

[music]

Clay: And again, what we're doing, we'll turn right back around and bring it to the next Industry Advisory Board meeting and say, "Hey, here's what we're seeing in the market. How does that fit into your curriculum?" So, it's this constant conversation of... Oh, I wouldn't really even call it "continuous improvement." But it's more of a "How do we keep tuning the programs, so that they stay fresh and up to date with what the current times require?"

[music]

Mike: From the Center for Occupational Research and Development, welcome to *Preparing Technicians for the Future of Work*. I'm your host Mike Lesiecki. In each podcast we'll reach out to people who are actually on the front line of the future of work and hear what they have to say. That means interviews with industry, interviews with working technicians, forward thinkers in the field. We'll do some background research, and we'll curate that research to make sure you have the most up to date and relevant information. And in every episode, we'll suggest action that you can take. We want to inspire you to take that action.

This podcast is brought to you by the Center for Occupational Research and Development, known as CORD, with financial support by a grant from the National Science Foundation's Advanced Technological Education program. Opinions expressed in the podcast do not necessarily represent those of the National Science Foundation. You can find out more about our project and our approach at "PreparingTechnicians.org."

Well, listeners, today we have a really exciting event because we've engaged three people to talk today. One, from a leading semiconductor manufacturer. Another colleague from a major university. And our third guest from a national organization. So, I'll introduce them as we get started. But it's exciting because we're talking all about the same thing from three different perspectives. And you'll hear that today. Let me start by introducing Clay Nagel. Clay, you're the Deputy Director and Senior Manager at Global Foundries. Did I get that right Clay?

Clay: You did!

Mike: Your focus is on technical training, right?

Clay: Yeah, that is correct.

Mike: All right. Good. Thank you for joining us, Clay. I've got a bunch of questions. I'm going to put you on the hot seat in just a moment. Let me introduce Dr. Bob Geer. Bob is the Senior Vice President and COO (that's Chief Operating Officer) at SUNY Polytechnic Institute. Thanks, Bob. Thanks for joining today.

Bob: My pleasure, Mike.

Mike: I appreciate your being with us. And our third guest is Robert Weinman. Robert's the Director of Workforce Innovation (I like that title!) at the National Institute for Innovation and Technology. Robert, that Institute is a pretty new organization, isn't it?

Robert: It is new! It's new this year, yep! But the work that went into it has been decades in the making.

Mike: Good. We'll hear a little bit more about that as we get started. So, thank you all three for joining us today. Now let me get started.

Clay, I promised I put you on the hot seat! You work at Global Foundries, a major, major semiconductor fab. First of all, before we get started, people might not be familiar with the term "foundry." What exactly does that mean?

Clay: Sure. So, a foundry in the semiconductor business basically makes microchips—semiconductor integrated circuits—for other customers who do not have manufacturing capacity or manufacturing facilities at all. So, we make chips for our customers. So, we work in conjunction with them right from design phase through manufacturing, and help bring their products to market.

Mike: Perfect. Our focus of our project is preparing technicians for the future of work, Clay. What do technicians do at Global Foundries? Do they run equipment? Do they process chips? What does a technician actually do there?

Clay: Yeah, so in today's advanced fabs, we have both equipment and process technicians. Equipment technicians focus on making sure that the extremely complex and expensive equipment is maintained and "up and running" on a regular basis. You can imagine that the lifeblood of what we do is completely determined by being able to keep our manufacturing line up and running—absolute tip top condition. So, their mission in life on a daily basis on the equipment side is to make sure that all of that equipment is running the way it should.

On the process side, those technicians are more focused on the actual wafers themselves, to make sure that anything that needs to be dispositioned, from the standpoint of any data that comes out, that might look like there's an issue. So, the first line of defense to disposition, whether something can move forward? Or whether an engineer needs to take a look at it is to determine what we do next. Is it something needs to be pulled out on the line to do some measurement? Is it something that we can move forward? Is there something that needs to be even scrapped, right? We're seeing data that says that that particular wafer can't move on. So, one set of technicians is working on the equipment, the other was actually working on the process itself, and the wafers, and the data coming out of that.

Mike: You know, Clay, in thinking about these technicians, as you described what they do. If you had to imagine for our audience, as you see your workforce entrants, right? People that are coming in to work at a place like Global Foundries. Are there real gaps that you've noticed? That you said, "Well, I wish they would have had more training in this area. Or more education in this area." Are you seeing gaps?

Clay: So, it depends. If we're getting folks in from some of the programs that we really like to hire from (The issue there, of course, is we can't get enough of those folks.), we don't see as many gaps. So, for the technicians from a community college perspective, if we're hiring people who don't have semiconductor background already, we get them out of electrical engineering, technology programs, or out of mechatronics programs. They typically have a really good baseline set of skills that then we can take them and train them up into what they need to know to do the job once they're with us.

For the folks that we're hiring with a high school diploma, some of the gaps that we see are real gaps in hands-on skills. So, missing: the ability to work easily with hand tools. Knowledge of hand tools. Definitely a gap in electricity and electronics. And then there are also some math skills. You think about things like statistics and statistical process control. Those tend to be missing from folks who don't go through the programs that I just described.

Mike: Clay, I know you've worked with both Robert and Bob, on the call with us today. Let me turn now to Robert.

Robert, at NIIT you have an initiative that's actually looking at these gaps and trying to work with educators to close the type of gaps that Clay has talked about. Could you tell us a little bit about, first of all, NIIT? And then this idea of working with industry and educators. What strategies are you using to close those gaps?

Robert: Yes. NIIT is a national institute. And we're working on supporting strategic sectors with a focus on talent pipeline, supply chain, and then communications. But what we've identified that the biggest challenge right now, as strategic sectors, is getting the talent pipeline in. And so, that's been a laser focus for us. And we've had the fortune under an NSF grant to work with SUNY Polytechnic Institute with Bob (on the call here) to really develop a national talent pipeline strategy for semiconductor design and manufacturing.

And a little secret here is: The pipeline and competencies required for semiconductor design and manufacturing are very much in line with any industry in advanced manufacturing. So, I'm sharing our secret sauce here. But that's something that we've identified, the biggest challenge is what we call "communicating the competencies" (knowledge, skills and abilities) that are needed in these industry sectors, with a little bit of focus on semiconductor. And really, a short way of describing our project is: We're trying to clarify and amplify what employers need.

And the last piece of that is we've added some torque to that. So, we've developed a cloud-based portal that intersects all the stakeholders without interruption. So, while they're going about their normal business of recruiting for jobs, or applying for jobs, or training for jobs, our portal gives us real time signal on: What are the competencies that are in high demand? What are the new competencies that are emerging? And then also, what are the competencies that are becoming kind of old and rusty and irrelevant—kind of like the ability to use a slide ruler. And I apologize to my dad because he still uses his! (He's an engineer!)

Mike: So, is this portal live? Could anyone look at it? Should we link to it in the Show Notes, Robert?

Robert: Yeah, so the portal right now—we're in Alpha release. So, that's kind of like pre-release. And we're using it with partners. So, SUNY Poly has worked with us. And we're working with a network of community colleges, which we think are really at the foundation of all the work that we're doing. And then we're in the development of Beta. At the end of that development phase, it will be going public. But right now, it's like with industry partners. But we're very much inviting many others to get involved. So, I mean, anyone that has some interest and wants to reach out to us, we'd love to work with them. And we have identified and are working in several regions that we think are really important exclusively to semiconductor.

Mike: So, is this true, Robert, that you've actually worked with people like Clay (!) to help identify these competencies and these potential gaps?

Robert: Man, do I want to admit that?! [laughing]

Mike: That's good!

Robert: Yeah, actually, I said like the work of the NIIT has been kind of "decades in the making."

So, one little insight there is: There was a team of us that worked at Global Foundries that... Just to kind of give a little perspective... Global Foundries: One of the largest construction sites in the world at one point; huge fab placed in the middle of the woods in upstate New York. So, there was a real challenge in finding workforce there. I had the privilege to be part of the team that tried to work on greater alignment and actually signaling to the workforce community, and ecosystem out there that, while we have some very amazing technologies going on inside the fab, the base skills that we need are very applicable. And, like Clay had mentioned, these "elect tech" programs and mechatronics programs. So, did a lot of work there with a small team, including Clay. And then we took that on a national level with an industry association. And now we've branched off with the National Institute.

Mike: That sounds good. Let me turn to Bob Geer.

Bob, you're on the education side of this equation, right? And Robert talked about signaling and amplifying. Do you like those signals? Do you like...they're not exactly telling you what to do. But they're suggesting what your education program should look like. Is that a good thing?

How does it work? What's...what is the interaction between you at an educational institution like SUNY POLY? How's it work with these folks?

Bob: That's a fantastic position to be in, to be honest. One of the challenges in education is that certainly faculty and committees, and we all have advisory boards, multiple companies, but our data set in terms of what is really important to employers can get limited. And so, the most important thing is to have your finger on a pulse. And to be honest, considering who we educate—and especially in the technology fields—we haven't really taken advantage of the incredible power of the Net in terms of being able to get information from many, many companies at the same time.

And what NIIT has been developing (this portal), Robert didn't really go far enough in saying all the work they've done is to engage hundreds of employers across the country, especially in the semiconductor area. Having access to that is just a goldmine to faculty, because they can see this is what's really a priority.

And then, it's sort of our job to translate that into curriculum, and to content, and engage students in it. And I've got to tell you, it's much easier to engage students and excite students, when you can tell them "This is exactly what that giant, white building, 20 minutes up the road, needs in the people they hire!" And I'm referring to Global Foundries. So, it's an absolute benefit!

Mike: Sure. Let's think about your faculty for a minute, Bob. Do they have to develop random courses? Sometimes that's a pain—you have to get it through committees. Or can they update their curriculum based on these signals that are coming? How does it work?

Bob: Yeah, that's a great question. In working with Robert, and really interfacing with folks in the industry, like Clay, the goal has been to make this alignment, if you will, of current curriculum. And Clay, mentioned that programs that are really sort of "on target" give them candidates with a great skill base. So, what we try to do is make sure that it's less of a "creation," and more of an "alignment." In other words, "a listen." You have a great set of courses here, if you could add these three topic areas (and to be honest, you can add them in any way that works best for you), that's going to help an individual student's skill profile get closer to what the industry needs. There's no

one right answer or wrong answer. The question is: What works best for a particular institution?

Mike: That's a great comment, Bob.

Clay, let me follow up with you on that. Our project has emphasized what we're seeing more as "cross-disciplinary skills," right? So, you've got your electromechanical skills, let's suppose. Your mechatronics skills. But what about crossing those with things like IT? And cybersecurity? And you mentioned the technicians having access to data? Are you seeing these "crossing skills" being operational inside the fab?

Clay: Yeah, absolutely. So obviously, you can imagine in a highly technical environment and very advanced environment like a modern chip fab, IT is everywhere! IT skills are kind of a given, and they're built into some of these programs. We obviously have worked with our partners in education to discuss the kind of IT skills that we're looking for incorporated into their education. And as Bob said, it's not really a "how do we create it?" It's how do we take what they're already doing, and almost "tune it" to what we're looking for. And really, not just Global Foundries, but any advanced manufacturing environment. We try to keep it not just "for us," as selfish as we like to be. We know that we're not going to hire everybody. Not everybody's going to want to work for Global Foundries. But we want it to be applicable.

Which is to go back to another thing that was said: the Industry Advisory Boards. It gives folks like me who sit on some of these Boards an opportunity to talk to other manufacturing companies in the area to make sure that what we're talking about is aligned, so that we're not really pigeonholing any one company's needs into a degree program.

From a data science perspective, a modern chip fab today probably generates more data in an hour than most companies generate in a year. So, it's being able to look at that data, understand the signals in the data, and really use more modern things like AI and machine learning to its best use. Where we can take that data and create solutions out of that data very quickly. And so, we can run a lot of data very quickly and get the answers if you will.

Cybersecurity in today's day and age is "table stakes." Everybody's got to be hyper vigilant about everything that they're doing. Any email that comes from somebody that you

don't recognize could be someone trying to formulate an attack on the company. So, we do an awful lot internally to continuously train folks on the latest threats. In cybersecurity we have a whole program around that at Global Foundries, to make sure that it's NOT just a one and done, "Oh yeah, by the way, remember: you need to be hyper-vigilant about cybersecurity. Good luck in your job." There's a constant beat of quarterly training that happens around "What's the latest threat?" And it's continuously renewed. So that: it's not what you saw last year. Because last year's "really old," in the cybersecurity business.

All these things come together. There's a need for all of the baseline skills. Or really: those electromechanical, mechatronics skills. That's how you get in the door. And you can start to be successful in your job. And then it's: What else can we add to those programs, so people come in with IT, and data science, and cybersecurity awareness? And then we like to bolster that with our own programs inside.

And again, what we're doing, we'll turn right back around and bring it to the next Industry Advisory Board meeting. And say, "Hey, here's what we're seeing in the market. How does that fit into your curriculum?" So, it's this constant conversation of...Oh, I wouldn't really even call it "continuous improvement." But it's more of a "How do we keep tuning the programs, so that they stay fresh, and up to date, with what the current times require?"

Mike: One of those "feed forward loops," Clay!

Clay: Really? Yep.

Mike: Bob Geer, listening to what Clay had to say (Okay, this is going to put you on the spot a little bit), but are the education programs doing this? Are they integrating IT and cybersecurity in their advanced manufacturing programs? Is that starting to happen?

Bob: It is. Based on working primarily with other institutions that are involved in some of the projects we are (that Robert was discussing,) we see where, "Yes, there absolutely is coursework that treat this." But to Clay's point, it's not really distributed the way it could be. In other words, sometimes academics (and I count myself in that category), we tend to look at things in a very one-dimensional way. If this is the job, we think, "Oh, here's a certificate. Or a degree program. Or what have you." When in reality, many degree programs have a foundation that

covers so much of what an advanced manufacturer needs. And so, we have to be very careful about saying, "Well, you know, this particular major doesn't need that information. Or doesn't need that priority on data literacy. Or it doesn't need a priority in terms of statistical analysis." Those skills are really universally needed. So, when it comes to whether it's cybersecurity or information security, those are courses that are best deployed across a wide range of degree programs.

And in doing this work with NIIT, that's been a fantastic side effect: of people really looking at their curricula. And seeing what skills and competencies are really being given. And seeing where gaps are. And Robert was describing that portal tool to really be able to help analyze that. And it's been an eye-opening experience. So, we really hope that happens more. Because to be honest, you can increase the value of a degree just by inserting some of these components! It doesn't have to be three years of study. We can really build on skills and competencies just bit by bit, courses here and there.

Mike: Right. Great points, Bob!

Robert, let me turn to you. I'm going to be specific here. Does your tool (or the portal that we're talking about) does it address these crossing skills like IT and cybersecurity? Are there signals that you're sending in that area as well?

Robert: Yeah! So, a couple of things, too. That the tool is designed to integrate with the work that training providers are doing. And employers are doing, while they're doing the recruitment process. And workforce development process. And talent, while they're applying for this. And they're also looking at their own profiles of competencies and seeing how they match. All that work that's done (the job search, job placement process) is being tracked by our system. And what it starts to do is like, applying for jobs has always been a one-way street: you apply, then you're "ghosted."

Mike: Sure.

Robert: And you may never hear again. So, you really don't know: What was the gap? Was it my picture? Or was it my skills? Right? So, this system is designed to help empower the individual, so they can start to see, "Where ARE the gaps?" So, they can actually look at the match of their competencies compared with a profile of a job—not a job

description, but an actual competency profile of that job—and determine if this is within reach? And if there is a gap, is there a training program (that's been profiled by this tool that we have) that directly matches that gap? And that goes back to the whole thing of, "We've tried to look at this from the talent perspective mostly." Because we all need talent. And we're competing with many other industry sectors. And other employers. And training providers.

So, looking at this from the talent perspective is, "How do we empower them?" We've talked about data and automation. How do we give them tools so that they can really understand? And also communicate. And build their value proposition for a job. And then also analyze the value proposition of jobs that are out there for their next move. Or for training programs that can help align to those target jobs they have. So, that whole piece ties into it.

And the last piece to this is what Clay said. He talked about Industry Advisory Boards. Global Foundries is like that "unique 5% of employers" out there. They show up on a consistent basis to these Industry Advisory Panels. And they're 100% engaged! And that's why we've chosen them as one of our most important partners. So, they really spend a lot of time on this. There's many other employers out there that are underrepresented. Either because they can't show up. They don't have the resources. They're small operation. Or what have you. And what the portal does, it allows them to show up VIRTUALLY. So, their data is being tracked. That data can be analyzed by the community college program at a regional level, at an industry sector level, or at an employer-by-employer level. And then that can be digested BEFORE they have the meeting where they all get together, and eat doughnuts, and then discuss it. Right? Well, we're trying to inform that conversation to make it a little bit more sustainable, especially for the community college, as they provide people and train people for these jobs.

Mike: That's good, Robert! Thank you for that insight.

You know, as we wrap up today, let me turn back to Clay. Get out your crystal ball, if you don't mind. Look out in the future from your perspective. What do you see in terms of emerging future skills? I'm talking more about the technical skills here. I mean, are people going, "They are not very much inside the fab now. They're mostly in the chase, right? Are those people going to be replaced by

automated systems? It's all going virtual." What do you see out there, Clay, in terms of technical stuff?

Clay: So, automation is a very big thing already. So, I see that continuing. And an understanding of automation and automated processes. So, the skills that you'll see developing from a technician standpoint is "working with the automation" and "the software that integrates all of that automation together." And again, come back to the data that you're going to see in that. I think that's going to be a really big mover over the next few years.

Mike: Uh-huh.

Clay: I would just like to add to that, that from an acquiring-talent perspective, it's very hard to do right now. And I see that at least in the near future, I think we're going to be hiring folks in and doing a grow-your-own program. So, working very closely with portals, like what Bob is talking about, and then working with our education partners, is going to be SUPER IMPORTANT because we'll almost be flipping the script, if you will. We'll be sending people BACK to school, right? Rather than hiring people FROM a program, (which we will continue to do, wherever we can), but the need is so great, we'll actually be spinning that back around. So, it's going to give us an even greater interface with the folks like we have on the call here today, just because of the "nature of the beast" that we're up against.

Mike: Very important point there, Clay! Thanks.

Bob, let me turn to you (Bob Geer). Will education be changing in the near future? Put on YOUR crystal ball. I mean, you hear things about more micro credentials, and things like that. Do you see ways that education can respond faster? Do you see changes in that world?

Bob: I think that change has started, and I think will accelerate. And just for the folks listening, whether it's a micro credential, whether it's a certificate, it really is the same type of approach. It's trying to respond faster. And trying to respond to a particular group of skills. Or group of knowledge. Group of abilities. And I think that's going to continue. Simply because the world, as you well know, the skills required by folks, especially in advanced manufacturing are ballooning.

I think a second point (and especially for your listeners that are from two-year colleges, community colleges), if I look backward, 10 years, maybe 12, I could probably count the number of cybersecurity programs at two-year colleges on my two hands. Now, they're absolutely ubiquitous. And so, in fields where people thought, "Oh, you know, this is absolutely a four-year type of degree." No, that's not the case. And we're seeing more and more of that. Of being more aggressive in terms of pushing these high-skill areas down into two-year degrees, because people come through faster. And, as Clay mentioned, it's a foundation to build on at whatever career you happen to choose. I think those two trends are going to continue, to be honest.

Mike: Good, Bob. Thank you.

Robert, we're going to give you the last word. But here's your question. What advice do you have for the two sides? (I know there's not just two sides, but let's call it the educator side and the industry side.) How can they become part of this? What should they do in the next three years to really start being part of this whole thing? What do you think, Robert?

Robert: I think we have (I don't know) version 4.0 of the "learn-and-earn model." So, like apprenticeships, fellowships, internships—those are going to become much more, I think, the forefront, which is great. Because, with tools like the portal that we've lifted up (and there's others in this space), one: ours is agnostic. So, it allows us not to really be selective. It just allows us to interpret "What are the competencies that are needed out there?"

But what's important about that signaling is: You can now make the decision as an integrated partner. So, community colleges and colleges being an integrated training partner with the employers to decide, "What are the core competencies we need to deliver—in the shortest space of time—so that people can enter into employment safely, but also able to do the job? And then simultaneously work with that employer to train that person up into that position and into future advancement.

So, we're in a unique space now, where we can really prioritize competencies, not just on "Here are the core competencies," but "What is their impact for THIS actual job?" So that accelerates job analysis. And also,

individual analysis as far as, like, "How to optimize this person? How to optimize this job?" And also, "How to optimize education?" It really is a great space right now, because data is allowing us a much better dialogue between the three stakeholders. And we're just at the cusp of that, and we're just really excited to see that grow.

Mike: Thanks! I like the picture that you painted there, Robert. Perfect!

You know, listeners today, we heard some really strong insights. What struck me is: A lot of our discussion today applies not only to the semiconductor manufacturing industry, but to a broad industry segment, because we're facing the same type of challenges.

You heard us talk about "clarifying" and "amplifying" signals. That's a good way of thinking about the way that communication occurs between, let's say, industry and their education partners.

You heard Bob Geer say "This helps us keep the finger on the pulse." That was a good analogy.

And then the even stronger use of Industry Advisory Boards as one way to pave forward this path that we're on for future technicians and preparing them for the future of work.

So, let me wrap up today by turning to each of our participants and thanking them. Robert, we really appreciate your time here. Good luck with the things that are occurring at your National Institute.

Robert: Thanks. I hope it's not up to luck!

Mike: [laughing] Thank you.

Clay, appreciate the taking the time. Good luck with everything! (Here I go with luck again!) [all laughing] Best wishes for everything—in finding those technicians. I know it's a challenge today. Thank you, Clay.

Clay: You're very welcome. Thank you.

Mike: And Bob, thank you again. It's a pleasure always working with you. Hearing your perspectives from the education side. Thanks, Bob.

Bob: Thanks very much, Mike.

Mike: Goodbye, everyone.

[music]

Mike: Today, listeners, we talked about sending and amplifying the signal. And of course, we're referring to the communication between education and industry in regard to preparing the workforce. And our context today was in one of the world's most advanced manufacturing facilities: one that make semiconductor microchips.

Today we've discussed a strategy for engaging many, as many as hundreds of industry members in this conversation and expanding the role of Industry Advisory Boards.

You heard the term, and I like this one: "fine tuning." That is, making adjustments as we go forward in our education and training programs to keep them paced with industry needs.

So, your action today is: Look and see if you can fine tune your own relationship, whether you're in industry or education, look at that relationship. See if it can be fine-tuned to be more responsive to each other. Openly discuss that. And use the resources that you'll see in today's Show Notes.

I'd like to acknowledge that our audio production is done by John Chamberlain at CORD. And thank you, John, for all of your excellent work. Our project is led by Principal Investigator Ann Claire Anderson, also at CORD. Thank you, Ann Claire.

Now don't forget, folks, as you access this podcast on the website, right next to the Show Notes, you'll see a link that says, "Feedback Survey." Take a moment. It's just a few questions. And that helps us improve these podcasts going forward.

By the way you can find this recording, and all of our previous podcasts, on "preparingtechnicians" (that's all one word) dot "org." Or you can also access individual podcasts through Google Play or Apple Podcasts. A rating and review are always appreciated.

And thank you, our listeners for Preparing Technicians for the Future of Work!

[music]

Please include the following citation when citing or using content from this podcast:

Lesiecki, Michael (Host). Preparing Technicians for the Future of Work Podcast: Episode 32, *Sending and Amplifying the Signal* (audio podcast, transcript). Center for Occupational Research and Development, Waco, TX. November 2021. Retrieved from <http://www.preparingtechnicians.org/>