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I was curious, are most of your school groups from the Queens area or in other boroughs as well?

Yeah we get a lot of school groups from all over the area. In the museum itself we get from all over. In the Makerspace it's a little bit different than our other school group offerings in our other areas such as Design Lab. Those are 20 minute engagements and they're free. In the Makerspace, they are 90 minute engagements and they're not free. That's something that's been challenging at times. Teachers will often just look at the surface and see they don't have to pay for some workshops. Often times they choose the free one and even within Makerspace we house other education services, and in that department we do other activities and school group workshops that are centered a little bit more on "traditional science." Those are also shorter and less expensive than ours. When you have so many different things going on you can compete with yourself in some ways.

You do have very advanced tools in the Makerspace so I assume it's very costly.

Yeah. Just in general all of our school group workshops the kids come and learn about certain concepts depending on what the workshop is and then they use tools and materials and actually build something that they take with them. In the other workshops they don't do that, it's just more of an experience so then there's a little bit more on the materials cost, things like that. We're trying to rework our school group workshops right now. There are a couple different tiers. There are title 1 schools which you get funding from the government to help them pay for certain curricular such as museum visits so we work with title 1 schools and those workshops are generally free if we have grant funding to support them. We also work with basically any school that wants to book from all 5 boroughs and even some schools from upstate. Especially in the summer, we get summer programs that come down here from Larchmont, or maybe like an hour or two away.

We have tinkering activities, table top activities that are very low or no facilitation up to very focused workshops where we're learning a tool and building a skill. A lot of the stuff we are leaning toward now- this is how we are trying to advance our school group workshops- is to create workshops that are really solely about skill building as opposed to any content. There would be some sort of a tool focus, and then they actually experience using the tool and we see those kind of benefits. So we are kind of pulling away from specifically project-based or content-based workshops. It leaves it open. In an ideal world is teachers would see- "I'm in fourth grade and I'm learning about circuitry. We can come to the museum and learn how to use a soldering iron. We might make a circuit board but it's really about how to use the tool itself and then how can they bring that back to their classroom or how can they use woodworking tools are something. So really they would pick tools to use and they would think about how to apply that to their curriculum that they want to get across at school. That's our next experiment.

What do you mean by content?

Specific things. If there's some sort of science concept or even engineering concept. They may experience or engage with it but we are not explicitly saying "When you leave here, you should know that 1 + 1= 2." We kind of like to see it that when you leave here 1 + 1 equaling far more

than 2. We do implement some of the content or specific science or engineering general stuff that would attach to school curriculum, but really just trying to push that in a way that's not specifically about that. It's more about building skills and building confidence. How can you utilize your own skillset and your own ideas to any discipline. It's not necessarily discipline focused.

You guys are hosting the MakerFaire, right?

Yeah we host the MakerFaire every Fall. This will be our 8th or 9th year. That is something that will be interesting to see. There's a lot of push and pull around the Maker Movement and what it means for education etc. But the first year we had it, I think that was 2010. Over the weekend we have about 20,000 people. Last year we had over 90,000. To get people out here it's not the easiest thing to do. One of our biggest challenges being a New York institution is people don't come out to Queens.

What did you mean exactly by the push and pull of the Maker Movement?

There's lot of "is it inclusive, is it more of like a white man's thing"… I think there are certain truths to all of that, but one of my questions is, what makes it different from any other institution in our country- "Oh the maker movement is not inclusive or it's the white man's game," our country is built on the white man's game. It's far deeper than just being able to point fingers in that way. There's nothing wrong with pointing fingers but, it's a greater problem. Getting people into spaces and doing more in depth, personally driven experiences is a better step than the steps we were taking even ten years ago, even in education. I say it's a movement in the right direction. A lot more work needs to be done but in any situation there's far too much exclusivity or implications for being not a white man.

I think it's definitely an advancement and a step in the right direction, the Maker Movement in general, but I'm just really interested in, is it trendy? Is it not sustainable? How is it developing in schools rather than museums? I see a lot of these libraries and tech spaces evolving in these "Makerspaces." Do they have facilitators, who is fore fronting these changes. How is that different from what's happening here because it's totally different.

Being formal institutions, school have a lot more regulations and a lot more things they have to do as far as curricular focus. In order to do something that's considered more "makery" or outside of the regular bounds you have to substantiate it in some way. Fortunately when you are being creative or exploring something in a new way, there's not always a direct answer, where schools need that direct answer. How is that applying to the curricular goals that you have. You need to pitch and support how it's supporting thing. I think at times, how do you prove creativity or confidence? You can say I got a 90% on this test. There were 100 questions and I got 90 of them right. That's a direct metric to what you got on this test but is it a direct metric to telling you what you actually learned. That's where the debate lies. That's one of the challenges in schools now. If your administrator has buy-in, they're willing to take the risk of "well you know let's just throw it up and see where it lands or see if it sticks." They're finding, at least from my experience, that schools are seeing kids that typically might be considered challenging or unengaged to be very engaged. I also find that the kids that do really well in school, at times, may struggle more with this because they don't have the answer. Some kids that do very well in school, it's more about playing in the system as opposed to learning things and figuring things out, or they figure out a system I guess. I think there's a whole different responsibility as a teacher than you have as an informal educator. It's extra, it takes time and it takes more staff.

We have a 3D design program that we do here. It's a semester long or a summer camp, but it's basically 60 hours. It's a really deep dive. We couldn't do that program with two facilitators, there's just no way. We do a skill building portion as the first half, 30 hours. They are learning how to think, to interpret materials and building materials using tools. Anything from paper and pencil up to woodworking tools up to digital design tools and fabrication tools. They're getting this whole breath of how do you design, create, make, build, prototype something. The last portion which is the next 30 hours, they get to apply these skills to some project of their choosing. They can make anything they want. We might have 20 kids doing 20 completely different projects. Some using woodworking tools, some using computers, some using electronics. How do you wrangle that into a setting? If you're solo or even if you have two people there's no way you can support them because everybody needs individual attention. If you were to relate that into a classroom, everyone has their own individual learning styles. To have one teacher try to build a platform in an individual classroom with 30 kids- I would call it a bang your head against the wall exercise. It's not conducive to sanity.

During that workshop, do the kids design their end goal ahead of time or do they just play with materials and see what comes out of it? Are they problem-solving, do they have something in mind?

We start out exploring the tools and how the kids interpret materials. They look at what the potential for what these tools and materials are. For instance the kids have to make a project box. The kids have to take measurements in which they use math skills, but they also have to cooperate or collaborate with their groups. It's a group of like 3 to 5 to keep them more manageable. They have a storage area with one shelf. They figure out how to create their project box so that all of them fit on the shelf. So they have to measure the shelf and divide by how many people they have, but that also have to think about the width of the wood, the height of the shelf, could they stack the boxes, things like that. They figure out how to solve that problem. That's problem solving but we aren't sitting there saying "okay when you start problem-solving you need to come up with your problem." We don't do that, we let it happen more organically and then through the reflection and discussion we talk about what they did and then they express how they interpreted it. In some ways we think maybe we should talk more about the engineering or design process but I kind of see it as like, how do you get from point A to point B and do they need this explicit circle to understand this. That could be debatable but I don't think so.

How old are these kids?

They are 5th to 8th grade. Typically when I started working here we did 5th and 6th grade and then 7th and 8th grade. But I find expanding the age… like a 5th and an 8th grader are very different develop mentally, so to have them in the same room learning from each other and experiencing the same things, they are going to interpret things differently, they're going to have different cognitive abilities, different physical abilities. It really builds this community where they're learning from each other. One of the kind of serendipitous outcomes of that was- by having a 7th and 8th or 5th and 6th grade class- that chance of having siblings was possible but rare. To have siblings from 5th to 8th grade is actually pretty normal. So parents are registering their 7th grader and they can put their 5th grader in the same can and they work together. It's a one-stop shop. We saw this sibling dynamic play out, which was really interesting. I come from a large family, I have 8 brothers and sisters. I know a bit about personal sibling dynamic and the hierarchy and then support. There's a lot of nuanced aspects of being a sibling or having a family member. But when you're in this space, you're trying to be cool and you want to do this… you end up seeing

them really supporting each other and their relationships seem to build stronger as opposed to them not getting along and fighting. It was a pretty interesting thing that was totally unexpected, but when it started happening it began to be more of a focused idea. We start to build trust in these relationships because we have them for 10 weeks. By the end of the 10 weeks they are going to have to talk about their projects, talk about the process, what they did, how they did it, what went wrong, and then we have a culminating event. If it's a summer program they actually showcase at MakerFaire…When we invite their family and friends we speak to them beforehand and say go to your kids tables and talk to them about their projects but then go around to the other kids tables and ask questions, ask them how they did it, really grill them. They know their stuff. Challenge them and ask them why they did something. Through reflection and constant discussion throughout the whole program this is built, but then we really focus on terminology. We might start out the program in our reflections saying "I used the thing to drill the hole. Well what is the thing? Oh I used the drill." We can ask if anyone knows what that "thing" is. We tell them next time try to remember what that thing is, if not you can ask someone else. But just the importance of that, not only are you learning to think and learning how to make things, but you're also learning how to talk about them and express your process. Those things are really at the crux of "soft skills" or "21st century skills" or what the job markets are looking for. We don't talk about career path or career development, I know that's a huge thing. I find that to be a bit weird.

Do you have any examples that spark your memory of really great projects that these people created?

There are so many. Literally we get absolutely different projects. Occasionally they will team up. What's great is they will often combine different tools and materials and processes. We had one collaborative project between two kids. They built a lasercut model of the empire state building. They embedded LEDs and electronics in it so they could turn it on and off. A kid made a material box for her dad's workshop. It had little compartments where he could put screws and this and that. Another kids made a trash can for his desk at home. We usually get 1 bookshelf per program. We had a drawing machine with gears. Games and stuff are a general theme. Before they decide on their final project we have "consultation sessions." We will sit around a table with 4-5 kids and we have a discussion like what is brainstorming? How do we come up with ideas? How do you pair down your ideas? We have them come up with as many ideas as they can, they make a list of at least 5. Then we have another consultation session and ask what sort of tools would you need to make this? What materials? Processes? Then they make diagrams for their projects and take measurements and they do a list of materials they would need, a list of the tools they would need. Sometimes kids get caught- they know what they want to do but they don't know how to do it. So we'll have a discussion with the other kids. One of the kids wanted to make a dome for this UFO that he was making. The kids create something out of wood blocks, then they measure that and they transfer it to Tinkercad, which is a 3D design software, then they print that out and they cast it in silicone, and they create a mold in silicone and they cast it in crayon/plaster/metal, all these different materials so they see this kind of replication and manufacturing concept. Hot glue is one of the things they cast it in so one of the kids said "well, could you take a bowl and cast the inside of the bowl with hot glue and pull it out for your dome?" You have this sort of thermos-plastic dome. When the glues still wet you can embed LEDs in there so then you have a UFO that has lights on it and stuff. When I was thinking about it I was thinking way too complex. This kid came up with something they already knew and that's what they did. There are a lot of cool ideas when you get from the start of the projects to fruition.

I saw online that you do Little Maker activities, what is that?

I actually don't oversee that program. It's interesting because when Little Makers first started- I actually have a background in early childhood- it's something that I wanted to contribute to. But it is about material exploration but I feel like it could be pushed a little bit more into the tool basis but you have to be comfortable if a two year old is using a power drill, you need to be comfortable in facilitating that. They do a lot of food making stuff, like they did an ice cream thing. They use more everyday materials. The actual making part is a little more arts based. They're not using actual tools like power tools or even just hand tools. It's a well-attended program. Every Sunday they have it in the Makerspace. They've done block printing and paper making, things like that.

Do you have open hours for the Makerspace?

During the school year Monday-Thursday in the afternoons we have a program called Science Ambassadors. During the day we have a lot of school groups but then at 1pm all the DOE buses have to leave so from 1-5pm it's fairly empty so we have a program that runs 2-5pm. We started implementing this thing called 50 tools. Each week we had a different tool we were focused on. So it is about that skill-building. You come in and you may have a scroll saw. Really the whole idea is you just want to experience the tool, and if you want to stay and create something with that tool that's fine. All we really are facilitating is the skill and learning about the tool. Each week we have a different tool and families can come up and do whatever they want.

On Saturdays and Sundays we have workshops. It's not quite walk-in but it is just open to the public and they would have to register for the workshop. It is a limited amount for our space. It depends on the tools we're using. It's typically one parent and a child. The idea is to have a set of people that come in and learn a skill to apply it to a project and then they get to take something home with them.

Friday afternoons we have Make It Friday. It's open to the public because we have free hours in the afternoon. Those are typically more table top tinkering activities such as linkages or circuit blocks or something like that. It is very low facilitation where two people might be able to do it without a problem at all. Accessing our space in the afternoon is relatively new, we just started the Science Ambassadors program last Spring. Some days we might have 200 people. In general it's usually lower attended. Its a museum-wide program. Makerspace and Design Lab are just one of the areas. We're hoping as people start knowing about it more it builds up.

This summer we're planning to run afternoon programs around tools.

The weekend family workshops are meant to engage all ages so we have to think about how to engage a 4 year old a 10 year old a 20 year old and a grandparent. They're typically encouraged to do their own projects. A lot of times parents start doing things for the kids so by distracting them with their own project the kids are able to able their own stuff. Usually with some prompting the parents will back off. In the end if the parent wants to engage with their kid that's fine. At the end of the day we want them to have a good time.