

Building Maker Spaces vs. Building a Maker Culture

In 9th grade, I cut my thumb on a saw in wood shop and had to get stitches. It wasn't too bad... However, that was the last year I took "shop" class in high school. I had enjoyed making our CO2 cars in middle school and liked the process of learning in "shop" class, but the food in Home Ec, and the potential game-making in Computer Programming took me away from wood shop. Nonetheless, I continued to create and make long after high school.

As a high school teacher, I began to see a divide between the kids who took shop class and often went to the local technical school, and those students who took all "academic" classes. This is not to say that they weren't academic. We had fantastic discussions in English class where high-level connections were consistently made, yet many did not see themselves as "academic" and wanted to do other things after high school. In fact, many thought high school was a waste of their time because it had "nothing to do" with where they were headed.

I loved the "real world" perspective many of these students brought to my class, but I hated the fact that I categorized them as "those students", meaning tech school students. The other piece was how the percentages were swayed heavily to boys in both our "shop" classes and technical school. I mean 90%-10% heavy!

The flip-side of this equation was a set of students who took every AP and Honors level class they could take during their high school journey. Their goals for high school were different. They wanted to get into a great college and knew they had to have a HS resume that would reflect how intelligent and hard working they had been for the past four years.

They rarely did anything with their hands. Rarely made anything in school that was not tied to a set of standards or written out in paper. This was not to say that they weren't creative. Far from it. However, their opportunities were limited in "making" because of the academic path they took in high school.

If only it were that simple..

Like most things in life, school for me as a teenager, and as a teacher, was not that cut and dry. Most students did not fall into either of the above paths, including myself. I fell somewhere in between, shying away from AP classes and also not seeing the value in tech school.

Yet, I always was tinkering around. Making videos (before everyone made videos) and making my own songs, recording things, and always interested in music as I was part of a band. At the time I didn't know I was a "Maker" or have any idea about that term. I did know that when something interested me I usually jumped at the chance to mess around and play with it to learn.

When I gave my students the choice to work on whatever project they wanted to for our 20% Time projects, I joined in the fun. I decided to build my own app from scratch (something I always wanted to do) and the Maker in me came out again. I saw how my students struggled with their projects, yet continued to push through. Even though our projects were not tied to grades, they still cared and had a higher level of commitment than I could have ever drawn out with a quiz or test.

This was English class, and we were making things with our hands. We were also writing, reading, speaking, and listening about our own projects and the other students that were in the class.

Although my students and I embodied the “maker” mindset during those 45 minutes each week, the problem was simple: **That was not enough time.**

They needed more experiences in school like 20% Time where they could fail safely, learn by tinkering, collaborate freely, and see an idea go from seed to creation over a period of time.

Why this needs to change in the 21st century...

We all know how the world has changed, and how our students have changed. Not to mention how the workforce has and will continue to shift towards jobs that are going to require critical thinking, communication, collaboration, and creativity.

But I still see many schools as silos. If you want to go to college take this path, and if you want to get “career ready” take this other path over here. That’s not going to cut it anymore.

The “career ready” path has to have strong academic merit to it, just as the “college ready” path has to have creativity merit to it for it to actually prepare students for life after school.

Shouldn’t a student who is heading to college to take engineering courses have hands on experience designing, making, and building in school?

Shouldn’t a student who is starting their own landscaping or design business after graduation have experience writing business plans, speaking to an audience, and connecting their math class to their business interests?

And shouldn’t an elementary student interested in everything have the opportunity to explore with their mind and their hands as they make their way through our K-12 system?

As a teacher, parent, and student myself I believe we need to expect more out of all of our students, and give them the opportunities in school to do “real” work instead of consistently “preparing” them for what is next.

Building a Makerspace vs. Building a Maker Culture

I met Dan Moyer for the first time three summers ago and was immediately impressed by his knowledge and attitude towards teaching and learning. He was a Tech Ed teacher in Upper Perkiomen School District and I was the new administrator. We were on the same interview panel for new teachers and got to know each other quickly. Dan had a wide range of experiences teaching every level of Tech Ed and Industrial Arts within the district. He had been at the Elementary School, Middle School, and made the switch back to the High School that summer.

We got into a discussion during our first meeting about the changing landscape of high school and how the Industrial Arts department and program needed a re-design. **By September our idea had transformed into something tangible, as we understood this challenge and gathered research to support our idea (Phase 1 and 2).**

We set out to create a new 9th grade course where students would have the opportunity to learn design and engineering concepts hands on through a variety of creative experiences. We also wanted to create a course that would be gender-neutral in its description and experiences, hopefully bringing the ratio between boys and girls in class closer to 50%.

After meeting with the High School Principals, our Assistant to the Superintendent, our area Robotics expert, and the other members of the department **we began to put together the pieces of this course to frame the opportunity for our students and school (Phase 3).**

With the challenge, idea, and opportunity firmly in place, our next steps were meeting with various stakeholders and then going back to the drawing board again and again (Phase 4 and 5).

We decided this course had to be a funnel for the rest of the department’s offerings. We couldn’t have all the 9th graders take a design and engineering course...only to take traditional “wood shop” courses in 10th-12th grade. We also wanted to make sure we kept the good pieces of our Industrial Arts program instead of throwing everything out.

Our refined course idea looked like this:

CREATIVE DESIGN AND ENGINEERING

Course Description:

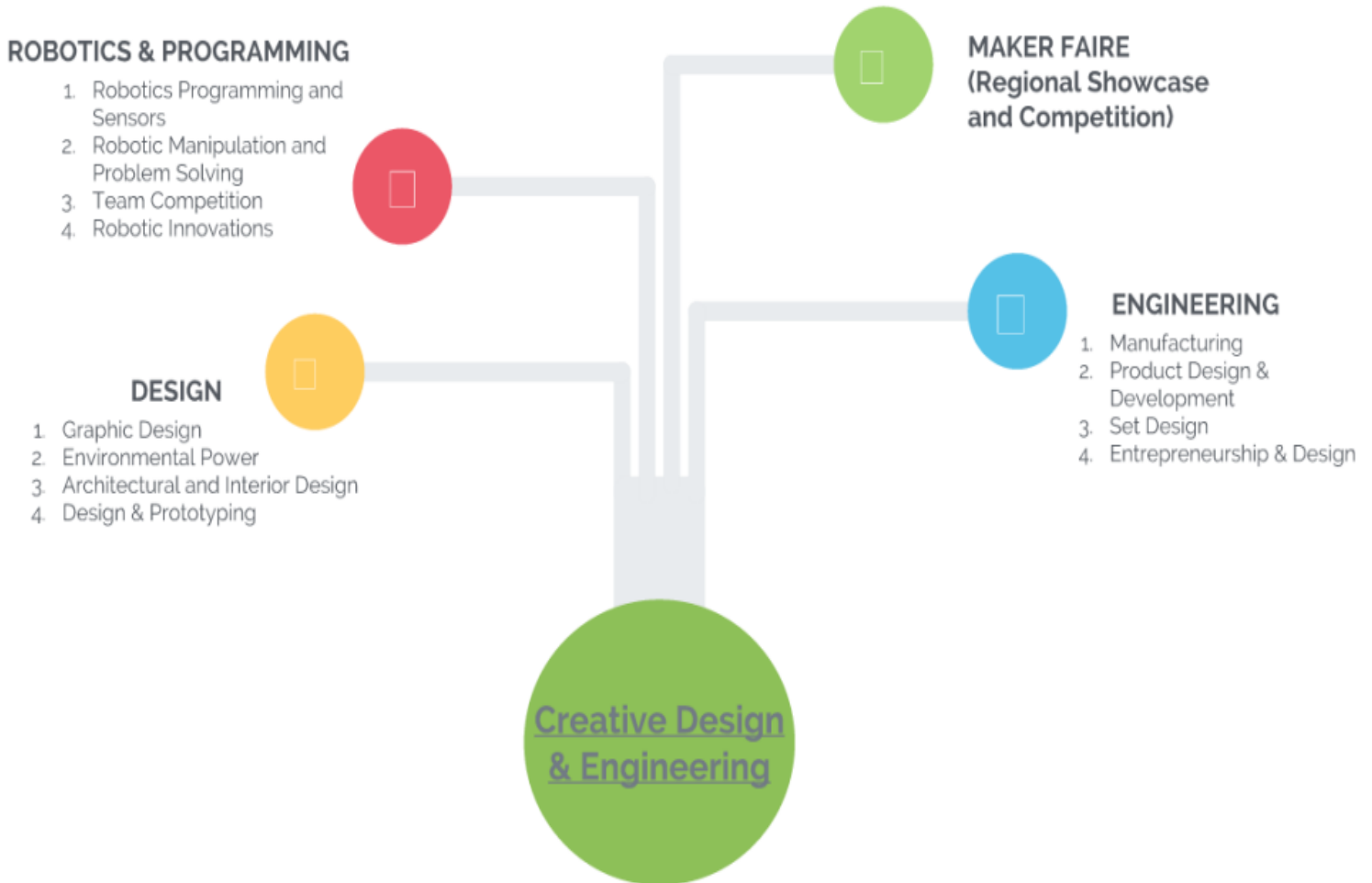
This course will provide students with an active hands-on learning environment that promotes a higher level of thinking through real life problem solving situations. Introduce students to the world of creation through the principles of design and engineering while brainstorming, modeling and collaborating in a team environment. Together students will form a foundation to help them succeed in our ever changing society.



And as we got more and more feedback, we re-designed the entire flow of offerings and courses in our IA department (Phase 6):

Impact: The Entire Program

6



Our course was named, “Creative Design & Engineering” and students would be making/creating/building in four different areas:

- Students will compete in a head to head robotics competition while learning the principles of design, construction, and programming.
- Students will construct a fully functioning desk clock that demonstrates the creative concepts that go into the building process.
- Students will be given the task of creating a product for daily use in their life that will be designed in AutoCad and printed using a 3D printer (i.e. iPhone Case).
- Students will design and create their own personal logo that will be cut on a vinyl plotter and placed on an article of clothing or other graphic product of their choice.

In order for students to have these experiences we had to propose the new course to our school board along with the budget requests to make this a possibility.

We needed the following equipment to make it all happen:

- Vex Robotics team set for students to build out their own robots in each class and then create a competition where teams of robots played against each other.
- 3d Printers from Airwolf. We searched far and wide and felt their line of 3d printers were perfect for our new course and department.
- 4x8 CNC Router will allow students to design and create professional grade products for our community and school district. Our students will be able to create their own custom products with almost any material.
- Vinyl Cutter/Plotter which are versatile and allow for a wide variety of finished products that include: shirt logos, magnets, decals, signage and other creative media.
- Heat Press to be used along with the Vinyl Cutter for our design aspect of the course.

We presented our proposal to our school board (Dan, Blake, HS Principal, and myself) and had a good amount of questions about the course and direction we are headed. The following week they unanimously voted for our course approval and budget requests.

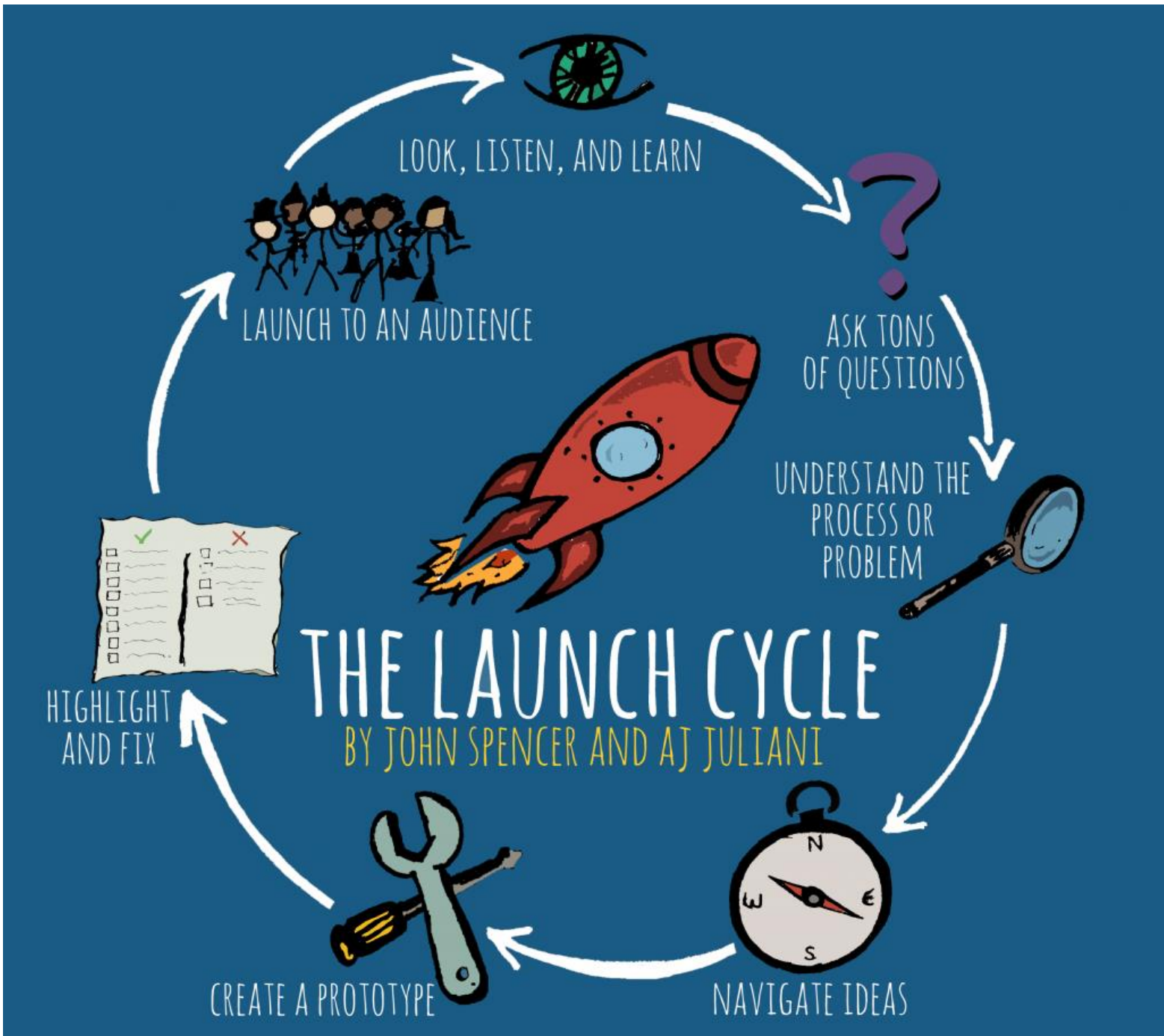
Our final piece of the equation was hosting an area-wide TEDxPennsburgED where our students built and designed the entire set and stage with their own hands. (Phase 7)

From these experiences we are hoping students find real interest in one or more of these areas and choose to take electives in their 10th-12th grade years.

More importantly, **we wanted all 9th graders to have this opportunity, and for their feedback and interests to continue to drive course creation in the upper-grade levels (Back to Phase 1).**

Expanding Design Thinking and Making Beyond the Maker Space

You may have noticed the **bold text** above with Phases 1–7 listed above. Those Phases are part of the Design Thinking Process and [LAUNCH Cycle](#).



While I'm extremely excited about the growth of Makerspaces in schools around the country and world, I'm just as pumped to use the Design Thinking Process in other areas of our K-12 spectrum.

This design thinking process can be used in a few key areas:

- Curriculum Design
- Unit and Lesson Planning
- Learning Spaces and Classroom Design
- Project/Problem Based Learning Design
- Research and I-Search Papers
- STEM Lab Design and Problems
- Strategic Planning and School Initiatives/Pilots

Design Thinking can be used as a framework to tackle many of the tough issues we are facing in education right now. And I believe the same can be said for the "Maker Movement" with our students.

The Maker Movement matters to all students, because each deserves the opportunity to take an idea from conception to reality, to fail and experiment along the way, and to feel the sense of accomplishment when they make something original.

How to Grow a Maker SPACE into a Maker CULTURE

In Nick Provenzano's book, [Your Starter Guide to Makerspaces](#), he makes the case that a maker space can start a movement inside your school. I agree wholeheartedly.

There are many folks who have been saying to "stop" using the word Makerspace, and it shouldn't only be one space. But sometimes this space is the seed that plants a maker movement into a maker culture.

At Centennial School District (where I'm the Director of Tech and Innovation) we've been slowly beginning to build a maker culture out of maker spaces. It is a process and one that doesn't happen overnight. Here is a few things/ideas we've done that have jumpstarted the movement towards a culture:

1. Our K-8 libraries have Mobile Makerspaces. This decision was made deliberately to extend the space into any classroom in the school. Our librarians helped plan out the space, the mobile cart, the materials. Even better, our students all partnered together in a collaborative competition to design their space and make it flexible.
2. We started a Maker Madness tournament in our K-8 schools. Each grade level received a maker challenge to complete in teams and the compete against each other. The maker challenges were specific for each grade level, and Maker Madness happened during our PSSA (state testing) period of time that is normally downtime in general.
3. A group of our HS teachers started [CentennialX](#) a few years ago. CentennialX is a summer program that focuses on human-centered design. Students create real products to solve real companies problems, and then pitch them to an authentic audience.
4. Our Centennial Education Foundation has sponsored numerous grants in robotics, 3d printers, drones, and so much more to further the maker culture in every classroom.
5. Programs like Camp Invention, Girls in STEM, Hour of Code, FIRST Robotics, Lego League Jr., and many more have sprung out of the collective culture.

This May 2nd we'll continue building that Maker Culture by participating in this year's [Global Day of Design](#). I hope you join us and 40,000 other students in turning design, creating, and making into a fabric that weaves through our entire K-12 experience!