Aprendices

APRENDICES - DESGRABACIÓN EN INGLÉS

Episodio especial: Alejandro Chu

INTRO

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I had that curiosity since I was 4 years old and I still have it to this day.

Education is to provide the tools so that the person can adapt in the practice of their profession, and that is what I did.

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PREVIA

How long have you been living there in the United States?

Since 1969. Before you were born.

I should have gone to the hairdresser, right?

No way.

I'm fine, thank you very much.

Thank you.

Well, Alejandro.

Good afternoon.

Well, welcome to the set again.

A pleasure to receive you here in Ceibal.

Aprendices

A pleasure to be here.

This talk is an episode of a cycle we call Apprentices, where we talk with relevant, interesting personalities about the impact of education on life.

The idea, Alejandro, is to talk about your learning experience throughout life. You had a diverse learning experience, in many places, so you will have a lot to tell us.

And also the effect of education on my professional career.

That's exactly it. And then, also, a bit about how you see engineering today and how it is different from when you started working as an engineer.

We had the opportunity, in the last 50 years, to see extraordinary changes in that field worthy of science fiction.

I would love to talk about each of those changes that you mention, and how they took the profession to new places.

I'm glad I got the chance to do it.

Alejandro, take 0, final clapperboard.

CHARLA

Welcome, Alejandro.

Thank you.

A pleasure to start talking with you. As I was telling you, let us talk a bit about your learning process, okay?

The idea is to go through your life experience and how you learned everything that you know today, and share that with us.

China, Uruguay, the United States, all that journey... What was it like, first, leaving China and arriving in Uruguay? Tell us about that experience.

I was six years old when my parents decided to leave China. It was a four hour flight over the mountains: from the Himalayas to Hong Kong. And Hong Kong, at that time, was not a place for a family because there were a lot of refugees from China.

We're talking about the 1950s.

1949. Four years after the end of World War II. My father made a few trips to Asia to see if there was a place where he could establish the family again and he did not find a favorable situation. So he made the decision to emigrate.

We were four siblings, and we also had my aunt and my grandmother with us. So, my parents ended up selecting South America. We had three possibilities: Brazil, Argentina or Uruguay. And then, on a three-month trip, they saw that Uruguay was the Switzerland of America, a democratic government, so they decided to come to Uruguay, for which I am very grateful because here I had a good education, a good experience, a good culture.

How was it like for a Chinese boy to enter the Uruguayan educational system of the time?

My mother, in 1953, was 33 years old, and she decided to learn Spanish. She hired a teacher, eight hours a day, and also bought records to listen to, and in a month she learned to speak Spanish.

In a month, in 1953, she learned to speak Spanish?

She did it in a month. And when we arrived on the ship, a three-month trip, from Hong Kong, through South Africa, to Uruguay, we got off the ship, 33 people in total, and Mom was the only person who could speak Spanish. So, she grabbed the four children, plus my aunt who was a little older than my sister, and she took them to the British School. There, they accepted my aunt and my older sister. But they said, "The younger ones, we don't think they're going to fit into the system". So Mom took us to the German School.

Tell me how it was that you discovered your interest in engineering, because I understand that you had it from an early age.

It came to me very early because in China my father was a textile engineer, and though he no longer worked on technical matters, he took me with him to work. And at that time I hung around the factories and I was amazed because textile factories were the robotics of the moment. All the machines were automatic and the workers fed the textile machines with threads. Everything was done by machines. And I was stunned. So I thought: "Well, I'm going to have to study how these things work". So, I had that curiosity since I was four years old. And I keep it to this day.

As a kid, I wasn't very promising. I would take a screwdriver, I would dismantle something and I couldn't put it back together again. It was frustrating, but an experience all the same. Pedro Figari, in his book from the early 1900s, wrote that handicrafts teach a person to adapt.

And so, out of curiosity, I dismantled a number of things that, to my surprise, my parents never punished me for. I even broke a phonograph that was a wedding gift to them, the jukebox. I dismantled it and couldn't put it back together, but they didn't punish me.

At that time it was like disassembling a computer today, or even harder.

Was it that curiosity that led you to choose to study at UTU?

Exactly, exactly. I was lucky that at the German School, the German government sent a very good team in Mathematics, Physics and Chemistry. So we had laboratory demonstrations at the high school level. I went to school every morning with a big curiosity... Every day you learned something new.

I found out that UTU existed and it had workshops and things, so it was an opportunity for paying for everything that I'd broken to that moment, when I was 15. But it was a very rigorous regimen: high school in the morning and then from one to seven in the afternoon, three hours of workshop and three hours of theory. I would go home, have dinner, go to bed, and at three in the morning I would get up to do my homework.

For how long did you do that, Alejandro?

Six years. UTU comprised three years as an apprentice and three as a technician. And I did it in the morning, listening to Carlos Gardel on Clarín radio.

At UTU, you kept that workshop experience, right?

How did you decide to emigrate to the United States to take that experience and professional development to another country?

At UTU we had a very complete preparation. We had electricity, blacksmithing, foundry and models workshops. We went through all the workshops to be an apprentice. I knew how to work metals, including blacksmithing. We knew how to file, drill, we could operate machines to produce things.

After UTU, I taught at UTU workshops for two years, and later, at the Faculty of Engineering, Industrial Engineering, I was in 5th grade, and 1968 was a time of strikes. So what I felt during the high school years and the UTU years was that my curiosity was satisfied every day. But in college, because of the pedagogy, I didn't have that feeling and I was starting to lose confidence in myself. So, at that moment I said: "I cannot lose my confidence". Given the circumstances, I was able to apply for admission to universities in the United States and in 1969, at the age of 26, I emigrated.

And you went to study there, in the States.

What was your first place of study there?

Well, I was lucky to be admitted by MIT. And I think MIT was interested in me not because of the courses I took in college, but because I went to UTU. That in the United States is very unusual. And also because UTU is both workshop and theory, and the MIT logo is an anvil, two men, one with a hammer on the anvil and the other with a book. It is the same concept. And the logo says "mens et manus". Mind and hand, which is the work of the craft and the intellect.

You mentioned "mens et manus". What do you learn that way that you can't learn otherwise?

At MIT, for example, we had labs with kits to build different circuits, and when something didn't work, you were forced to wonder why it didn't work. And that is learning. What one learns with experience is retained much longer, and this is what Pedro Figari expressed in that document in the early 1900s. A brilliant man.

When did you come out of MIT?

The first attempt was in 1970, but there was a recession. So, I continued with the master's degree in engineering. I came out later, in 1972.

And once you were out, what was your first professional experience?

Hewlett-Packard.

Hewlett-Packard in the 70s, which isn't quite the Hewlett-Packard of 2020. How was it like in the 70s?

It was already an exceptional company in terms of company culture. And from a work point of view it was very efficient. All of us engineers had a desk and the equipment for designs and everything. That's how we designed an instrument that was very advanced at the time, a microwave system from 2 to 18 gigacycles. At that time there were different instruments, from 2 to 4, 4 to 6, 6 to 8, and we covered the whole range, from 2 to 18. So, it was a difficult instrument to make. And with new components.

With the experience from UTU, I went from the Development group to Production, where they taught me all the jobs they did, and I was able to do the transition documents for the insertion of the technology in production. The project worked very well, but one component was difficult if we didn't have good transistors. Driven by curiosity, I said: "I have to know what is inside these transistors, how they are designed". And it was then that, with the same curiosity that I had as a child, I went to Stanford.

To keep learning.

To learn more about solid state and the interactions of the electrons, the currents, the inner workings of the transistor.

Alejandro, you were in the States in the 70s and 80s, and you mentioned the complexity of technological development.

What was it like to be a participant in that technological revolution and, above all, to understand what was happening in technological terms, in a communication ecosystem different from the one we have today, where it was not so easy to know...?

Information did not circulate in the way that it does today.

How did you find out about everything that was happening in terms of electronics, robotics and computing in that world?

It's an interesting question, because when I was in college, for example, the greatest difficulty for engineers was making calculations. So we used the slide rule. At Hewlett-Packard, in 1972, they gave me a calculator that had only the arithmetic, trigonometry, and logarithm functions. At that time it cost $450, and a Mercedes Benz cost $2,000. A quarter of what a car cost. It was a moment of transition in technology, and from then on computers, laptops, and all the rest developed.

What I want to emphasize with respect to evolution, is that in education what is important is the formation of concepts. Education enables you to test the tools so that you can best adapt in the practice of your profession. And that's what I did. So, for example, in the power area, at UTU we made electrical machine connections practically by hand. Today it is done with software, with a computer, but the concepts are the same. Every time I do a job in that area I am updating my knowledge from 1960. And that is the evolution that education provides.

For example, what Ceibal is doing with the sensors, with the kits, is to give students the basic tools. Technology will continue to evolve. They are going to work in companies where robotics is going to be much more complex. But students will be able to update their core knowledge.

In what way is engineering today different from before?

It used to be just hardware, there was no software. Very little software. It

was relay logic. Today there is not only hardware and software, as a discipline, but also firmware. So the distinction is not clear cut.

The educational programs have to be broader, they have to cover subjects in an interdisciplinary way, and that is what matters in the curricula.

At Ceibal we say that our job is to learn from the future.

Exactly.

In this journey that we have taken through your life experience, you have had to learn a lot about the future and what is to come.

But where is the future? Looking forward.

Yes, yes. Without a doubt, and it was accelerated by the pandemic. Because of telecommunications and computing power, computer systems today have added value when they communicate. And that presents problems from a security point of view, because the information goes from one machine to another.

Without a doubt, this is a field that is going to continue, in various forms. For example, in computers, the sheer potential of computing power. Artificial intelligence is going to continue, undoubtedly. And in this system, in telecommunications, encryption is necessary. But in this field, looking to the future, one has to extrapolate information from the past. In the area of cyber security, banks have decades of experience, and these systems are resilient because they can continue to function under attack. That kind of information gives you a knowledge of the existing tools. The curricula must include those elements. That field is going to continue to evolve. Education has to follow the times. The curricula has to be adaptable. And I believe that Ceibal, with its team of experts in these areas, provides educational institutions with the tools that we have just discussed.