THE TRANSMITTER

Bringing neuroscience to rural Mexico: In conversation with Mónica López-Hidalgo

By offering education and translating scientific terms into Indigenous languages, López-Hidalgo's outreach program, Neurociencias Para Todos, provides schoolteachers with tools to bring neuroscience to their communities.

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This transcript has been lightly edited for clarity; it may contain errors due to the transcription process.

Ashley Juavinett
Thank you so much for taking the time to talk this morning. I'm super excited to hear more about everything you're doing. I mean, could you just tell me a little bit more about the program and where it started and what you were trying to do with it?

Mónica López-Hidalgo
OK, so thank you for having me here. It's a great opportunity to share with us, with all of you, what we are doing. So we have a program, the name is "Neurociencias para Todos," which is in Spanish, means neuroscience for everyone. And we're thinking this program for this last word, for everyone. So we all try to do it, all the people, but in reality, there's many strategies that are keeping a lot of people out of science and also out of neuroscience. So this program was created like really funny. It's funny for me and I think it's a good experience for all kids and young people to hear that because it really started because there was two students, two bachelor in neuroscience students, they were in the second year and they just approached to me and said like we want to do something and I thought at the beginning to do like science, know, wet lab and they said "no, no, no we don't want to go to wet lab we want to do something, you know, for the people or outreach or educational resources." And then at that moment, I wasn't implying anything, but then I thought like, me think about it and then we will see. And I was thinking like, what we can do because they were so highly motivated and enthusiastic that I thought that I should, you know, take that opportunity.

And then I think in parallel, I was teaching histology also for undergraduate students. And then I realized that there was many students that have never seen a cell using a microscope, even if they were in a public or private school, there was just like very little people that really flows into cells into the biology, you know. And then I feel like it was a pity because they were like missing all this visual information that is just going to feed their minds.

And then also, I the third part that was part of the creation of this program is that my fathers, my parents, both are teachers in high school. So my father in particular, always believed like the education was the thing like to change the world, you have to invest your time in educating people. I don't know, he like always tried to teach about, you know, these thing of you have to be useful, you have to do something for the people, not for yourself. And he was always giving classes to teachers. He was a mathematician and he was teaching other teachers how to teach math. And he was doing that for free. Like always, I remember my father just going there and then helping other teachers to do that. And then that always like stuck in my mind.

So, I think I just put the three things-- but at that moment, I thought, let's do a program for teachers, directed to teachers, and that we can help other kids or young people to see stuff and then to just fit their minds with questions and visions and things like that. It was like that. And at that moment, I just got from Backyard Brains, this RoachScope, it was like a microscope. It was so cheap, and they were working and I was excited and said like, can just try to do a course and bring some teachers. And then we decided to do the impact in rural communities because that's the one that needs the most and the ones that have the less. And then in this idea to keep everybody inside of science, everybody have access to neuroscience. So then we thought like, will go to the ones that have the less opportunities, that's the rural communities. And that was the end. And we start, I don't know, maybe in 2019, long before the COVID started to reach all the countries. So that was like an idea.

And this is how it was created. So I always share this because usually think that young people think they can't do too much, that their impact is little. But I always said without these two young minds, we will not be doing this. We will not have this program because they just started pure, saying, you know, we want to do something.

Ashley Juavinett
Yeah.

Mónica López-Hidalgo
And then I just put some things together and so far they are still with us. And there's another teacher who was the one that I shared this histology class. It's just Erica that is the other teacher and myself and these two kids. And this is the four that we started program and the four that we are still in this neuroscience for everyone program.

Ashley Juavinett
That's amazing. And so in 2019, did you just start your faculty job or you were a couple of years in? Like where were you sort of in your own professional trajectory in 2019?

Mónica López-Hidalgo
So I start in 2018 and I just thought it was not the best moment to start something because I was starting my lab. You know, this takes a lot of energy.

Ashley Juavinett
Hard work, yeah.

Mónica López-Hidalgo
Yeah. And also, I was leading the undergraduate program of neuroscience, which was also a lot of work. Yeah. And also, it was the first generation of these neuroscience programs. So it was a really, really new brand new science program. And it was the first generation. So it was a lot of work studying of everything. And I was leading the program, the undergraduate program. I was starting my tenure track position trying to do science. And at the same time, I was teaching a lot. I actually don't know how I managed to have energy to start an outreach program. I also have two kids. At that moment, my young one was two years old.

Ashley Juavinett
Wow. Wow. So if these two students hadn't come to you, you probably would not have gone out of your way to launch a program like this. But it was the enthusiasm of these two students and the wanting to do something that was like, "OK, all right, fine, we can do something here."

Mónica López-Hidalgo
Yeah. Exactly. They were really important and they have always been really, really important for this program.

Ashley Juavinett
Love that. I love that. So yeah, I love this like you kind of set it up as like this sort of intersection of you want to bring neuroscience to everybody. You want to help people see, like literally see the brain and see tissues. And then there's also this focus on teachers specifically. And I want to like dig into each of these things because I think they're all important. But maybe we could just start with the seeing part because I agree, it's so important to see things and actually, you point out it's just such a privilege to have the technology to see the brain, how important that is. So I'm like, can you tell us more about just what students are actually doing in the labs that you're bringing and what you're trying to teach them or show them?

Mónica López-Hidalgo
What I'm trying to teach the students or the teachers?

Ashley Juavinett
Well, yeah, I guess ultimately, like, what do the labs look like, like that the teachers are doing and then also that the students will do that they teach?

Mónica López-Hidalgo:
Ok. So for this program, we are focused on the teachers and we want to provide them knowledge and equipment. This equipment is a backpack that has a microscope has tissue samples. Not only for neuroscience, we also have the leg of grasshopper or some plants or bacteria. So they can see many things. They can use this for many things. Focused in biology or medicine, but it's diverse. So rural teachers, it's also really important because we knew that after starting the program.

So they are usually there are two or three teachers in the whole high school and they teach like all kinds of different courses like really complicated because they need to know about everything. And they are also from different areas. So they are not all biologists. Sometimes they are math, mathematician guys teaching science. And that means also biology.

So then we need to show them what we are talking about. So, when we bring them and we show them cells, they say like, "wow" like, I mean, it's amazing that they are seeing for the first time what they see in the books. So this is like, you know, the onion, you know, like, oh classic. This is the wall of the cell. We do these kinds of practices with them.

And it's amazing how they are adults and they just, you know, the eyes just, right. You know, just like get excited seeing a neuron, an astrocyte, seeing, you know, on the hippocampus, seeing, um, the onion or a leg of grasshopper. And it's just how they are amazed. So, this is what we're trying to do. Like, like we try to amaze them, so then they can feel all the energy to go back and then to amaze the kids. So these two days they are here. We are trying to support them in terms of saying that we value how they are doing that great job out there, without electricity sometimes, without the building. And they are doing the best effort to do the best for their students. So, we thank them.

And also we try to help them to understand. Sometimes when you're a teacher, you kind of need to know everything. And most of the time you don't know everything.

Ashley Juavinett
As it turns out, we don't know everything.

Mónica López-Hidalgo
Exactly. So then we create a space that they can share, like, "I have never understand this, know, meiosis." I don't know, like, because they sometimes they don't have the opportunity to ask. So then we have time for this. They learn, we help them with the knowledge, with basic knowledge. Also, we show them, we do with them practices that they can go back and do with their portable laboratory that we give them. And we also teach them how to use it. Because sometimes you just give them tools without all the preparation, all the knowledge for them to use them, they are not gonna use them because they don't know how to. They can be confused. So, we spent two days talking about topics and about like basic information, answering their questions and also doing some practices so that they can go back and do the same with their kids.

Ashley Juavinett
It's so amazing. And I think, you know, like as you said, it's both you want to give people the knowledge and the know-how, but then also the motivation and like to have them see the beauty in these things and feel like really excited to go and bring it back and like put in the effort to bring it back I think that's amazing. these teachers, so this is grade school, like the kids are about how old that they teach typically?

Mónica López-Hidalgo
So this is high school, which means it's around maybe I don't know, 14 to 17.

Ashley Juavinett
Okay, yeah. And then these teachers, I mean, this is like, I think an important thing to note about your program is, like you said, the teachers don't necessarily have a ton of in-depth experience in one area. They're sort of like teaching multiple things, like math and biology. And so, like, and that's a feature of these rural areas that you're going into and teaching. And so, and you mentioned like offhand that there's not electricity. Can you tell me more about just the schools and what these areas are like?

Mónica López-Hidalgo
Yeah. So we are a poor country. There are many, people living with difficulty to eat or to dress. And so the communities are more affected, especially the rural communities. So we target today. So for us to choose-- because this is a free program. We get money from many different foundations or, know, at UNAM also from our university, they give us the money. But so we just select people. So, then we ask them, like, why you want to be part of this program? Why we should be choose and so they sent us a letter and usually they add pictures.

And I mean, we have selected like many schools that are in the mountains where there's, I don't know, maybe a community of a thousand people. And in that community, because it's in the mountains, then there's no electricity, there's no water. And sometimes, because we have seen some schools like that, that they just have like chairs in the soil and they just take the classes just like that.

So, there's many stories we have talked also with the teachers to know their experience and many of them arrive when there's nothing. And they just sometimes, you know, the parents and themselves, they built one room or two rooms, you know, with their hands. And sometimes in the communities, if it's not so rural, so you know, in the mountains and it's just rural community, but it's just more big community. Sometimes there's the government spaces and they give them, you know, one or two rooms. They start there, the school. So it really depends on the area, as, like now, there's many more people knowing about the program and we have every time more people like requesting to be part. And then we are choosing, and then we are now reaching like the poorest regions.

And it's really hard for us to choose because when you choose twenty, you are taking some out of the possibility of getting this. And last time, it was last year, we had a serious problem. It was two in the morning. We were not able to decide. We have thirty and it was like, "which one are you going to take out of this?" And it was like, "no, we can't do this to this.

No, we can't do this to this teacher or this school or this community." So it's getting like emotional because you see what they are living. You see what they are trying to do. You want to be part of this change. And, also our resources are limited. And because we, pay for the transportation to them to, to Queretaro sometimes its flying and we pay also for the meals and the hotels and the portable laboratory. So it's not cheap. we have so far selected only twenty, twenty five. Last time we'd say, okay, let's select twenty five. We figure out how to pay everything. And then we select five more that we were expecting, just because we were not able to take out someone. It was just impossible. At that moment it was just, and I still, the other day I was talking with my team, and I said, I still feel bad for one that I want to keep. And then the rest were like, no, no, this needs to be out. And I still feel bad. We took this teacher, he was with garbage bags, these plastic garbage bags. So, they were open and they used with some structures just to make the walls. So maybe for you to avoid just the wind. And then the students were in were in the chairs in the center, just surrounded by these bags. And I just can't take that image.

Ashley Juavinett
It's heartbreaking.

Mónica López-Hidalgo
Yeah, I feel so frustrated. I need more money. I need to do more for them. It's hard.

Ashley Juavinett
Yeah. So, I mean, it's so hard. think this is like the double-edged sword of being in this work as you get to serve some people and see the benefit, but you know there's so much more you could be doing or that needs to be done. Yeah. So I'm curious, like, what are the things that have made this work possible? Like you mentioned that you're using Backyard Brains or some other sort of microscope. So these are like very low-cost things that you can actually easily package up into a backpack and bring to these communities. Like, yeah, like what has made this possible to do at all to any extent?

Mónica López-Hidalgo
So yeah, we use, at the beginning we use Backyard Brains, this Roachscope and we just bought them, we buy them. But then the next year they were just not available anymore. They are not producing them. And then I was trying like, okay, "I need twenty, I need twenty for my course." They said, you know, "I know that there's seven in Chile" because they're like, like branches, right. But they, what is nice, and I just told Greg Gage that is the owner and director of Backyard Brains. I told them "I need this for these rural teachers." And they say, "okay, we can send you the how to make your own microscope." And they send me all the instructions, all the details and everything. And I thank Greg, like a month ago, like, you send me all the information to do it. And then we start to do our own microscope based on Backyard Brains's design.

Ashley Juavinett
Cool.

Mónica López-Hidalgo
And so they gave us all the instructions, all the things. We, start to build our own microscope and now we are using a different model based on Backyard Brains, original microscope. We lowered the cost and make them like more resistant. Because, so sometimes a teacher have to walk like one or two hours to reach the communities. So, then they need to be like resistant. Sometimes they go to another community to do some neuroscience fair or something. So it needs to be like really portable and easy to do, to fix it. So then we change. We use that as a starting point. And now we have one that is cheapest and that is working a bit better. But it was actually thanks to Backyard Brains that we could continue with this even if they were not selling those anymore.

Also, we are asking money to like IBRO, for example, IBRO gave us money, and my university gave us money. We are now starting, we're going to do a raising money because this year we don't have almost nothing. We have just a little bit and then we're going to do a raising program My university have like the possibility to do with a foundation of my university and then to raise money. I think we're going to start to do that because it's getting harder to get money for this program. You know what people usually ask me is like "why you need to bring to to pay the teachers to come to Queretaro to take the course. This is really expensive. Can you not do that?" Nothing. No, this, because we need to motivate the people and we need to teach them and we need to, to work with them with their hands to know how to do it. So it's important for them to come and their salaries are not good. They will not be able to pay and to come.

For me, I prefer to have ten teachers, each one with ten laboratories, each one with one laboratory, but they all know how to use it instead of giving, you know, I'm gonna give forty, then you're have them in your house without knowing how to do it or the motivation to do it. And also we are part of a community. We have monthly talks with them. If they have a question, if they need something, they can reach us. We are helping them.

We are trying to make a community so then we can work together.

Ashley Juavinett
You're investing in them.

Mónica López-Hidalgo
Yeah, us it's important. Yeah, but this is expensive. This is the thing that is hardest to pay.

Ashley Juavinett
You know have this focus on teaching the teachers and you mentioned that your dad was a teacher. And I wonder if you can just talk more about like, why is that the model and like how, I don't know, how does that help with the sustainability of it and the growth of it and kind of what's your thinking around that?

Mónica López-Hidalgo
So, I mean, usually most of the outreach programs are focused on kids. And I think this is one way to go. But for us, it's better if you teach one teacher. Because we all have one or two teachers in our lives that make an impact. One teacher that talk to us or show us something and suddenly change our work, change our lives. So, I think they are seeds.

They talk with many students and they have many students each semester, each year. So I think it's a better investment to make these seeds like strong and well nourished. So then they can help us to disseminate sons in all these difficult places. So, if we have only sixty-six teachers that have been trained for us and give these portable laboratories,

But then they see, I don't know, for example, a hundred students per year. So then each year, he's gonna be impacting teachers and students and more students and more students. It's like this sixty-six, but then it's just like, you know, extending. And because now we are creating this community then if there's one teacher with this portable laboratory at one city and then there was another teacher that were not accepted in the

program, then they can share. So, then we always say like, share with other people what you know, what you have. Then help us to spread this and to use this as much as possible. They have created like bridges between teachers and sometimes they do like a neuroscience fair in another community or they have like, oh, I love this, there's one club, neuroscience club in the mountain. And then they go to another mountain to teach other kids about neuroscience. I love this.

Ashley Juavinett
From mountain to mountain.

Mónica López-Hidalgo
Yeah. And it's true, know, once we were to a place, name is Ixtepec in Puebla, to do a neuroscience fair. And so we were expecting, I don't know like two hundred people. And then suddenly, you know, the night before we are expecting fifty people more. What? Yeah, because there's another school that knew about this. Then they are going to they're going to walk really, literally, like walk through the hills to arrive where we were just to bring the kids the opportunity to have these neuroscience fair. And they walk and they are like hours. So then like an hour and a half. Wow. And we saw that like, they are getting closer.

Ashley Juavinett
You can see them hiking.

Mónica López-Hidalgo
Yeah, I mean, we saw. And like, they are close. And they are really, really doing this. People are used to walk through the hills because there are not like roads. And so then, I mean, I think it's the best thing for limited resources just to feed seeds to nourish those seeds and then they help us to help them. And then this is the way that we think we spread more because maybe we can have, I don't know, a thousand of students, but they're always going to be distracted. Maybe, you know, yes and no, but the teachers, I think it's the best. And for reaching the kids directly, we do this neuroscience fair to visit some rural communities. And it's always nice to see them like also, you know, the eyes get like, you know, so bright, excited. And it's also good for us to know better about what we are doing to make this best, the best for them, because we don't live there. We think we know about it, but when we go there, we understand more about how to do this better for them.

Ashley Juavinett
Yeah. Yeah. That makes sense because if you're not interacting with the students at all, you might miss a couple of things. So it's nice to see how they interact with the labs and do it. And then you can iterate even further. Like you were saying, like iterate on the microscope design or the labs or the protocols, whatever it is. Yeah. Yeah. I love that. So has anything been sort of like surprisingly difficult or, know, I know like one thing you've mentioned to me is like some of the main languages and the communities that you're visiting are not languages that even have like scientific, any scientific term in it, right? So like, I don't know, could you speak more about that process of like, what that's been like? And what is it like to actually create resources for those communities where they speak an indigenous language, for example?

Mónica López-Hidalgo
Yeah, this has been a surprise for us. This was not in our plans at the beginning, but there was I think two things that put us in the context to see this problem about the language. So we asked for the teachers, we did a competition to create your own practices to include in a different manual, a manual for students. So then all the teachers started to work with their students to make practices and to help to make this new manual.

They sent us like many different practices and one of them was in video and they were speaking in Maya. Maya is the second most spoken language, indigenous language in Mexico and then they were speaking and then we were like blah blah blah blah because we don't speak Maya and then it was like "jamaica" because the only word that we understood like "jamaica."

And we're like, what? So they were using "jamaica" as a colorant to stain the onion or to stain. Yeah. But it was really nice to see them speak in their language. And then at that moment, was like, sure. I mean, they speak Maya as their native language. They are making this in Maya. I think that was like the first like "wow, this is amazing. We never thought about it." It was just natural.

And then the second thing was when we visit Ixtepec this place that I told you about, the people coming through the hills. And there it was some students using these regional costumes, like really pretty dresses. And they were all saying to us that young students, you know, his classmates, didn't want to use this dress or these clothes because they were feeling ashamed of being indigenous. And so she was always speaking in their native language. And there was very few people trying to preserve their cultures. And then most of them were rejecting. And then we talked to them, like, "why don't you want to talk?" And they said, like, "because I feel different than people that speak Spanish. They look at us like we are weird. We don't feel like part of Mexico. We don't speak Spanish." And then also, the school is usually in Spanish. Even if the teachers try to learn indigenous languages, sometimes they do, sometimes they don't.

So then we talk with adults and with young people and we realized that this was a problem that they were losing their culture. They were rejecting their culture. At that, in your science fair, there was also the presentation of a book in, I think it was Nahuatl, the language. And so we were speaking with the author. He was a person from that community that was written like stories, but in this language. Then I talked to him like for a few hours about the relevance, keeping the cultures because Mexico, it's many, many different cultures. But because we are Mexicans, we speak Spanish, then we're keeping the people that also speak Spanish out of many things, including science. So then I think that both things were just like occurring in our minds and in our work. And then we decided to do something. So we decided to start to work on translating some of our manual

in different languages. Now we are doing this in Otomi, that is spoken in the Bajío, where is the university now, in Queretaro. And then also we are translating in Maya, that is the second most spoken language.

And this was also a different story because usually this is like we are highly motivated, “yeah, yeah, let's do this.” And then once we are there, we realize that it's more difficult than we thought. And then we realize that it’s not about translating because there's word that doesn't exist in their language because their cosmovision is based on their culture, what they can do, what they can see. So they don't have a word, for example, for microscope, because in their culture, there's no microscope.

So then we include another student. was also a undergraduate student at neuroscience that he was spoken, he speak, uh, Otomi. And then, uh, he and his uncle, we're working together to create words. Like for example, like “microscopio” means “seeing stuff, like closely,” you know, like, so they are creating words. And at that moment where we are working with these two translators, we realized we need to work together, not to translate, to create words, to make this language bigger. And that maybe can be simple, but it's the cosmovision of the culture. Like, “wow, this is made of cells and I can see a cell.” It's amazing. And it has been really, really difficult to explain. Like for example, you say like a cell, if you have never hear about a cell, you don't know that things are created from cells. It's difficult to explain them.

Or nucleus, it's a nucleus-- or a membrane, or I don't know. It's just the whole world. And this has been a nice and very interesting path that we are starting to walk. Now we have one chapter in Otomi and in Maya it's almost closed. Like for example, for the Maya girl that is

participating in translating, she's going to come to Querétaro because like Luis that is translating in Otomi, he knows about neuroscience. He can do it. But Alondra that is from the south of Mexico, she's a translator in Maya. She's a young girl, very talented. She's a translator. And now she's coming in middle of June to stay three days with us. As a teacher, we show her a microscope, tissues, nucleus, know, everything, stains and everything, so she can have a better idea about what we have there and how we have to create these words.

Ashley Juavinett
So she can do the same.

Mónica López-Hidalgo
Exactly. And we are working more closely with Alondra because she's not in the background of neuroscience. This is also another problem. There's many people that say, “yes, I could help you translating, but I don't know anything about this topic.”

Ashley Juavinett
You need people who are both.

Mónica López-Hidalgo
Yeah, because you need to create words. You need to create a language. So people need to understand what they are creating. And at the end of this translation, we are going to have a dictionary of all the words that we have created in this microenvironment.

Ashley Juavinett
Yeah, you're not only like teaching neuroscience, but you're actually creating like scientific language in different languages. I mean, that's incredible. Like, and this is then a resource that other people can use. Oh my gosh. It's amazing.

Mónica López-Hidalgo
It's amazing. I feel like I'm surprised and amazed and happy to do this. And it's against, I don't know what you think, but it's against, you know, like the whole movement of the globalization, know, like speaking in English.

If I work in science and I need to speak English, I need to write in English, I need to do everything in English. I even allow to use my native language, which is Spanish. And I can do it because I have the privilege to learn English or to live outside of Mexico.

But then there is so many, many, many people that doesn't speak English, that just speak Spanish. And there's some other people that just speak their native language, or they just speak half and half. And it's, so this is going against all the root of the globalization. We have to make this accessible for all. We need to go to them. We don't need to teach them English to come to us.

We need to make accessible the science and neuroscience to them with their cosmovision, with their culture. And I think that's the way to do it. Otherwise, if you want to learn this, yeah, this is the text in English. You can't read it, bad for you.

Ashley Juavinett
And it's not just accessibility, it's also having them feel like it could be a part of their culture. Like, as you pointed out, like people like they code switch, like even for you coming in, you know, and they're like, oh, I can't wear the same clothes because this is not like professional or it's not academic or something. And so you're also giving people the opportunity to like to exist in their culture, in their language and do science. And that's so powerful. Yeah, that's so powerful.

I could talk to you all day, but we should probably wrap up. My last question is just like, you know, where is this heading? What is it going to take to get there? What are you excited about? What's next?

Mónica López-Hidalgo
We want to put more effort in doing the translations. We need to raise money. That's the first thing. I'm pretty sure we're going to have. We always have, and we're going to have. So what we're going to do with that money is to put more effort in translating. Also, we want to do a fair, a neuroscience fair in the South, the poorest part of Mexico. And this is the Maya speaking people. And we want to make all accessible. We need to put all these into a web page so people around the world, if they need it, they can just download and do the same. We would like to be part of a community, you know, like many people around the world just working together to do this more effective.

And also we want to extend these to neighborhoods in Querétaro because also there's like some dangerous or poor neighborhoods in Querétaro that usually you don't go there because you you're scared but then also even if they are in this city they are also being excluded and we like to include them.

So then we would like to work with the governments. They help us to do neuroscience fair in this neighborhood. We call this "Neurociencias en tu barrio," neuroscience in your neighborhood. But go with the neighborhoods that are also not in the conditions to come, even to come to the university to our fairs that we do here. So we also want to go there. And for that, we will need to work with the government so they would have the spaces and the support for doing that. These are our plans.

Ashley Juavinett
Amazing. This all sounds so amazing. Like wishing you a ton of luck with everything. I hope people see this interview and this article and get excited about it. Yeah, thank you for doing the work that you do. And it was really nice chatting with you.

Mónica López-Hidalgo
Thank you for having the opportunity to share with us.