

-: Hello, my name is Ainsley Latour. I am a co-founder of IDEA-STEM and I'm very happy to be collaborating with the University of Toronto to bring you this virtual symposium around supporting students with disabilities in STEM classrooms.

The purpose of my video here is to introduce our session around the use of laboratory assistants as accommodation solutions for students with disabilities. I am going to be conducting this session in an interview format and collaborating with Dr. Mahadeo Sukhai throughout the session to bring you relevant information and experiences around the topic of using a laboratory assistant as an accommodation solution in the classroom.

Now, Dr. Mahadeo Sukhai is a geneticist who is blind, perhaps Canada's first, and in the context of being blind or partially sighted, throughout his STEM training he actually utilized the accommodation of a laboratory assistant to perform a lot of his work throughout his PhD.

And in his PhD, he was manipulating mice and using those mice as a model of one of the particular genetic variants that occurs in a form of leukemia.

And so we're going to have a bit of a discussion and we're hoping that you're able to interact and find the content applicable and useful to bring back to your own classrooms.

So I'm just gonna give a little bit of a visual description of what people will see on the screen right now if they have access to that.

I am a white female in my 30s. I have my hair, which is dark brown, pulled back. I'm wearing dark-rimmed glasses and a headset, a black jacket, and a black shirt. I am sitting in my home office. The wall behind me is medium brown and there is also a whiteboard on the wall behind me which has no markings on it.

Now, laboratory assistants are human beings and they provide assistance to students with disabilities during STEM learning activities and labs, and using examples that are relevant to high school science, in the session we outline some of the examples where you could use a laboratory assistant and the types of tasks that that laboratory assistant could perform.

Importantly, the role of a lab assistant is performed typically by an educational assistant or someone in post-secondary who may be hired to work for the institution, but at the high school level, a laboratory assistant could also be an itinerant teacher, a parent or a sibling or other family member or guardian.

It could be anyone who has the capability of performing that role in whatever the student with a disability may need from them. So where the curriculum expectation is to design an experiment or troubleshoot an experiment or interpret the results of an experiment, a laboratory assistant doesn't actually change the learning expectation for the student.

If the learning expectation is to physically perform the experiment then perhaps using a laboratory assistant does modify the curriculum expectation. However, we included this session in this conference because we believe that students with disabilities often sit out of science labs or they are doing something a little bit different from what their peers are doing.

And if they don't have access to the same information or the same way of interacting with something or they're just not participating at all then it creates gaps in their skills and their knowledge and what they're able to do in STEM and those gaps get exasperated the longer the student sits out of labs over time.

And so we believe and we advocate for the use of laboratory assistants where students would be sitting out of a lab completely or perhaps not interacting with information that is the same or as rich as their peers without disabilities may have access to in performing this lab or this activity.

So in this session we're going to speak a little bit about different scenarios where a laboratory assistant could be useful. We're going to elaborate on the benefits of using a laboratory assistant, both for the student with the disability but also their peers who may be acting as a lab assistant.

And finally, we outline some of the skills that a laboratory assistant And the student with a disability may need in order to make this accommodation solution effective for that particular student.

So we're more than happy to engage with teachers and educators in a dialogue around lab assistants outside of the session. Feel free to contact us if you have questions or concerns or just feedback.

We'd be very happy to hear from you. We hope you enjoy the session. Thank you.

Welcome to our session on laboratory assistants and how laboratory assistants can be used to support students with disabilities in the science classroom, whether it be face-to-face or virtual.

Before we get started, I would just like to do a couple introductions and a little bit of description as to where we are in our homes recording this and what we look like for folks who may not have the same visual access to the screen as typically someone with full sight may have.

So my name is Ainsley and I am one of the co-founders of IDEA-STEM. I am sitting in my home office with a brown wall behind me and a white door and a whiteboard which has nothing written on it. I'm wearing headphones with a boom microphone. I have dark-rimmed glasses. I am a female of about 30-ish years of age and I have light brown hair that's tied back in a ponytail. I'm wearing a pink sweater with a blouse that has some flowers on it.

And I'm gonna ask Mahadeo to introduce himself.

:- Okay, thank you very much, Ainsley.

So hi, everyone. My name is Mahadeo. I am also a co-founder of IDEA-STEM and happy to be here with you in this session to chat about lab assistants. I am a brown-skinned male in my early 40s with black hair, mostly black hair. I'm wearing metal-rimmed glasses, which I will often push up my nose because they have a tendency to fall down. I am actually wearing Apple earbuds, which I will adjust every so often. I have a dark blue blazer over a slightly lighter dark blue shirt with very, very, very tiny white dots and I'm standing in my home office at my standing workstation.

Behind me is a sort of beige wall and a darker brown drapes that are pulled over a sliding door to the outside.

:- Okay, thank you very much. So let's get right into the session It's going to be a question-and-answer sort of format and I'm gonna begin by asking Mahadeo, what is a lab assistant? Could you please tell us?

:- That's a great question, Ainsley. Thank you. A lab assistant is, very simply put, a human being that is in a science classroom setting, particularly in the lab kind of component, who is providing help to a student with a disability.

Notice I said help, not guidance. The lab assistant is there to act as supplemental senses, so to act as hands, eyes, ears, to the student with a disability and to assist them in the performance of the experiment. Again, the role isn't to do for. The lab assistant isn't there to do the experiment for the student. The lab assistant is there to do with and to provide the help that the student might need based on their own ability set.

:- Okay, thank you. Who can be a lab assistant?

:- Well, so right now, we are in a setting where many students are learning virtually or remotely. They're learning from home. They're learning from home because of the COVID-19 pandemic. They're not allowed to necessarily be in a classroom. And so if you're learning from home, your lab assistant is whoever's in the house with you who's got time to be your lab assistant.

So it could be, it could be a sibling, it could be a parent, could be a guardian, could be a family member, whoever's in the house with you who can fulfill the role as I've just described it to you.

If you are in a classroom in a school, so you're actually learning in person, there's a couple of different ways to do this. The cheapest, in air quotes, and easiest way to do it would be to

recognize that within your science class there's you, the teacher, there's the student with a disability, and then there's a bunch of other students.

And so if the labs are all done in group settings, whether it's groups of two or three or four, then you can tap the other students or another student on the shoulder and say, "Please serve as a lab assistant." So that's a cheaper way.

The other way of doing it would be to actually have an educational specialist in the room. Whether it is a vision itinerant teacher for a student who is blind or partially sighted or an equivalent for another disability type or you have a special ed teacher, you have an educational assistant, then you've got an educational specialist.

Now, of course, the thing is, the students are learning alongside each other and so that student isn't necessarily an expert if you tap them on the shoulder and say, "You're my lab assistant." But then you have no reasonable expectation that your educational specialist is also gonna be an expert, and so we'll talk a little bit about this, about whether you need an expert or what kind of expertise you're going to need in the person who is gonna be the lab assistant.

But that's sort of, the way to do it is either you ask a student or you've got the capability of bringing in another educational specialist.

-: Okay, great. So I think that was a really nice segue into our next discussion, which is about the skills a laboratory assistant might bring to the classroom.

-: So that's a fun question. I actually just realized there's a third way you can actually get a lab assistant and that is if you've got a fellow teacher within your department who happens to have a spare when you need them and then you can sort of just drag them in the classroom and have them serve as a lab assistant as well.

And in that particular case, because you're getting a colleague who happens to know the subject, hopefully, as well as you do, then you actually do have somebody who can assist with the expertise in the subject that's being taught, and that's almost your best case scenario but also probably the most impractical because spare time for teachers is in such short supply.

So what skills would you need? And the answer to this question depends, I think, a fair bit on what does the student with a disability need you to do. So maybe I'm gonna answer this question by giving a few concrete examples. How does that sound?

-: Great. Yep, that would be wonderful.

-: Okay, so if you are, if you're a student with sight loss, so either you're totally blind or you have some functional vision, you can have, you can have sort of low visual acuity or a low visual field or issues with contrast and color, so if you're a student with sight loss then you need somebody to act as your eyes. And so they need to be able to describe to you what's going on

and sometimes because you're own manual dexterity might also be affected then they might need to do something for you based on how you describe.

So in that case, your lab assistant has to have very, very good descriptive skills, so they have to observe but then they actually, more importantly than observing, they have to describe it. But then they also have to be able to respond to the instruction that you're giving them.

So they have to be able to do something with a degree of motor skills that you may not have in order to help you actually do the experiment. If you're a lab assistant for a student who is deaf or hard of hearing and the experiment actually involves sound, so you're actually doing experiments with sound or with high-pitched tones, low-pitched tones, with musical notes, things like that, then what you're also gonna need to be able to do is you're gonna need to be able to describe, now, you're describing sounds and, again, you're gonna be describing for the student in a way that conveys the information and gives the student what they need to know without giving away sort of the quote, unquote, answer, right?

And so, again, your descriptive skills are gonna be super important in a scenario like that.

If you're working with students who have poor manual dexterity, then very much the hand-eye coordination and the ability to do things based on the instructions that you are provided, that actually becomes very important. I'm gonna give a specific example. Let's say you've got a student who is neurodiverse and as part of that neurodiversity they do have hand-eye coordination issues but that student also doesn't perceive color the way that you perceive color as a lab assistant.

And so if you're in a chemistry lab and you've got a color change reaction, you have to recognize the blue for you may not necessarily be blue for the student. And so now you actually have to, you have to figure out how to parse your observations and relate that knowledge in a way that doesn't assume that the other person's gonna interact with the world the way that you're interacting with the world.

The last example I'm gonna give is if you are a lab assistant for a student with a learning disability and that learning disability means that they can verbally describe something but writing it down is less easy for them to do. And so in that case, you get to be a notetaker and you get to be a recorder.

And so, really, the skillset that you need, for the most part, comes down to you have to know what's going on, you have to be able to handle whatever it is you need to handle, and so, but you also have to be able to describe and you have to be able to describe without any assumptions about what the other person, what the other person can interpret your description to mean.

That means if you're working with a student with sight loss you try to not focus on visual things that they may not have experience with. If you're working with a student who's deaf or hard of hearing, you try not to, you try not to describe using oral kinds of cues.

You recognize, fundamentally, that that student that you're working with may have a different, the term I would use is frame of reference. They may interact with the world differently than you.

And so your powers of observation and your powers of explanation, not interpretation, but you're describing, you're explaining what's going on, those are really critical to this kind of role as a lab assistant as well.

-: And so if you have a student who has fine motor difficulties or may not be able to see to interact with certain pieces of lab equipment, then if you're using, say, a microscope or something a little bit more involved, then you would expect that lab assistant to be able to have knowledge of how that lab equipment works so that they can set it up and operate that lab equipment as they need to.

-: That's right. And I think a microscope's a really good example, Ainsley, because I would then expect the lab assistant would be able to know how to actually put the slide on the stage, right? And I would expect the lab assistants to be able to know sort of where the eyepiece is and how to use objective lenses versus eyepiece lenses.

I'd expect that the lab assistant would be able to understand kind of how to turn phase contrast on and off on a microscope, which are not things that, in this case, you would necessarily expect the student to be able to pick up.

And, in fact, those things may not actually be germane to the experiment. They're just, okay, how do you use the equipment?

-: Right, right. So there can be a piece of professional development here between the teacher and the educational assistant or the teacher and whoever it is that may be acting as the lab assistant in a laboratory where there is a piece of equipment that requires a little bit more knowledge and experience to operate.

-: Oh, yeah, absolutely. And I'll tell a story a little bit. So we didn't have gel electrophoresis equipment in my high school, not until the last year that I was there, and we didn't get to play with it in OAC bio or OAC chemistry because the teachers themselves were just figuring out how to work it (chuckles) and it was a new toy for them but it was also, you know, they had never had any experience with it before either.

So then the professional development isn't just for the educational assistant, it's also for you as the educator having to explain how to use the piece of equipment, and if it's a newer or more complex piece, then there's gonna be a bit of a learning curve for everybody.

-: Okay, that makes sense. So with that in mind and keeping in mind that teachers are so busy and they have so much on their plates already, I wonder what, or if there is an advantage of using a lab assistant as an accommodation for a student rather than having them either sit the lab out or maybe what happens, I think, often for students who have some sort of disability is

that they may get included in a group of students working on a laboratory assignment or activity but maybe that student is always the recorder or they're always the student gathering the materials or whatever they might be, they always might be doing the same role.

And in that situation, it comes across that they may not be getting a chance to practice some of the other skills inherent in doing science. Can you just speak a little bit about the advantages of having a laboratory assistant for a student over other types of accommodations that might be used, such as a computer simulation or just having the student do something else entirely?

-: I'm going to, I'm gonna start this conversation with making sure that we all have a chance to understand what the learning objective of that lab is going to be. And so I mean, you as the educator, you will know that and it'll be clear how the lab sort of fits in to the unit or the module that you're then teaching, right?

And so the lab assistant gives the student with a disability the closest experience to what the other students in the classroom are getting. And so if that student with a disability then goes and does a simulation while everyone else does a hands-on lab then you've got to make sure as the teacher that that simulation happens to be meeting the same learning objective and is doing it in the same way so that when you actually test the student they're not going to be at a disadvantage because they did something fundamentally different.

Same thing if the student just sits it out, right? Or, you know, I recall one presentation I gave where a vision itinerant teacher was very proud of having her student, instead of doing a frog dissection, the student assembled a 3D-printed puzzle of a frog.

And I mean, it sounds really cool but are you achieving the same learning objective? So the immediately obvious benefit of using a lab assistant is that most of those are-we-achieving-the-same-learning-objective challenges in your head go to one side because the student's in there in the classroom having the opportunity to participate the way that other students are participating.

That said, there are lots of other benefits to the student as well. The lab assistant, if correctly used, is used in such a way so that the person is doing with, not doing for. The person is helping. But for the help to be effective, the help has to be guided by the student who is receiving the help.

That means that the lab assistant is, let's say I'm the student, the lab assistant is my hands and my eyes. I'm telling that lab assistant what to do. I have to be able to describe that, I have to be able to explain what I'm expecting is going to be the end outcome from this, and I have to be able to interpret what the lab assistant is telling me based on what they're seeing.

Now, the lab assistant is forbidden from interpreting the experiment for me, but the lab assistant is telling me what they're seeing as that, you know, color change chemical reaction's happening or as the frog dissection is going on or as we're building a circuit in physics class, right?

So I have to lead that interaction as the student and so I'm gonna get leadership skills. I'm gonna get, I'm gonna get highly theoretical understanding of what that experiment's gonna be and I have to know upfront going into this experiment what potential places to troubleshoot are going to be because I will not expect the lab assistant to troubleshoot for me. I have to troubleshoot based on what the lab assistant's telling me.

And so there is a, there's a way of internalizing the information and processing the information that actually ends up meaning that I, the student, ends up knowing more than and in more detail than my colleagues by having this lab assistant working with me.

And so leadership skills, interpretation skills, a deeply theoretical understanding of what's going on, and the ability to troubleshoot just from the theory are some of the outcomes that are gonna come out of this for the student with the disability.

If you're actually using a lab assistant who is a student, so a fellow student within the class, then that student's gonna gain all sorts of impressive skills about how to observe and how to describe the observation in ways that, as I say, are absent of a frame of reference, right? So how to describe something so that somebody else understands it when I can't assume that I know what they're gonna understand. And that's a very powerful skillset that the student who is the lab assistant's gonna gain.

-: Thank you. It also strikes me that students who are able to either act as laboratory assistants or utilizing a lab assistant and therefore participate more fully in the lab or facilitate participation in the lab for somebody else are going to gain self-confidence because they're gonna be able to do things more independently and they're not sitting it out and they're going to feel more belonging in the classroom and it should contribute towards sort of a positive classroom culture.

-: Absolutely.

-: So to speak. It also strikes me that students who need the accommodation of a lab assistant and who are able to utilize this particular accommodation need to study the material in a much deeper depth, in particular, the language and the vocabulary and the concepts and the equipment, all of that, than their peers who don't utilize a lab assistant in order to be able to ask effective questions of the lab assistant.

-: Oh, absolutely. And I mean, coming back to that gel electrophoresis equipment that I was telling you about earlier. Now, the student, let's say I as a student with sight loss, I wouldn't necessarily need to know how to turn it on but I should know how to connect the leads in the right way so that as I'm giving that level of instruction nobody gets electrocuted, right?

And so there is a little bit of, there's a little bit of making sure that I know all of the million ways that something could potentially go wrong or go differently than that lab manual actually says that it should go.



One of the interesting things just from a philosophical perspective is when we design an experiment for the classroom, almost always we design the experiment to work, right? But then for the student with a disability, I have to make sure that I know how that experiment can actually break. So I have to mentally try to break it. And if I'm trying to break it then I have to figure out, okay, if it's broken, what could possibly be wrong? And so you end up actually knowing a lot more science this way.

And I had a lab assistant in my graduate degrees, my master's, my PhD, very good lab assistants, and we worked out the shorthand. We understood the code. Because we worked with each other day in and day out for months and years, we understood each other's language, we understood each other's habits and ways of doing things.

But it took time to get that, right? I can tell you about the experiences I had in high school and in my undergrad where the lab assistants that I had were, for example, fellow students and it took a while to actually get the language of the lab assistants down and actually understand how this was gonna work properly. And I'm telling you this now based on years and years of experience because I've had lab assistants for years and years and I've figured out how to get it right.

And so I recognize that one of the major challenges with lab assistants is if you don't have the benefit of a conversation like this and you don't have the benefit of somebody else who has experience, there's about a million ways you could get this wrong.

-: Right, right. That makes a lot of sense. I guess it's a skill and definitely not something that's used a lot, I would say, in high school science. But I guess for any teachers who were thinking about this as a support for any of their students, I guess we would just encourage them to try it out and let it go a few times and just develop it into what it needs to be because the skills of the teacher in guiding both the student and the lab assistant to develop the skills that they need to do this and then the practice is gonna be a bit of an evolution of skill development, as in any skill.

-: So you know what? It's also about collaboration too, Ainsley, because the thing is that nobody does science alone anymore and trying to teach science as if we do it alone is a bit of, it's a bit of a false expectation thing, right?

And so because science is very collaborative, the more group work that's done, the better, kind of thing. And so if you're doing, if you're doing individual chemical reactions and you've got this one student with a disability in your class who's paired with a lab assistant then that poor student's gonna stick out like a sore thumb and the lab assistant's gonna stick out like a sore thumb.

On the other hand, if everybody's in groups then it becomes less of an issue and all sorts of groups are gonna normalize the group dynamics in different ways and you're gonna find that somebody's gonna do all the work and somebody's not gonna do all the work.

But the group where you've got the student and the lab assistant is gonna be way more egalitarian because there is something that that student has to be able to do and there's something that lab assistant is doing with them that means that that becomes, for the duration of that experiment, it becomes a partnership, it becomes a collaboration, and then that student goes away and learns something about how to collaborate in science.

-: Brilliant plan. Is there anything else you think we should say about lab assistants or is that pretty comprehensive?

-: I think the take-home message is that it's tricky to get right, but it is, it is the, it is the closest reflection of the hands-on experience. Better than a simulation. Better than a computer lab. Better than a virtual thing. Better than sitting it out and saying, "Okay, just read the textbook for an hour."

And because of that, it's definitely worth kind of paying attention to it.

Some parents might say, "Well, I don't want my kid to have a lab assistant because they'll feel singled out," but I think the feedback, again, is you know what? Science is done this way more and more. It's been done this way for a long time and I don't think that we've taught it in the way that reflects this being done and group work and lab assistants sort of really get at that.

And it will give the student a better sense as to how things will work if this is something that they wanna do for their careers. So it's definitely something, I think, that we don't pay enough attention to and I encourage you to try it out.

And you know what? Feel free to reach out and contact me or contact Ainsley to talk about it. I think that if there is, if there is the evidence that it can work and you've got people who can role model how to be a lab assistant then it'll be a lot more comfortable for everyone to use this as an accommodation in the science lab.

Ainsley: Okay, thank you.

Mahadeo: Thank you.