

Episode 245: Invisible Barriers in STEM Education

Lizzy: Hi, I'm Lizzy Ghedi-Ehrlich

Lisa: And I'm Lisa Hernandez

Lizzy: And we're your hosts for Scholar Strategy Network's No Jargon. Each month we'll discuss an American policy problem with one of the nation's top researchers without jargon. This month we're talking about STEM opportunities for marginalized students or the lack thereof.

Lisa: Hmm. And I mean, I feel like there's definitely a noticeable disparity when it comes to STEM folks, but

Lizzy: Right, on the final end, the actual people who are getting the opportunities. True. You know, for me, humanities all the way, um, but I'm interested in learning more about why STEM. Oh yeah. You didn't know that already. No, no. Science is important as is technology, engineering and math? I don't know, the professor that we'll speak to will make sure that I'm getting that acronym correct, but of course, yes, these are things that we need in our lives, and if the path to actually be those people providing them to society is inequitable, then that's bad.

Lisa: Yeah, absolutely. And there definitely should be some solutions. Hopefully you'll get to talk about some policy solutions that people can come up with to try to resolve this huge disparity, but at the same time, you know, my heart lies with humanities and I think everyone should lead into it.

Lizzy: Well, as a humanities person who thinks about how these systems interact, yes. Policy. Always with SSN, we're thinking that way, but we've got students, we've got families, we've got local school board folks, we've got federal level policy makers. It's definitely, I, I predict it's gonna be everybody working together, but we'll find out in this week's episode.

When I spoke to Professor Lara Perez-Felkner, an Associate Professor of Higher Education and Sociology at Florida State University. Perez-Felkner's research uses developmental and sociological perspectives to examine students' college and career outcomes. She investigates racial, ethnic, gender, and socioeconomic disparities in post-secondary educational attainment and entry to scientific career fields.

Here's our conversation.

Lizzy: Hi, Professor Perez-Felkner. Thanks so much for coming on No Jargon.

Lara: Hi. Thank you for having me.

Lizzy: So in keeping with the theme of our show and our entire organization, we're gonna go ahead and start our conversation by breaking down what STEM the acronym actually is.

Um, you know, what does it stand for? Can you give me examples of classes that fall under the STEM umbrella, and careers that fall under STEM?

Lara: So STEM stands for Science, Technology, Engineering, and Mathematics Fields. Sometimes people have different definitions of that too. They may also include Arts, for example, and refer to it as STEAM. Sometimes people, um, especially, in Europe and some other countries have an extra m on the end to pull out medicine as well.

But generally here we're thinking about the natural sciences and technology fields. So for example, students might be taking an introductory physics course in a community college or four year university. They may be taking a seminar in quantum mechanics. It, it, uh, is a whole range of different subjects, but they cluster together because there are some themes that they share in terms of

both some of the content and also some of the experiences and structures of these fields. So the notion that these are, spaces for cumulative knowledge, for example, that you, you have a certain base of math knowledge, for example, that you might build and then keep building on that you need to be able to go forward.

Those are some of the things that are shared across some of these fields and, reasons why we tend to think about them as a cluster, certainly before college, but also during college and graduate school, and thinking about these careers as well.

Lizzy: Mm-hmm. Um, I wanna ask you about, just to tee up the rest of our conversation, the advantages of STEM careers. And I'm also interested more broadly in your thinking about, I love what you just told me about why these things are grouped together in this cumulative knowledge idea, but also like why STEM. As a, as a parent of younger children, this is definitely a concept and a term that's gained popularity over the past few years.

I don't think it existed, you know, when I was in elementary school, and so I'm interested in Yeah, advantages and why. Is the why defined by the advantages, I guess or not?

Lara: Yeah, that's a great question. I'm gonna start with the end first.

So I think some of the interest is, in terms of the research interests, in terms of schools and parents being interested in how to do, STEM learning at home and STEM toys and toolkits and apps that you can buy -

Lizzy: It's really having a moment.

Lara: Yeah.

I'm also a parent of, school-aged children, young school-aged children, and, also the, the daughter of a teacher. And so I have seen these things take shape over time. And so in terms of my research and a lot of folks' interest in, in this area of research and also in terms of what's happening on the individual level with some families, I do think that that idea of these fields being stable, sources of income, that they're like the, the careers for the future, that they're going to be, reliably there for earnings and potential upward mobility and a certain kind of status that all of that, kind of like frothy bubble of things of like status income, potential upward mobility, or at least being able to kind of solidly be in a place where you might not have to worry about economic shocks and vulnerability.

Those are some of the reasons why people are interested in these fields, and one of the reasons why I mention status is because this idea of cumulative knowledge or like these are areas that are difficult or these are resources that aren't available everywhere. You've gotta kind of build and cultivate this talent, and nurture it.

There is this kind of sense that these fields are special in some way, which is a subjective idea. They're not necessarily any more uh, special than other fields, but they do have certain shared ways that they are experienced. Students and workers in those areas and also by, the ways that we kind of think about and reward skills and talent in these areas.

Lizzy: So it sounds like an a, a frothy bubble it is indeed. Um, and I loved that you used an evocative phrase, putting, putting the, a back in stem where it's missing the arts part, but, you know, so regardless of where you come down on why STEM, there's, there's inequality, there's

gatekeeping, and that's I think what we're mostly here to talk about today and what your research shows.

And we want to start at the beginning in the American school system, we're getting introduced to science and math early on. Those are building block things, but what grades typically are students given more of an opportunity to really prep for future STEM majors in and careers beyond that, when does that happen?

Lara: So, there is some exposure all the way through that does look different depending on, students' opportunity structures when they're, when they're young, they may be getting exposed to STEM through play, through activities, through Centers that are very interactive at schools that are more resourced, whether they're public or or private.

So like magnet schools or schools and higher socioeconomic zip codes. And neighborhoods may tend to have more resources for interactive exhibits and plays or, uh, going to museums and, different kinds of building blocks that are not, not necessarily also needing to be expensive,

but the approach to stem as play tends to happen more in those areas and, that tends to foster a sense of interest and creativity that might keep on going through those later grades before things get more formal. So at the end of elementary school and going into middle school, there's increasingly a little bit more formality that comes in, like, now we're going to do this unit, or we're gonna break science down into these different sectors and elements.

And then there's the tracking starts to shift as you get into the later grades of elementary school such that the beginning of elementary school is focused on reading capacity and if there's any personalized learning or, separation of students by, measured ability, as ranked and rated by teachers or their grades or other kinds of things that are both objective and subjective that tends to be focused on literacy at the beginning and often around fourth grade or so, the switch comes to math, and then math starts to be that kind of organizing set of, of courses and competencies that makes friendships go together. So like, are you in these classes together with your friends? Are you in these kinds of programs? Are you getting pulled out to be in these opportunities or go on these trips or get invited to be in these clubs?

And that keeps going over time such that by high school learning gets even more specialized and students start to get the opportunities to choose certain courses. Some of that also happens in middle school. Although middle school families and students may not necessarily know or understand that, that is a really important time for them to be, you know, performing well. So they might be recommended to take algebra in eighth grade, for example, or to be taking a certain kind of science that might then set them up to be on an accelerated track in high school.

Then what you're taking in high school really can set up your opportunities in college that then you may or may not be positioned to once you start college, have the placement skills and experience to be successful in those majors. So that's one of the reasons I brought up cumulative learning earlier, is there's this idea that you need to know a certain amount or have a certain amount of training to be successful when you walk in the door. If you are a, like traditional starting in, at the age of 18 or so, college first year, which is also not the norm for most students anymore.

People come in at all different times, but all of that stuff starts to build really early and it's built in a fun way for students with more opportunity and advantage. And it's sometimes not framed as play or fun, or sometimes those science resources are not as available for students who are less economically advantaged, who also are more likely to be from racially minoritized groups,

and, immigrants and low-income students. They may be in courses where they're learning, with worksheets and flashcards and other kinds of things that may just not be as inclusive or welcoming to those spaces. And so we start to see attrition happen at really early ages.

Lizzy: Yeah. And so that's, you know, your research focus. Some of your research focuses specifically on how marginalized students, people with societal disadvantages are shut out of

these fields. Um, and that's the brief that you wrote for SSN that folks can check out, Transforming Opportunity to Support STEM Opportunity for All.

Um, and you gave already some great examples of like, when this process happens, and I'm already in my head just having these big conversations about like, oh man, all these paths that we're supposed to know about and understand these timelines that are happening and I'm supposed to start now. Oh my gosh.

And then all these other reasons why that process, hard as it is for everyone, is also inequitable. Um, so if you wanna do a little bit more detail on like, how early does the process of shutting students out begin? What does it look like? And I'm interested in, I don't wanna say whose fault, but, I'm interested in how, you know, is it, is it parents?

Is it policy makers, is it educators? Is it everyone? You know, whose job is it to be thinking about how to unkink those pressure points?

Lara: Yeah. that's a great set of questions. So I also teach courses in, in sociology of education and, one of the things I, I share with international students especially and other, other folks who might be new to thinking about a systems approach for education is how complex and somewhat decentralized we are in the United States.

So in terms of, I don't know, placing blame or trying to locate a particular pinpoint of if we make this lever of change, then there'll be these cascading effects. It's really hard to pinpoint that when you're thinking about things that happen within families, within peer groups, within classrooms with, uh, you know, the, the media and local school.

Different states, uh, different, you know, federal expectations too. So, it's a, a complex swab of things. One of the reasons I, I brought up math earlier is, for one, it is something that gets invoked a lot in all of these fields. Whether you're looking at STEAM or STEM, or STEM with an extra m for medicine, they all have pretty good reliance on mathematics and mathematics skills, interest, confidence as being really important to your capacity to be successful in those areas.

So, to some degree, the way that we teach math has for, for good reasons, been a, a focus for a while in terms of some interventions of expanding course taking access for advanced courses in urban schools and in some states and trying to train teachers and students to be able to, go beyond Algebra One, for example, in high school or to increase greater capacity to, to teach students precalculus and calculus. So that way they'll be ready to be able to take physics, for example, or computer science or whatever it might be In college and that they're not getting shut out earlier.

So math ends up being really determinative sometimes of what kinds of courses and what kinds of majors students can pursue in college, but sometimes what kind of math preparation you have by end of high school is determined by things that happen in middle school.

So there are some things like, is there communication to families about what these majors are and what it would be like to be in these careers? Is there a certain amount of exposure or, accessibility that can be introduced so that way students might be given greater opportunity to move into this and that also, there's not an overly limited set of students who might be tracked into taking those kinds of courses. And are there opportunities for students to be able to catch up, for free, ideally, in high school, so that way if they decide in 11th grade that they actually would really love to be in a science program, but they need to take another course to be able to be like college ready in science and math, they might be able to do it in high school and not have to pay extra in college for what functionally is, is remediation sometimes in lower income schools, there might be more of a norm for teaching to the test for a lot of reasons, including the financial structure of teachers in schools being rewarded or penalized depending on how they perform on these state assessments.

And so, if science learning isn't on the test or if there are not as many resources to have professional development for teachers so they can kind of stay up on ways to make science and math more innovative and fun, then some of the onus for that can feel like it's falling on the families and families are just really strapped and stressed and have a lot to do.

So I definitely don't wanna come out of this conversation and making it feel like, oh my gosh, there's so much we need to do. Our child will never have the opportunity to go into these fields if I don't make sure that they have these apps or that they're not in the special camp where they're doing 3D printing

Lizzy: Right?

Lara: - at age eight,

Lizzy: And of course, there's a whole industry instead of industries that want people to feel that way so that they -

Lara: Sure. Definitely, definitely there's, uh, there the financial advantage for companies to, to kind of feed that, that hunger and drive and some of those apps and games and toys and little robots for kids are really cool and fun But that's, not a necessity. There's a lot that students come away with without having to spend money, but that kind of culture of this is for some people and not for others.

Or there are these, suggested or invisible barriers for entry. That kind of thinking that is shared and reproduced culturally in schools, among family groups, in the media, those kinds of very

addressable norms and expectations and sometimes explicit messaging to, families and students is, is some of what I'm, I'm talking about in the brief and in some of the, the other areas of my work around these kinds of on-ramps and off-ramps there's been literature around, uh, a leaky pipeline in STEM for a few decades of here are all the people who could potentially be in these fields, but we're losing them, and why are we losing them? But we haven't had as much attention to how can we bring people in? What are the ways that we can try to make these areas more accessible for students to, to learn and think in?

Because oftentimes they are very interested in playing and exploring in these things, but, the socialized messages, for example, the ones that girls get as early as, very early childhood. And certainly there've also been a number of studies looking at, you know, fourth grade, eighth grade, beliefs and kind of aligning, students' ability beliefs about whether or not they're good at these areas, whether they can increase their competency in math and science.

And then looking at how they're actually performing. Like these are not necessarily students are struggling in these areas, but they keep getting messages that this is not really an area for them. Or this is maybe these toys, like the STEM toys are in the boys' aisle, or these are available at some stores, or you need to have a certain membership or subscription to get access to these things.

And so, students may just check out or feel pressured to just do something else that might be in their frame of reach and have more support.

Lizzy: Yes. So let's talk then about like what to do and then when we haven't even gotten to college yet, so we'll go there next. But you know, you, I love that you brought up sex and gender because that has been top of my mind this whole time. You know, and I, I know that there is no way that being born with certain chromosomes or whatever gives you a math brain or a STEM brain or not.

And then we look at the results and we're like, well then therefore, you know, if, women are being shut out of these fields. That has to be because of the system we've created that allows some people through and incentivizes some people through and have other people are part of those leaks, you know, that fall out.

Um, that's one of the things that seems to be a barrier. You also write about STEM courses having this, like notoriety. They're the hard classes. And they both have a reputation for that. And then there's also the reality that GPAs tend to be lower, they're graded differently. and I'm just interested then about like interventions.

Like what can we do then? And we're still at the K through 12 level. To make these classes less intimidating to students who are excited about math and science, regardless of their socioeconomic status, their sex, uh, all of those things. But, you know, what, what do we do to educate parents about those grade differences?

Is there a fear that we'd need to make them less rigorous? And then you run into problems at the college level. How do we address these issues?

Lara: You use the word hard and I think about even the way that we use that language, uh, around the hard sciences, or this is also me being in, the social sciences and in education, that sometimes those fields are talked about as the soft sciences, even though, um, psychology and economics have, just as much math and very similar methods as, engineering in a number of other areas, but we tend to think about them differently. I don't think folks are looking to make the training less rigorous or comprehensive or to kind of skip knowledges that folks should have to be able to be successful in these areas.

But there also could be different kinds of, sequencing opportunities or tracks that are available to kind of help people, you know, jump forward perhaps, I'm not perfectly up to date on whether or not this is still happening, but for example, in some schools in Chicago and in St. Louis, you might be able to take summer enrichment courses so that way you can kind of boost up a little bit and um, as an alternate to doing camp over the summer, or maybe in the afternoon. You're doing kind of camp and play at your school, but then in the morning you're taking a class while your family is working.

Those kinds of opportunities can help families that are working paid work during the summer and need childcare, uh, that is safe and good for their kids, and also allows students to be able to do this academic enrichment without incurring a lot of costs or making it be this really cumbersome, process.

And something that I mentioned earlier too, around setting certain expectations, norms or, or mandates for students to take, for example, a minimum of three years of, uh, of science in high school.

And then that way they're at least taking a certain number of years of courses and they're not different from their friends for doing that. So some of the research on gender has, for example, looked at like, girls will follow their friends and if their friends are not in those courses, or for example, um, students of color are often one of the very few students in very, in more integrated high schools that might be in advanced courses.

And so, if you are, making these courses optional for some students, it's going to often exacerbate those kinds of inequalities so that way some folks may opt out, and then it seems like only certain types of people are the ones who keep going in those fields, and then those opportunities

Lizzy: And you keep reinforcing -

Lara: Right?

Lizzy: - the ideas that we're trying to break down. So more on-ramps, more accessibility of on-ramps, accessible on-ramps throughout the K through 12 life course to use a social science

term, um, so that we're not just providing these tight windows, um, of entry, and we're keeping people's interest and we're combating ideas about who's supposed to be represented in those spaces.

Um, so we do all that. We get together as a society and as a country. And then, um, these children get to college, uh, where there's even more attrition for marginalized students and more leaks in the pipeline. You did some research talking to students in STEM spaces in college. What can you tell us you heard?

Can you give us a few stories about what that was like for people? Like what did work for them? What kept them going? What made them not keep going? I suppose

Lara: So, I'll start with community and financial support. So one thing is that on the finances piece, there is a lot of, like before college, a lot of these kinds of hidden costs. That not always, not necessarily, and perhaps especially at public institutions that may not as comprehensively fund everything, there are these little things that students might be expected to do in these majors that might potentially keep them in their courses and being successful in their courses, but not doing, extracurriculars or classes or -- not extracurricular activities or labs or often unpaid internships, uh, sometimes expected, and required unpaid internships.

These kinds of things exist and sometimes, there can, can be a gulf available there. And that there's a sense of like having to build so much cumulative knowledge and experience and expertise and this idea of, kind of shortage or scarcity. So sometimes STEM fields can communicate this idea of like, oh, it's really hard. You have to work really hard. You have to do these special things.

But then you can, you know, join this club of people in physics and engineering and you're on a path now to be making, you know, a hundred thousand dollars after you graduate with your BA. So folks may persist and struggle through these spaces, but they may not know how to go through the process of trying to cultivate relationships with faculty that may then recommend them and possibly even fund them for internships or other kinds of opportunities that can then set them up for that first job after college or opportunities in graduate school and such that can help them bridge those gaps.

Like there, there are opportunities available to help support students from all backgrounds, but sometimes this idea of hidden knowledge or kind of specialness and exclusivity can make it hard for students to know how to approach and navigate these systems that can feel very complex, and difficult to break into. So that's, that's one piece that's both about relationships and hidden knowledges and also around finances and how they go together

Lizzy: Yeah, and that's not exclusive to STEM either. Those are, that's, that's supported in research of all students who, from marginalized backgrounds who do make it to college, whether it's community college or otherwise, that there is that level of knowing, um, that if your parents haven't translated it to you, your school district hasn't translated it to you, where do you get that? And so is that what you're hearing for folks? We wanna hear more stories about people actually going through it in college. How did people deal with that?

Lara: Yeah. Those are some of the things that I've heard from students over time and we've done interviews with students in engineering programs, including, you know, very successful students that are, in internships and in other kinds of, um, you know, they're in the major, they've done well, they're at farther along in their undergraduate and graduate careers, but they are still navigating these kinds of on-ramps and, application required kinds of opportunities, that can be difficult and have sometimes unwritten assumptions around whether or not housing is provided for their summer research, internship or other kinds of things.

So you're absolutely right, Lizzy, that these same kinds of patterns happen in other fields, but there sometimes does feel compared to students I speak with in other fields, like there's more of it happening in STEM.

Lizzy: I mean, there's no reason not to believe that we're taking something that we know is the path towards a stable future in high paying jobs. And you're saying there's more barriers to exclude people from that space so that only rarefied types of students that just happen to align with the pockets of society that generally already hold power.

Like, yeah, that makes sense to me that that would be the system

Lara: Yeah. And, you know, that can create these kind of multiple challenges for students. So for example, there's a student who was, a, a resident assistant in her residence hall, which is often very competitive and also very nice housing provided kind of job available for students. Um, but you need to have a certain kind of uh, GPA to be able to hold your scholarships in financial aid.

And these are jobs that, uh -- these are fields that tend to have lower grades earned by students. And so, yeah, so this, so this was student who like dipped below her 3.0 GPA, which I know for example, when I was talking to students at, my graduate university, the average GPA for upper class, uh, you know, junior and senior physics majors was a two five, which broke me. I mean, I did leave after -- I did leave STEM as an undergraduate student. a year or two in, I moved to psychology from biochem.

And so I never got deep enough to see all of my peers be, be at like a two five, but still staying in that field. but these are fields that really do have grade penalties associated with them. And that perpetuates this idea of hard. So for this student who is hardworking, who was a well-rounded person who wanted to be also in, one of the music programs as an extracurricular,

and was invited to be in this engineering lab and was, you know, a solid student through the first year.

lost their housing job because they dipped below a 3.0 and then they didn't have a place to live. And they got kicked out of their room and they had to sleep in the lab for a couple weeks until it was discovered what had happened. And then it felt just like so overwhelming to think about joining one of these, uh, research intensive internships over the summer that said it had funding.

But when was the funding actually gonna be there? All kind of vague. And so these are just things that students can, fall into, especially if they don't have a buffer financially or families that can help them fill in. A lot of these systems were built for folks who have more advantage, and so if you have an eight week period where you're not getting funding, and maybe you also need housing --

You know, you can, you can like find someone's couch to sleep on while you're also working a 15 hour a day job. 3D printing materials at unpredictable hours and trying to find an affordable meal, while you also don't have a car. And so you need to eat, like, at the university for \$8 for lunch.

So there are all of these kinds of roadblocks that can happen. And they feel like they can be overwhelming sometimes for -

Lizzy: Yeah. Well, they can, they, they literally

Lara: But

Lizzy: - be overwhelming

Lara: Yeah. Yeah, this was a success story of a student who made it through and had great support and was able to continue before a lot of students, it's just, it's just too much.

So like maybe they might, you know, struggle through their major. They might switch out of their major into something else that may not feel like it's, you know, battering them all the time in the same kind of way. They may have a really supportive, you know, advisor and mentor, like happen for the student.

But they also may step out and then end up with debt and, uh, and other kinds of challenges, like in that immediate case, where does a student live? Is there a safe place for them to go?

Lizzy: So you've given us plenty of ideas for both the K through 12 and the college level of various interventions in places where you haven't mentioned specific interventions. You've really

done a great job of highlighting these little areas and little rules and policies and systems that seem like they wouldn't be a big deal.

Um, but then when you take someone who's maybe less resourced, they really can be and they can super knock somebody off course. And just thinking about ways that, you know, school administrators might make small changes, um, to not have that happen anymore is something that's already in that conversation and that's great.

Um, but especially, you know, knowing what you know from the stories of students, and it sounds like from your own story as well, that I hope, you know, you count as a, as a success story that you found your place. Um, but if not, you know, what did you learn from that? What needs to happen next? What's your set of core recommendations for how we can patch the pipeline?

And also, it sounds like just change the shape of the pipes so that it's not kind of a straight shoot, but more of this kind of multifaceted, multi, multi doored kind of operation.

Lara: Yeah. Thank you for asking. So I, I do think, creating more, on ramps. Uh, the, the brief had this analogy of escalators that kept coming to my mind, but, you know, how can we move people up and help them accelerate sometimes as well, and not make it feel like this, this like rapid deceleration that's happening for them where they're, they're slipping down and they can't get back up, like shoots of ladders.

So how do we let people get back, forward? Uh, there are some things that could be done that I, I kind of alluded to, in some cases and in other cases I, brought up with some more specificity, but we can rethink the ways that we grade students, so that way, you know, there's no reason why sometimes there's been attention to there being overly high, grades assigned in some fields that it might be too easy to get an A or an A minus or a b plus in some fields. That's one argument. There's also potentially an argument that it might not be the norm or the benchmark that sets the curve to have a C.

For students who are very academically talented, who want to be in this major, who are, you know, supporting the department with their credit hours and, and tuition dollars, and wanna be in the field, how can we not constantly tell them that they are average or below average in the, the grades that they're receiving, and, uh, and not risk their, their financial aid.

So is there some sort of consensus. You know, thinking about academic affairs units for example, or state governance agencies, is there some sort of normed expectation that could be set so that way there's a more uniform grading policy for students who are doing strong quality work, but so that way we're not pushing people out of these fields. And while that's happening, we might also wanna think about financial aid.

Um, and if students are going to class, if they're doing well, are there, are there ways that they may be able to, not have to be sweating the potential loss of their financial aid package every semester so that way they're able to be thinking about that idea of play I was bringing up earlier around like science being fun, like it just feels so joyless in student descriptions and my own memories as well for my, myself and my friends going through these fields of if every test feels like it's high stakes, if every lab assignment that you turn in, feels like it's potentially gonna make or break your ability to afford being in school and then potentially bringing shame on your family that's like been investing in you and cheering for you all this time and sees you working so hard.

That's just a lot to have to carry all the time. And these students in these fields can often be more stressed.

It's in our interest to help students feel good while they're doing this work, so that way they can perform and create this wonderful cadre of scientists and, and engineers and skilled workers that can enter any of these fields, uh, of work that they may go into.

Um, but making it painful. I'm not sure what that gets us making it so painful and so hard

Lizzy: Right?

Lara: And so

Lizzy: Is there any policy recommendations, like if you were a legislator or even someone like on a school board, what would you try to address some, not all, don't worry, of what you've laid out for us today.

Lara: Yeah, that's such a great question. So a very, accessible and we're even, looking at this here, here locally, is to create better communication, clearer communication and more consistent communication for families, teachers, counselors, and students at the middle school and high school levels around the alignment between course taking opportunities, who might be a fit for them and how this fits with career tracks with an inclusive list of career tracks. I think that that's something that can be very compelling. It's free, uh, communication and clear materials. Um, doesn't cost anything and it's something that might be able to change the conversation.

What's some professional development for, for teachers? Some invited workshops that might be available remotely or recorded for families and teachers translated into multiple languages. Um, there's a lot of research lately on these high-impact, but low-touch interventions. So like you don't necessarily have to do a lot, but these kinds of low-touch interventions can be that, that don't require a lot of work, but are often around the communication simplification and, democratization of information for, for families around course taking and being prepared to be able to go into these courses and be successful in middle and high school and then in college.

Uh, that's something that really does seem to be, boosted by research evidence across multiple state, national, and local studies over the last couple of decades and seems like something that would be very translatable for local districts and schools.

Lizzy: Well, that is so great to think about. And in the meantime, while we work on that, I'm gonna go be grateful for the fact that my children are still elementary school age and I haven't yet got to the pressure points you've outlined. But thank you so much, Lara, and thanks everyone for listening. For more on Professor Perez-Felkner's work, check out our show notes at scholars.org/no-jargon.

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