



United States Patent and Trademark Office

Questions for Dr. Croak

(Fireside Chat on 10/21/2020)

1. Nancy Bagley [USPTO Employee] asks:

"I think it's extremely important and helpful to learn from others experiences, what mistakes have you made along the way? And, if you could start all over again, what would you do differently?"

There have been people who thought what I was trying to do was too hard or difficult. A few times, I allowed their opinions to slow me down or distract me. Now, I use criticism as input to help make my ideas better rather than allowing it to discourage me.

2. Arlene Heredia [USPTO Employee – Patent Examiner] asks:

"How did the challenge of raising 3 children impact your career path and what difference and similarities do you see mothers facing today?"

Throughout my career, I have sought out models of men and women who were able to have stimulating careers while raising children. One of my first managers, Randy, left work in the middle of the afternoon to attend his son's baseball games, and then would resume working later in the day. He taught me how important it was to seek out flexibility in my work life. When that was not possible, I focused on surrounding myself with people who would step in and provide nurturing support for my three children when I was unavailable. It takes a lot of planning to raise children while having a satisfying career but it is so worth it if you desire to do so and are fortunate enough to have both in your life. I don't see that things have changed much over the last few decades so it continues to be a challenging but worthy pursuit!

3. Isaiah from Chelle Myrann's Engineering Class in Laveen, AZ

"I would like to know, how does it feel to know that you are helping people in need?"

You gain so much in life when what you do can help people. It is truly a gift to be able to do so. I find that helping others is reciprocated many times over.

4. Yenika who is a senior in Mr. Westlake's class at Saint Thomas Academy in St. Paul Minnesota:

With the Covid-19 pandemic forcing students to embrace many different learning platforms including in-school, hybrid, and distance learning, how do you think Voice over Internet Protocol will be used to create new and improved educational infrastructure?"

I think we have learned that some students actually thrive with remote arrangements that use VOIP technology whereas others perform best with in-class support. Hopefully, once the pandemic ends, we can continue to support both models.

5. Chelsea D'Angona (USPTO Employee) asks:

"What advice might you have on how we can better inspire and support first-time inventors?"

I deeply appreciate the work the patent office is doing. Anything that makes it easier for independent inventors to understand the patenting process would be a huge benefit.

6. Randy Caldwell NTIS (from chat) asks:

"I can guess that your brain is always thinking about solutions. What techniques do you use to help maintain a focus on accomplishing one invention?"

Usually I think about problems – what may be going wrong in the world, or what may be more difficult than it needs to be. Then, I start thinking about possible solutions to one class of problems. Teaming up with others who may be just as interested in the problem helps you to stay focused on it. Most problems are easier to solve if you collaborate with others.

7. Darlene Ritchie [USPTO Employee] asks:

"I would like to ask Dr. Croak if she ever felt challenged to the point that she wasn't sure she should continue in her work? Did you continue pursuing your goals? In other words, did you ever have to try multiple times in order to achieve a goal when at first it seemed farfetched?"

When times are hard, that is actually when I have learned the most. Some of the significant contributions I have been able to make have been out of difficulties, whether technical or interpersonal. I believe this is true of history, too. Scientific revolutions typically happen during periods of turmoil – where everyone is motivated for something new and something to alleviate the chaos.

9. Dung Lam [USPTO Employee] asks:

"What advice do you have for parents in raising kids to have inventive minds?"

Try to encourage your kids to use their imagination without being constricted by reality. Expose them to real people who are, or were, inventors. Ask them to think about different, novel ways to do everyday things that improve processes or make life better. Once their creative switch is turned on, ask them to come up with a new invention once a week. Show interest in whatever they come up with.

10. Derrick James (from chat) asks:

"Once a problem that requires a new invention has been identified, what processes do you go through to generate new inventive ideas?"

I start by asking why an everyday thing is the way it is. There is always a certain conventional way – a status quo – and that's because someone decided, "This is the way it's going to be." But it doesn't have to be. The world is very elastic and can change.

11. Jeannie (from chat) asks:

"What kind of education / courses would you suggest to someone who wants to become an inventor?"

Anything that helps you think creatively and to look at the world around you in a different way.

12. Rosalita Santiago from Arlington County Public Schools asks:

"What advice do you have for STEM advocates? How can we bridge the (STEM) opportunity gap in public schools?"

I think it would be beneficial for corporations, educators and the patent office to collaborate on programs to encourage students in STEM pursuits.

Katherine Owen's 3rd grade STEM Entrepreneurship class at Washington Episcopal School in Bethesda, Maryland asks...

15. "What is your most used patent and which patent is your favorite and why?"

I think the patents that help to keep VOIP communications up and running are in heavy use right now due to the heavy use of VOIP during the pandemic.

One of my favorite inventions that has yet to be realized is one that enables a person to register with a network to wake a particular person's phone that is on silent or turned off. Many parents would appreciate such a capability but I am not sure their children would like it!

16. "When did you first realize you wanted to be an inventor? Did you have experiences that lead you to invention? "

I was a little younger than you when I realized I wanted to be an inventor. Whenever a plumber or electrician would come to our house, I would follow them around. They were heroes to me, and I loved learning how to fix things.

17. "How has science helped you with your inventions and patents?"

Science teaches us that we learn and make advancements by failing. Many experiments using the scientific method do not work and that is a fine outcome as it shows us what paths not to take. We can often learn more from failure than from things that work easily.

18. "How does it feel to have done so many important things in your career and what advice do you have for kids to follow in your path?"

My advice is to remember not to be discouraged by failure. Most of my career has been a series of failures. Science is mostly failure. You have to learn from it and use that knowledge to make your ideas better.

19. "What got you interested in inventing, and is there anything we can do at ages 8 and 9 to help us be inventive and have a career like yours?"

My advice to future inventors like you is to ask yourself about why things are the way they are, and think outside the box about ways to change it. Challenge yourself to think of something new once a week. Soon, once a day you will start coming up with creative ideas. Invention is like a discipline that you have to switch on. It's fun, too.

20. "What advice can you give an 8 and 9 year old on how to develop their innovative and entrepreneurial thinking and do you think it is important to learn these areas?"

Try to think about new ways to approach everyday things. It's people who make conventions, which means there might be a different path. For example, we use a knife and fork, but one day we may eat with something else. Even though you might meet resistance, it's important to always challenge convention. That is how the world can improve.

Students in Yaritza Ortiz's STEM class at RL Turner High School outside of Dallas, TX are curious...

21. "Who inspired you to go down your career path?"

So many people set me on the path that eventually became my career. Most influential were my mom and dad. My dad encouraged my love of math and science, and modeled resilience by not giving up when life became difficult. My mom always seemed impressed by "my big imagination." I also had stimulating teachers along the way that made learning enjoyable. And all the men and women I read about in books who changed the world through their discoveries and innovations inspired me too.

Romy Perez, 1st place prize winner in the spring 2020 Jacobson Institute Innovator Competition, Chief Marketing Officer at Germ Genie, and senior at NSU University School in Davie, Florida, asks:

24. "I'm a senior in high school and already part of an invention-based business -Germ Genie. What advice do you have for me and for other young women who want to have a seat at the inventor and/or entrepreneur "table" throughout my career?"

Congratulations on your business! Many times I have felt it can be an advantage to not fit in perfectly or have that seat. It allows us to step back and really observe where the gaps are and what needs to change. Invention requires you to be different. However, it is also very important for those who already have a seat at the "table" to leave a pathway for others to step in. I want to make sure that future generations can climb the ladder, too.

Lori Kuzmin-O'Neill, Jacobson Institute BizInnovator Startup educator from Parkland High School, Allentown, PA asks:

25. "What do you see as the connections between invention and entrepreneurship?"

How would you explain the differences/similarities to high school students? In what ways did you employ an entrepreneurial mindset when creating and rolling out your invention?"

They are very similar in that they both depend on creating something that the world values. Compared to a pure inventor, I think an entrepreneur needs to have a greater sense of the business and a financial perspective on what is being created.

In the work I did for VOIP, I was very motivated to help AT&T understand its importance as it was an emerging technology that could eventually disrupt its core business. I was more on the

invention side of the equation but those around me were highly motivated to understand the financial implications of the technology.

26. Tyra from Chelle Myrann's Engineering Class in Laveen, AZ would like to know, "In a recent audio recording I listened to, you stated that you had many different interests, in college did you bounce around or know exactly what path you would follow?"

I did definitely zig zag quite a bit because many things interest me. I find knowing something about different disciplines helps to enrich your ultimate destination.

27. Manuel from Chelle Myrann's Engineering Class in Laveen, AZ would like to know, "Was there anything that discouraged you or made you want to do something else?"

Yes, at moments other people who were critical discouraged me and made me think about quitting. This occasionally still happens. Usually in a few days, things clear up and I get back in the saddle.

28. Alexzander from Chelle Myrann's Engineering Class in Laveen, AZ would like to know, "If technology changes drastically, would you try to improve the reliability or way we call on the internet, if so how and why. What might that entail?"

Yes, things are always changing and we need to ensure that we are continuing to improve the internet's reliability. During Covid the reliability of many systems supporting online services is being tested so reliability improvements like capacity increases and fine tuning network quality must happen periodically.

29. Israel from Chelle Myrann's Engineering Class in Laveen, AZ would like to know, "When you failed over and over again what made you want to keep going, and why were you so motivated?"

The supporters I have been lucky to have throughout my career. I find that it helps to find one supporter who will advocate for you. Just one. They do not need to be the highest level executive. This person will empower you to keep going, even if you meet resistance or obstacles.

Clara Mabour (Lemelson-MIT InvenTeams teacher from Oakland Park, FL) and her students ask:

30. "What kinds of methods or best practices do you recommend businesses and schools use to inspire more inventors of color?"

I think it is important for schools and companies to create cultures of innovation. At my current company, Google, we have what is called a blameless culture. People are not punished for failure. Instead, our job is to always be curious and learn from our mistakes. We are also encouraged to collaborate. It's very atypical that an invention will come about from one person. A diversity of people need to partner in order for innovation to happen.

Alesa Allgood asks:

31. "Have failure and turbulence along your journey as an inventor played a role in your development as an inventor?"

Absolutely. Science is all about failure, and I use it as fuel to help make my ideas better.

32. How did you manage to keep a work-life balance and be a mother of three kids and still have a very successful career?"

Throughout my career, I have sought out models of men and women who were able to have stimulating careers while raising children. One of my first managers, Randy, would leave work in the middle of the afternoon to attend his son's baseball games, and then would resume working later in the day. He taught me how important it was to seek out flexibility in my work life. When that was not possible, I focused on surrounding myself with people who would step in and provide nurturing support for my three children when I was unavailable. It takes a lot of planning to raise children while having a satisfying career but it is so worth it if you desire to do so and are fortunate enough to have both in your life. I don't see that things have changed much over the last few decades so it continues to be a challenging but worthy pursuit!

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