Rob ():

Hello everyone. Welcome to Chem4REAL because Research Engages All Learners. This podcast is hosted by the Chemistry Division of the Council on Undergraduate Research (CUR). We are a community of faculty nationwide who 'walk the talk' of engaging student learning through undergraduate research. Each episode we will discuss recent findings, experiments, and strategies to assist faculty in defining, expanding and building a community of lifelong learners around undergraduate research experiences. Whether in a classroom, laboratory, or the community, undergraduate research increases student engagement, advances student adaptability, and promotes overall resilience.

Catherine ():

In this podcast, we have three experienced faculty in different STEM areas speaking to mentoring diverse STEM students through engagement in undergraduate research. We will talk about supporting and recruiting diverse students, establishing personal connections and trust, building networks of support, and finding institutional resources to build these supports.

Hello everyone. I'm Catherine Chan, a faculty in biological sciences and chemistry working at the University of Wisconsin-Whitewater. So whitewater is a regional comprehensive institution within the University of Wisconsin system. I've invited two of my STEM colleagues here today to chat a bit about mentoring diverse students. And I will let them introduce themselves.

Kris ():

Hi, I'm Kris Curran. I am a professor of biology at UW-Whitewater, and I've been here for 15 years and mentored many, many students over that time.

Ozgur ():

Hi, my name is Ozgur Yavuzcetin from the physics department. I've been at UW-Whitewater for like six years. And I have also mentored many students, not as many, many.

Catherine ():

Well it's suffice to say that combined amongst the three of us, we have many years of experience mentoring undergraduates. I think we calculate it to be about 35 years just mentoring students on this campus. And as you can imagine, just like most institutions of higher education, our campus is serving a more diverse populations of students. So we'll touch on how we see diversity a little bit later in this podcast, and mentoring and supporting these students through engaging them and undergraduate research comes with its own set of challenges and rewards. So here today, we're here to talk about some of the strategies at the institutional and personal levels that have been successful for us. So Kris and Ozgur, do you have specific strategies for recruiting diverse students to work in your research groups?

Kris ():

And so I guess my answer for that is not really not at least for getting them into the lab, although I feel like they find me and the reason they find me is that I'm an approachable instructor. And I try to incorporate my research into every course that I teach. So at the beginning of each class, I talked to them about what my research interests are. And then as the semester goes on, if something exciting

happens in the lab and usually something gets published, that's exciting in my field of interest, I share that with the students and that seems to pique their interest and the questions I'm asking and they usually come to me.

Catherine

That's good. Ozgur?

Ozgur (03:50):

So as like most other physics departments in the country, the physics department at Whitewater is also pretty small in terms of our own physics students. However, we also offer a lot of service classes. So I also like try to mention a little bit about what we do in our department, to our students. And if there's someone who is really like interested in, they usually, I try to invite them also, like they approach me to me or to other faculty who's doing the research and so that we can explain to them what we do in our department. The other recruitment place that I see is like when I do advising meetings with our students. Usually it's a conversation one on one. And again, one of the advantages of being a small department, we try to know our students a lot better.

So we asked them like, what kind of skillsets they have, what they're doing in summers or winter breaks. And as a department, we try to have them at least like one or two research experiences throughout their studentship. So that's another place where we a basically like, try to get closer to our students and ask them what they're doing in terms of research or internship. And then based on their skillset, sometimes we say, okay, there's this faculty you can work with. Or there's that kind of a job, like, are you planning on applying? Sometimes we try to match them with the projects. The other recruitment area that I was thinking of will be the undergraduate research days that we have on our campus. So like usually students present their posters or other type of interdisciplinary research. There, I can also like see what other departments are doing and the students are also like working on. I also work with a couple of companies in the area and they usually have certain like small job postings and so that I can match a student who is interested in working with the company or sometimes like if the company is thinking of hiring a certain student with a specific skillset. That's something they can approach us, too. So these are basically some of the venues for recruiting students.

Catherine (06:20):

So it sounds like, you know, at least for Kris and Ozgur, you're using, you're trying to establish connections with the students, either through the classroom, by sharing your excitement in the field or your own research, through advising appointments where you have perhaps more of a chance to talk to these students more in a private one on one setting, public events where research is celebrated, research accomplishments of fellow students is being displayed and celebrated, or making use of your own connections with other entities, be it private companies or what not, to help students land that next opportunity. So I think this actually speaks to the importance of not just our own individual efforts, but also having some sort of programmatic, institutional type of support to help these students find the mentoring and help them stay engaged in these opportunities. So on our campus, we're kind of lucky in that we have a relatively new program called the Research Apprenticeship Program where beginning students, so primarily freshmen, sophomore, and newly transfer students, but not exclusively so, are recruited to engage in mentored research experiences early in their college experiences, in their college careers. And this particular program is a little bit different from some others where again, beginning students, including freshmen students, are recruited into research programs because our program actually tries to remove some of the early, the hurdles of early engagement in research, especially for

students from minoritized backgrounds, such as, you know, students not having the confidence or the skillset to formulate clearly a research question, are not connected enough to find a mentor or mentors on a particular campus, or cannot afford to engage in these experiences if they are not paid. These hurdles, or at least we try to reduce these hurdles, through the use of institutional resources. So our program is actually a paid research assistantship program. The program helps students find appropriate mentors as opposed to putting the burden on the students on themselves to find those appropriate mentors. So we're hoping that, you know, these resources are actually working in conjunction with individual faculty's effort to help provide opportunities to these students. So, you know, following up perhaps on that, so in your experiences, Kris and Ozgur, what are some of the most successful strategies in supporting these diverse students once they are in your research groups?

Kris ([09:13](#)):

Okay, so, well, I think the financial aspect, at least for this group of students is, is very key. So when I think of diverse students, I think of not only underrepresented minorities, but also first generation college students, as well as non-traditional students who are coming back to education and they may have a family. And so I have found that many of these, these people that I would call our diverse students have the will to do the research. And if we think this is a high impact practice, that would really help them. It's their obstacle is, one reason is, financial. So if we can support them financially to at least get their foot in the door, into research in a lab, even as in very early in their, in their, college career, that would be really, really helpful. The other side to that, being a mentor, I think is, once a student has kind of decided they would like to be in your research lab is to support them fully, you need to tell them how flexible you are. And you need to be very flexible for this particular group, because they may have other people that they are supporting while they are at the university, and those other people don't understand what those students are going through. That could be their family, that could be siblings, that could be small children, okay? So telling them, well, this is my expectation – it's this many hours a week. Now I'd like you to come in on this day, but once you're trained, you can, this is a little flexible. So once you're trained, you can work a little bit more independently or, say, you have a test that you need to study for. Okay, well, let's take that day off of research and you study for that test, but then next week, I'd like you to come in double time or I'd like you to come in on Friday, and just be really flexible with these people. And that really helps them.

Catherine ([11:22](#)):

Yup. That is important. That personal piece, understanding the student's needs as a person, right. Not just as a, just another worker or helper in the lab and research group. Ozgur?

Ozgur ([11:36](#)):

Yeah. Again, one of the most important thing or a strategy that I've found, which is useful is reaching out early. And I think the Research Apprenticeship Program does this pretty well. So that that's the program offered to first and second year. A lot of times I also see students when they come to the lab. If I assign them projects, if they don't know what they would like to work on - could be something that they may not like it, which is totally fine because in the end they still get the experience. They get a taste of like how research works or work in a project where sometimes it doesn't have to be a research project. It could be something to help us, still that earns them some type of like experience to work with the faculty. And I see that sometimes students actually, if they don't like what they're doing, they can steer into other fields or they can even like change what they are thinking of pursuing in their future, like as in graduate school or as an engineering degree or something else.

So, I mean, there are a lot of benefits of like having them to start early. So that's at least one of them. And in terms of supporting a wider variety of diverse students, let's say you want to work with a minority student who may not have the, like Kris mentioned, may not, they may not necessarily have the financial support. There are some programs that could actually provide them extra support, like McNair Scholars Program or King Chavez is one of them. In the past, we have had some minority students who have worked with me coming either from like other departments, from different majors, or within the physics department. And these programs have been very helpful in finding financial support for them or summer support at least. So just like, for example, WiscAMP has been one with these programs. And WiscAMP is Wisconsin Alliance for Minority Participation Program. And they have been supporting some of our students throughout the semester or also for the summer.

Catherine ([14:02](#)):

And WiscAMP is part of an NSF funded initiative that belongs to the Louis Stokes Alliance for Minority Participation. So it is actually a nationwide effort. So we're fortunate in Wisconsin that we have such a support, but it is also up to the mentors to know and be aware of these supports for the students and encourage and help students to utilize these resources. Right? Because especially for students who might be first gen, who are not completely connected, if you will, with a complete suite of resources that a university can provide, we, the mentors are the ones who should be in the know more than the students. And it takes extra time and effort to get students connected to these resources. But as Kris and also you both were mentioning, these resources sometimes determine whether students can afford to stay in the mentoring experiences or not because they have other priorities. They have other obligations in their lives and being a student is only part of the identities of the whole identity. Just like we, right?

Kris ([15:11](#)):

I like to speak to the benefits for the faculty, too. So I would say in all of the programs mentioned - both the Research Apprenticeship Program as well as the other programs that Ozgur mentioned - It's, it's not just a one way street. So first of all, having that student in your lab is, is always a good thing because having a new person come into your lab and seeing your research question from a different perspective than you and asking you questions that you can't answer, is always better, right? And having a diverse set of students coming in, just increases that. So it just helps you on the scholarship side, but most of these programs have some financial support for the faculty and it's your reagents and your animals that these people are doing research on.

And yes, it is a financial toll because they are undergraduates and they make mistakes and they leave enzymes out that costs $200. Right? And so these programs all have some sort of, it's not a lot, but a small amount of money to help the professor deal with some of the costs of training these students, which I think is really great. And the last thing I want to speak to is the RAP program benefits on its own. And that is that, I don't know about you guys, but teaching introductory biology classes and even into the sophomore level, we all know how many students come to our office hours, right? Not many. And much of that is due to them, I think just, you know, you have power over them. And they're, even if you're as approachable as, you know, I - I really don't think I'm scary - but evidently I am, but these kinds of programs, first of all, the RAP program helps to takes the, takes the work out for the students.

So they apply to the RAP program and they match them to a mentor so that they don't even need to come talk to you. And you can just say, Hey, I need a RAP student. Like right now, I need a RAP student to help me with screening and we're screening for a particular genetic transgenics. And I really don't want to devote a undergraduate research project to it because it's really just looking, looking for

tadpoles that have my gene, right? But it's a wonderful RAP project. It's great for a person just starting out to learn some basic techniques, how to assess light production and possibly transgenic tadpoles. How much fun is that? How could you not get excited about biology doing this project? And I need the hands. So to be, that's like a match made in heaven for RAP. So if you have like a project like that, that's kind of a, kind of more of a grunt work project or kind of a simple project.

That's perfect for someone who's just coming in, who needs to get their hands wet. And in my lab, it is actually they get their hands wet, because the frogs are in water, but they get excited about the fact that: Oh, wow, these frogs make light. Yeah. You want to see how it goes? You know, you can really spark someone's interest really early and also break that barrier. So those RAP students that work in my lab, they come and ask questions about their introductory biology classes. They come back and get help for cell biology or genetics, and classes I don't even teach, you know, like I need help with this. And that breaks that barrier. Now they come into your office hours and they stay for like an hour talking about this and that – research, life. And all of a sudden, it's now more collegial. It's not like this person with power over you. It's more of a collaboration. And that, that is so much better for them to realize that you're a real person early.

Catherine (19:08):

I mean, our students at some point, hopefully, you know, will become our collaborators, right? That's how, at least certainly in the sciences, that's how knowledge is being built and expanded and transmitted. Right? We are trying to cultivate the next generation of scientists who will hopefully become our collaborators down the road.

Kris (19:30):

That will be a colleague. You hope by the time they're a senior, if they've been working in your lab a couple of years, that you're more collegial than anything, that it's more of a 50-50. Instead of me saying this, they come and say, Hey, I think we should do this control.

Catherine (19:45):

And I think this is actually important for the students to realize too, that they are not just taking up resources, our time included, but we are actually trying to build relationships together. We are trying to foster new information, new knowledge together. Yes, in the beginning, perhaps we, as mentors, are providing a little bit more assistance than they provide to us the other way around perhaps. But we are trying to build that relationship so that in the end they will actually be, you know, turning the table a little bit and providing assistance to us. And then I think it is important for them to, to be aware and to value that because then they don't necessarily feel like they are a burden to us, right? They are working towards something bigger than themselves. And I think there are cases where people are thinking, well, especially for a relatively inexperienced students, beginning students, can they really manage research?

And I think we have some very great examples here that as long as one can be flexible about how we conceive research projects, that we make them into smaller, more manageable, understandable chunks that even the beginning students should be able to accomplish. And we should be able to do that, right? That's how science is done. You have small, the building blocks. It depends on how you envision those building blocks. Right? Nobody should be excluded, I think, from the process of science, just because they've come from a different background from us, that they are inexperienced in this particular area. And here, I think we're trying to change that perhaps old paradigm that should not be applicable.

Kris ():

And you know, what's interesting too, is that some of my best researchers, my research students, have not been my A students. They are not; they are the C students. I've, I've like accepted people where I've been thinking: Oh, I don't know. And they turn out to be, everything works for them. I was like, Oh my gosh, what talent? So some of my, my strongest research students are not my best in the classroom, which is really empowering for them because they know they're not the best in the classroom. And yet they come into your research lab and they just blossom. And yeah, it's a really amazing thing.

Catherine ():

Yeah. It's a different skillset. And I think we are trying to encourage them to discover themselves, discover their own strengths and their talents and work on perhaps areas that need improvement, just like all of us.

Kris ():

Right, right. But then they start making the connections back to their classrooms. Then you hope that they do better when they go into the classroom because they've had that experience.

Catherine ():

Certainly, they have the motivation to stay in college and do well enough in the classes to remain in college. Right? So, yeah, cool. So it sounds like there's no one size fits all strategy, right? Because everybody's different, just like us as mentors, everybody's different, but I guess it is important to - for us all to remember - that since we're all different, now, students are unique and, therefore, we have to spend the time to know them and figure out what they need.

I think the trust is really important and trust cannot be earned overnight. We have to really put in some effort to build it, but since we're cultivating our future colleagues in here, I think it's worth the effort. And I think sometimes students may find asking for assistance being a stigma of some sort, that I'm not good enough and, therefore, I need help. I think as mentors, we can try to help reduce or eliminate that stigma, be it in the classroom or be it in the research lab and it's very, I think it's easier to do that in the research lab because everybody makes mistakes. I make mistakes as a mentor and it's a teachable moment. Right? I make mistake and you know, well, how do we try to avoid making the same mistakes again, rather than beat yourself up on making that mistake. So I think that's very translatable to the classroom, too.

Kris
Right.

Ozgur ():

Hmm, and I want add something there. A lot of times when students approach the faculty and sometimes faculty can ask: Oh, why don't you bring your resume? Let me see what you are, what kind of skillsets do you have? And when they come out of high school, they think actually they don't have any skillsets. But even bartending can be related to a certain type of skillset, or working in a grocery store, or helping dad with the car and with the mechanics and other stuff. So a lot of times students actually underestimate what kind of skills they have or which they are not aware of. But once they start working

with the faculty, they actually realize that, or as a part of the conversations, they can actually be aware of what kind of skills they have and they can put it on their resumes for their future careers.

So I found that actually pretty useful. And again, as you said, like this relationship does not start overnight. But as you work with the students, I mean, you kind of like create that bonding of, which is kind of like, the professional friendship and you, so you talk about future like plans on like graduate school or jobs, and you can talk about your own graduate school experiences. So you actually give them a much better idea of what it will be like in a graduate school rather than what they just hear from their friends. And I found that pretty useful too. And the other thing that as Kris mentioned, the other joy of like working with the students is, like how they shape their future. Sometimes they again students come and they are not the highest achieving students. However, if they discover something that they really like working on and they try to pursue that for their future career. And in a couple of years, when you hear that, Oh, actually that student ended up doing that kind of engineering, like, wow, how did that spark come out? Which is, I think one of the biggest enjoyments as faculty in here, like to see how they - students themselves - like see they have own steering motivation, and they can change their future careers in that perspective. So I found that to be the biggest joy is being a faculty.

Kris (26:25):

I know on the outside of my office, which now I'm thinking after this conversation that I should just hand these two articles out to all my intro bio students. One article is "The Importance of Stupidity in Science", and it was published in the science journal Science. And the other one was also published in Science, and it's "How My Rhubarb Pie Got Me a Job in Science". And that, that particular article is really funny. But the woman like had a friend, a family friend who loved her rhubarb pie and he was a researcher. And he asked her, well, based on your rhubarb pie, can you come and work as a lab technician in my lab? And so she started working in science and then went, and I think she got a degree after that, but like, like you said, the skillset, well, if you can, if you can cook something in the kitchen, you're probably okay, I bet, in the laboratory.

And I must admit when I'm teaching about research, I'd say, well, would you put your meat back in the freezer after you thawed it? Hmm. Let's think about this. You know, and I'll say, well, I don't think we should freeze thaw this reagent. What would happen if you put your meat in and out of the freezer? So a lot of it comes back to cooking for me.

Catherine (27:42):

Yeah, so something that is relatable.

Kris (27:45):

But it also it's a skillset. So if they already know how to measure things carefully in the kitchen, then they're going to measure things carefully in the laboratory.

Catherine (27:53):

Right. Here, we're just kind of shepherd their journey further than they thought they could. Right? Because we have the networks, we have perhaps a little bit more information and knowledge than they do.

Kris (28:05):

And the other thing, I think that benefits them coming into our laboratories, is that not all students, is that many of them have no idea what kind of job you can get with a physics degree or a chemistry degree or biology degree.

Physicists, they must do something with rockets, and chemists, they must do something with making Kool-Aid, and biologists, it has to be a doctor or a nurse. And they don't realize like just the diverse types of careers that they could do. And that's something that we can, we can help with too. And it's easier to do it in a research relationship where you already know where the student's interests are. And you can say, Hey, have you thought about this? Yeah.

Catherine (28:46):

And apart from ourselves, we have friends, we have colleagues who can be role models for them, or examples for them, too, right? Okay, you know, not necessarily like all science students want to become faculty, but we also know of colleagues who are not faculty who work in different types of positions, even within the university setting, right? So I think we can actually help these students expand their, literally, their role model.

Kris (29:10):

That role model thing just sparks something in my brain, Catherine, I'm really sorry.

Catherine

No

Kris (29:12):

But when I was speaking about some of the advantages of the RAP, the Research Apprenticeship Program, the other thing is role models. So they're, if they're doing this at the very earliest freshmen/ sophomore year, they're working in the same lab that I have juniors and seniors working at. And this also is a real big bonus to the RAP or the Research Apprenticeship Program. And that is that they start talking to upperclassmen about their classes, how to study, like what their projects are about. And they get mentored, not just by you, they get mentored by their upper-class mates, which is really cool.

Catherine (29:57):

Yeah. I think actually this expanded network of mentors, be it peer mentors or faculty or staff mentors, is really important. I mean, we have different needs at different times. We cannot really just bank on having just one person, or one source of support.

We all need that. And I think for students with diverse needs, that's even more important, right? Because there could be several different hurdles of different kinds or natures that can derail one's, you know.

Kris (30:23):

it also, it also helps them to realize that they can't work alone. Like many people think science is a very lonely thing to do, but not many people work alone in a laboratory. And when they're working in a research lab, even as a Research Apprenticeship Program, you find as, the research apprentice, sorry, they are helping some of their other peers in the lab. But they also might be asking those peers: Hey,

can you, can you help me with this? And they learn to ask for help, which is, everybody has to ask for help. I have to ask for help.

Ozgur ():

Or they learned how to like, schedule this certain instrument, if it's a very commonly shared facility.

Kris ():

Or if you've taught them once and they don't quite remember, they can either ask their peer or they can ask you and that's, that's all good.

Catherine ():

Yep. Well it sounds like, you know, obviously there's no one strategy that is successful and works for everybody, but you know, the relationship part, the trust part is really important. We obviously have to spend time and effort, but there are rewards coming back to us, back to us as mentors as well. So it is important. I think we all, I think we all agree here in this room, it's important to support diverse students, their needs and help them engage in research as a way to cultivate the next generation of scientists and actually educated citizens as well. Hopefully we have shared some thoughts with the folks who are listening and you know, we welcome other inputs as well.

In this episode, we talked about building trusting relationships with students which, of course, is the foundation of good mentoring, important considerations on accommodating the needs of diverse students, and taking advantage of the full range of support available to students - including those that are offered through various institutional resources. If you don't know what these resources are, I encourage you to talk to your colleagues on campus, especially those working in the Undergraduate Research Program, the Research and Sponsored Programs, as well as perhaps colleagues in Student Affairs. And of course, connect with your colleagues at CUR, the Council on Undergraduate Research.

Karen ()

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