Evelyn Lamb:	00:00	Welcome to the Lathisms podcast. I'm your host, Evelyn Lamb. In each episode, we invite a Hispanic or Latinx mathematician to share their journey in mathematics. Today I'm happy to be talking with James Álvarez. Hi, how are you?
James Álvarez:	00:25	Great. How about you?
Evelyn Lamb:	00:27	I'm doing well this morning. Can you introduce yourself, tell us where you come from, where you are now?
James Álvarez:	00:35	My name's James Mendoza Álvarez, and I am from Texas. I teach at the University of Texas at Arlington. I'm a professor in the math department, and I've been at UT Arlington for 20 years. Before that, I was a professor at Texas Tech University, and I attended graduate school at UT in Austin. I grew up in South Central Texas, a little bitty town outside of San Antonio.
Evelyn Lamb:	01:04	When you were a child, were you interested in math?
James Álvarez:	01:06	Yeah, I actually was when I was little. My mom taught at a rural school which is really close to where we lived. At the time when I was a little kid, I think the school had two grades, and she was the 1st grade teacher. I got to go with her to school even though I was only four or five. I would just go and hang out in her classroom. I would sit at the back of the room. Then I just kind of spontaneously learn the mathematics on my own, and then I used to tutor other kids before I ever went to 1st grade.
James Álvarez:	01:36	I've always really liked math. I liked art also when I was a kid, and music, but math kind of was very constant in the things that I felt like I was good at. I remember then later maybe in 5th grade I had a teacher, Miss Higgins, who was teaching us about other bases, and I remember being really fascinated with that, and then I understood it, and I got lots of great feedback from her. Her feedback was really important, I think.
James Álvarez:	02:04	I think I was just always a really solid student at mathematics. Perhaps in the environment where I was growing up, I mean because we were in a rural environment, there wasn't a whole bunch of extra enrichment in mathematics, but at the mathematics I was getting, I really liked it.
Evelyn Lamb:	02:20	I assume then this interest continued as you moved forward in school?
James Álvarez:	02:26	Yeah, so I did ... In Texas, we have this content called University Interscholastic League, or UIL, and I competed in The Number

Sense Contest which was basically a lot of mental math work that you had to do. One turning point I always mention whenever I'm thinking about my own trajectories is in 9th grade ... In my school, we didn't have ... at that time there was no calculus course so everyone started Algebra 1 in freshman year. I was a freshman in Algebra 1, and I was going to compete in this contest in San Antonio. So again, some of the bigger schools, and my high school had 600 students in it. So my graduating class eventually was 125 students.

James Álvarez: 03:09 My math teacher, who actually happened to be Hispanic, and I loved her to death, Miss [inaudible 00:03:14] Camilla. I always mention her. She helped me kind of accelerate a little bit in the algebra so that I could be competitive at that contest, and so when I won a trophy at the contest I remember one of my classmates saying, "Oh wow, that's pretty impressive," because nobody from our school usually does that well because we're a small school compared to the other schools we were competing against in San Antonio, and so that kind of made me think maybe there's some outside encouragement or an outside kind of reinforcement that I was able to continue in math.

Evelyn Lamb: 03:50 When you got to college, was it clear that you wanted to be a math major?

James Álvarez: 03:55 Yeah, actually I either wanted to become a band director or a math teacher.

Evelyn Lamb: 04:01 Nice.

James Álvarez: 04:01 I always loved teaching since I was a kid. My mom's a teacher, my dad's a teacher, and so I absolutely loved teaching other students and helping my classmates. I either wanted to be a band director because I was pretty accomplished on the trumpet or become a math major. Then when I was in college what I realized is I really enjoyed my math a lot, and I think my dad was happy that I chose math over music. In the end, I realized that I really liked the mathematics more, and I really wanted to pursue being a math teacher at the time. Then later on of course in college, I realized that I just wanted to keep studying more math, and that's how I kind of decided to go on and get my PhD.

Evelyn Lamb: 04:50 Did you have a lot of encouragement in college to continue that and to go to grad school?

James Álvarez: 04:57 A lot of it was pretty self driven I think. My parents encouraged us to follow what we were passionate about, what we liked. My mom always used to talk about how she just enjoyed going to work every day. She enjoyed her job. That was kind of the thing I wanted to do. I was pretty self driven that this is kind of the trajectory I was on, and I wanted to learn more math, and then I started looking into what it would take to go to graduate school.

James Álvarez: 05:22 One person that really was instrumental as undergraduate was [Stewart 00:05:27] Anderson. He taught me Calculus 2. I think he taught my linear algebra. He taught my topology, so several courses, and he was a good mentor because he said, "Before you go to grad school, you really need to take these courses. Here are the courses you probably need to take to best prepare you to go to graduate school." In that way I think he supported my goals.

Evelyn Lamb: 05:49 In graduate school, what field of math did you end up studying?

James Álvarez: 05:54 I ended up studying percolation theory. Percolation actually looks at the structure of a medium. Trying to model structures on a 2D fractal basically, the structure of a two-dimensional fractal, model whether or not we could predict that based on that randomized structure that you can find a path, say, from one side to the other. Because in other words, if you had a fluid that spilled on one side, would it percolate through the system and basically get to the other side? I looked at those kinds of problems on a randomized fractal. That was my dissertation work in mathematics.

Evelyn Lamb: 06:41 I feel like I've heard about this kind of research involving sea ice and how fluids move through that. Do you work on an applied side of this, or was this from a very theoretical perspective?

James Álvarez: 06:57 Mine was very theoretical, but yeah. One of the examples that I might use but I didn't actually do was we could think about what's ... If you had an oil spill and think about what is the porousness of the soil and would then that oil be able to seep down into the water table, for instance, right? So what is the structure of the soil that you could predict ahead of time, "Well okay, well it won't get to the water table," which is what you would like to be the case, or if we have some kind of a spill there's a certain probability that it would get there.

Evelyn Lamb: 07:35 Right, and have you continued research in the area of percolation, or have you percolated your interest out further?

James Álvarez: 07:46 Yeah, I've percolated into other areas. No actually, when I was in graduate school I got involved in teaching in the Emerging Scholars Program. One of my first loves is I wanted to be a math teacher, right? Then I thought, "Well I'll get a PhD," because I love math, and I wanted to continue doing that, but then I also wanted to be able to teach students.

James Álvarez: 08:08 In graduate school, I talked to another TA who was TAing in the first year of our implementation of the Emerging Scholars Program which is a program that's an honors type program that Uri Treisman created at Berkeley and was adapted at UT Austin that focuses on historically underserved students, but the idea of the program is to both support and enrich the students' experiences in mathematics at the same time. So to speak to their perception of themselves because you're going to UT Austin or you're going to UC Berkeley for instance, you perceive of yourself as somebody who's academically capable. Rather than addressing students who are underserved as students who "need help," it was like, "Okay, let's capitalize on your strengths but also offer the support and make sure that you basically blow calculus out of the water, you make an A."

James Álvarez: 09:06 Anyway, so I found out about that program, and I thought, well I really wanted to be involved teaching in that program because I felt from my own experiences that there were lots of places where my own experiences could have been enriched, and I would have risen to that expectation or risen to the occasion.

James Álvarez: 09:26 I got involved and started teaching in the program, and then that kind of spiraled. I started then training TAs to do it, I wrote worksheets, I wrote things, and I basically trained emerging scholars, instructors from all over the country, for about 15 years straight. That lasted through graduate school, through my post doc, through my position at Texas Tech and also when I started here at UT Arlington. I would go back every year and run the mathematics portion of that workshop.

James Álvarez: 09:58 I spent a lot of time on that, and so that naturally led into the fact that what I really found myself spending a lot of time on was curriculum development and how do students learn the mathematics, how can we better teach the mathematics, and so that led to this post-doc at The Dana Center that I did with Uri Treisman, and then I basically switched my research area into mathematics education.

James Álvarez: 10:26 In mathematics education, one of the things that I've looked at of course is the evaluation aspects of the Emerging Scholars

Program, how effective it is for students, but more recently I got involved in trying to look at what is it about the nature of the mathematics work that they're doing in ESP, in the Emerging Scholars Program that actually can be associated with their increased performance or their better performance when you compare them to non-ESP students in calculus, say.

James Álvarez: 11:03 That work then inspired my work in mathematical problem solving which I have had NSF funding to pursue. Because what seems clear to me and which is very hard to investigate is what is it ... We kind of know what foundational knowledge students need to be able to get to calculus and be successful, right? We know the foundational mathematics knowledge and procedural kinds of things, but there's something else that they need that you could have a student who has all that foundational knowledge but then still doesn't do well in calculus. To me that lies in the area of sort of mathematical problem solving.

James Álvarez: 11:42 One of the areas that I'm interested in is finding out exactly how can we increase students' capacity in mathematical problem solving before they get to calculus in a way that capitalizes or leverages all of their mathematical knowledge so that they will be successful in calculus.

James Álvarez: 11:59 Another aspect of my research is on mathematical knowledge for teaching because I think our teaching of teachers, so perspective and practicing teachers, this idea that there's a certain mathematical knowledge that we need to develop that is an application or something that mathematics teachers in particular need to know in order to be able to teach well. Along with that is then the development of the curriculum materials that would help support mathematics teachers build that knowledge for themselves.

Evelyn Lamb: 12:27 And something I like to talk about with people is the importance of mentorship in their career, especially you've been at UT Arlington for 20 years now so I'm sure you've been on both sides of mentoring; you've been a mentor and been mentored. Can you talk a little bit about how that has been important in your career?

James Álvarez: 12:46 I get a lot of joy out of mentoring students and encouraging students. Because I think sometimes it's hard for students, especially students coming from underserved backgrounds, but also students who don't have a tradition in their family of going to college, or they have non-traditional kinds of backgrounds that I think I enjoy mentoring them and letting them ... When I

see something that a student does well, I always let them know. Because I think that goes a long way if your professor says, "Hey, this is really good work. What are you thinking of doing with it?"

James Álvarez: 13:29 In particular I have this one example where I had a graduate student, she was getting her Master of Arts in mathematics, but she was working on her thesis with me in mathematics education. She was doing great work, and so toward the end when she was about to finish I asked her, I said, "Are you thinking about getting a PhD? I think you really have what it takes to get a PhD in mathematics education."

James Álvarez: 13:56 She was like, "No." She was just going to continue teaching, which is very honorable right to continue teaching in high school, but she really didn't give it much thought. Then a couple years later, she entered a PhD program. She now has a PhD, but I remember she wrote me a letter, or an email, and she says, "You know, I would have never thought to even pursue a PhD if you hadn't mentioned it that day in your office."

James Álvarez: 14:24 And so I thought, "How many of these little things do we do for students that really go a long way?" Now for my own mentors, like I mentioned Stewart Anderson is an undergraduate, my own advisor Bill Beckner, I think he was a mentor in the sense that he's a world class mathematician. He took an interest in me, and he was very supportive. I remember being very taken aback when I was studying for prelims and he gave me a book. I was just like, as a grad student, thinking, "Oh wow, this was a very expensive book that I needed to be able to study for prelims, and it was checked out of the library and couldn't find it," and it was a very expensive book so I wasn't going to buy it being a poor graduate student. He had one on his shelf, and said, "Oh here you go," and so he let me borrow it. Then at the end of the process he says, "Oh, well I ended up getting another one. You can have that one." I remember just being so touched that he did that for me.

James Álvarez: 15:20 There was another Dr. Efraim Armendariz who passed away several years ago, but he was the associate chair and department chair at UT Austin when I was a graduate student, but then he and I kept in contact after I left. He was just this really quiet, exacting presence. We kept in touch after I graduated. He gave me lots of advice about managing the tenure and promotion process and just having that person that I could talk to. He wasn't in my area because he's an algebraist

but just having that person that kind of was looking out for you was really important.

James Álvarez: 15:55 And of course as of late I really admire, not that he's come in as of late, but as of late I've gotten to know Richard Tapia pretty well. He's at Rice University, and he is an incredible human being, has an amazing experience that I feel resonates a lot with my own experiences, and so on just a pure joy level admire him and also feel very fortunate that our community has him.

Evelyn Lamb: 16:20 Do you have any advice for students or non-students who are looking at challenges in their mathematical career and advice about how to overcome those?

James Álvarez: 16:31 I would say don't be afraid to reach out. Ask questions. People are much more ready to help you than you think. That's one thing that I feel like I have done throughout my career is I've thought of something I needed to do. I then sent an email, introduced myself to whoever it was, and said, "I understand you're an expert in this area," or, "I understand this," you know and, "Here's my question," or, "Here's the kind of information that I need or that I would like to understand." I would say probably 95% of the time the person wrote back. So don't be afraid to reach out.

James Álvarez: 17:13 Of course work hard. That's a given that we're all working hard, but try to work in a way that is strategic, that you choose the kinds of things to work on that are going to get you to the goal that you have. So for instance if you're an assistant professor and you need to get tenure, what are those requirements? And if that's your goal, then how best do you position yourself to get the publications out that you need to do, or get a grant that you need to get, or mentor the students that you need to mentor?

James Álvarez: 17:47 That doesn't mean that I was never discouraged in my career or that I never hit a roadblock in particular, but I think one of the things that I focused on was like, "Hey, I am doing what I like, and I am also being smart about it in the sense that I'm also not trying to buck a trend." If I know that my work will be judged in a particular way, I need to make sure that I present it in a way that not only is true to me but also then can communicate to others that you are doing what the expectations are in your particular area, your particular field.

James Álvarez: 18:25 I think one of the biggest things is make sure you find mentors that you reach out to people, that you're not afraid to ask questions, and that you're not afraid to be wrong. Because the

		only way we can learn is when we realize that there's something to learn.
Evelyn Lamb:	18:43	Thank you for listening to the Lathisms podcast. It's produced by me, Evelyn Lamb, and made possible by a Tensor-SUMMA grant from the Mathematical Association of America. Our music is [voll-va-ray 00:18:55] by La [Floresta 00:18:57]. Lathisms is an initiative to celebrate the accomplishments of Hispanic and Latinx mathematicians. It was founded in 2016 by Alexander Diaz-Lopez, Pamela Harris, Alicia Prieto-Langarica, and Gabriel Sosa. You can find more information about the project at lathisms.org. That's L-A-T-H-I-S-M-S dot O-R-G. Join us next time to hear from another inspiring mathematician.