

FEATURE

Best Practices
in Empowering
Learners &
Teachers

IF YOU BUILD IT, THEY WILL COME

HOW I STARTED A
MAKERSPACE
FROM SCRATCH

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The school library is buzzing with activity; it's a full house today. I am part of a circle of bodies as nine middle school students take turns with the blinking, scooting Ozobot robots on the round table in front of us. The students are giggling and cheering one another on when they place these programmable mini-bots on each sheet of paper criss-crossed with colorful loops, straight lines, and zigzags that guide the mini-bots. A line of students is behind me chatting and patiently waiting to check out books they just procured from "The Teacher Librarian's Top Ten" display table, while my teaching assistant helps with the checkout process. To my left, seventeen students in the Minecraft Club work collaboratively on building and surviving in their virtual world, creatively named "Lunch 2." On the other three computers the sixth- and seventh-grade "Codemen" are busily creating characters and adding movements to their (quite literally) made-from-Scratch video games. The remaining computers are connected to our 3-D printers, and two sixth-grade girls use design software to create their own fidget spinners. This is what lunchtime on Free Choice Friday is like at the Baker Middle School Library in Tacoma, Washington (see figure 1).

I have always loved libraries. I have always loved books and the experience of learning. My parents like to tell everyone about the time when I was three years old and my Havana-born *abuela*, who loved to spoil me with treats, asked me what I wanted. Thinking I would reply with "candy" or "ice cream," I surprised everyone when I replied "buy books!" (I still have a book-buying addiction to this day.) I was destined to be a school librarian. I ended up in the right place at the right time: Tacoma, "the City of Destiny," and at Tacoma Public Schools, where future-ready leadership had been established

and the school librarian position is evolving into what it needs to be for today's students.

My idea of the best kind of library has changed over the years. Reading and the love of it is very much a part of this school library. However, encouraging reading is just a part of what our 21st-century school library does. This is not the type of library I grew up going to. The Baker Middle School Library is a future-ready library. It is a hub of activity and fun. This is a place where talking, debating, exploring, and creating are fully encouraged. This is a library chock-full of STEM learning opportunities, technology, and tools. Ours is a library for the students of this generation. This incredible group of young thinkers, collaborators, and makers experience a much-needed creative oasis here. At an age when associating with peers is everything, they connect with one another through these learning experiences, and, while they do have a guide if they need one, they can relax because no one tells them what they have to do. Unlike the classroom, students have choices about what they want to learn, whether that learning takes place through being part of a creative team, building a robot, using the maker kits, designing in 3-D, or through individual reading (see figure 2) or group discussion.

As a fledgling school librarian just starting to learn how to fly, I wanted to create a nest that was equal parts warm, welcoming, interesting, and exciting. I want students to want to be at our school library. I want them to own it, feel that it is their library. I dove head first into the implementation of a makerspace the moment I was introduced to the concept at the Washington Library Association's October 2015 conference. It was just the thing to bring in the students, I was convinced. Like any good librarian, I started doing research. I

read all I could find by others who were already doing what I wanted to do. I connected with like-minded colleagues online and in person at conferences and meetings. To learn even more I joined Twitter and followed experienced school librarians and others implementing makerspaces around the country. The ideas started flowing, and Baker's makerspace—home of Baker's Makers—would soon turn into reality.

Many of the makerspace offerings I started out with in November 2015 were simple, no cost, or inexpensive. Donated and recycled items became the start of the arts and crafts center. Our career and technical education teacher donated his late wife's sewing machine. An encouragement to me from day one, Dawn Baughman, a fellow middle school librarian, started sending her beginner's sewing books. After I discovered that fabric stores will give away their scraps and extra fabric, we had a fully functioning sewing table complete with a nearby laptop computer for students to watch YouTube how-to videos on sewing. The computer games and Minecraft Club were already built, and after laying some ground rules, naming and launching their Minecraft worlds, students were off and running without any further assistance from me.

Fortuitously, an opportunity presented itself when our local YMCA's after-school program, due to lack of space, needed a place to store four full-sized 3-D printers. I offered a deal: our library would be their 3-D print shop home as long as we could use the printers during our lunchtime makerspace activities (see figure 3). Turns out, this arrangement was a win-win for both programs. Knowing nothing about 3-D printers, I recruited students who had learned how to use them during the YMCA's after-school program. At lunchtime, a

Figure 1. *Something for everyone at Baker Middle School Library.*

few of these students came up to the makerspace and introduced a group of students to the ways of the 3-D design software—and the group took off! Word spread quickly, and students started coming to the library every day during their lunch period. There were days that, due to collaborations with teachers and classes in our library, I had to open only during one of the two lunch periods. Running a makerspace is many things, but most of all it is a feat of keeping plates spinning during a balancing act! Little did I know, I was about to add even more plates to the act.

In spring 2016 our newly minted Washington Library Association Administrators of the Year, Hannah Gbenro and Dave Davis, announced that they would be offering a makerspace grant to any Tacoma Public School library. I already had a growing wish list on various companies' websites and, with the full support of Principal Scott Rich and Assistant Principal Amy Latimer, I started filling out the grant application. I remember thinking that I was asking for a lot, maybe too much, when I submitted the grant for the proposed amount, which was well over my existing library budget. What did I have to lose? Even if we were granted even one of the tools on my wish list, it would add more variety and learning opportunities for our students. I was thrilled to find out in June 2016 that our Baker's Makers were granted the full amount requested, and I immediately went on a shopping spree of LittleBits robotics kits, Snap Circuits sets, filament used by 3-D printers, and lots more! (See figure 4.)

In my excitement, I had a terrifying moment when I thought to myself, "When am I going to learn how to use all of this new tech?" At first, the robotics kits were challenging for me—not knowing anything about



Figure 2. *Comfortable readers on book club day.*



Figure 3. *Students designing 3-D print jobs and watching the printer work.*



Figure 4. A wealth of resources inviting students to ask themselves, "What would I like to try?"



Figure 5. Students jumping in to play with the new tech tools and kits.



Figure 6 . Suggestions for daily focus.



anything—to wrap my head around. Then the first day we broke out the boxes, the students—without even glancing at the instructions—took the reins and started building with Snap Circuits, creating colorful paths for the Ozobot robots, constructing musical instruments with the Synth Kit, and building fully functioning robots on wheels (see figure 5).

As fun and exciting as all this was for the students, I knew that resource use could be better with a system in place. With all this growth, I had to establish organization for everything to run smoothly. I received the best advice from another one of my librarian colleagues Lisa Metcalf. As part of her library's makerspace—and to "save her sanity"—she had established a makerspace system of specifying the focus for the day. This scheme was just what I needed to do. I still wanted students to have the freedom to simply come and read and to have the option to check in and check out books, but I also wanted to establish more of a focus on a specified activity center for those who needed that structure. For example, Mondays became "Minecraft & Coding" and Tuesdays became "True Blue Book Club & Book Checkout." See figure 6 for the full weekly schedule—which is a daily guideline, not a firm rule.

When I was shopping for the makerspace, I was not sure what a good starting off point would be for students unfamiliar with robotics. As I browsed, I saw a line on the Ozobot website at the time that read, "Creative robotics to learn and play." Playing with Ozobot robots was a perfect first step for the students, especially those who knew nothing about robotics. Unlike some of the more-intimidating circuit board robotics kits we have, these Ozobot devices are little spherical robots that read color codes. For example, green, black, and red together in that order

translate into “turn left.” As students plan their paths, they can consult a guide we place in the middle table. Once the students learned that all they needed were markers, paper, and an Ozobot, they’d work together to create a path for their bot that would wow other students. They are learning code and basics in robotics, even if they think they are just playing a game together. We’ve only touched the surface with what an Ozobot can do.

A colleague of mine Jodie Caldwell of Kent School District in Washington curated a list of resources (mainly from the Ozobot website) of short activities and full lesson plans. She agreed to share her list. As I write this in July, the next step I take will be to put together a plan to show how these lessons support the existing learning standards and then approach my fellow teachers at Baker in science, technology, or math departments. My hope is that together we will brainstorm ways we could incorporate these lessons into their classes. Here is a link to an example of a lesson that hits on the ISTE student standards 1 and 4, and is designed to bring together math and science targets in one lesson. Quoting directly from the Ozobot website, this lesson “...introduces the solar eclipse by modeling one Ozobot as the Moon and a second Ozobot as Earth, and using OzoCodes to create the elliptical orbit.” Visit the Ozobot website for more free, easy-to-apply lessons using Ozobot robots: <<https://ozobot.com/stem-education/stem-lessons>>. Also linked to the page are a few testimonials from teachers using Ozobot robots, including a teacher who runs her school’s makerspace. Reading other educators’ stories and ideas for using these devices in the classroom has planted seeds in my mind for what could happen and how collaborative efforts can blossom into true growth and learning for students.

One successful (and fun!) collaborative effort that came out of the Baker makerspace occurred in April during National Poetry Month. After seeing a Pinterest post I loved, I shared it with our wonderful and creative art teacher Isaac Dana. He and I talked about what we could do to bring this idea to Baker. He had the idea of having his art students collaborate to design a feather and illustrate it. I added that I thought we could “poetrify” the project by asking students to write their favorite poem or part of a poem on the feathers. We both loved the idea of each student representing a little bit of themselves to form a beautiful depiction of what we could be together and how beautiful our diversity and differences are together (see figure 7).

Within the library, the focus on Poetry Month was a hit with the students and took on a life of its own. At the “poetry center” in our makerspace the students created their poetry feathers and browsed some of the library’s poetry books and books about poets. Inside the library, we created a “Post-it Poetry” wall (see figure 8) on which students posted their favorite poems written on sticky notes. The after-school program’s poetry club added some handouts for a local Youth Poetry Slam event. Having received a letter inviting any school to participate in a national poetry contest, I printed off some entry forms and placed them on a table for students who wanted to submit their original poems. By the end of April, we had ten entries that we proudly sent off to Washington, DC. At the end of June, we received notice that a poem written by one of our students will be published in a book of poems and that her entry will also be placed in the final round of competition!

Our makerspace participants embellished Mr. Dana’s feathers in the art and poetry center, and he used the feather project with his art students

as well; we ended up with a couple hundred feathers. Some students wrote their own poems on their feathers; others contributed favorite inspirational quotes or poems by beloved poets. We displayed the full quote featured in the original Pinterest picture that inspired it all; the original poem was written by poet Erin Hanson. About a third of our Baker students participated in the poetry feather creation. A few teachers wanted to create and add feathers of their own. After seeing the full wingspan in the hallway as shown in figure 7, students and staff alike came in the library to tell me that they loved it! Isaac Dana and I agreed we could do more in our collaboration next time and that the project was a fun way to connect art standards with ELA standards and art classes with the library. This collaboration also brought art- and poetry-loving students into the library and opened the door to reaching more who hadn’t previously known what was going on during lunchtime.

When an opportunity presented itself to introduce the use of the makerspace in a classroom, I hadn’t anticipated the far-reaching impact this use would have. The broadcasting elective is Exploratory Technology; what better class could one think of to incorporate some of these STEM learning opportunities? Coincidentally, many of the students in the class were in the higher grades; some were athletes and student leaders. Beginning in December, once a month we’d have a Makerspace Monday for which I’d set up rotating stations for the students in the broadcasting class. Use of the makerspace piqued the interest of these students. The projects the students in the broadcasting course worked on could most often not be finished in one class period. I told them that all of the resources needed for the projects were available at lunchtime, and I let the students know that they could come up and continue tinkering. In



Figure 7. Eighth-grade poet and makerspace participant in front of display created in collaboration with an art teacher.



Figure 8. Poetry month displays in the library.

middle school, students have their lunch crews they hang out with during their break. As a result, these popular students would invite their lunch friends to join them in the library, bringing in even more curious students. The power of positive peer influence and word of mouth was in action! As a bonus, an eighth-grade student used Adobe Premiere Pro video-editing software to create a how-to video featuring the virtual reality goggles available in our makerspace. We broadcast this video to the whole school as a makerspace advertisement on the school's daily news show. The virtual reality goggles were suddenly famous and in demand! I was delighted to discover that these goggles can be purchased for about \$10 or made for even less, and I hope to collaborate and use these in the classroom as well. To learn more about using virtual reality for educational experiences, I highly recommend the article at www.weareteachers.com/virtual-reality-classroom.

Although every day has its own theme or focus, on any given day students are free to use the other activity centers if they want to. Freedom of choice in the makerspace is a big part of the draw. Curiosity and a willingness to try are all anyone needs. Some students want to illustrate their own bookmark or color in pages from the adult coloring books. Some students want to create origami birds. Students will try a new activity or do something fun with their two best friends, while others are laser-focused on a 3-D print design that has been weeks in the making. While I have taught the students a little and tried to create a welcoming and interesting space at school for them to explore, they have learned more and taught me more in the short time I have been there than I could ever have thought possible. I look to the upcoming years with hope and anticipation as the program continues to morph into a center

for exciting learning opportunities that interest students and help shape and stretch them, enriching their lives now, while preparing them to become future ready.



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