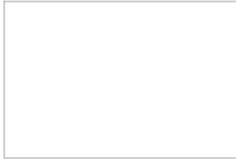


# Makerspace Collaborations across the Curriculum

I work with an innovative administrative team that begins every year's back-to-school professional development with an engaging, fun activity. In 2015, I read several journal articles about makerspaces that shaped my view of making as a key way to engage learners through truly authentic learning experiences. During my evaluation conference that spring, I raised the idea of starting a makerspace program in the library with my administrative team. Their response—and I am paraphrasing here—was something like, "that's great Brian, but how will this be tied to the curriculum?"

That conversation started our makerspace program and led to an opening professional development activity that fall. Our teachers were divided into their academic teams and tasked with making something that represented their team or the goals of their team. They were given access to a collection of Legos, duct tape, craft supplies, green screen video equipment and other materials including a one-foot-tall Iron Man doll.

This opening maker activity could not have provided a better beginning for the Lakeside JHS maker program! It gave all teachers first-hand experience with the wonders of making and a lens to start considering how makerspace activities could be included in their curriculum. The Next Generation Science Standards have brought renewed interest in inquiry-based learning and problem solving. The Common Core literacy standards also reflect this emphasis on inquiry. And, as Andrew Tawfik has noted, libraries are uniquely positioned for collaboration on inquiry-based projects such as those often conducted in makerspaces. In our school, the initial positive experience with the teachers has fueled an ongoing series of content area collaborations with science, math, English, social studies, and family/consumer science teachers.



## Science Collaborations

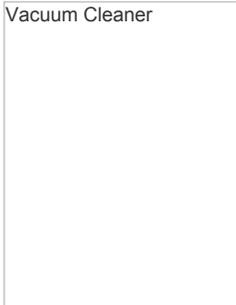
Science might be one of the most natural avenues for collaboration through making, since inquiry is such a major theme in the curriculum. The makerspace has hosted collaborations with our eighth grade science classes on projects to answer questions such as, "what type of container will successfully protect a potato chip as it is transported through the mail" and "what is the most efficient design for cars and roller coasters?"

For each of these projects, students were asked to do some research (inquiry) prior to creating their projects. For example, students researched the best materials for their potato chip containers. Then, they had to work through the design process to develop the best protective case. We made an arrangement with a local middle school to send the student-designed containers through inter-school mail. The students were highly engaged and the looks on their faces were priceless when some of their containers came back with the potato chips intact!

The library has also collaborated with the science department on DIY car and roller coaster projects. In both cases, students started with a question about materials. They researched the best materials and designs before building and testing their prototypes.

## Social Studies Collaborations

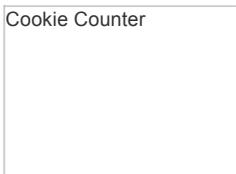
Vacuum Cleaner



One of my favorite makerspace collaborations of all time occurred last spring. I had learned about a concept called invention literacy at a conference and was inspired to implement it in my building. Invention literacy focuses on the teaching of the inquiry/research skills librarians often teach, such as reading and writing about a topic of investigation, but takes it a step further. Instead of creating a presentation or a piece of writing, students are prompted to build the object they researched. As Colleen Graves describes, when students participate in invention literacy, they are making "their own version" of something (2016). Writing is still included in the form of a reflective journal where students chronicle successes and failures they encounter through the making process.

I collaborated with a social studies teacher who wanted students to start with a problem they had learned about in their study of the Progressive Era and build a solution. These problems were then transformed into questions such as, "how can we build an invention to solve a given problem from that time period?" or "what are the best materials to build a given invention?"

Cookie Counter



The teacher and I brainstormed a few inventions from the Progressive Era, including the airplane, railroad, the elevator, and a few others. The students surprised us when they asked if they could go *beyond* our initial suggestions. One thing that was different from other inquiry-based collaborations was that students did their research about the inventions *after* having two days to test out different materials for their projects. Although the steps were completed in

a different order from most projects, they were well situated for the task. Since students had already spent time testing different materials for their inventions, they were more focused and purposeful in their research into the inventions they chose to build.

What students developed was truly amazing. There was a Morse code receiver created with two Microbits to solve the issue of long distance communication, a working vacuum cleaner built using Little Bits components to improve the cleanliness of life at home, and a 3D aspirin molecule design to aid workers who returned from a hard day in the factory with sore muscles.

Probably my favorite invention was a counting machine. For this invention, students sought to solve the problem that children employed in factories were not in school learning how to count. To solve this issue, a group of students built a game using Little Bits components to teach students how to count cookies before they went into the oven.

### **Making+Inquiry Equals an Advocacy Opportunity**

Telegraph



One of the best things about the invention literacy project was the advocacy piece it became for the library program and the makerspace. During my summative evaluation, I shared the project's success with my administrative team. The classroom teacher had arranged for her students to complete a gallery walk in the library where they could share their process and projects—which just so happened to be going on during the time of my summative meeting. So, I invited my administrators to see these students' incredible work. (Read more in our library blog post: <https://goldeneaglelibrarybookblog.blogspot.com/2018/07/invention-literacy-challenge.html>).

We also extended our learning through a Google Hangout with Stony Evans, librarian at Lakeside Hot Springs High School in Arkansas. He had collaborated with one of his history teachers on a similar project, and our students had a chance to share their projects/process with their peers from Hot Springs.

Our invention literacy projects turned out better than I could have ever imagined! It was exciting to watch students grow their inquiry skills as they invented and innovated their project designs. By seeking out these opportunities, we stoke the fires of their inquiry learning and promote ingenious thinking. As librarians, we can collaborate with our teachers to help students make their inquiries visible through making. Given the importance of information seeking during the inquiry process, we truly have a unique chance to take a leadership role with our teachers as they implement inquiry-based learning.

### **Work Cited**

Graves, Colleen. "Invention Literacy Research – Part One." Create+Collaborate Innovate Blog. September 20, 2016. <https://colleengraves.org/2016/06/07/invention-literacy-research-part-one/>

### **Keys to Inquiry-Based Makerspace Collaborations**

1. Present making opportunities as essential.

Present making not as an add-on to teachers' curriculum, but as an essential, engaging set of activities that fit easily into their content area teaching. Offer to co-teach the lessons to lighten their load!

2. Start with key questions as a basis for inquiry.

Essential questions can be mined from existing curriculum maps and then "repurposed" into opportunities for making. Making is a natural fit for solving these types of open ended problems.

3. Keep the focus on the learning, not the technology.

It is easy to divert attention from the learning towards the technology tools students may employ in their inquiry projects. When we focus more on student learning and allow them to seek out and use the technology that is a best fit for their learning, they can turn out amazing things.

4. Target your early adopters.

Since all the teachers in my building had first-hand experience with making through our opening professional development activity, I think as a group they were more open to incorporating it into their curriculum. However, revisiting the combination of inquiry and making with some of the teachers in my building who are early adopters helped to add it to the norms of instruction at my school.

5. Enlist your students as "tech missionaries."

Often, before I propose a project idea to a group of teachers, I will have my student library aides test it out. They will provide me with honest feedback. When they are fired up about an idea, I encourage them to go out and share those concepts with the teachers and other students. An added bonus is that the tech missionaries get to come back and serve as expert technicians on the projects when teachers bring their classes into the makerspace, which they love.

6. Have a flexible approach.

If curricular time is at a premium, look at other opportunities for makerspace collaborations. Hold a lunchtime session to introduce teachers and students to ways inquiry and making can be combined with some simple activities. Collaborate with your teachers to provide makerspace activities as an extension activity for students who have already mastered concepts. Collaborate on activities that can be conducted during your school's TIER 2 Intervention time (or other time designated for school-wide improvement goals). For example, in collaboration with our math department, students program Finch Robots using scientific notation, or build review games about transformations using Microbits.

7. Be creative and resourceful in collecting materials.

Work out an arrangement with your office so that all the cardboard boxes from shipments of school supplies are immediately added to the makerspace collection. Request materials from your teachers: old cell phones, jewelry making supplies, Altoids tins, and other materials are great tools to encourage student inquiry!

## About the Author

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### MLA Citation

Johnson, Brian T. "Makerspace Collaborations across the Curriculum." *School Library Connection*, May 2019, [schoollibraryconnection.com/Home/Display/2187123](http://schoollibraryconnection.com/Home/Display/2187123).

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Entry ID: 2187123