Markers of self-efficacy in making: evidence from youth interviews Lee Martin, Sagit Betser UC Davis



BUILDENGINEERTINKERADAPT





Overview

- Three sites
 - Public charter high school in Sacramento
 - Boys and Girls Club serving middle school aged youth in Sacramento
 - Title I Elementary school in Davis, serving 4, 5, and 6th graders.

Data from High School Site

- Brief end-of-session interviews (2-6 minutes)
- Data spanning 3 school years
- 40 distinct students, ~590 interviews
- Focus here on subset of 9 students
 - 2+ years of participation
 - 20+ interviews
- Yielded 235 interviews for analysis

High School Site

- 40 distinct students:
 - 2.5% Asian
 - 25% Black
 - 17.5% Latino/a
 - 35% White
 - 20% two or more races;
 - 47.5% girls, 47.5% boys, and 5% in another category

Interview

- Questions varied
- Always included:
 - What did you work on today?
 - Did you run into any sticking points?

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Analysis

- Broad interest in youth *agency* \rightarrow self-efficacy
 - An individual's belief in their ability to complete tasks in a given domain
- RQ: what are the forms of self-efficacy in making that students develop and express during their participation in a school-based makerspace, and how do these develop over time?

Analysis

Analysis is preliminary

Engaged in thematic coding process

- 1. Transcribed all interviews
- 2. Identified statements with a self-efficacy component
 - a) Explicit or implicit
 - b) Yielded 211 statements
- 3. Open coding \rightarrow 29 distinct codes
- 4. Consolidation \rightarrow 11 subcodes in 3 categories

Execution – 49%

Generate Ideas	4%	Because I asked for a smaller piece of acrylic than I actually needed I had to make changes here. I had to make slight changes in the design. I figured out how to do all that.
Help / Teach	4%	Mostly I helped my friend [Tim] with his project, the box drum. So I helped him cut out a box, like a rectangle with a laser cutter, and I added this cool design on there as well.
Overcome sticking point	9%	I'm ready for any challenge I have to keep trying even though if, like say when the computer was shutting down on me, I just didn't give up. Not give up when I have sticking points, but keep trying.
Multi-step plan	13%	My confidence level is pretty high. We've got a project going on, actually, we're in the process of just the very basics of creating a vacuform table, so we've started a base. We're attaching the legs very soon
Project task	9%	I think that's a pretty easy project for me to do because it's a box. I've done it before. So I think that'll be pretty quick.
Skill	9%	I guess the most challenging was working with Inkscape. It's sort of hard software to get used to so that was mostly a challenge but I feel like I got the basics down so far. I feel really good about that.

Execution – Overcome sticking points

Colin: Yeah so how confident are you feeling in terms of your ability to do that or to do stuff in general here?

S: Like on a scale of one through 10?

Colin: Sure.

S: An eight.

Colin: An eight? Cool. Why an eight?

S: I'm ready for any challenge that there's going to be, if there are any challenges. Well, there might be. I'm just confident that everything will turn out to be fine. I have to keep trying even though if, like say when the computer was shutting down on me I just didn't give up. Not give up when I have sticky points, but to keep trying.

Affect -20%

Identity / Excitement	10%	I really, really, really like electronics and I kind of want to get more people into it because not many people really know about it or know anything about it
Fear	4%	The soldering. Because I was really nervous to do that. I was super nervous and my hands were shaking and I thought I was going to do it wrong and have to buy a whole new strand of LED lights 'cause they were going (to connect to) each other.
Pride	6%	I'm most excited about how the hood looks a lot better I feel really proud though. It's my first cloak and it looks good.

Affect - Fear

Colin: Well, what about for the project over all, you know, for the past few weeks. What were some of the biggest sticking points?

S: The soldering. Because I was really nervous to do that.

Colin: The soldering?

S: I was super nervous and my hands were shaking and I thought I was going to do it wrong and have to buy a whole new strand of LED lights 'cause they were going (to connect to) each other.

Colin: And so how did you get around your nervousness and the shaking and all that?

S: I didn't. I just, I just went for it.

Learning – 30%

Improve existing skill	19%	When we were playing with the LED lights, and we were playing with the motors and everything. We were trying to connect all the cables, and it was super complicated in my head, but then I figured out how to do it, and I'm good at it now.
Learn something new	11%	I understood more about how laser cutting works because I really didn't know anything about it until today, until you were helping us and explaining the process of laser cutting.

Learning – Improve existing skill

Colin: Anything in particular that you feel like affected your confidence the most?

E: The LED lights. When we were playing with the LED lights, and we were playing with the motors and everything. We were trying to connect all the cables, and it was super complicated in my head, but then I figured out how to do it, and I'm good at it now.

Colin: And why do you think that affected your confidence?

E: Because now I know one specific thing that I really like that I really, like, learned well.

Next Steps

- Look at change over time
- Look for interrelations
 - E.g., is pride more strongly associated with learning, with overcoming obstacles, or in completing tasks?
- Expand to full dataset

Acknowledgements



Colin Dixon



Sagit Betser

Martin, L., & Dixon, C. D. (in press). A mobile workshop model for equitable making with high school aged youth. To appear in *Advances in Engineering Education*.

