



# AN EDUCATOR'S PERSPECTIVE: DO WE NEED A RADICAL APPROACH TO TEACHING PROGRAMMING?

Ivan Ruby is a Ph.D. Candidate in Educational Technology at Concordia University in Montréal, Canada, investigating the integration of novice learners' prior experiences into their introductory computer programming learning journey. He draws the ideas behind his methods from his personal experiences of learning computer programming in different countries, spoken languages, and social groups. We had a chat to Ivan this week about his work and why he believes we need a more radical approach to teaching students programming skills.




**Arduino Education:** Hi, Ivan! Good to talk to you. Please can you tell us a little about yourself and what you do?

**Ivan Ruby:** Hello, Arduino! I'm an Educational Technology Ph.D Candidate and I research introductory computer programming, taking what I like to call a "radical" approach. I try to focus more on what learners know and can do, rather than what they don't know and can't do. I have undergraduate and master's degrees in Computer Science and before coming to Concordia University in Canada, I studied in Mozambique (my home country) and India.

**AE:** You've had quite a journey, how did you get to where you are today?

**IR:** Since childhood, I've been passionate and curious about technology. I started my first undergraduate degree in Mozambique in Electronics Engineering before getting a scholarship to study in India. Making the transition was an enlightening experience. I was exposed to the similarities and differences between the two countries, cultures, and education systems. That is a big part of why I'm so interested in my research. There is a wide range of difficulties and underlying reasons why learners face problems in computer programming. Complexities in the conceptual parts of programming, inefficient study strategies, the list goes on. With my experience in different countries and on different continents, I'm inclined to believe that,



irrespective of the difficulties, novices share a set of similar resources that can aid their learning and are often not capitalized: their existing experiences and abilities.

[AE](#): Why do you believe that programming and making are so important?

[IR](#): In the world we live in, programmable devices are everywhere. From devices that we wear on our wrists, put into our pockets, backpacks, and onto our desks, to those we can't see but can access, those on the "cloud". I think that understanding how these devices work and, most importantly, how they can work for our particular needs and desires is a fundamental aspect of participation in society.

The maker movement brings the democratization aspect of technological participation with its DIY roots and emphasis on the [prosumer](#) (producer-consumer) idea. It emphasizes that we shouldn't limit ourselves to being passive consumers. Collectively, we can help each other and develop mechanisms to distribute knowledge, explore our curiosities, generate and test ideas that might be simply for fun or might advance our understanding of the world by contributing to it.

[AE](#): As part of that, can you tell us how you work with Arduino?


[IR](#): I'm part of a research group called [Education Makers](#). We have a makerspace, #MilieuxMake, at Concordia University where we can hold events and informal gatherings where people would get to try different emerging technologies like 3D printers, vinyl cutters, and work on projects that use a wide range of microcontrollers. Given my research interest, I focus more on designing learning experiences that facilitate the initial steps into programming. So, we hold a variety of workshops about educational robotics with different themes.

The most interesting project I've worked on is an Arduino-powered wire car. Wire cars are a very common push toy back home and it's something kids grow up learning how to make - and they are the best at it! When I thought about one way of introducing the Arduino platform to them based on a project, I wanted to start from something they were already good at and transition from there. At the same time, I think it's a very interesting project for someone who already has some knowledge of the Arduino platform but wants to better understand how to use recycled wire, cans, rubber bands, and other resources to create a toy.

[AE](#): Let's talk about your maker space program...

[IR](#): Before the world went on lockdown, we held face-to-face informal gatherings that we called maker jams. They were open to the general public and we used to get great feedback from all the participants. People could work on different projects, learn individually or collaboratively or just peek around and see what others were doing as a way to spark curiosity.

Understandably, we had to stop these sessions, but rather than abandoning them altogether we challenged ourselves with migrating them online. We couldn't just transfer the activities online so we had to gradually and iteratively design and test what worked and what didn't.



We focused on introducing programming with the Arduino as it was a common interest amongst participants of our makerspace. Each of them has an [Arduino Starter Kit](#) and we moved forward with a blended-learning-like experience. Each of them goes through the manual at their own pace offline and we use the online time to fill in conceptual gaps, troubleshoot together, and work on projects that might be challenging to work on individually.

The pandemic conditioned some of our approaches, the ones that depend on physical presence but, ultimately, we created a world of possibilities to ask questions we weren't considering before. Questions such as: how can we design learning experiences for online, hands-on, collaborative learning for novice learners in computer programming?

Our response has been to be flexible and face the challenges as we identify them. A big part of making is being resourceful and failure-positive. We try to incorporate that mindset into our research, too.

[AE](#): What are your ambitions for the program?

[IR](#): I would like it to get bigger, and to get more learners involved and develop a more replicable learning experience. I would like to have our pedagogical approach implemented without me being present. Right now, we're waiting to hear from a grant application we submitted. During the next couple of months, we plan on dedicating time to design, test, and refine our program.

[AE](#): Thanks for the chat, Ivan, and good luck with your maker space and research projects!

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