Makers and K-12 Education

William Van Loo

EDPS687

Due Wednesday, December 16, 2015

Dr. Joe Bishop

Abstract

The experience of attending public school in the United States is unique for every individual. How does that experience shape individuals who define themselves as "makers"? What is a "maker"? How does one's educational background prepare them for life, and life as a maker? These questions are addressed by examining the lived experience of five adults who define themselves as makers, with a critical eye towards the ways their life experiences shaped their current identity and practices of making. Future educational directions for promoting the maker mindset are considered in context of these experiences.

Introduction

What does it mean to be a maker, and how do individuals become makers? According to Martin (2015), there is currently "growing interest among educators in bringing making into K-12 education to enhance opportunities for students to engage in design and engineering practices, specifically, and science, technology, engineering, and mathematics (STEM, or STEAM when art is included) practices." (p. 30). This has not always been the case across K-12 education in the United States, however, and has not necessarily been the common experience of US students over the past 30 years.

Adult Makers and the K-12 Experience

I personally define myself as a maker, teacher, musician and photographer. Over the past few years, these four passion areas have led me to YouTube and other social media networks as a way to connect with others who are also involved in these areas, especially those who define themselves as "makers".

Many adults who define themselves as makers have expressed to me that they "wish they had this kind of thing in schools when I was a kid", referring to the technology and engineering classes I teach. I myself have shared this sentiment with others myself at times. A related facet is that many adult makers had formative experiences with making things (for example, playing with Lego or learning to weld on the family farm), but that these were outside the formal school curriculum.

As such, my guiding question is, "How does the K-12 schooling experience shape adults who define themselves as 'makers'?". What influences, either positive or negative, did that formative period have on the adults that make up the community I am part of? What is the lived experience

of adult makers, and what might it suggest for ways in which I, as an educator, can offer

opportunities and engagement for my own students?

                                        Procedures and Participants

        In order to engage with makers in the community I belong to, which is primarily centered

around YouTube, I sent out my request for interviews via a video I posted to my own YouTube

channel. The video request I made is available to view at the link found in Appendix D, Online

Links.

        Within 24 hours, six potential participants responded. I ended up scheduling interviews

with five participants, as one was unable to schedule a time. All five participants are males who

use YouTube, and are subscribed to my own YouTube channel. They vary in age from 33 to 42

years of age. Each participant was provided with an Informed Consent Agreement (see Appendix

B) and signed an Informed Consent form (see Appendix C).

        I conducted 5 interviews over a period of 10 days (see Appendix A for a list of interview

questions). All interviews were conducted via Google Hangouts on Air from my home office.

Google Hangouts on Air is a free service provided by Google which allows for multiple

participant video chat, and the video chat is automatically recorded. After completing the

interviews, I downloaded the videos, and imported the audio tracks from the recordings into

MaxQDA for transcription and coding. I spent many hours listening to the audio recordings, both

for the transcription process as well as listening to the audio on its own, in order to truly soak in

the words used and the potential themes that would emerge (see Appendixes E through I for

excerpted transcriptions of my interviews with these makers). Some of those hours were spent

making things myself while I listened to those words; I felt a keen and personal connection with

these other makers as I sanded, sawed, or tidied up my own workshop.

Positionality

As stated above, I define myself as a maker. I make projects in my home workshop as often as possible. In fact, I made a project during the course of this research, using the time as an opportunity to reflect on the work, and unplug and recharge. Like all of my participants, I use YouTube as a way to share videos I have created about making things, as well as a way to view the videos of others, and connect with the growing maker community who uses YouTube in these same ways. As such, I have a strong personal interest in seeing the interests of the maker community served, and the stories of this community told with fidelity, compassion, and depth.

I am also an educator, teaching technology and engineering to students in grades kindergarten through 7th grade. I work every day to prepare students for a technological-oriented future, and I see my job as empowering my students with tools, skills, and strategies for negotiating an increasingly complex and technologically-oriented world. I place a high value on my students' experiences with designing and making things.

Finally, I have my own personal educational experiences in K-12 education as a student. During the course of the research, I identified more readily with the K-12 schooling experiences of some participants than others. For example, Tyler had been in a gifted-and-talented program in elementary school, an experience which I shared. He also stated that he had never taken a shop class in high school because he was "college bound", which was similar to my own experience.

Thematic Analysis

Three major themes emerged, each of which contained several sub-themes. These three themes are what it means to be a maker, the applicability of the makers' K-12 educational experiences, and the importance of exposure to the practice of making things, especially early in life.

What does it mean to be a Maker?

All participants grappled with the idea of what it means to be a "maker". When asked to define what a maker is, the most common definition included an idea of a maker as someone who "makes things", though the "things", the ways they are made, and the reasons for making them varied.

According to Tyler, "A maker is someone who makes things". Bryan introduced the possibility that one could be a maker for varied reasons: "Anyone who makes things for their own personal pleasure, or as a hobby, or somebody who actually makes things professionally." Patrick added a dimension of creative vision and design to the definition of a maker: "Anybody that has an idea in their mind of something they want to make or something they want to exist physically, and they take that perception in their mind and they actually transform it into something in real life."

Many various ways of creating things were described by the participants. For example, Robert described the areas of a maker's knowledge as belonging to "woodworking, metalworking, model building, whatever else comes along, I suppose." The most common ways described by all participants to make things were woodworking, metalworking, carpentry, sculpting, painting, photography, sewing, and some sense of "digital making", which will be explored in greater depth later in this analysis.

Concerns about the term "maker"

All of the participants expressed various levels of concern and uncertainty, even suspicion, over the term "maker". This was particularly interesting, because my call for research participants specifically asked for those who defined themselves as "makers". For example, Robert, who develops software for a living and considers himself a "hobbyist", "handyman" or

"do-it-yourselfer", expressed that he was "not 100% comfortable with the new term 'maker'", and referred to it as a "little bit of a hipster term".

Bryan, who worked in construction for ten years and later made the switch to working for a company that manufactures CNC machining equipment, describes his unease with the title "maker":

> My perception of that title is…I dunno, I'm a little skeptical of someone who calls them, you know, the title "maker" is so broad, and so generalized, that, y'know, the people that call themselves makers nowadays, now that the Make Magazine, Maker Faire, Mini Maker Faire, all of these kind of commercialized events have popped up over the last 5-10 years, I feel like it's a little more commercialized than it used to be. Personally, I spent my elementary school and junior high years making things, you know? Making little go-karts out of wood, and making little, building a fort. Building a fort out of pallets and wood that was free behind the hardware store. And that's how I got started being a maker, and I never would have categorized myself as a "maker". I would have categorized myself as a woodworker, or a "sticking lumber together engineer", so…I'm a little skeptical of the word "maker".

Patrick, who primarily self-identifies professionally as a woodworker, feels that "people applied this new name to it, so it's all trendy now", and went on to say, "I came to call myself a maker when people started using that word (laughs), so I dunno, like a year ago, year-and-a-half ago, few years ago?"

A final dimension of what it means to be a maker that addresses these concerns was expressed by Tyler. Tyler is a musician turned maker, whose primary media are wood and metal.

People want to put labels on stuff. Like, a cook is a maker, but there's another word for

that, we can call them a cook, y'know? And like a seamstress is a maker, but there's

another word for that - they can sew. So I think that sort of in the more broader 2015 sense

of it, a maker is one of these people that doesn't specialize in one media or the other.

Evolution of Making Things

Several of the participants alluded to a newer area of making things, which involves digital

design and fabrication. Waller and Fawcett (2014) note that the maker movement and additive

manufacturing have the potential to cause a significant effect on the disciplines of manufacturing

and supply chains. Additive manufacturing is the technology used in 3D printing. Tyler was

clearly grappling with ideas in this realm as he thought through what it means to be a maker in

2015.

Yeah, and then there's this world of digital making as well, that some people, y'know,

don't necessarily…and I might even be of that mindset a little bit, y'know, of like, "ahh,

well, they hit 'Print'", y'know? But they're still making stuff because they're doing the

making in a different way. And in this day and age, we need to understand that that's still

making, too. So, computer making is just as much creating if you're actually making

something tangible, even if it's not tangible, even if you're just making video content, I

guess you're kind of…making. I never really thought about it this deep. (laughs). I'm just

thinking out loud, you know?

Two out of the five makers I spoke with had direct experience using digital fabrication

technology in their own personal practice of making things. As James stated:

I have a 3D printer, which is fairly new to me, I've had it for about 8 months now, so I'm

going into not only printing, but also the digital artistry part of that, which is something I

got exposed to in high school. Modeling, sculpting, I'm trying to do some electronics work,

small electronics, everything from making some simple circuits to working with Arduinos

and Raspberry Pi.

Bryan goes a step further, linking his professional career and his personal practice of

making things with both traditional and digital fabrication. CNC milling, in which designs that

are created digitally are then cut, or milled, them out of wood, metal or other materials, is one of

the digital fabrication tools on the forefront of the area of "digital making".

Right now, I build controllers for CNC machines, so, that's my day job. And I take parts

and pieces and put them exactly where they need to be in a box all day long. So I'm literally

making things that make things. So, if you want to take it that way, I'm a maker of makers

at this point.

The K-12 Educational Experience

Pera & Viglia (2015) talk about makers as "a community that also empowers individuals

and groups from different backgrounds and skills." The makers involved in this research had a

variety of different backgrounds and skills. Some of them had direct opportunities to learn the

kinds of skills they use today in school, while others did not.

Robert:

There was another course that I decided to take which was, I suppose you could kind of

describe it like an independent study, but it was in shop, in metal shop, and at the time it

was called the Tech Challenge. So we had, me and my team, we had come up with this

whole method of taking these wood blocks, and sending them down through a hopper. We

had access to lots of stuff to build with, so we had pneumatic cylinders, it was mostly

pneumatics, PLCs to control it, and, you know, all the welding equipment and we had a

laser engraver that I had gotten to be sort of the local expert on...So it was just an intense semester of really interesting problem-solving and doing it with cool toys. That was an awesome experience, and (I) had a great shop teacher that I worked with on that project, and I think, so that really positive experience is a large part of what pushed me into the engineering program that I went to college for. Of course, I went to school for engineering and now I'm working in software, but it is all tied together. At any rate, that was sort of my highlight of my senior year.

James had similar experiences in high school with an "Energy, Power, and Transportation" class, and also gained experience with digital modeling that he now uses for working with his 3D printer.

<div align="center">Missed or Denied Opportunities</div>

Some of the makers interviewed, however, did not have these sorts of experiences. Tyler, for one, wished he had been given the opportunity, and was discernibly angry about it:

Down in the basement, there was the shop wing...I never got to go there though, because I was "college bound" because of my scores in previous, I never got to go down there and do all that cool stuff. I feel like they ripped me off from that opportunity. Y'know, they never let me go and use the lathe, man, I'm still mad about it.

Tyler continued later on in our conversation:

It was never really laid out as an option, and I didn't know I wanted to do it. The way my school was set up, there were the college-bound kids, and the kids that weren't going to college. This was the late '80s, I graduated in '91. ...So it just wasn't an option. I remember going down there once; my whole 4 years in that school, I went down there once.

The stigma that shop classes are for "kids that aren't going to college", was echoed by Bryan:

Is it still true that the kids who are put in shop class are considered to be the, the lesser achievers? This is something that I've heard about the public school system that I never got to experience because I never took shop class.

Self-Directed Learning

Where formal education falls short, makers teach themselves. Self-directed learning plays a major role for all the makers I spoke with; the orientation toward being self-taught came up again and again in our conversations. According to Patrick, "All the useful things in life I've self-taught myself." Bryan noted that "I can't really say that any class I ever took, any real structured class that I took, gave me any insight into the industry that I find myself in. It was all self-taught. All of the skills that I have built over the last 15 years have all been self-taught." The common platform of YouTube was cited by several participants as one of their primary sources of self-learning, along with books, magazines, and other online resources. Interestingly, none of them cited learning from other makers in face-to-face settings.

Early Inspirations

Several makers noted the important influence of family members on getting started in making, through teaching, encouragement, and inspiration. James gave a powerful and somewhat emotional testimony to the impact his grandfather had on getting started in making:

My grandfather had a small shop in his basement. It was probably about the size of the office that I'm in, like 12 by 20, something like that. I remember the bandsaw, the drill press, he had a belt sander in there, had a radial arm saw which I remember him using…and a workbench. I remember, I spent some time as a child in there, early adolescence, probably

up til I was 12, just doing small things with him. I think I remember doing, I was a Cub

Scout, I think at one point I built a Pinewood Derby car in his shop. Mostly I did that with

my father in our garage, which is closer to what I'm doing now, is just piecing things

together. My grandfather had a much more organized woodshop. Unfortunately, when I

was 12 or 13, he had a quadruple bypass that his sternum never healed from, and he really

stopped doing much of the woodwork after that, so the more formative years that I could

have really learned a lot from him, I didn't really get that exposure from him, but I still take

a lot of inspiration from what he did from that. (pause). I kind of trailed off there, I'm sorry.

Due to his homeschooling, and the time at home this afforded, Bryan also had an especially

influential relationship with his grandfather.

I'd say, a big turning point, or a root project that really got me into wanting to learn to

create things on my own and do projects on my own was my grandfather retired in 1990,

and he spent a lot of time at our house building things. And he built raised garden beds, he

built a play structure, he came over and helped my dad build a shed, and because I was

homeschooled, and he was retired, I was there, and he was there. He's a retired Boeing

engineer, you know, Boeing is up here in the Northwest, he retired in 1990, so he got into

Boeing a long time ago, and was, he was a mechanical engineer, so that mechanical

engineer who also like to do woodworking was a huge trigger for me. Because I was there,

I was home, and I would finish up my schoolwork as quickly as possible so I could get out

and work on the garden or work on the play structure or work on the shed with my grandpa.

So there's my huge trigger right there.

<p align="center">Conclusions</p>

The guiding question for this research was, "How does the K-12 schooling experience shape adults who define themselves as 'makers'?" It is worth stepping back to consider this question again in conclusion.

For example, Tyler's lament that he never got to experience shop classes in high school was a powerful moment for me during the research, as my wife and I both had the same experiences in our own high school education; we both currently define ourselves as makers, and we both have reflected on the clear message we heard: hands-on, "shop" classes are not for the college bound student. In my own experience, I never got to experience a hands-on class, such as woodworking, in high school, and have only the foggiest memories of a middle school woods and metals class.

There have been debates in the fields of technology and engineering education for decades (Petrina, 1998) about how the disciplines of technology and engineering are taught; what they include, what they exclude, and the politics of these decisions. With the new rise of STEM education, especially Integrative STEM education (in which the disciplines are taught in purposefully connected ways), there is great hope that students will be afforded these opportunities in the future (Sanders, 2012). Tyler, however, expresses concern over this direction, and identifies a critical aspect which may be missing:

Nowadays, there's this push toward STEM, which is great, but the same time they're pushing STEM, they're still cutting back on the arts and the music programs. I think that there's this divide between art and manufacturing that there shouldn't be, because if we just raise a bunch of manufacturers, we're going to have a bunch of people who manufacture things. We need to raise dreamers, creators that can actually use these tools. Maybe that's

what a maker is, is a person who can use tools and create, not just make. Maybe we should

be creators.

Tyler's hope that the arts will not be forgotten is the focus of the relatively new inclusion of

the "A" (for Arts) in the updated STEAM acronym (Daugherty, 2013). Much work has been

done, including by the author, to explore and implement what it looks like to add the arts to

STEM, and there is great promise in this approach.

<div align="center">Beyond STEM and STEAM to Making in the Classroom</div>

Even more specific to the concerns of the makers than either STEM or STEAM is the idea

of directly teaching and supporting making in the classroom. Martin (2015) suggests that making

in the classroom involves three critical aspects: digital tools, community infrastructure, and the

maker mindset. Although only some of the makers interviewed identified digital tools as

essential to the definition of being a maker, the community infrastructure (YouTube, etc) and

"maker mindset" (identified in this research as a tendency toward self-directed learning and

exploration) resonates strongly. Many of the makers suggested that future educational policy

included explicit education in problem solving, "learning how to learn", and student voice and

choice. Making in the classroom, and the maker mindset posited by Martin (2015), provides one

way to encourage this type of learning.

<div align="center">Raising Dreamers and Creators</div>

These conversations point to a number of topics for future or continued research. First, since

all these makers are adults between 33 and 43 years old, it is worth asking a number of questions.

How well do current K-12 educational practices promote or discourage the hands-on making of

things? What can be done in the future to encourage young makers? What does the current, and

future, educational pipeline into work and life as a maker look like? What does it mean to raise

dreamers and creators? These are the questions we must continue to ask ourselves as educators,

parents, and members of the maker community.

Afterword

I have been pressed hard by the amount of time and work required to do high-quality qualitative research for this project. However, I also discovered a beautiful analogy for this work.

As I mentioned in the introduction to this paper, I have been working on a project during the course of this research. Specifically, I built a new pedalboard for my guitar effects pedals. This project has been my sanity saver during my research work. During hours of grappling with research theory, transcribing interviews, and attempting to synthesize and put it altogether, it has been wonderful to go out to the workshop and spend an hour cutting or sanding a piece for the next step on this project as a way to clear my head or reflect, whether consciously or subconsciously, on the themes presented and the next step to take in the research.

The pedalboard is now done, and my research is done as well. However, I see them both living on. Just as I will add new pedals to my board, and use it in new creative musical endeavors, I see this research living on as well. I am firmly embedded in the maker community, and plan to only deepen those relationships and work to build that community. Having the insights I've gained during this research will serve to further that goal. I plan to investigate the possibility of submitting this for the Journal of Technology Education, the peer-reviewed journal for technology and engineering teachers, and I can imagine the possibility of using this as a starting point for my capstone project for my Master's degree as well.

Below is a photo of the finished pedalboard (Figure A). I think it is a beautiful analogy for the work in this project. Hours and hours of preparation went into both artifacts, and I am tremendously pleased with the results of them both.
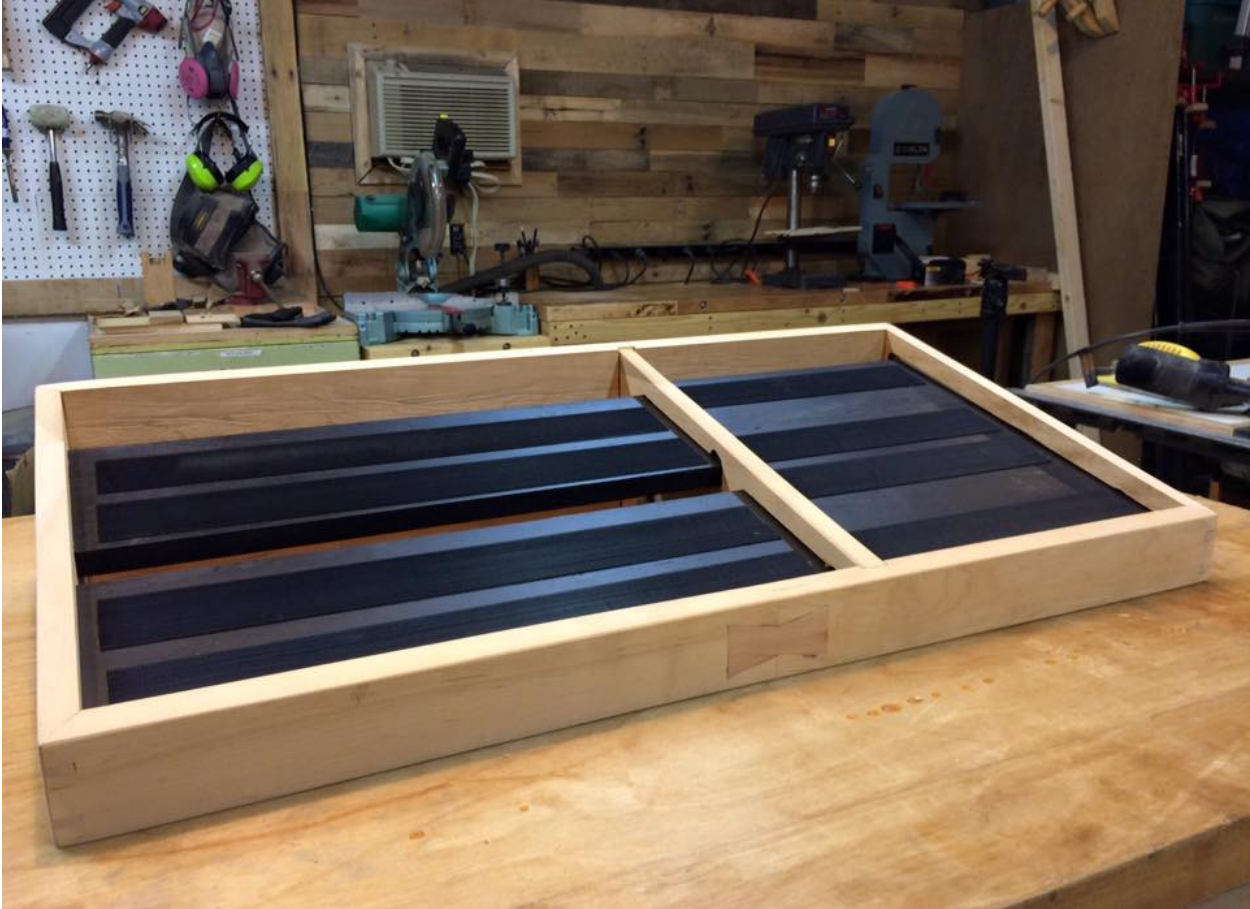
Figure A: The completed pedalboard project

References

Daugherty, M. (2013). The Prospect of an "A" in STEM Education. Journal of STEM Education,

14(2), 10-10. Retrieved December 15, 2015, from http://ojs.jstem.org/index.php?

journal=JSTEM&page=article&op=view&path[]=1744&path[]=1520

Martin, Lee (2015). The Promise of the Maker Movement for Education. *Journal of Pre-College

Engineering Education Research (J- PEER),* 5(1) doi:http://dx.doi.org/10.7771/2157-

9288.1099

Pera, R & Viglia, G (2015). Turning ideas into products: subjective well-being in co-creation.

The Service Industries Journal, 35:7-8, 388-402, DOI: 10.1080/02642069.2015.1015521

Petrina, S. (1998). Multidisciplinary Technology Education. *International Journal of

Technology and Design Education*, 103-138.

Sanders, M. E., (2012). Integrative stem education as best practice. In H. Middleton (Ed.),

Explorations of Best Practice in Technology, Design, & Engineering Education. Vol.2

(pp.103-117). Griffith Institute for Educational Research, Queensland, Australia. ISBN 978-

1-921760-95-2

Waller, M., & Fawcett, S. (2014). Click Here to Print a Maker Movement Supply Chain: How

Invention and Entrepreneurship Will Disrupt Supply Chain Design. *J Bus Logist Journal of

Business Logistics*, 35(2), 99-102.

APPENDIX A: Interview Questions

1. Could you tell me about your perceptions of what it means to be a maker? What is your definition of a "maker"?

2. How would you describe your experiences in K-12 education? How did that impact your current practice of making?

3. When did you first come to call yourself a maker?

4. Could you describe a class, teacher, or interaction from your K-12 schooling that impacted what you do (or who you are) today? Can you describe it for me?

5. How would you characterize the overall impact of your K-12 education on your practice of making?

6. How has your typical schedule changed over time? Why has it changed?

7. If you could change any educational policy in a way that would positively impact makers in your community, what would it be?

APPENDIX B: Makers & K-12 Education Informed Consent Agreement

Brief Information

I am a graduate student in the Educational Media & Technology Program at Eastern Michigan University. The final project for my course, EDPS 687: Qualitative/Interpretive Research is an interview-based qualitative research study in which I explore the interaction between K-12 education and adults who define themselves as "makers". The Study involves one audio-taped or video-taped interview of approximately one hour in which I will ask you questions about your perceptions of the effects of your K-12 schooling on your experience as a maker. With your agreement, I may request to meet with you for a second short follow-up interview for further clarification. Participation in the study is completely voluntary and you will be assured of complete confidentiality if you choose to participate.

Benefits of the Project

This research project will provide me and the students in the course with opportunities to develop our research skills and reflect on our own learning through the interview process. The benefits to you as participant may be an opportunity to reflect on your experiences in K-12 education and making as you describe them in the interview process. There are no foreseeable risks to participating in the project.

Dissemination of Results

Findings from the research project will be shared with my professor and peers at Eastern Michigan University, as part of the requirements of the course; and if you would like to see the final report, a copy will be sent to you as well. The findings may be written up for presentation at the Graduate Research Fair at Eastern Michigan University, or used in later professional

presentations at Conferences or submitted for publication. Any dissemination of findings will be anonymous and complete confidentiality will be ensured

      If you would like to participate in the research study, please read and sign the consent form on the following page:

Appendix C: Makers and K-12 Education Consent Form

I agree to participate in one or more interviews conducted by Bill Van Loo as part of a research study about K-12 education and making. I understand that the interview(s) will last approximately 60 minutes and that the interview(s) will focus on my perceptions and experiences of my history with K-12 education and its effects on my practices of making. I will be asked questions about my past educational experiences and any other issues that I would like to discuss about my current practice of making things.

I understand that my participation in the interview(s) is completely voluntary; that I may choose not to answer certain questions, and that I may withdraw and discontinue participation at **any** time if I choose to do so. I further understand that my confidentiality will be protected at all times and that a fictitious name will be assigned to me after the interviews are completed, and that any identifying characteristics about me or insert my family here or name of organization, workplace etc as relevant will be deleted. The transcripts of the tapes will be assigned a numerical code and kept in a locked filing cabinet in the author's home and in a password protected computer file. I further understand that if I decide at any point after the interview that I do not wish to participate, my tapes and transcripts will be destroyed and no material will be used from the interviews.

I agree to allow anonymous research findings from my interview(s) to be included in Eastern Michigan University presentations and/or disseminated in future publications, conferences, and professional settings.

Interview Respondent's Name:

_____

Signature: _____ Date: _____

For further questions or concerns, please contact: William Van Loo

602 E. Forest Avenue Ypsilanti, MI 48198 Tel: (734) 652-6883 wvanloo@emich.edu

OR contact the Course Professor Dr. Joe Bishop

Teacher Education Department 314S Porter, College of Education Eastern Michigan

University Ypsilanti MI 48197 Tel: (734) 487-3185 joe.bishop@emich.edu

This research protocol and informed consent document has been reviewed and approved by the Eastern Michigan University COE Human Subjects Review Committee. If you have questions about the approval process, please contact Dr. Beth Kubitskey (734.487.0042, Administrative Chairperson of the COEHSRC, mkubitske1@emich.edu).

Appendix D: Online Links

Online Interview Request Video

https://www.youtube.com/watch?v=x2JCWnrB_cI

Bill Van Loo – YouTube Channel

https://www.youtube.com/billvanloo

Appendix E: Transcription of "Tyler" Interview

Tyler: A maker is someone who makes things. It's a pretty simple (laughs) term, and it's very open-ended like that. Again, my definition, obviously. A maker makes things, and I don't care if it's umm, you know, if you're sewing, or you're making with wood, or you're mixing media, umm, I think where people get a little, uhhh, labels, y'know, people want to put labels on stuff, like a cook is a maker, but there's another word for that, we can call them a cook, y'know? And like a seamstress is a maker, but there's another word for that - they can sew. So I think that sort of in the more broader 2015 sense of it, a maker is one of these people that doesn't specialize in one media or the other, and you'll even, I'll even see in like the make group that we're both members of now, a lot of times these guys will post pictures of dinner, because that's just the way they're thinking, is like they're taking raw materials and they're making them into something else. Doesn't matter what they are. So yeah, making is become this, y'know, sorta trendy word for that, but yeah, it encapsulates a lot of just anything being made, y'know?

Bill: OK. So, umm, one thing that you mentioned in your definition there is this idea of maybe working across different media and that it's not tied to any one specific media. And you also talked a little bit about the idea that it could be an umbrella term that encompasses other things. So in your perspective, what would be some other things that fall under that umbrella term? You mentioned cooking, and working with wood…what are some other things that you might see that fall under that umbrella?

Tyler: Machinists, people that are doing that sort of high-end, uhh, very detailed type of work, as well as metalworkers and fabricators. Y'know, I wouldn't consider, like, a plumber a maker

necessarily, but maybe I should because they're, you know, maybe like the new construction

plumber is the maker, the one that's actually laying the pipe out, but then there's the other, the

plumber that goes in and repairs them is not really making at the time, and I think that that,

y'know, it is, cuz it does imply working with your hands a lot, there might be some grey areas

like that, like I'm a maker, but if someone asks me to repair a table, I'm not making it at the

time, but I'm still a maker. Yeah, and then there's this world of digital making as well, that some

people, y'know, don't necessarily…and I might even be of that mindset a little bit, y'know, of

like, "ahh, well, they hit 'Print'" y'know, but they're still making stuff because they're doing the

making in a different way. And uhh, y'know, in this day and age we need to understand that

that's still making, too. So, computer making is just as much creating if you're actually making

something tangible, even if it's not tangible, even if you're just making video content, I guess

you're kind of…making. I never really thought about it this deep. (laughs). I'm just thinking out

loud, you know?

Bill: No, that's perfect. That's great. So I want to kind of keep digging on that for a second.

When did you first come to call yourself a maker?

Tyler: Uhh, I did not. Other people called me a maker first. I used the word "make", I guess, but

umm, y'know, I was a tinkerer, I was a builder…"maker" is an easier word to use to describe

what I do, cause I don't like being called a woodworker, and I work with other media. I work

with wood probably primarily, but I still don't consider myself a woodworker, so "maker" does

fit better. I always just say "I make stuff", or it's kind of like, y'know, I would use the word

"make" and I never really used it like that, "maker", until, it sort of started going around, and

people are like, "well, yeah, you're a maker", and I was like, "uhh, I guess I am", so I went with that.

Bill: OK. About how long ago would you say you noticed that trend starting to happen?

Tyler: Well, I've only been making stuff professionally for about 6 years. It was always just tinkering, I was a tinkerer before I was a maker, and I'm probably still more of a tinkerer than a maker, but uhh, so, it was very shortly after that, probably like 2010-ish, 2011, is when I was still just working with wood, but then I was like, incorporating light bulbs or whatever, and people would say, "oh, you're a maker". I prefer, as you know me, but I prefer to call myself an upcyclist.

Bill: Sure, OK. Lemme hone in on a couple of those things for a second, then. So you mentioned that you prefer not to describe yourself as a woodworker specifically.

Tyler: Mmm-hmm.

Bill: Can you explain why that is?

Tyler: Well, I think that…I think if you say, and that's maybe why "maker" is such a popular term, if you say "woodworker", I think we get an image of someone that I don't think I, well, I guess I am wearing a plaid shirt, and I have a beard, and I live in New England, so I guess I do fit that image exactly (laughs), here it is…

Bill: the requisite plaid shirt

Tyler: Y'know, but I don't, my grandfather was a carpenter, and he was a woodworker, like he was a guy, like I felt like he knew things like "quarter-sawn", "cross-cut", like all these words that I mean, of course I know what they mean, but I don't feel like I have that reverence. I don't think I've earned that title yet. Now, Izzy Swan, I said this to him, and he was like, "you ever gotten picked up a hammer and gotten paid for it? He's like, "you're a woodworker". That's his attitude. And I respect that, but I give that term a reverence. I feel like there's, I don't think I'm patient enough to be a woodworker, I think it's this, I think it's something that's larger than I am. Like, I think "maker", even though "maker" is a larger term, when you get, "woodworker" is more like a specialist inside that term that I don't consider myself special enough to be.

Bill: OK.

Tyler: (laughs)

Bill: It sounds like it's the specialization part?

Tyler: Yes. Yeah, that's a good way to put it. Like, I don't think I have enough knowledge and enough skill. I mean, I make stuff out of wood, but I don't think I'm a woodworker, I don't think I have that…I don't think I've been doing it long enough.

Bill: OK. So, I'm curious…could you describe a class or a teacher or an interaction from your K-12 experience that impacted you or what you do in some way today?

Tyler: I do have positive experiences from my public education, and one of the most positive influences in my life was from my high school art teacher, who, she gave us a still life painting to do. Cuz it was all art and music for me, that was my solace in school , cuz that was the wing down at the end of the hall. Of course, there's down in the basement, there was the shop wing, right below the art & music stuff where all the shop stuff was. I never got to go there though, because I was "college bound" because of my scores in previous, I never got to go down there and do all that cool stuff. I feel like they ripped me off from that opportunity. Y'know, they never let me go and use the lathe, man, I'm still mad about it. But my art teacher gave us a still life, set up a still life, and said, "OK, you can paint all of it, or just a little piece of it, whatever, this and that. You have X amount of days, and you can use black, white, and one other color". So of course, I said, "well, I want to use more than one color, there's like a million colors in this thing, how do you expect me to be creative with only one other color?" And she said, "that's just the thing, you have to be more creative". And that really resonated with me. I was thinking about limitations. I've lived my whole life to date with limitations, we all do. I've probably had more financial limitations than a lot, at some points in my life, as a musician for a living. Maybe I shouldn't say a lot, but a lot of Americans. Obviously I've always had first-world problems, not third-world problems. And I've always used these limitations to give me an opportunity to really strive and do something special. I try to make something special out of it. And I learned it from my high school art teacher. Mrs. Hannah was her name.

And the other thing I learned from her was, that very painting I did…actually, it might have been a different painting cuz I think it had more than one color in it. But I remember her taking this painting I did, it was a still life, apples on the bowl or whatever, and for whatever reason I had done this dark purple band across the top of it. And she looked at the painting, and she's like, "phhhhhh", and she flipped it upside down, and she said, "oh, now I like it."

Bill: You talked about the woodshop and metal shop being downstairs from the music room. During that time, was that something that you consciously knew you wanted to do, or was it never laid out as an option?

Tyler: It was never really laid out as an option, and I didn't know I wanted to do it. The way my school was set up, there were the college-bound kids, and the kids that weren't going to college. This was the late '80s, I graduated in '91.

Tyler: So it just wasn't an option. I remember going down there once, my whole 4 years in that school, I went down there once.

Nowadays, there's this push toward STEM, which is great, but the same time they're pushing STEM, they're still cutting back on the arts and the music programs. I think that there's this divide between art and manufacturing that there shouldn't be, because if we just raise a bunch of manufacturers, we're going to have a bunch of people who manufacture things. We need to raise dreamers, creators that can actually use these tools. Maybe that's what a maker is, is a person who can use tools and create, not just make. Maybe we should be creators.

Appendix F: Transcriptions of "Bryan" Interview

Bryan: So, my school years were right up through my junior year of high school was all in-home schooling, and I did sports and things like that at the local high school and junior high, but I was schooled at home.

Bill: OK

Bryan: Spent a lot of time with my mom and sisters. So, it's a little bit different, although I do have a, my high school diploma is from the local high school, I never actually attended a class there.

Bill: OK, OK. Well, cool. Thank you for clarifying that. I'm sure we'll dive much more into that over the course of the interview.

Bryan: Didn't know if that disqualified me or not.

Bill: No, no, I don't think so at all. So, I want to start with some questions about you as a maker. So, the call that I put out was for people that define themselves as a maker. And so the first question I want to ask is, can you tell me what your perception is of what it means to be a maker?

Bryan: My perception of that title is…I dunno, I'm a little skeptical of someone who calls them, y'know, the title "maker" is so broad, and so generalized, that, y'know, the people that call themselves makers nowadays, now that the Make Magazine, Maker Faire, Mini Maker Faire, all

of these kind of commercialized events have popped up over the last 5-10 years, umm, I feel like it's a little more commercialized than it used to be. Personally, I spent my elementary school and junior high years making things, you know? Making little go-karts out of wood, and making little, building a fort. Building a fort out of pallets and wood that was free behind the hardware store. And that's how I got started being a maker, and I never would have categorized myself as, y'know, a "maker". I would have categorized myself as a woodworker, or a "sticking lumber together engineer", so….I am, I'm a little skeptical of the word "maker" when it comes to someone calling themself a seamstress, or someone calling themselves a luthier, someone who calls themself, I dunno, some other specialized industry, those people are the real makers in my mind.

Bill: OK. So, when I put out the call the call for people that define themselves as makers, what would be your definition of somebody who is a maker? You mentioned a couple of different, various crafts, or trades, if you want to call them that, that you would think about, maybe, as what you defined as "true makers". What would your definition of a maker be?

Bryan: Obviously, it's anyone who makes things for their own personal pleasure, or y'know, as a hobby, or somebody who actually makes things professionally. You know, it's, I would say it's a maker of things.

Bill: OK. Great. When, I know you said you would hesitate to call yourself a maker, or at least that maybe that's not something you would call yourself right away. At what point, if it all, did you first come to think of yourself or to call yourself a maker?

Bryan: Well…(pause)…I spent the last 10 years of my life in construction, and now I've moved from construction to an industry where I build things with my hands every day. So, I've been a maker, like I mentioned before, since I was very young. I've literally been making things, been building things with my hands, my entire life. But over the last 10 years I've slid back and forth between being somebody who builds things on a grand scale, I was literally building skyscrapers and sports arenas, to I've gone completely in the opposite direction, to be someone who builds things that are very, very small. I build computer components now. So I've slid the complete other direction, from building giant buildings to building very small computer components. Right now, I build controllers for CNC machines, so, that's my day job. And I take parts and pieces and put them exactly where they need to be in a box all day long. So I'm literally making things that make things. So, if you want to take it that way, I'm a maker of makers at this point.

Bill: OK. And are you in your shop right now, it looks like?

Bryan: I'm in my personal woodshop right now. I have a table saw, and a CNC machine, and a few other things in here, my bandsaw's in here. I just put up these walls just the other day, but I still don't have doors, so, it's December and I'm outside, so it's pretty cold out here.

Bill: I understand, my own shop is unheated, uninsulated. At least it has walls at least, I guess.

Bill: So, talking about work, that actually is a really nice lead-in to one of the questions I wanted to ask. How has your typical schedule changed over time? Like, what does a typical day look like for you now, and maybe how would that have changed over time for you?

Bryan: So, my schedule when I was in construction was very structured. When you're in commercial construction, in Washington state we have labor unions, and I was a journeyman laborer, so my typical day would start at 7:00 and end at 3:30 with a half-hour lunch break at noon. And, y'know, just doing construction stuff, one day I'd be pouring concrete, the next day, or the next job I'd be vacuuming floors, so it would vary from day to day, and anymore, ahh, y'know, I kinda roll in around 8:00 and, y'know, read some emails, respond to some emails, and then I kinda get started some time around 9:00, y'know? it's, the structure has definitely changed to a much more fluid dynamic in my workspace. I have one employee who works directly for me doing some assembly jobs, and we eat lunch, y'know, whenever, so the schedule (laughs), the schedule for building things gets really busy right before the holidays, and it gets really busy right at the beginning of spring, when people are kind of, y'know, they get that tax return and they wanna go blow it on a CNC machine. So there are times when I'm very busy, but for the most part, I'm salaried now, so if I'm working 8 hours, I'm putting a long day in. (laughs) I kinda like it, if you haven't noticed. The keg in the fridge doesn't hurt things one bit.

Bill: So, I want to start to draw that connection a little bit into education. So you said you were home-schooled, K-12. And this is a pretty broad question, but how would you describe your experience in K-12 education?

Bryan: My experience overall was…I'd say, consistently inconsistent. When you have a teacher like I did. My mother has a Master's in education, she taught public school for several years before she decided to take my sisters and I and bring 'em home and do the homeschooling thing. She has, my mom, she has her specialities, she's an English teacher through and through, and she instilled that in me, and she instilled a love for literature, and writing and reading, and I'm very good at those things. But she doesn't like math so much, and that translated directly.

Bryan: Junior high, you know, when I was 12, 13, 14 years old, before I had a car, I had a lot of time on my hands. I would get done with my schoolwork around 10:00AM, and my friends who went to public school wouldn't get home until 2:30, 3:00, so I had time to get into trouble, and time to do whatever I wanted to do that day, and for the most part, since I did have 100 acres of woods out behind my house, I was out there building stuff. I had several projects going on at any given time, so I'd say that the time I was given, free time that I was given, really impacted my learning how to use tools, learning how to hurt myself with tools, and learning how not to hurt myself with tools.

Bill: Well, I want to dive into that a little bit, then, that's really interesting. When you were talking about those free time projects you had, were those things you came up with on your own, or were they things that your teachers, or your parents suggested, or knew what you were doing?

Bryan: Well, I'd say, a big turning point, or a root project that really got me into wanting to learn to create things on my own and do projects on my own was my grandfather retired in 1990, and he spent a lot of time at our house building things. And he built raised garden beds, he built a

play structure, he came over and helped my dad build a shed, and because I was homeschooled, and he was retired, I was there, and he was there. He's a retired Boeing engineer, you know, Boeing is up here in the Northwest, he retired in 1990, so he got into Boeing a long time ago, and was, he was a mechanical engineer, so that mechanical engineer who also like to do woodworking was a huge trigger for me. Because I was there, I was home, and I would finish up my schoolwork as quickly as possible so I could get out and work on the garden or work on the play structure or work on the shed with my grandpa. So there's my huge trigger right there. And then, when he wasn't around, I was stealing all his scrap lumber and his sawhorses, and I was taking them out in the woods, and building forts and structures, nailing ladders to trees just so I could climb up and see what's going on, you know, goofy kid Bryanff like that, and that goofy kid stuffff turned into, I always wanted to be a carpenter, and when I found out how much carpenters make, I always wanted to be a structural engineer (laughs), so because of my math grades I never got to be a structural engineer or an architect, but it just instilled a love of making things, mostly out of wood and sometimes metal.

Bill: Were there classes or programs that you see that specifically connected to what you find yourself doing now?

Bryan: I'd say no. For a brief period, when I was choosing my classes my senior year, I thought I was going to be a music major ….

I can't really say that any class I ever took, any real structured class that I took, gave me any insight into the industry that I find myself in. It was all self-taught. All of the skills that I have built over the last 15 years have all been self-taught.

Bill: If you could change any educational policy in a way that would positively impact the community of people who call themselves makers?

Bryan: If I could change an educational policy…is it still true that the kids who are put in shop class are considered to be the, the lesser achievers? This is something that I've heard about the public school system that I never got to experience because I never took shop class. I don't know about that, I don't have a whole lot of insight into the classes that are offered to the most influential age, being junior high and high school, so I really don't have a good answer to that. I would love to see more mechanical engineers come out of high schools instead of IT people, because for what I see here in the Pacific Northwest, obviously we have Amazon and Microsoft, and that's where all the money is, and I see a lot of parents pushing their children into computers. And I have no problem with it, but I also want to see more people like me, who just have a love of making things with their hands. When I build a table, or I build a mantle…I built a mantle for a guy 3, 4 months ago now, and his kids were just staring at me like I was an alien. I got out my Rotozip and made a little pocket for a bolt that sticking out of the wall, and it was like, y'know, I just created fire for the first time. It was the most amazing thing in the world for them to see someone making something. It's kind of disappointing when people don't even think about the way things are made, let alone who made them.

Appendix G: Transcriptions of "Robert" Interview

Bill: I want to start by focusing on this idea of being a maker. So my first question in, can you tell me about your perception of what it means to be a maker?

Robert: (laughs) I'll say I'm not 100% comfortable with the new term "maker". Maybe that's a generational thing, and I'm not, I mean I'm only 34, so I'm not old necessarily, but I feel like that term came along more recently, so I mean, I like to make things with my hands, I like to be creative in various ways, so I think the term "maker" fits me, but I don't know that I'm totally comfortable with that word itself yet, if that makes any sense.

Bill: OK

Robert: I guess, what a maker is, in my mind, it's sombody who like to create things, physical things with their hands, whether that manifests itself as, y'know, woodworking, metalworking, model building, whatever else comes along, I suppose. So that's sort of the general term as I understand it.

Bill: OK. When you're talking about it, you said that you don't necessarily apply that term to yourself, or that you're not necessarily comfortable with that term. Can you tell me a little bit more about what you mean?

Robert: I dunno, it's probably just because, for me, that term hasn't been around very long, so it's like, that's a new label that I don't feel like I've totally absorbed yet….umm…I just, y'know,

I…without sounding too cliched, it almost feels like it's a little bit hipster of a term, not that it's a bad thing or anything, it's just like, "OK, I'm a maker", and I get that, I don't really know how to articulate it much better than that, to be honest with you, but it's…yeah. (laughs).

Bill: OK, that's fine. Having said that, what would be some words that you use to define yourself, or to talk about yourself?

Robert: uhh…mmm….(pause)….I think, you know, I'd may go more along the lines of, hobbyist, or craftsperson, craftsman, although I think craftsman is probably a little bit elevated for some of the stuff I do. I feel like I just like to try out lots of things. Handyman, do-it-yourselfer…uhh…and then, and I realize a lot of that stuff sort of lumps into "maker", but ehh… so, I'd say some of those terms would probably fit.

Bill: OK. When did you first come to call yourself a maker, or a craftsperson, or a DIY-er, or any of those words you used to kind of draw out what your definition is? When did you first start to view yourself in that way?

Robert: I would say probably during college, I would say I started identifying with that, because going through middle school and high school, and I was making things at home, or making things for school projects, but it was always directed by my schooling, or my parents, per se. I think once I got into college I started taking those skills and things that I'd gained over the years and was starting to do things on my own, so some more self-directed making. That's…y'know, I wasn't doing projects because I had to, or someone else suggested it, it was more, now I'm

coming up with this stuff on my own, now I can sort of self-identify with this sort of thing. I'd

say it was about during the middle of my college years I…my big project that sort of popped into

my head when you asked me that question was I'd taken an electronics project that I'd made, and

modified, and developed it into a circuit board and a kit that I made and sold. So that was my sort

of big undertaking that in my mind sort of identifies, "OK, I did this big complicated project,

created something of my own free will", and I think from then on, I consider myself a maker and

a do-it-yourselfer and that sort of only built upon itself in the years after that, especially once I

got a house, and there's projects involved there, and on from there.

Bill: About how old were you when you had that experience?

Robert: Yeah, I'd say I probably would have been age 20, I suppose?

Bill: So when you were talking about each one of those, you mentioned learning new skills.

What were some ways you learned new skills as you were working on those projects?

Robert: Through the wonderful resource of the Internet (laughs). Yeah, I think once I really

started tackling projects on my own, it was, starting back in my college years, like I mentioned,

the Internet was becoming more widely available, that would have been just in the early 2000s, I

suppose. And now, YouTube is a huge resource for me these days, even if I'm, I may not be

making something, but I may need to do a repair on our vehicle or something, i can learn a lot

that way and of course there's blogs, and other how-to sites, and just anything else I can turn up

through Google, that's my primary source of information for most things, and I think that's just

an attitude that I, that really resonates with me. I always want to be able to learn something new. In my day job, I develop software and I have a subscription to an online, screencast based learning for all things software development, or at least the stuff I work on , so I regularly find myself going in there and trying to pick up some new skill in my professional life as well. I've just always enjoyed learning something new.

Robert: In high school, I'm pretty sure it would have been my senior year, I had actually started out, I was gonna take this class that was on, it was like a web development class…

There was another course that I decided to take which was, I suppose you could kind of describe it like an independent study, but it was in shop, in metal shop, and at the time it was called the Tech Challenge. It was a somewhat local, regional competition, I think it was sponsored by 3M at the time, where high school teams would compete. So we had to, each year they would publish this challenge: "OK, you have to build a device or a machine that does X". And so throughout your semester you build this machine, and bring it to the competition and present it, the machine and your design process and everything that went into it to do that. So it was just a fascinating experience. So we had to build a machine that would take a set of wood blocks of different dimensions, and they had given us a present order, that you get this block, this block ,this block, and you had to package them into 3 different packages, according to their size.

So we had, me and my team, we had come up with this whole method of taking these wood blocks, and sending them down through a hopper. We had access to lots of stuff to build with, so

we had pneumatic cyclinders, it was mostly pneumatics, PLCs to control it, and, you know, all

the welding equipment and we had a laser engraver that I had gotten to be sort of the local expert

on. So we were cutting plexiglas on the laser to make all these enclosures and parts for this thing.

So in the end we had built a machine that we had sort of had to figure all this out along the way.

So it was just an intense semester of really interesting problem-solving and doing it with cool

toys. That was an awesome experience, and had a great shop teacher that I worked with on that

project, and I think, so that really positive experience is a large part of what pushed me into the

engineering program that I went to college for. Of course, I went to school for engineering and

now I'm working in software, but it is all tied together. At any rate, that was sort of my highlight

of my senior year.

Appendix H: Transcriptions of "Patrick" Interview

Bill: My first question is, can you tell me your perception of what it means to be a maker?

Patrick: It's pretty interesting, because I think it always existed, it just recently had a label applied to it.

Bill: OK

Patrick: It's kinda weird like that. Making things, and tinkering, and hacking - those are all typically what what would've been maker things, just suddenly, people applied this new name to it, so it's all trendy now. But it's always existed. That's my perception of it, at this point. It's something that always existed, but seems to have resurged in pop culture just because it has this new trendy label on it.

Bill: OK. Can you tell me what your personal definition of a maker is?

Patrick: I guess anybody that has an idea in their mind of something they wanna make or something they want to exist physically, and they take that perception in their mind and they actually transform it into something in real life. That's…nice and broad.

Bill: What would be some pieces that make up that definition? What are some of the things that in your definition would fall under that category of being a maker?

Patrick: Like categories of making, or makers? Is that what you're getting at?

Bill: Yeah, so you said that anybody who takes an idea, and makes it into something real. What would be some examples of that for you?

Patrick: Well, for me personally, I guess it's woodworker, but y'know, metalworker, carpenter, mason, sculptor, painter…anyone, photographer…let's see, what else we got…I'm drawing blanks now. I guess fabricator? Someone doing electronics….umm, let's see…I dunno, there's a lot of 'em, pretty much any medium you could possibly think of. A glassblower would be a maker, umm… I dunno, anything like that, I guess.

Bill: On a related note, would you define yourself as a maker?

Patrick: I think I fit under that umbrella.

Bill: OK. When would you say you first came to call yourself a maker?

Patrick: I came to call myself a maker when people started using that word (laughs), so I dunno, like a year ago, year-and-a-half ago, few years ago? (laughs). That's when I first started hearing that term, but as far as what I define maker as, I've always been someone who likes to make things, or make things happen in reality that are just in my mind. And the medium has changed over the years, but I think the desire and the core of it hasn't, for me, over the years.

Bill: OK. You said that the medium has changed over the years. Can you give me some more information about that?

Patrick: Sure. So, before I did woodworking, I was into photography and electronics…before that, I mean I was out building tree houses and forts when I was a kid, you know, stuff like that. So I've always had that desire, I mean I had Legos and K'nex as a kid, so it's not like I just woke up one day, I had never made anything with my hands before, it was always, it's always been something I wanted to do, or I had a desire to go out and do in my free time, I guess.

Bill: OK. What are some things that you've made that you're proud of?

Patrick: Probably the bigger things, usually, cuz they take the most time and they're the most impressive. Probably my patio, that was easily the physical undertaking as far as hours spent and weight of things installed. And then my secretary desk that I did. Those are kind of my bigger, I guess my biggest things these days. They're my more prouder things at this point.

Bill: How did you learn what you needed to know in order to make something like the secretary desk?

Patrick: I read some books, I watched some videos, and they kind of got me going in the right track, and then I got out to the shop and figured out the fine details to make it come together and happen I guess, on the job so to speak.

Bill: Is that typically how you learn new skills?

Patrick: Yes

Bill: That combination of things?

Patrick: Yeah. All the useful things in life I've self-taught myself.

Appendix I: Transcriptions of "James" Interview

Bill: I want to start off with finding out some things about the maker side of things for you. So, my first question is, can you tell me about your perceptions of what it means to be a maker?

James: That's an interesting question. So, to me, I think a maker's kind of a broad topic. A lot of people…kind of equate that to people who are hand-crafting, the hand-crafting movement, Etsy, Amazon Handcrafted, you know, people things, selling things on Craigslist, anybody who's making things for sale. I think there's also another perception where it's people who are making things for anything, making gifts for other people, stuff for their homes…I see an actual broader scope of it. I was thinking about this a little earlier, I expected you to ask me when I started considering myself a maker. I love to cook, I think people who do anything with their hands, who take raw materials of any sort and turn it into any sort of crafted item is a maker, in some sense. So that can be anything from woodworking to food, or even intangible things like programming, digital media, digital artistry, and even music, to a certain extent.

Anything from, I think more a traditional thought is woodworking, metalworking, something like that. Handcrafted jewelry, those are the more traditional things. But you can go further into saying, like I was saying, I love to cook, I think people who do cook are makers in that same respect, all the way to doing more intangible things, programming, artistry, is definitely a form of making. And musicians, composing is of a different sort, it's more an emotional link.

Bill: OK. So if you could boil down your definition of what a maker is, or even expand it, what would your definition of a maker be?

James: I guess I would boil it down to, somebody who takes raw materials and turns it into something else that it was not before. Somebody who takes the parts and makes it into something that is more than the sum of just those parts.

Bill: Ok, great, thank you. And I think you kind of alluded to this a minute ago, but when would you, when did you first come to call yourself a maker?

James: Um…(pause)…actually using the term, I would say, fairly recently. Just because it…I wouldn't even say it was necessarily in my vocabulary more than a couple years ago, but now that I do consider myself a maker, like I said, I love to cook, I've been cooking since I was a teenager, now I would say that I was a maker back when I was a teenager. Actually using that term "maker", probably within the past 2 years.

Bill: OK. I think we'll probably go into this, but can you tell me more about what you mean when you say, looking back on it you would consider yourself a maker when you were a teenager?

James: Well, like I said, I've always loved to cook, that was the first thing I would really say that I crafted. When I was younger, I started cooking for myself and for my family on occasions, or if I was the only person home, I'd cook something, anything from fried eggs, hot dog, I remember from a very young age being allowed to cook some simple things from myself. But I started looking up recipes and finding creative things to make and to even alter those recipes

themselves, probably when I was around 14 or so. Like I said, at the time, that wasn't really the term I would use, but now, looking back to it, I use some of the same techniques that I did then in making food when I'm crafting anything. The bench that you can see in my background, I just finished building that, and that came from taking workbench plans, and videos that I saw on YouTube, and using that as a basis to make something that was just my own.

Bill: OK. So, what forms of making do you engage in now? I know you said cooking, and then obviously you made your workbench, so can you give me a sense of what forms of making you engage in now?

James: So, cooking, like you said, woodworking. I'm trying to do some metalworking, I just don't have a good facility for it right now. It's mostly a woodshop, and wood, and torches, and sparks don't go too well together. I have a 3D printer, which is fairly new to me, it's, I've had it for about 8 months now, so I'm going into not only printing, but also the digital artistry part of that, which is something I got exposed to in high school. Modeling, sculpting, I'm trying to do some electronics work, small electronics, everything from making some simple circuits to working with Arduinos and Raspberry Pi. So, I'm kind of…I'm either unfocused, or just try to spread things out, I have many focuses.

Bill: OK. And this is a pretty broad question, but how would you describe your experiences in K-12 education?

James: They were mostly pretty good. It's a fairly large school district. It was, at the time, I want to say the second-largest school district in Pennsylvania. I was part of a graduating class, when I graduated high school, I want to say it was 1300 people. So it was quite large. The nice thing about that is that there were always a lot of different opportunities presented, there were groups for everything. Particularly as you got into middle school and to a greater extent to high school. There were groups for everything. What I was experiencing as I was going through particularly middle school and high school was the shutdown of the arts programs. And actually to a lesser extent I think it's growing now is the shutdown of the technical programs, the woodshop, the mechanic's shops. When I was in high school, there was an automotive shop 5 years before I got into high school, but it was gone by the time I was there, they were shutting down those programs.

Bill: OK. So you said you would characterize it overall as a positive experience?

James: Yeah

Bill: And maybe this connects to some of the things you were just talking about, but how would you say that your K-12 experience impacted your current practice of making things?

James: I definitely got some of the foundation in a lot of things. It's where I learned the digital modeling that I've been using just recently. I was doing some 3D modeling when I was in high school. I was part of the AV crew, I was given access to some applications, and didn't really do anything substantial, just kind of played with it, but got to get some 3D relations. I was exposed,

I did have one graphic design course, which was an Illustrator/Photoshop class. So it gave me the ground work that I was able to have of those digital arts. As far as the other things that I've been working on, I've never really had any education on the electronics side, which is something I'm now personally studying. 3D printing obviously existed at the time, but wasn't publicly available. The woodworking I all got out of personal experience. I never had a woodshop in school, in high school. I had one class, it was called "Energy, Power, Transportation", which was almost like a physic in practice course. It was a shop course, but each one was a, the course was a series of projects to build a different kind of vehicle. So, one thing that we did was a wind-powered hovercraft, which was just ceramic magnets which went on a track, did a boat, did a mousetrap-powered car, did a CO_2 car, so it was kind of an engineering, I guess it was more of an engineering, I guess it was more of a engineering, a practical engineering course where you were designing. That would be probably , as far as making goes, in the traditional course, that's probably where I had the most education in there. I got expose to some of the tools that I use - bandsaw, drill press, belt sanders - but I had used them before. My grandfather had a woodshop, and I'd used them, like I said, that was my real first exposure, education, how to do more of the woodworking stuff.

Bill: Oh, OK, tell me more about that.

James: So, umm, it was…so, my grandfather had a small shop in his basement. It was probably about the size of the office that I'm in, like 12 by 20, something like that. He had…I remember the bandsaw, the drill press, he had a belt sander in there, had a radial arm saw which I remember him using with quite confidence, and now knowing what I know about radial arm saws I'm

now…terrified that I'm going to find that in the garage and feel obligated to use that…and

somewhat excited because it is good for certain things…and a workbench. I remember, I spent

some time as a child in there, early adolescence, probably up til I was 12, just doing small things

with him. I think I remember doing, I was a Cub Scout, I think at one point I built a Pinewood

Derby car in his shop. Mostly I did that with my father in our garage, which is closer to what I'm

doing now, is just piecing things together. My grandfather had a much more organized

woodshop. Unfortunately, when I was 12 or 13, he had a quadruple bypass that his sternum

never healed from, and he really stopped doing much of the woodwork after that, so the more

formative years that I could have really learned a lot from him, I didn't really get that exposure

from him, but I still take a lot of inspiration from what he did from that. (pause). I kind of trailed

off there, I'm sorry.

Bill: No, no, I totally understand, I actually have a really similar experience with my

grandfather, I totally get that. When you were talking about your high school experience, one of

the things that you said was that were lots of different options available in your high school

because of the size of the school. Can you tell me what some of those options were? I think you

said that there was an automotive shop that closed before you got there, but there were the digital

arts programs…

James: Yeah, so, as far as courses you could take, there were a lot of options for afterschool

activities, extra-curriculars, different groups. I remember a lot of social groups, I wasn't really

involved with them, I'm a geek, I told you, I'm an IT guy. …As far as courses go, I'm trying to

remember back, it was the late 90s…we had a certain number of electives that we could do, we

had the core education - math, sciences, social sciences, and that sort of thing - there was a lot of music programs, I was involved with a number of those, that was what I was primarily focused on at the time. There was a lot of computer programs starting to bud at that time. I was in some programming courses. There were a number of arts courses, and there was some shop courses, but they seemed to be dwindling, from what I recall. Like I said, there was a car shop, I remember the band director talking about how the school ended the shop program. …

 Yeah, they were starting to dwindle down, it was partially funding, and partially a lack of interest. So if they didn't have enough students say that they wanted to take a course, they wouldn't do it, and that's sometimes, there was actually a course I wanted to take, it was an electronics course, and it was actually, I think I remember that it was basically computer hardward repair, basic electric engineering, that sort of thing. And that got cancelled, they had a full course, i got into it, and that got cancelled for some silly reason, I can't remember what it was. That's how I ended up getting thrown into the computer-generated art course, because my counselor just thought, "Oh, you tried a whole bunch of computer courses that were all programming, hardware, fixing, repair, building, that sort of thing - this is a computer course, you'll like it." I did end up enjoying, just a little upset about it at the time.