Learning from What Doesn't Work:
The Power of Embracing a Prototyping Mindset

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Introduction

You can read all the books beforehand, but there is nothing quite like the first moment you hold your newborn infant in your arms. Learning on the job is really what parenthood is all about. That kind of immersion is much like what Stanford University students experienced as they became mentors to East Palo Alto Phoenix Academy middle schoolers during the Spring quarter. The students were enrolled in the class *Educating Young STEM Thinkers*, which was part of an NSF grant called d.loft. The focus was to integrate design thinking, mentorship and STEM learning. The students, who were a mix of engineering, math, education, and science majors, were learning design thinking- a human-centered innovation process- as they were teaching it. This article highlights how this group of dedicated and passionate students dove passionately into an experience that changed the way they thought about learning in some very small and very big ways.

A Prototyping Mindset

 A prototyping mindset is characterized by the notion that if you try something and it doesn't work you simply learn from it and try again. This mindset is an essential part of design thinking-it's about failing fast and failing forward. The Stanford mentors learned to be comfortable with not knowing all the answers as they worked with the middle schoolers, something that was not easy for them to do. What happened, though, was that they realized that they were modeling the importance of making mistakes as a way to learn.

One student described a activity where the middle schoolers built tin-foil boats to learn about density and volume.

> *"I learned that embracing that inevitability, instead of freaking out about it or getting upset about it, usually makes everything work itself out. ...when we were working with the students on the boat-building activity and it turned out to be much easier than we expected, we all looked at each other and said "oh well," thought on our feet abut how to change it, and then tried the change out. The activity worked out fantastically! The students knew that we had misjudged the challenge, but I think that seeing us react to our mistake in a positive way helped them realize that we were human and helped us to make huge steps as mentors."*

It wasn't easy for the university students to show their vulnerability, but when they did, they found that it helped create bonds with the middle schoolers.

> "I think one thing I learned this week about mentoring is that as much as I feel anxious about "messing up" in front of the students, it can actually be a good thing to show them that we are not perfect...our design challenge didn't work out quite the way we wanted it to. The students figured this out, but instead of it ruining the session, they laughed with us as we tried to figure out how to make it more difficult and then rolled with it. I think it helps to bring us to an equal level of expertise, which is really important if we are trying to connect emotionally with these kids."

Teaching a prototyping mindset while learning what it was had a strong impact on the university students. They were discovering their own feelings about taking risks, making mistakes, and what role that plays in learning as well as having to embody that mindset in their interactions with the middle school students. One student described how being forced to lead students even when she felt uncomfortable or unsure was a pivotal part of her learning experience. A future educator thought about how he might incorporate this into his own classroom one day.

> "Reflecting on my own growth throughout the quarter, I am becoming more cognizant of my discomfort with uncertainty. This discomfort finds roots in a desire for something to be perfect. Two consequences arise: I spend much of my time planning without getting feedback from my "users" or my students, or I feel stifled because planning something perfect is… impossible, actually. A prototyping mindset has directly addressed this discomfort, and I want to internalize this mindset more and see what it looks like in teaching."

As the mentors and middle school students experienced what it meant to adopt a prototyping mindset together they were able to push the boundaries of learning. Becoming a 21st century thinker requires this sense of resourcefulness. Through this experience, the Stanford students discovered that they learned as much from the middle schoolers as they taught them. And that's always a good thing- in ways both big and small.