Making a Makerspace: Planning the Steamworks

August 19, 2013

This fall, I move into a brand-spanking new classroom. As part of this move, I've been heavily involved in the planning, organizing and logistics of moving my school's Math & Science program into our new digs. In the words of a close colleague of mine, what a great problem to have! Long term readers of this blog have probably noticed a distinct drop off in posts over the past year – well, this massive move has been the main focus of my long-term planning and energy, leaving little left over

for blogging or new projects.

That's about to change. This is the first of a series of posts on how I'm transforming an empty 20' x 20' room into a Makerspace. I will be posting progress reports throughout the Fall 2013 semester, so keep checking back. This post will focus on planning out the Makerspace, which I've named the STEAMworks.

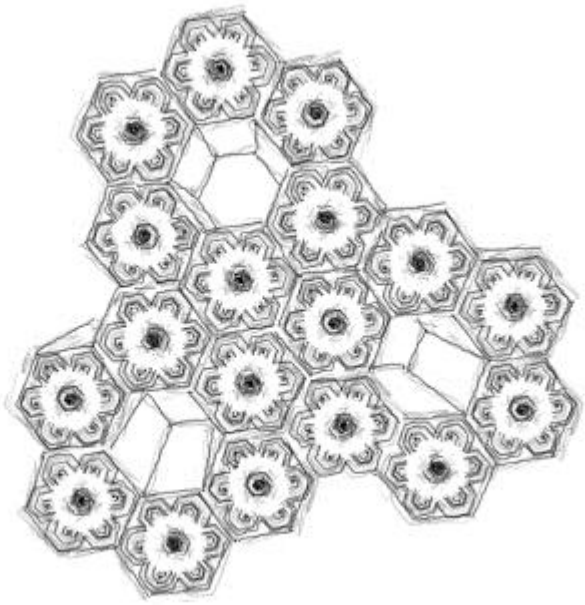
The Stakeholders:

At the beginning of this project, I sat down and took a hard look at who my makerspace serves and whom it may serve in the future. My school serves about 80 students, from fifth to post-high school students, teachers, and the surrounding scientific and maker communities through our environmental program. The makerspace must support a variety of curriculum, mainly through a physics/electronics lens. It must reasonably house ten (generally adolescent) students at a time.

The Research:

Next I did a little research, some on the 'net and some in person. As an all-around shop addict, I've spent some time in hackerspaces. TX/RX Labs has been a great learning experience for me. I've seen them set and reset and reset their shop, looking for a perfect space and system. I was heavily involved in the set up of their woodshop and have tweaked its design through three to five woodshop classes. Speaking of, if you are in Houston and want to learn woodworking, we are the best value in town.

I also cruised Makerspace.com and Makered.org, review their various playbooks and blueprints. I'm a tool-geek and I've taken a lot of inspiration from their section on suggested tools. Luckily, through the last three years, I've been collecting a variety of those tools during my various classroom projects.



Finally, I referenced the work of the HEFCE & JISC to inform the physical space design. Their article, "Designing effective learning spaces" reviews open, collaborative learning settings, such as media-centric libraries, vocational workspaces, internet-rich lobbies, etc, throughout the United Kingdom and draws a number of takeaways from the experience. Specifically, the authors highlight how the design of the space influences the teaching and the practice of the spaces and vice versa. I also listened to the ASCD's Whole-Child podcast's show on "School Environments: Transforming Learning Spaces. The discussion reinforces many of the concepts elaborated in the JISC paper. Specifically, I paid close attention to the administrators discuss the practical design changes their work and the connection between pedagogy and design.

Some reoccurring themes return again and again in all of these spaces. Each space puts a premium on collaboration and conveys this through mobile workstations. All of the workspaces I've seen also use tons of technology, often with laptop & internet access, CNC machines, 3D printers, laser cutters and the like. Central areas stay clear while the walls clutter up with computer stations and stationary tools.

Curriculum & Pedagogy

Informed by my research, I began to explore two questions: *what* and *how* I will teach in this new space. How, in my school is a lot easier to answer than what. I teach Math and Science in a research-based, project-based, inquiry-driven, open-community, student-centered classroom. Translated into non-educator jargon, those adjectives translate to this: imagine a classroom in which the student literally builds her knowledge. Brick by brick. Imagine a classroom with more laughter than lecture, a classroom of excitement. That's the classroom I try to create, and that's the type of school I teach in.

The Simple Box Project

In past years, *what* I teach could be hard to answer. I've taught computer programming, electronics, woodshop, physics, chemistry, middle school science, high school science, integrated middle school mathematics…and a whole host of other things. In the past six months though, I have pushed to standardize our middle school and high school courses, similar to the progression of courses a student would see in a more traditional school environment. In their "eighth" and "twelfth" grade years, our students will enroll in capstone courses which heavily incorporate making and makerspaces, inquiry-driven curriculum, technology projects and community outreach. This year, I have students in middle school physics, high school physics, a middle school capstone course and a high-school capstone course.

Tools, Space and Technology:

The STEAMworks holds a variety of hand tools, measuring devices, etc. I have a number of soldering irons and multimeters for electronics work, a decibel meter and two sewing machines.

I have a number of arduinos and assorted electronics. No rhyme or reason to the purchases, just picking up parts for individual projects, random donations and scattered pushes for technology-driven curriculum. Throw in some RC cars, a variety of "project in a box" kits from the era before Twitter, a number of solar kits and I have a cabinet full of "stuff that might be useful one day". I'm making it a point to find some use out of it this year or toss it and start anew.

Every STEM Fair (a science fair with a Science, Technology, Engineering and Math twist) we have a number of students choose a rocketry project…who wouldn't? As a result, I have access to a number of Estes rocketry kits, tools and launching equipment, water rocket kits, etc. In the physics and motion schemes, we have a number of teacher-made tracks for derby-style car races, CO_2 rocket cars, aeronautic materials.

Lastly, I have a complete crafting tools – printmaking kits, paper, duct tape, straws, that sort of stuff. You want to make it in a classroom, I've got it somewhere.

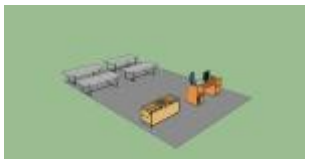
The space in self contains some kitchen-like cabinets for storage and counter space, a double sink and two gorgeous windows giving generous natural light.

Last, but not least, the STEAMworks will contain 4 to 5 computers and one Promeathean Board. I will have access to one or two digital cameras and plan to increase access to other peripherals.

The Design:

With all this information jumbling in my head, I began designing a new room. In fact, I did not do this activity alone – I used the brains of my students. As our final science class assignment, many of my students designed makerspaces in Google Sketch Up 8.

Woodshop and Grids



Why am I facing away from the students?

U shape lecture with stuff at walls.

Why the boxes? And the chainsaw?

A pretty great built in design

Interesting floor plan…

Computers!

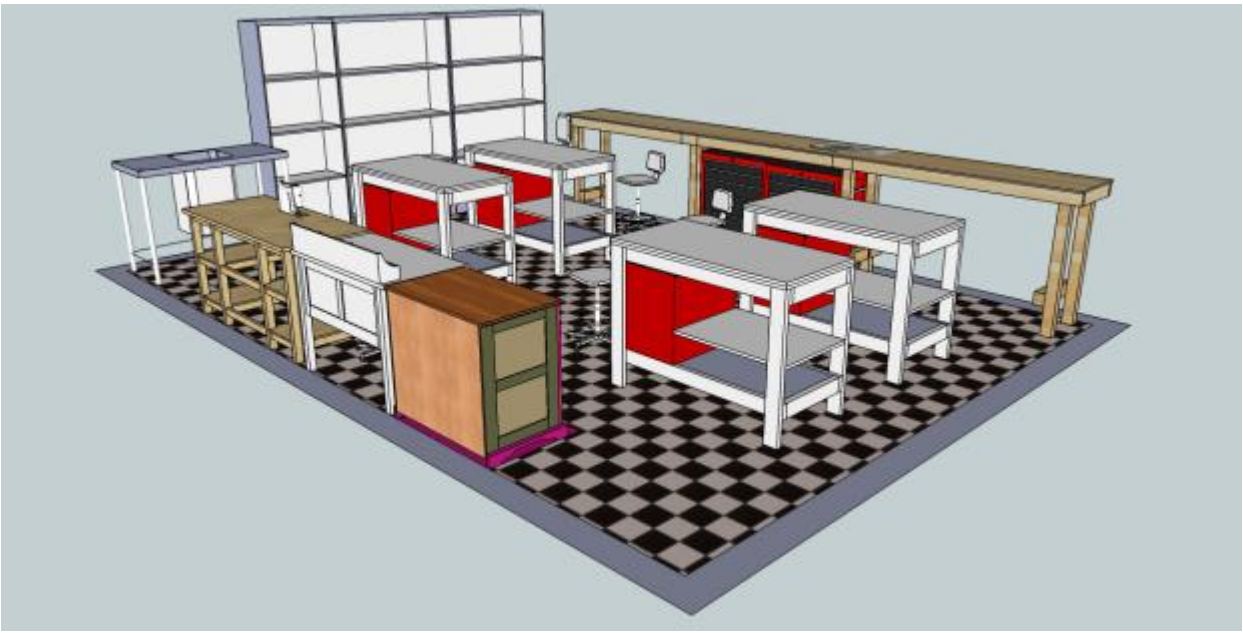
A mix of lecture/workspaces

Some interesting things shake out of my students design. All of them love computers and see technology as central to interesting and fascinating curriculum. Physical tools have no place in their imaginative world. Desks are in grids. Teachers lecture. It's as if my philosophy on student directed, tool-heavy, inquiry driven STEM education has never existed.

What the heck is going on here? How can so many kids *want* so-called traditional classrooms, even when they have had negative experiences in those classrooms, experiences which brought them to my school? I don't have many solid answers, but I do have some theories. My students see technology as something to consume, something I call the Apple Complex. As a tech geek, I think Apple makes amazing machines which allow us to connect to the world in incredible ways. iPods gave us instant music libraries and turned us all into instant DJs. iPads give us productivity apps, speech-to-text readers, streaming internet and movies. Kindle puts every textbook into your back pocket. Smartphones are more powerful than any computer I had as a child (and I'm just thirty years old) and connect us to the world every moment of every day. This has been a boon to delivering content in the class, but it creates savvy consumers of apps and technology – it doesn't create *content-creators.* In my classroom, I intend for every student to view a laptop as a tool to create, not just a way to find a more fascinating lecture on Newton's Laws of Motion. My students should be able to design physical objects in CAD, write blog posts, build a Google map, print 3D objects, create carvings on a CNC machine, write professional emails and look at their internet presence (such as my presence here on WoodshopCowboy) as a professional extension of themselves. The new resume in our tech-savvy world won't be on paper. It will be our online

presence. This dichotomy means my students are looking for more engaging material in their lives but they find it in a computer, not in a tool. More access to tools at a young age may change that dynamic. In the same way, the grid pattern reflects what they know, not what they can imagine. When I asked a student to create a comfortable lounge for his peers, he included sculptures, bean bags, video game areas and computers. A little closer to what a MakerSpace should be.

After taking all this in, this is what I came up with. This makerspace has massive amounts of storage with my 2×4 shelving system, a textile cart, four mobile workstations with laptop and tool storage, a long woodworking bench, seating for 10 and access to a white board. Now all I have to do is build it…



Keep an eye out for Part 2: the Build Out.

Make it safe & keep the rubber side down. You can continue your support of WoodshopCowboy by liking us on Facebook or following via email!