

# Conversations on Economic Inclusion with Daniel Zaharopol

## Dionissi Aliprantis

This is Conversations on Economic Inclusion. I'm Dionissi Aliprantis, the director of the program on economic inclusion here at the Federal Reserve Bank of Cleveland.

In our program, we aim to bring together researchers and practitioners to learn about what it takes for more people to participate more fully in the economy.

Careers in science, technology, engineering, and math pay well, but preparing for them requires what Professor Basit Zafar describes as sequential human capital investments. Students need to build the foundation for them in layers of learning. What does it take to build the early foundations, particularly for underserved students, so they have a chance to pursue careers in stem?

To gain some insight on this question, I recently spoke with Daniel Zaharopol. Daniel established Bridge to Enter Advanced Mathematics, BEAM, to create pathways for underserved students to become scientists, mathematicians, engineers, and computer scientists.

The 12-year-old nonprofit provides intellectual, emotional, and financial support to help participants from sixth grade through college navigate the requirements of math courses needed for a STEM education.

Zaharopol was trained as a mathematician, but has spent much of his career figuring out how to encourage an appreciation for the beauty and practicality of math and higher achievement in it among kids from modest backgrounds.

BEAM's model starts with instruction of mathematical subjects that are typically not found in the standard curriculum and leverages a sense of community with its students so they know they're among a group of peers who also love doing math.

Students also receive support in non-traditional forms as needed, help with study skills, coaching and mentoring, assistance with college applications, money for textbooks and transportation to and from school, and connections to internships and job opportunities.

BEAM instructors even work on the little things like the right way to send a professional email or phone call. The range of assistance hints at one of BEAM's challenges, students' needs are difficult to predict. One of the more effective ways BEAM has found to address these issues is to pair students with mentors who can help them work out solutions tailored to their circumstances.

Before we get started, I should mention that the views expressed here are those of the participants and not necessarily those of the Federal Reserve Bank of Cleveland or the Federal Reserve System.

And now here's my conversation with Daniel Daniel Zaharopol.

All right, so Dan, can you tell me a little bit about Bridge to Enter Advanced Mathematics, BEAM?

## Daniel Zaharopol

Yeah, absolutely. So BEAM is a program that works to create pathways for students from low-income and historically marginalized communities to become scientists, mathematicians, engineers, and computer scientists.

Modeled a little bit on my own experience. We run summer programs for the students in the summers after sixth grade and seventh grade that are designed to be intensive introductions to mathematics and mathematical thinking going well outside of the school curriculum. So it's not that we're trying to advance them in the school curriculum, we're doing something that's a little bit orthogonal that is really

saying, "How can you go deeper in your reasoning skills? How can you see through to why things are true, why we do things in a particular way?"

Those programs are also really... A core part of them is around building a sense of community for the students and community membership that there are other kids, like me, who love doing math, and I think one of the things that's unique about our program, aside from the mathematics we do, is that we continue to work with the students for years thereafter.

So we continue to provide programming and resources to every student who goes to our seventh-grade summer program, essentially up through college graduation. So throughout that time, we are offering coaching on high schools. We are supporting with weekend classes for the students. We're helping with college admissions, we're providing coaching while they're in college.

I would say a lot of this program that I described, it's still a work in progress that we're creating. So our first cohort essentially graduated college two years ago, and we're doing a lot of refinements to the model. We're always learning from what we're doing, but the goal is to be there throughout to try to provide everything the kids need to be successful. To really be thinking about what are the core needs, what are the information gaps, what are the steps that we can make clearer to them so that they can be successful going forward?

### **Dionissi Aliprantis**

So that's interesting. And I think I'm going to go off script a little bit here. So you said this, you made the comment you want to provide everything they need to be successful in their careers. So I'm curious if you could describe some of those, I don't know, needs or some of those things that you're providing that maybe would've surprised you before you started doing this work that might surprise others, but that, you might see now as being fundamentally important?

### **Daniel Zaharopol**

Yeah, and I think I'll actually give some examples both of what we do and what we don't do, because I think both of those might be helpful

In terms of what we do. There's academic content and there's also what we call things you need to know, which is essentially life skills at various points of the student's development.

So for example, as students are transitioning to high school, we try to support them with study skills and how do you find a peer group in high school and how do you navigate high school, how do you write a professional email and a phone call and so forth.

We also help students find other enrichment programs throughout their time in middle school and high school. And then research opportunities or internship opportunities in college. A lot of programs don't do this, but this is in some sense a little bit standard stuff.

We have a last dollar fund where if a student has some unmet financial need that is blocking them from something important, we will essentially cover that little bit of gap. So for example, say that a student is admitted to a residential academic summer program somewhere and they get a full tuition scholarship, but they don't have travel, their travel isn't covered. Well, that can actually be a big blocker for our students. And so we'll just buy them the train ticket or bus ticket or plane ticket.

Or if a college student, for example, doesn't have a textbook for their class, we can just make sure that they can get the textbook so that they can [inaudible 00:06:55]

### **Dionissi Aliprantis**

So you're kind of like a backstop there, or you, you're bringing resources that kind of higher income parents would be able to bring and a kid with maybe less socioeconomic opportunity or with lower income, it might actually serve as a big barrier to them?

**Daniel Zaharopol**

Exactly, exactly. And we try to target this towards high-leverage, relatively low-cost interventions.

**Dionissi Aliprantis**

Those are usually good.

**Daniel Zaharopol**

Yeah. One example was during COVID, we had a student who didn't have access to a desk, and so all of a sudden they couldn't go to school, they couldn't go to the library, and they literally didn't even have a desk to work on at home. And so we got them a, I don't know, \$50 desk off of Amazon and it more than satisfied the need. But that was a real blocker for that family during COVID.

**Dionissi Aliprantis**

And it's hard to predict those things, I feel, like ahead of time until you get to that situation and that individual circumstance and then you realize, oh, that you need a desk or whatever it is that arises.

**Daniel Zaharopol**

Exactly.

**Dionissi Aliprantis**

I guess I will take a step back and I will ask, I think you covered this a little bit, but could you tell me a little bit about where the idea for the program came and just very generally, how do you define success when you're thinking about the-

**Daniel Zaharopol**

Yeah, it's really interesting. If I can take a step back to the philosophy of the program a little bit.

If you look at programs that are out there and educational resources for kids, what you find is that among high income or at least high access students, parents and families who are plugged in, there's this wealth of programs out there that are designed around enrichment and are designed around doing material that is not present in school. And those students, when they get to college, they've had all of these kinds of problem-solving. They've seen the language that comes up in different kinds of mathematics, they've developed a culture around it and it gives them a huge leg up in college that is not identified in the course sequence that students usually take in high school.

And meanwhile, if you look at low access students, what you often find that they're told is do well in school and you'll be fine. And that's the end of the conversation. And there's nothing about exploring other avenues of math or I don't know, computer science or astrophysics or economics or whatever thing might be of interest. There's nothing about exploring that. There's get good grades in algebra, get through algebra, pass your classes. And even that 70% of high minority high schools don't offer calculus. If you think about a STEM major, getting to college without calculus background, that's quite difficult. And in New York City, 40% of high schools don't offer pre-calculus.

### **Dionissi Aliprantis**

So can you talk about the mathematical philosophy behind what you just described? And I think I'd like to talk a little bit about, I don't know a mathematician's lament, but just the viewpoint of math as an art form. Because I think so much of our society, there's also this bigger issue that even aside from, obviously it matters, high access, low access, and I think it is even most prevalent I would say, in kind of low access school say, but just the idea of math, of being an art form and being about relative creativity and aesthetics and beauty rather than just kind of reciting facts or it just being a collection of facts.

Can you talk about what that means and why say somebody's grades in, I don't know, in algebra, might not correspond with what you are looking for, especially when you're talking about these puzzles and the types of problem solving that you're talking about?

### **Daniel Zaharopol**

There's a quote, and I've forgotten who said it, which is unfortunate, but I think it goes something like, "Mathematics is 90% struggle and 10% the best feeling in the world." And I think 10% might be a little bit overstated there actually, but the 5% of the best feeling in the world is really great.

Speaker 3:

It's all worth it. All worth it.

### **Daniel Zaharopol**

Yeah. I think mathematics provides a key to sort of deeper understanding of patterns and the world and beyond that, the kind of reasoning and logic that takes place in mathematics is incredibly fulfilling.

### **Dionissi Aliprantis**

I'd like to hear more about what specifically you do with the students at BEAM. And I'm curious, I'll be totally transparent. So I helped to run a math summer camp myself with a nonprofit called The Math Movement.

And I personally, from my experience, I think there's really kind of three main ways that I think of for getting kids excited about math. One that you alluded to earlier is community. Another is kind of just the raw beauty, just showing kids something really cool that captures their imagination and gets them excited about learning. And the other is kind of practicality, which I think it comes out of a very practical need for understanding the world or doing something in the world, definitely in physics, computer science.

So I'm wondering if you could maybe describe what you do with the students and maybe relate it to those kind of three approaches. Is there anything I'm missing from that list? What do you lean on most heavily and how do you approach some of those ideas?

### **Daniel Zaharopol**

I think of beauty and practicality as the parts that are intrinsic to math. And then community is what binds people together in doing it. What in some sense helps make it a really appealing thing to do.

So community is going to run through everything. And then the question is how do you show students these links? So I for one, happen to think that practical math is also really beautiful math. And so I think we try to make sure that beauty is just infused in everything. And some students are really going to latch onto that and they're going to love math for the sake of it being beautiful. I was just going to say, I think you can take all of high school math and you can make it much more beautiful.

**Dionissi Aliprantis**

All right. So you're using beauty and math a lot and you're using community. You talked about that as well. I'm wondering, could you talk a little bit about time? So we just had on Milani Joseph, we had a conversation with her and I'm impressed by how much what you do really follows a lot of her recommendations in terms of sticking with kids over time and thinking about just along the life course that it's not just a point in time or a one summer thing.

I'm wondering if you could talk about time in general and then maybe after that we'll also talk about the time when you all start with students around sixth grade and middle school.

**Daniel Zaharopol**

Yeah. Can I actually dive back to the previous topic just really briefly?

**Dionissi Aliprantis**

You can go more than briefly.

**Daniel Zaharopol**

We didn't talk about practicality, we didn't talk about the uses of mathematics. And I think this is actually a very important distinction that education doesn't always get.

A lot of times when people think about how is math used there, there are two things that might happen. A math teacher might have a chart on the wall that says, "This is what math you need for different careers," without really elaborating on how. Or, I think on standardized tests and a lot of textbooks, you get the problems about 99 watermelons and how they're whatever, who actually has 99 watermelons. You get word problems.

People say word problems is how math is used, and that's not a reflection of reality. When we talk about math being useful, yes, there is some amount of math that is useful for shopping, for understanding statistics and being an informed voter and so forth. But when we talk about math creating the opportunity to go into different careers for when you choose what career you're having, it's a much deeper connection.

And so when we do applied math, we are going to pick one topic and we're going to go deep into it. So we might have a class on genetics that is going to go deep into the combinatorics and the probability that's going on with genetics so that students understand, oh, they're really doing this topic. They're really seeing-

**Dionissi Aliprantis**

It's not word problems.

**Daniel Zaharopol**

How it's used.

**Dionissi Aliprantis**

It's not word problems.

**Daniel Zaharopol**

Exactly. I have an astrophysics class that I love to teach, and that's another class where we can say, we're going to really dive in and use this math from school. And you will see how one particular field of study uses it closely. And I think when people talk about how math is used, it's always these surface-level ideas when what you really need is to go in deep so that it's not about making sure that every kid imagines a career that they might go into that has math. It's about making clear that a lot of these careers you might want to choose do use math and exposing them to how that works.

**Dionissi Aliprantis**

So can you talk about that, why you think the issue of community and belonging is important for the students that you serve?

**Daniel Zaharopol**

I mean, look, I'm a white guy. I naturally fit in math communities and I would not have continued to do math if I hadn't found my peer group and my friend group there.

**Dionissi Aliprantis**

So you're the best-case scenario. And even for you, you needed that peer group to support you in doing the work?

**Daniel Zaharopol**

Exactly, exactly. I mean, I'm sure that I would've landed somewhere being fine, but it made such a huge difference for me. I felt heard and seen because there were other people like me who enjoyed math. And so the question is how can we give our kids the same experience?

And a lot of that is through building community, a lot of that is also giving them a vision for what the mathematical community can be like. Because quite frankly, as they continue in their careers, they're going to experience a lot of not great communities and they're going to experience a lot of times where there are microaggressions or not microaggressions, where there are all kinds of places where they're going to feel out of place and I want them to say, "But there is a mathematical community that works for them," and they can go and find it and they can seek out peers later on who are going to create a good environment for them.

**Dionissi Aliprantis**

I personally feel that middle school is very underappreciated time because I think in grade school, I'm not going to say you're a robot, but you're pretty much doing what people tell you to do. And I think in middle school you get a lot of autonomy and you also start developing your own identity. Kind of who am I? And so I really feel like it's a time when we can intervene and really kind of influence kids' trajectories.

I'm wondering if you, what's been your experience when you think about middle school and I guess maybe one question would be, why don't you start a little bit earlier? Why don't you start a little bit later? I'm sure there's all kinds of reasons for both of those. And just wondering if you could speak a little bit about that experience with that specific age demographic?

**Daniel Zaharopol**

I personally really enjoy working with middle school students because I feel like I can have a lot of impact there. People are going through so many changes at that time in so many different ways and

giving some guidance and saying, "These are future opportunities that you can now appreciate in a different light because you're more mature than you were before."

It's just an opportunity to have an impact and it's an opportunity to be there as students horizons are growing a lot and also as their ability to think and reason are also growing a lot in a way that's just really fun to interact with for me.

I think you're right that we do not support middle school students the way that we should. That we could be a lot more intentional about how we're creating opportunities and mathematical opportunity for them. And I see this a little bit in when we're finding programs for students to do, there are just a lot more high school programs than there are middle school programs.

And it's interesting because by high school, a lot of the programs we'd want kids to get into require fairly sophisticated mathematics. And so if you haven't had a good middle school background, then it's going to be extremely hard or impossible to get in and succeed at those programs.

So we find it quite important to be in there earlier. And in fact, we're thinking about going even earlier. There are logistical questions about that because the longer the timeframe that you're with kids, the more that kids move and there are things in life and so forth. But on the other hand, it's definitely the case that our students could have even more of a background in the mathematics we do before coming in and that would be really good for them.

#### **Dionissi Aliprantis**

Could you maybe tell us a little bit about what are some of the outcomes you've had with BEAM students?

#### **Daniel Zaharopol**

I remember there was a student who was really successful in our program, great participant, did well in high school, did well in calculus in high school, went on to college and got there-

#### **Dionissi Aliprantis**

Smooth sailing, everything should be fine

#### **Daniel Zaharopol**

... right, except it wasn't. And got there during COVID and I think ended up taking calculus two, three times the first two times without a textbook. Again, this was during COVID, so very little support and didn't tell us that he couldn't afford a textbook and plus didn't have a textbook.

Ended up dropping out of college, at least for the time being because of this struggle. And now at the moment I think he is on his way to a tech job through a bootcamp program that is well geared towards us. We were able to find another path for this student. There are so many obstacles in the way for students who don't have the support network that affluent kids have.

#### **Dionissi Aliprantis**

I'm just curious how much you think the very, in some ways, idiosyncratic and individual obstacles might be able to fit into some of those broader bins?

#### **Daniel Zaharopol**

I think what you see is an accumulation of challenges. It's very nice to say. "Here is the thing that knocked someone off course." But even with the student that I was just talking about, yes there was the buying a textbook issue, but there was also there was also COVID. There was all of the stress surrounding COVID. There was all of the stress surrounding having to work at home in a crowded home environment.

There was all of the broader lack of support that was present. There was being a student of color in that environment. All of these things together I think are factors. And I think it's very hard to pinpoint here's the one cause it's not like-

**Dionissi Aliprantis**

Maybe even misguided or misleading to think that it is that one cause rather than the cumulative effects of all of those maybe little, some large.

**Daniel Zaharopol**

... I think that's right. I think that's right. Which honestly it makes it hard to design a structured intervention. I think that a lot of the best interventions are ones that are going to connect someone with a mentor, with an advisor who can individually adapt to what's coming up.

**Dionissi Aliprantis**

Are some of the lessons that you think that you've learned and how they might apply to the broader K-12 or university education system?

So how would you think about STEM education? You talked about the fact that you all are actually doing math and working on curricula that is a little bit outside maybe the kind of standard curriculum. And so I'm curious how would you try to bring some of that in? And you talked about the ways that we could make the math curriculum more focused on beauty and incorporate more of that.

Do you have any thoughts on if you were in charge of the Department of Education or you were in charge of math curriculum in a state or a school district, what kinds of big lessons would you take from your experience?

**Daniel Zaharopol**

I want to be clear that I'm not a policymaker and what I'd like to do is put forth ideas I find interesting rather than say, "Aha, this is the way to do it." Because I think people are all too eager to say, I know the way to do it.

**Dionissi Aliprantis**

Everyone's got a solution.

**Daniel Zaharopol**

Exactly, exactly. All of these factors are interrelated. So if you were to produce a better curriculum, its effect is going to be limited if teachers aren't prepared to take advantage of that curriculum and prepared both mathematically and pedagogically to take advantage of that curriculum.

And the curriculum has to be tied to whatever measures of success we're looking at because right now, so much of education is driven by standardized testing and schools are incentivized to get students over the gap to get students up to a passing level. And if the tests are not deep, then that means surface-level



learning and rote procedural learning. So I do think you need an approach that's going to tackle all of this to some extent.

I would actually start, to some extent, with teachers and I think we should have a system where teachers are able to spend a little bit more time in an apprenticeship learning from excellent teachers. Right now you're a student teacher for half a year or a year where you're helping out a teacher for that time, sort of, and then you're thrust into a full course load in a school. And that's a really hard transition.

### **Dionissi Aliprantis**

That's not necessarily conducive to, I don't want to say learning the craft, but mastering the craft, right. That's what I'm hearing you say is it sounds like we're we want to help teachers get the training and the experience so that they really can master the craft.

### **Daniel Zaharopol**

Exactly. And there are models in other countries where there are paired teaching assignments where co-teachers, where I think you could really provide a better on-ramp to teaching and you could elevate teaching that's really excellent and use it as a model for future teachers so that your model going into the classroom isn't so much how I learned it myself when I was in school, but there's more of a dialogue created between teachers on how things work. Because there's often such a vibrant community online of teachers who are sharing ideas and lessons and so forth. But it's I think a very small fraction of teachers that really actively engage in that.

And if we could build these on-ramps, I think that would be much better for the education profession. It would provide avenues for career growth for teachers as well that I think is sorely needed in the profession for people who want to keep teaching but also want to see advancement in their career. This creates stages that provide that.

And then you have the opportunity to really say, "Now we're going to provide a high quality curriculum," that there is a teaching force that's ready to make use of this curriculum. And that's a curriculum that I think really needs to be driven more by, like we talked about beauty, problems that are intrinsically interesting and problems that are not procedural, where you have to think a little bit for each one about something new because that act of thinking about it means that you are reflecting on the mathematics you've learned in a deeper way.

You're forcing it to stretch, which means you have to actually understand what are its limits, what can and can't it accomplish. And you'll get a much deeper learning from that.

### **Dionissi Aliprantis**

Dan Zaharopol, from BEAM, thank you so much for taking the time to speak with us today. I really enjoyed speaking.

### **Daniel Zaharopol**

Dionissi, this was an absolute pleasure. I had such a good time.

### **Dionissi Aliprantis**

I hope you enjoyed this conversation on economic inclusion. Check out the other resources we have on our website where you can subscribe to receive updates on all of our work, and most importantly, reach out with your insights on these issues. You can find us at [clevelandfed.org/pei](http://clevelandfed.org/pei).