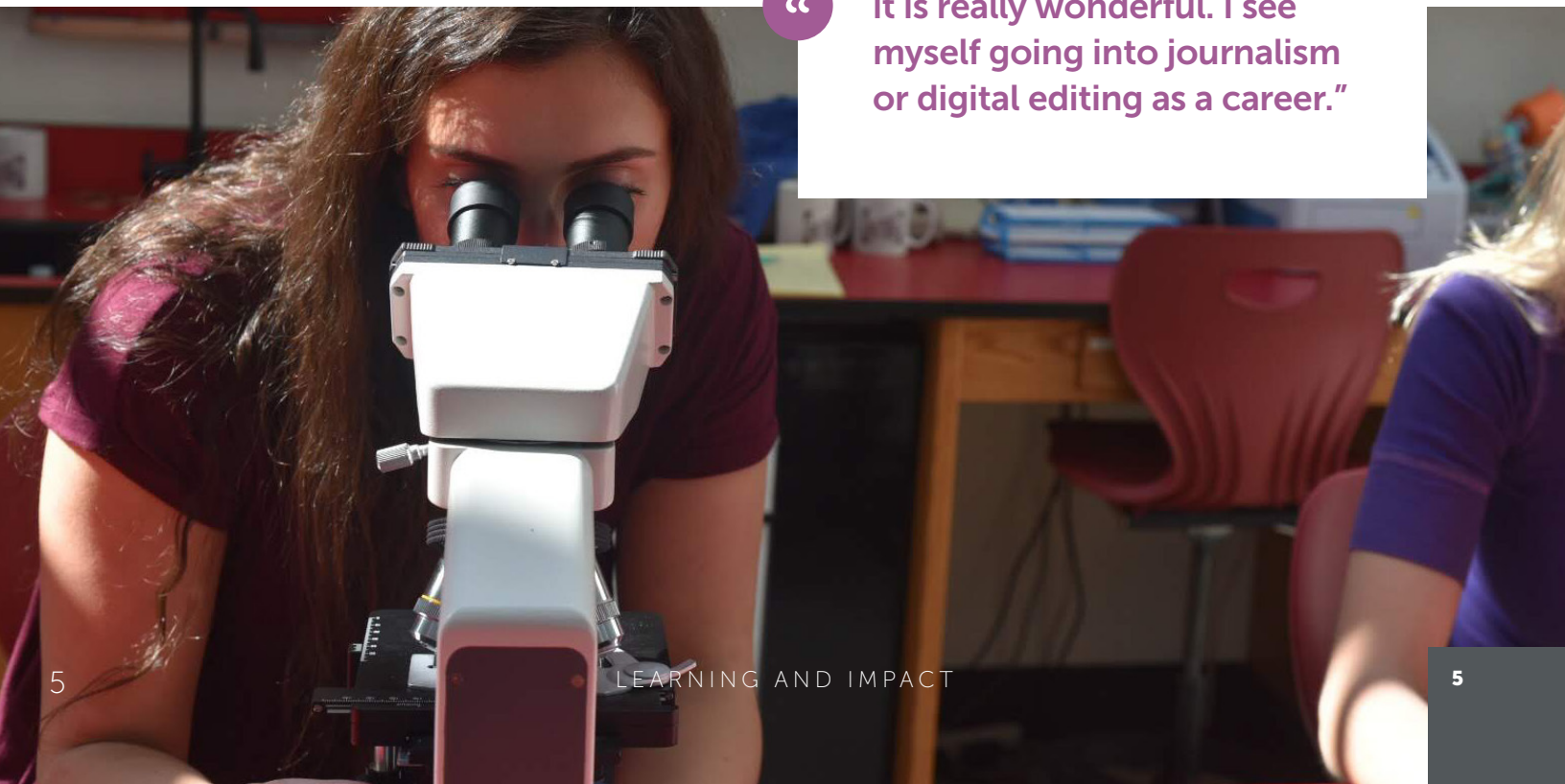
Learner-inspired curricular design.

At a neighboring district, high school students described the benefits of attending school in an affluent community and the desire that created to share with others who may not be so fortunate. These high school students developed a mobile “fab lab” (a trailer that houses 3D printers, laser engravers, vinyl cutters, and hand and power tools) that can be transported to a nearby school or community venue, where students set up the equipment and help (mostly, younger) learners explore and invent. These high school students explained that they enjoy bringing tools and experiences to younger children in schools that do not have the same resources.

One senior said, “I always knew I’d go to college, and I have devices at home, but I learned about circuits and building at school. I will be studying engineering at college. I have been fortunate to have these tools in my school, so it is great to be able to introduce these things to kids who may not have them at home or school.” One young man explained, “I love woodworking and making things. It’s what my dad and I do all the time, so the things we have at school

just take this to the next level. My goal is to become a teacher like our technology teacher, and help other kids learn about these things.” A young woman from this group explained that she had always been “sort of” interested in science and math but that her knowledge and passion about robotics and engineering have grown because of classes she has taken in school. She became so excited and curious, particularly about robotics, that she joined Girls of Steel, Pittsburgh’s all-girls robotics team. She said, “Now I compete in robotics with the school’s team, and also with the Girls of Steel team. It is really where I see myself finding a career path, although right now, I am not too sure in which direction.” Another student added, “I was able to take entry-level classes in computers early in my school career, but then I was able to move into more advanced electronics, robotics, a maker class, CAD, 3D parametric designs, and more. This really has become my passion!”

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Learner exploration.

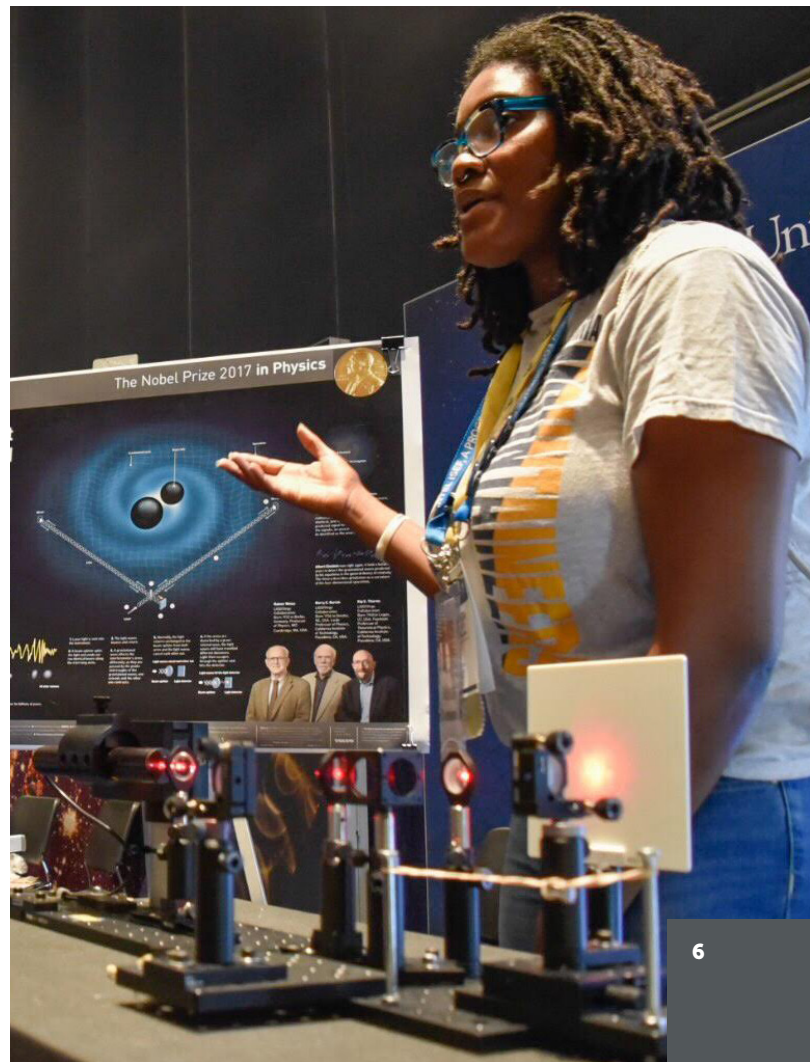
A rural school started a robotics program for ninth-grade students – a pathway to advanced robotics electives later in high school and participation on the school's robotics team. One senior explained, "I was always interested in electronics and engineering, so I was really happy that this [robotics] team and class were here in school. I have a scholarship to study engineering next year." Others came to the team with no experience but were encouraged to join by a friend or just because "robots seem sort of cool." The ninth-grade team competed locally and in their first competition, they did not do well, but team members were not discouraged. When asked what they had learned from their time in the program thus far, they responded: "Trial and error!" "A lot of problem-solving." "How to do really successful collaboration." "I learned about my individual strengths!" One young woman laughed and said, "It is really funny because if you had asked me, I wouldn't have ever thought I would like robotics. But I realized the challenges and excitement in making a robot move in a certain way or accomplish a goal."

At another school, new courses have been developed and offered, and many existing courses, redesigned and modernized. To expand students' experiences with digital technology, a former traditional shop classroom is now a technology arts studio where courses in robotics, computer science, digital production, and art take place. The media center was the heart of the redesign. The school has a sound studio for audio broadcasting, a "one button" video studio equipped with a green screen for creating video productions, a quiet space with couches for relaxing, doing homework, or chatting with friends, and a student-run coffee shop. Students have an option to spend their free periods as interns. Students were self-assured and poised as they described how the changes had an impact on them.

It is sort of like us helping and learning, and we talk to our friends and more students want to do this internship. Plus, we get to learn more about digital media, we help teachers all the time, and we get to focus on things we want to learn."

I started as a student helper when I was a freshman; now I am sort of the go-to person for the computers and Wi-Fi. I start college next year and will be studying digital media and art. I guess this has been sort of the best of all possibilities for me."

I like to come here with a team when we are working on a collaborative project; it is a place to chill, plan, and so on, plus we have all the tools we need to start to brainstorm our project. We can get help, look things up, and really make progress on a group plan. This is a place where we are treated like we want to be."



Hearing from Elementary School Students.

While younger learners may not focus on their long-term career goals, active learning spaces present opportunities for them to pursue their interests providing relevant, substantive, strengthening, and novel experiences.

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I think I learned not to give up when it went wrong. I learned to think about what caused the mess, and then try again.”

Relevant.

A first-grade classroom has been rearranged with areas for quiet thinking, group activities, and reading. Changes to the curriculum have accompanied the physical redesign. In addition to the usual activities you might observe in a first-grade class, students are challenged to investigate solutions to personally relevant questions and then to document and demonstrate their investigations. These six-year-olds were able to articulate what they wonder about, from how marshmallows are made to how someone is elected president of the United States.

They were happy to describe how they set about tackling their questions. The marshmallow investigator explained her research and then described her many attempts at marshmallow-making at home, most of which were fairly disastrous. As she got closer to success, she was excited to relay how her classmates would soon be invited to taste her

successful results. “I think I learned not to give up when it went wrong. I learned to think about what caused the mess and then [to] try again.” The young man who investigated the presidency was able to discuss the process as outlined in the U.S. Constitution. He also created an electronic poster to teach his classmates how the Electoral College works. When asked about the value of these personally relevant assignments, the students were eager to give their opinions. One replied that she “got to design something that shows my ideas.” Another added, “I loved that I could study something really important to me; then we get to figure out a way to show how it works.” One more commented, “Using the tools we have in the classroom and school to show what I learned was the best of all.”

Substantive.

In one school, all K-2 students spend a part of day in the “Learning Lab” where they extend and deepen classroom content by using technology to make their learning visible. Second-grade students, for example learned to program with Scratch. As part of their study of China, students were split into teams of four, each team programmed a robot to accomplish tasks that demonstrated the elements of China they investigated and used QR codes to display a narrative they wrote about their learning. The previous year, these children studied urban life and built and planned model cities. They were eager to describe their experiences and the decisions they made when building those cities.

Well, we built our cities last year and that was really good. We had ours so that people would not need cars. Oh, and we made it so that you could scan our QR code so you could read more details about our city!”

I liked that because I did not know very much about cities, and we had to think about roads and parks and housing and schools. But we planned it, then drew it, and then built it.”

It was fun to design a city. Now I really think about where it would be good to have a park or a hospital or something. You can read our story when you see it too [through the QR code].”

Oh, and we are again using QR codes for our China robot because there is so much we want people to know that we learned about China!”

In a primary school, students had the opportunity to

participate in a “making” rotation that included all kindergarten, first-, and second-grade students. There were six stations, and each group experienced three of the six. At one station, students were introduced to aerodynamic principles (lift, thrust, weight, and drag) where they created an object from plastic bags, feathers, streamers, and golf balls with a goal to get it to float high and stay in the air when placed in a wind tunnel. Most of the children said they had never experienced the concepts and had never seen a wind tunnel. Students were encouraged to try different combinations, refine their objects, and try them in the wind tunnel again. One stated, “This will stay up because the plastic bag will capture the air.” Another commented, “Mine did not float because I think the golf ball weighed it down.” One more said, “Wow it was cool to see hers [her classmate’s object] stay up. I think it’s because she put feathers on it to help!” The students learned from each other and also celebrated when an effort was successful.



Strengthening.

In a newly built elementary school, a large space was designated as a maker space. In this space, fourth-grade students were finalizing the development of a structure that demonstrated their learning about circuitry. In small groups, they were able to choose a model of some structure to build in Legos, and then to find a logical way to include a light that would turn on at appropriate locations on their structure. When asked about their learning about circuits as well as about the experiences in this space, students were eager to offer their ideas.



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So, you see, we needed the lights to keep our coffee shop open at night, and when you push this, it goes on.”

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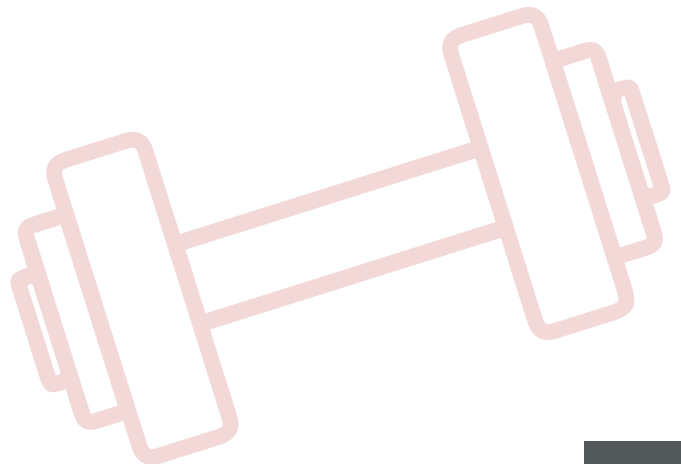
We thought the Statue of Liberty was a great structure to build. It was obvious where to put the light. But we have been studying circuits for a while, and this was a good way to show what we learned.”

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Our house has lights in several places. I did not know anything about electricity and such before, but now I can do it easily.”

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We made a yacht, which needed a few lights. That was fun. What I love about this place is that we get to try things over and over until they work, and we also can get help, of course. But then, when we finish our task, we can do any of the other great things here.”



Novel.

In a small rural school, a group of fourth-grade students were part of an afterschool Lego robotics team, sponsored by their reading teacher and designed to encourage creativity and an early interest in STEM. The group said that they started with no idea about what this would be like, as the idea of robots was intriguing but “scary.” They began early in the school year. At the first meeting, the sponsor opened several bags and displayed hundreds of small pieces and some instructions. “We were so surprised — I actually thought that the robots would already be built and ready to go!” One girl stated, “You should have heard us the first time we made a robot even move! We were cheering and clapping and were so excited.” Another followed up, “It was a challenge, but we were able to make things work. We worked together, we cheered each other, suggested ideas, and no one got mad.” The Lego robotics program announces a new theme each year; for their first year, the theme was space, “so rockets and astronauts that we didn’t know much about.” When asked about their tasks, one student answered, “So, for example, we had to program the robots to solve a problem or accomplish a goal. They all have to start at the base place, on the moon or Mars, and then the robot has to move about, knock down a barrier, put something on top of a rocket, put a stranded astronaut back in the ship, or change the flag, and then put it back. In competition, you get points for how you accomplish each task. Each time we had a task, we all said we could never do that, but then we did!” The younger sister of one of

the team members (a third-grade student who will join the team next year) said, “My sister came home and told me all about it, and it really sounded cool.” When asked what they learned, they all smiled and started talking at once.

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I learned a lot about programming. This is not something I really knew about, and now I am so eager to learn more and practice more.”

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We learned a lot about teamwork for sure. We learned what it means to not ever give up.”

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I think I learned about myself, as odd as that sounds. I thought I could not do certain things, but I can. I love that.”

In another school a classroom has been converted into a replica of a spaceship – where students participated in a “space odyssey.” Students take on different roles as the spacecraft experiences challenges and conducts investigations that draw upon their knowledge and skills in science and math, and their sensory-motor abilities. When asked about this unique experience, the students responded with enthusiasm. “We really learned a lot about leadership and teamwork, because whoever is the leader has to assign tasks and respond quickly,” said one. Another added, “We have to solve problems, and they require that we each do some task, share that information, and then try to accomplish the goal.” One commented, “Sometimes, a meteorite slams into our spaceship if we aren’t quick enough. But we learn something even when that happens!”

Active learning spaces encourage changes in how students think about learning environments and in how they see their roles in learning. In these spaces students have greater agency in not only how, but what they learn. The spaces encourage students to follow their passions and to be resilient in their pursuit of learning.





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