

## Webinar Transcript: Non-Verbal Learning Disabilities – From Diagnosis to Intervention

- [Susanna] The LD at School Team is very pleased to welcome our guest speaker Dr. Allyson Harrison whose presentation this afternoon is entitled "Understanding Non-Verbal Learning Disabilities: "From Diagnosis to Intervention". The Ministry of Education has provided funding for this, the production of this webinar. Please note that the views expressed in this webinar are the views of the presenter and do not necessarily reflect those of the Ministry of Education, nor the Learning Disabilities Association of Ontario. We'll also be tweeting throughout the webinar. So if you'd like to participate in the conversation, you can send us a tweet by using our handle @LDatSchool or the hashtag #LDwebinar. So that takes care of all the housekeeping for this afternoon, and we can get started. It's now my pleasure to introduce our speaker, Dr. Allyson Harrison. Dr. Allyson Harrison received her Ph.D. in Psychology from Queen's University in Kingston in 1992. She's currently the Clinical Director of the Regional Assessment and Resource Centre at Queen's University, a government-funded program that provides psychological assessments to post-secondary students, province wide. In addition, she holds an appointment as an Associate Professor in the Department of Clinical Psychology at Queen's. Over and above her clinical practice, she has been active both nationally and internationally providing continuing education on issues related to LDs and ADHD. Her areas of research interest are in assessments and differential diagnosis of LD and ADHD, and she's published over a dozen articles in peer-reviewed journals. She's also a member of the Editorial Board at the Canadian Journal of School Psychology, Journal of Psychoeducational Assessment, and the Clinical Neuropsychologist. Welcome, Dr. Harrison. The cyber floor is now yours.

- [Dr. Allyson Harrison] Okay, so, as Susanna said, we're going to talk about non-verbal learning disabilities. And so my first question to you is this. So you're getting a quiz right off the top. You discover that a student in your class has been given a diagnosis of a non-verbal learning disability. So you now know that they have a very predictable group of skills and deficits that you can easily apply known strategies that exist to remediate or accommodate their needs. Or B, that someone somewhere thought this student had some problem in some area, and that they probably have better verbal than non-verbal intelligence, but that's about it. Well, sadly, the answer is B. The term "non-verbal learning disability" has been so overused and misused that it really doesn't describe a consistent group of people at all. So there's no standardized way that non-verbal learning disabilities are diagnosed. It's not a recognized term in any diagnostic code book like DSM or ICD. It's not included in the LDAO or the LDAC definition of a learning disability. And some researchers have argued that NVLD is really just a useless diagnosis. So there are lots of myths about NVLD compared to reality. So those of you who go on internet sites to look up information about this, they're not reliable sources for information about NVLD. They often conflate non-diagnostic symptoms or signs with a laundry list of NVLD characteristics, and many of those NVLD symptoms aren't rooted in scientific investigation. And even some popular



press books that are written about NVLD are based on subjective clinical opinion rather than actual research. So people just say, "Well, this is what I feel like I've observed," rather than actually looking at their data. So the biggest myth I would say about NVLD is that a big split between your verbal and non-verbal intelligence is a sign of a non-verbal learning disability. So here's the problem. Lots of non-disabled individuals have better verbal compared to non-verbal skills. And in fact, the higher you go in IQ, the more you get those big differences normally. So in fact, in people who have IQs over 120, 36% of them in the normative sample of the WAIS IQ test had significantly better verbal than non-verbal skills. And I can promise you that if I went into the Ph.D. program here at Queen's and looked at the Ph.D. students in English, they'd all have significantly higher verbal than non-verbal skills. And if I went into the Ph.D. program in Engineering Physics, they'd all have significantly better non-verbal skills. That doesn't mean that they're all learning disabled, it means they've gone into a program that maximizes their strengths and minimizes their weaknesses. The other problem is that many clinicians, and many laypeople, misunderstand the idea of "significant," a "significant difference." All that means is that what you found is likely a real difference, but it doesn't mean it's pathological or diagnostic. So if I test those people in the Ph.D. program in English, I'm gonna find a significantly higher verbal than non-verbal IQ. But that doesn't mean they've got a disability. The number one thing you need in order to diagnose any type of a learning disability is academic impairment, and that's defined as performing below the 16th percentile in a domain of skills, so not just on one lone sub-test, but a whole group of tests that all measure the same type of academic skill. So just having verbal better than non-verbal IQ doesn't prove that, doesn't prove that you've got impaired academic function. The other thing I see often is that many clinicians misinterpret what is normal variability in functioning. 'Cause all of us have strengths and weaknesses, that's why we go into different professions. And in fact, as I said, the higher you go in IQ, the greater that variability is. And also the more tests that someone gives in their psychological assessment battery, the greater the chance that you're going to have one or two low test scores just by chance. So this is a table from a study that was done by Laurence Binder in 2009 where they were looking at the WAIS normative data. So these are all the people who helped develop the norms for the WAIS. They're all non-disabled, normally functioning individuals. And what you can see is that, as I said, variability in the difference between verbal and non-verbal is quite high in people who have IQs that are over 120. But it still is fairly significant even at lower levels of IQ. The second myth that I see compared often is that a non-verbal learning disability can be diagnosed if a processing disability is identified. So online websites, for example, will tell you that people with NVLD have problems with organization, attention, executive function, non-verbal communication, motor skills. Well in fact, all of those are symptoms that describe people with ADHD, not people with NVLD. Problems learning to tie shoes, ride a bike, tell time, those are all non-specific symptoms, and they can occur both in many types of disabilities, and also in normally developing children. I've got a daughter who didn't learn how to ride a bike 'til she was 10, and really struggled with telling time, and tying her shoes. And she's doing a Ph.D. in Neuroscience now. It's not necessarily diagnostic. Low scores on measures of processing speed are not sufficient to diagnose any type of a learning disability. So by themselves, they're not enough to make a diagnosis of a learning disability. What you need, the number one thing you need, as I said before, is impaired academic functioning. And that's performing below the 16th percentile in a domain of skills. So I see reports that say this, and it's just not backed up by science. There's no such thing as a learning disability in processing speed, or working memory, or

visual memory. They may be processing deficits that contribute to the academic impairment, but without the academic impairment as well, they may just be regular, you know, strengths and weaknesses that all of us have. The third myth that I encounter frequently is that low scores on a math test prove that someone has a non-verbal learning disability. So it is true that you have to have impaired math in order to get a diagnosis of NVLD. Just having a low score on a standardized math test doesn't prove that a person has NVLD. And more and more, we're seeing, especially at the post-secondary level, a group of students who have, in general, very poor math skills, especially math computation skills. And the EQAO and the PISA scores that we're getting back from Ontario show that the majority of students in Ontario these days have weak math computation skills. There was just a story posted on CBC website within the last year talking about the research that shows that. So, you know, we're getting a lot of students now, more so than ever before, who aren't meeting the general education standards for math, and PISA's scores are saying that too, that more so than ever before, there are a lot of students who just are deficient in their basic math computation skills. So what you need in order to diagnose NVLD is a lifelong history of the person being unable to do things like learn basic math concepts, telling time, what's the value of coins, greater than or less than relationships, understanding fractions, being able to read charts. Not just difficulty with math computation. The fourth myth is that having one or two low scores in a psycho-educational assessment proves that they've got a learning disability. Because what happens is that in any test battery, it's common for most normal non-disabled people to have at least two low subtest scores. So this was a study that was done by Grant Iverson who's from British Columbia, and Barry Brooks who's from Calgary. And what they found, they looked again at the normative data for the WAIS and the Western Memory Scale. So these are all the normal non-disabled people who they gave the test to so that they could prepare scores with whoever else was now taking the test. And what you can see is that 63% of these normal non-disabled people had at least two or more subtest scores on the WAIS and the Western Memory Scale that were below the 16th percentile. 46%, almost half, had two or more scores that were below the 10th percentile. 28% had two or more subtest scores that were below the 5th percentile. And 14% had two or more subtest scores that were two standard deviations or more below average. So having one or two low test scores in a test battery, and this is just two tests, it's pretty common. And again, so this is this misinterpretation of normal variability. Zakzanis and Jeffay out at U of T in Scarborough showed that depending on the number of tests given, up to half of university professors have at least two cognitive test scores below the 16th percentile. Now, you know, maybe you'll laugh, and say, "Well, I guess that's U of T Scarborough." Sorry, that was a joke. But I think what it shows, and what they concluded, is that cognitive variability, and even a few impaired subtest scores, alone can't be used to determine disability or impairment, because we all have that. If we all took a whole psycho-educational test battery, we'd all have a few low scores. Maddocks in 2019 looked at the normative data from the Woodcock Johnson test, and what she found was that, again, 61% of the general normative sample, so the normal non-disabled students, scored below the 25th percentile on at least one academic cluster. So not just one or two subtest scores, but a whole cluster of test scores, like total achievement, basic reading skills, reading comprehension, math calculation, math reasoning, and so on. And she implied that a much higher percentage of the normative sample would have at least one subtest score below 90. And that's similar to the findings that I was just talking about. So saying that variability, and even having a few low test scores, is something that you expect normally.

So let me talk a bit about the origin of the concept of non-verbal learning disabilities, because this was a term that really only surfaced in the early 1980s, and it was used by Dr. Byron Rourke. And he was studying children who had profound math learning disabilities, but who also demonstrated other weird perceptual, motor, and social skills deficits. And he contended that this whole cluster of symptoms together, which he called non-verbal learning disabilities, that the deficits in these children could be attributed to white matter disease or dysfunction, and he presented a lot of data trying to support this in his books. So for those of you who don't know, well, I'll talk about in a minute what white matter is, but his hypothesis really was that NVLD occurs when there's a problem with white matter in the brain, and also specifically more right hemisphere processing. And the problem is that adverse conditions in early childhood are more likely to affect the right hemisphere processes because the right hemisphere has a higher proportion of white matter than the left, and the right hemisphere is dominant in infancy. So the left hemisphere is more language-based, and the right hemisphere deals with more visuo-spatial skills and body language, looking around, and that's really, before, when you've got pre-language students, that's what they rely on more. Or children. So what is white matter? So white matter is kind of like insulation on wires. So it helps all of the connections in the thinking part of your brain send signals faster and without losing fidelity, without losing their signal. So it allows signals to travel longer distances without dying out. And the more white matter covering longer distances is found in the right hemisphere versus the left hemisphere. So in the right hemisphere, you've got longer spaces between the telephone wires or the connections compared to the left hemisphere, where the connections are closer. And that's just a slide from a medical textbook talking about what white matter is if you want to go back and look at it later. I was trying to think of how to show this. So, in your brain, as you're developing, at first what happens is you've got a blank slate. There really is no connection between various areas. It's like walking through the snow, and no one's been there before, and there's been a big snow storm, okay? It's difficult to forge out a path to connect areas and to learn new skills. But after a while, you know, you've trudged it once, there's a little bit of a path, but it hasn't been solidified. But the more you use certain skills, and the more you reinforce and practice them, the more the path becomes well worn and trod, and it's easier for the signals to go back and forth. But they're still vulnerable to getting lost if there's, you know, a snowstorm, or your snowblower on the other side fills in your path, you're going to have that signal get lost. And so finally, what happens, white matter really is this nice insulation that goes all the way around these connections that your brain has forged to protect them and make travel smooth and efficient. So this is a beautiful picture of your brain at the side. And in your brain, you've got lots of connections that go back and forth, side to side, and up and down. And some people have said that white matter is kind of like insulation that takes you on subway stops. So you've got pathways that go all the way through your brain up and down, side to side, like subways underground. And as I said before, I mean, this is just a map of Saskatoon and its surrounding areas. In the left side of the brain, you tend to have a lot, the links that get made tend to be a lot closer. Whereas in the right side, you can have connections that are much further away. So if there's something wrong with that covering, with that white matter that allows the signals to get sent, it's pretty easy for that signal to die out before it ever reaches its destination. So Rourke's system, this is what he thought caused non-verbal learning disabilities. Firstly, he said that you have primary, or the main, neuropsychological deficits. They have problems with telling differences between how things feel, being able to recognize things just by feel. They have problems with visual perceptions, so being

able to tell the difference between something that's square or something that's rectangular, or telling the difference between a smile and a grimace. Complex psychomotor movements, so having to string together a whole bunch of movements. Like thinking of a string of letters, and then having to produce the motor movements to make those, to write those letters down. And they have primary problems with dealing with novel material. So something they've never seen before. Again, because they've got, they don't have pathways that help them figure out how to deal with that, they really struggle when they deal with new situations. From those develop secondary deficits. So they, if you can't really tell the difference between how things feel or how big they are just by touching them, you stop or you have less attention to what signals your fingers are sending to you about what something feels like. And similarly, if you can't always trust your eyes to give you accurate visual information, then you don't necessarily pay attention to visual inputs. And if you aren't good at dealing with new information that you've never seen before, then you're not going to do much exploring, because then you might come across something that's new, and you won't know how to deal with it. And then finally, there were tertiary deficits. So all of these combine to have problems with not being able to remember how things felt, how things looked, forming concepts, or problem solving. So this is actually from one of Rourke's books, and this is a graph that he used many times to talk about the primary assets and deficits he thought the people with non-verbal learning disabilities had. And what you can see is he also felt that they had some assets, but they're mainly in those left hemisphere areas that are close together, so that even if the links don't have that good fast connection, they still do talk to each other. So auditory perception, they can trust their hearing. Simple motor tasks, rote material, verbal attention, auditory memory, verbal memory. So they end up with good, sort of rote verbal memory skills. So they tend to have a great ability to learn the meaning of words, learn spellings, verbatim memory for things, decoding words, so knowing how to sound them out. These kids are often what are called hyperlexic, they often can decode text at a very young age. And eventually, some time in adolescence, their handwriting gets better and faster. But in the early years, they have real handwriting problems. They've got reading comprehension problems, problems with mechanical arithmetic, with math, with science. And psychosocially, they don't deal well with novelty, they're not confident socially, they have problems with emotions, and they tend not to be very active. Again, because they're not going to explore their world. So these are all the things, and it's a big table, but these are all the things that you have to have, have to have demonstrated in neuropsychological testing to make this diagnosis. Tactile perceptual test. In other words, because they have problems with tactile perception, they have to have problems with tactile perception and with astereognosis, so being able to tell differences between fingers and hands. Target test. So they have to give the target test, and it has to be below average. Two of vocabulary, similarities, and information on the WISC or the WAIS are the highest verbal scales. Two of block design, object assembly, or coding are the lowest performance scales. And standard scores for word reading on and achievement test, sorry, that should be "on an achievement test", such as the WRAT is at least eight scaled score points greater than basic arithmetic. But arithmetic, it has to be impaired relative to most other individuals. So those are the things that have to be there. And then there may be some other things. So tactile performance is better, it worsens as you have to use your left hand and then both hands. Grip strength is impaired, and fine motor coordination's impaired. And the WAIS, you have to have verbal IQ higher than non-verbal by at least 10 points. So all of those things need to be there. So the first, if points one through five which I bolded on the last slide, if they're all

positive, that would confirm a diagnosis of non-verbal learning disability. But you could have seven or eight of all those features in total, including impaired arithmetic. Three or four of those features would be questionable in making the diagnosis, and have a low probability of being that. So here's the problem with Rourke's theory. He studied primarily children who had really rare injuries, or who were survivors of treatments for other medical or neurological diseases or disorders, which in it of themselves could have damaged their white matter or their brain. So many of the children in his studies had, either had a moderate or severe closed head injury in childhood, so that could explain the problems they had. Suffered hydrocephalus, where fluid inside your brain builds up and basically suffocates the cells in your brain, with delays in appropriate treatment or unsuccessful treatment. So they had a long time where the oxygen wasn't getting to parts of their brain while they were in childhood. They received large doses of radiation therapy to treat a type of cancer, childhood cancer, and that tends to kill white matter in your brain. They have a congenital absence of the corpus callosum, which is a part that actually connects the right and the left hemisphere. Or they had significant surgical removal of tissue from the right cerebral hemisphere. Well, that would certainly make right cerebral hemisphere functioning difficult if you're missing some of it. These are pretty rare. These are not the kids that we tend to see who come in who don't have a history of having surgery to remove parts of their brain, or having a severe head injury or having radiation therapy. They have unexplained difficulties often with math or with social skills. So there've been lots of criticisms of the NVLD concept. One of the main concerns has been its lack of specificity. So as I said before, lots of the inherent symptoms of it, NVLD, happen in all sorts of other disorders and conditions. It gets applied as an umbrella term, and it can cover all sorts of pediatric disorders. Autism Spectrum Disorder, math disorder, ADHD, developmental coordination disorder, Turner syndrome, and so on. And in fact, it was at the point where Maureen Dennis who's a psychologist at Sick Kids commented one time. She said, "The NVLD umbrella includes practically "every pediatric disorder, "many of which have diametrically opposed features." So in other words, knowing, you know, calling someone NVLD isn't really helpful, 'cause you're not saying anything about what you think caused the problem or what you think is going to help remediate it. The other criticisms have been that, really, the sample sizes that Rourke had were really small, and outside of his own lab, it's been hard for other researchers to confirm that diagnosis, or find it in a big enough group of kids. And the white matter causal, so etiology hypothesis, the idea that white matter causes it, has also been discredited. Mainly because you can have white matter damage that causes lots of problems, not just NVLD symptoms, and that many of the children that have been diagnosed with NVLD outside of Rourke's lab, when they do imaging studies, they don't find any white matter damage. And finally, as I said before, just knowing that someone's been given that diagnosis doesn't really help you much with saying, okay, what do I do? How do I treat this child? How do I remediate? Beyond saying, well, let's help them with math. The other problem is that even Rourke said there's just such a big overlap with what used to be called Asperger's syndrome that you have to wonder was he describing a condition that maybe is just Asperger's syndrome plus kids who also had math disabilities? So, you know, I would say that if you've got a student who's got significant impairments in motor skills, social skills deficits, possibly some learning difficulties, possibly better verbal than non-verbal IQ, but they also have a definite restricted range of interests or repetitive routines, rituals or stereotypical behaviours. This is probably a student who's got Asperger's or Autism Spectrum Disorder, so let's remediate for that condition. Let's just assume that's the condition that this



student has and work accordingly, and get the support you would expect you'd need for someone who's got ASD. But there's also an overlap with dysgraphia or developmental coordination disorder. So when young, children with NVLD often have fine motor or coordination difficulties. But unlike kids who've got dysgraphia, those with NVLD, as they get older, their fine motor and coordination problems improve. So if you've got a child who, at least in elementary school, has got fine and gross motor problems, visuo-spatial difficulties, maybe they've got higher verbal than non-verbal IQ, but they don't have any restricted range of interests or repetitive routines, rituals, stereotypical behaviours, then assume that they've got developmental coordination disorder or dysgraphia, and treat them accordingly. So these are kids who likely need occupational therapy support, and need to learn how to use voice-to-text or computers, because they're struggling with motor output. And it doesn't, what you want to do is divorce the functional impairment they have, the motor output problem, from the idea of, "I have ways to get the information that's in my head "onto paper and it doesn't have to involve hands." One of the things I often do when I'm giving workshops to faculty members is I say, you know, if you had a student who, God forbid, their hands were crushed in a car accident, you wouldn't make them handwrite an exam. And of course they all say, "No, no, no." So if you've got someone who has problems like this, it's perfectly acceptable to have them learn how to use voice-to-text or computer. And then they can learn how to get those ideas out onto paper, and they don't have to rely on other people to do it for them. There's also an overlap with math disabilities. So if you've got a child who's impaired in math calculation and math reasoning skills, they've got problems with concepts associated with math learning like telling time, estimating size, maybe they have social skills deficits, maybe they don't, maybe their verbal IQ is better than their non-verbal IQ. But if you've got a child like that, and this child does not have any restricted range of interests or repetitive routines, rituals, or stereotypical behaviours, my advice is assume they've got a math disability, and treat them with the remedial supports that we know help kids with math disabilities. And so in Ontario, we certainly find that NVLD is over-identified, and often it's just based on discrepancies between verbal and non-verbal IQ without understanding that discrepancies alone aren't diagnostic, and are in fact pretty common. But even more problematic is they often, we see individuals who've been identified as NVLD in the absence of any academic impairment. And most of the time, when we see individuals who've been diagnosed with NVLD, they haven't been given highly specialized neuropsychological tests, and those are tests that are usually outside of the scope of practice of school psychologists. So tests of tactile perception, and astereognosis, and grip strength. So clinicians really need to carefully consider the child's academic history and test profile. And typically, you'd make a learning disability diagnosis if there's impairments in a specific academic skill, like math. If you've got someone who also has social communication deficits, and those repetitive, stereotypical, ritualistic type behaviours, they may warrant an additional diagnosis of Autism Spectrum Disorder, or probably what used to be Asperger's. And then they'll get the specific help they need for those impairments. So the key take-home messages are NVLD really is pretty rare, and it should only be made after a comprehensive neuropsychological assessment. If math skills are the consistent weakness, consider where you'd be better off to just say they've got a learning disability in math. If social skills or communication challenges are really there and present, consider instead a diagnosis in that domain. And if fine motor and handwriting skills are the main weakness, consider instead a diagnosis of dysgraphia and treatment by an occupational therapist. So the last thing I want to talk about is some ideas for teachers and parents, too, regarding interventions and supports

you can use. My first piece of advice to you is to remember that you are only one person. You only have so many hours in the day, and there's only so much you can do to help some of these students. And some of the times when I see what's expected of teachers on IEPs, I just, I shake my head and think I don't know how you can do that plus also deal with all the other students you have in your class in the amount of time that you have. Because providing very targeted and specific interventions on a daily basis may be impossible or unrealistic. So the following slides talk about general ideas that will assist students with NVLD in functioning more effectively in the academic environment. But these are also, these are suggestions that are good for all kids, including students with many other types of disabilities. And this is sort of, you know, it's like a universal instructional design. It's good for the people who have disabilities, it's also good for everyone else. And consider, too, that if you've got students who have really severe problems that their parents may need to seek out more specialized and targeted help outside of school hours, because there's only so much that you can do to help affect change within the school environment. So what are the things you can do as a teacher? And even as a parent, I mean, these are all good strategies. First of all, classroom schedules and routines. More and more we're seeing students who grow up in environments where they were allowed to go to bed whenever they wanted, they never knew when things were going to happen, they couldn't predict things, and I think that is a big contributor to the anxiety problems we're seeing more and more in students. Kids really need structure, and routine, and predictability, and they need to know what are the boundaries of their life, and they need to know that tomorrow things aren't going to magically change. It's the same. So having a daily class routine, or a home routine that changes as little as possible. Post the class schedule, the rules, and exceptions, and make sure that the students see these. Maybe make a laminated card with the student's schedule on it, especially as they get older. Provide verbal cues before transitions. So, again, saying, "Okay, now class, we're putting these things away, "and the next thing we're going to do is..." You know, as you're doing it, rather than just assuming they can see that you're pulling out the math textbook, so it's now math time. And give students plenty of time to preview and prepare for new activities. So give them lots of warning, because certainly individuals with NVLD don't do well with change, they don't do well with unpredictability. Second thing you can do is introducing new concepts. So when you introduce a new concept, try and give them a short review, or try and connect previous lessons before moving on to the new concepts. So how is this new thing we're going to be talking about, how does that connect to what we already know? How is this another piece on our map? And in fact, I can't, I may talk about it later on, but one of the things when I try and explain to people what someone with NVLD, what their life is like, I say, their life is like a 10,000 piece puzzle and no one showing them the box with the picture on the front of it. So they can get overwhelmed and overloaded by information really easily, because they don't know how it fits, and where it fits. So if you can help flesh out that puzzle by saying to them, "Here are the edges, "now let's move slowly inwards from those edges," that can really help reduce their anxiety, and help them understand the concepts better. Give an overview of the lesson before teaching. So just like textbooks do, that they give you something, a preview right in the beginning saying, "Here's what to expect, "and here's the objectives for this chapter." Do the same thing for your lesson. Explain figures of speech when you use them. So it's interesting, there's an ADHD checklist where one of the questions says, you have to rate whether or not you step on people's toes without meaning to. Well, most of us understand that's a figure of speech. You don't really mean literally stepping on their toes. It means that you've hurt their feelings,



or you've put them out somehow. But many people with, not just with NVLD, but with learning disabilities find those types of figures of speech difficult to understand. The third thing you can do is break big projects into smaller steps. Again, because they can get overwhelmed and overloaded by a big task, and they can't see. They just have all these trees, and they don't see the path through the forest. Write out and number multi-step directions. So, actually the internet is great for these. If you've ever tried to look up how to do certain things, they'll give you a step-by-step with step number one, a picture, and a written instruction. Then step number two. And that's helpful for all of us. Describe graphs in words, talking through what each point represents on the X and Y axis. That's really helpful. And there's lots of good resources online. I just found two. But I thought, this was really useful. That it sort of says, okay, here, look, from, to, and between these dates, and here's the peak, there's the lowest point it remains stable, and simple descriptions. Or this was another one that I thought also had some really useful tips about how to describe what's in a graph in words. The other thing, too, is using manipulatives to help make learning more concrete. So LEGO to show fractions and percentages. I can't tell you how many university and college students I see who really struggle with fractions. And one of the math tests, one of the questions is, "What's  $3/4$  minus  $1/4$ ?" And many of the post secondary students we see, say, "I don't know how to do that." But then afterwards, I'll just pull out some visuals, and I'll say, okay, draw me a pie. Now cut it into four equal pieces. Now show me what  $3/4$  would be. Well, they can do that. Now take away  $1/4$ . How much is left? And they all go. So, you know, don't underestimate the power of concrete visuals. So if you haven't seen some of the websites that talk about using LEGO to teach fractions, please, please go and look at them. 'Cause really, it's fabulous. It makes, and it makes so much sense. Here's the whole. There's one out of eight pieces. Whoops, sorry. There's a quarter. So, 'cause you can put four of those onto this, and so on, and so forth. And using organizers and mind mapping software. I think many of you in your boards have smart ideas. We tend to use Inspiration, which is another mind mapping software program. Why I like Inspiration is it comes with a number of built in templates that students can use where it basically says step-by-step here's what you have to do. So, you know, it says, "Compare and Contrast Essay". Here's what you have to do. What are the similarities between these two concepts? What are the differences? And you can put in what's concept A, or what's idea A, what's idea B. And then you hit a button, and this turns into a written out line, so all you have to do, it's like your recipe for cooking. All you have to do is just write in the words that go along with that. And the other thing, if you can teach your students one thing that will help them function in the rest of their academic career, it's teaching them the three-paragraph essay. I have so many students who have never been taught the three-paragraph essay. And for students with NVLD, this is a godsend, 'cause it's like, okay, there's rules for what you do in an essay. You have an introduction, you have a body, and then the body has to have three main points, and then you have a conclusion. Good, I did that, done. And for older students, have them use the assignment calculator. If you haven't seen the assignment calculator, I've put the link to that as well, go see it. It is a fabulous resource. So this is one from Seneca's webpage. I just like Seneca's one best, but there are other ones on different university and college websites. So you put in when the day the assignment was assigned, when it's due, and then you can scroll through a drop down menu of what type of assignment is it. And then you just hit this, and it calculates your assignment schedule. So it gives you a step-by-step. On day one, you do this, on day two, you do this. And if you say, "Oh, my assignment is due tomorrow," it comes back and says, "Ha, ha, that's really funny, "that's frightening." But it's

incredibly useful. So I just, I put something in. And this doesn't give it all, but you can go try it yourself. But it's great. So step one, so this is the day it was assigned. So, "Seek advice about the research essay." And it tells you not only where you can seek advice, but they've got resources online you can link to. Including checking the key terms in your assignment to see what they mean, and they've got links to various YouTube videos about how you do whatever your assignment is. And then, that's all you have to do on the first day, and select, and focus topic. Again, and then write the working thesis. So, just basically, "What do you think you're going to be looking for?" So it really is quite useful. The other thing, and again, if you haven't seen this app, I absolutely want you to go and look at PhotoMath. PhotoMath, you take, you download it onto your phone, you take a picture of the math problem that you have to solve, and it then breaks it down for you. It tells you not only what the answer is, but it tells you step-by-step how it got there. And it will read handwriting as well as text. And they've got this whole group of math specialists who help them develop the programs, and it's astounding. So people who struggle with math can use this and get the answer. And not only get the answer, but learn how you can get to that answer. Cue cards or apps to drill basic math facts. This is one, Math Facts in a Flash. Again, people with NVLD do well when they, with rote memorization. This is rote memorization. So use that skill to their advantage. Using graph paper to line up numbers. This is really, really helpful, especially for people who've got visuo-spatial difficulties, so that they don't make mistakes because they have put the numbers in the wrong columns. Direct instruction in use of strategies for identifying main ideas, like underlining or highlighting key words, asking questions, summarizing key points. There's a great app on Reading Rockets that helps with reading comprehension. There's another called "The Main Ideas". There's sentences and paragraphs. These are free. These are free. And it basically tells you, "Here's how you know what the main point was." It's fabulous. The other thing is direct instruction in making the reading process more active. Like, teach them, how do you read aloud? How do you preview and question as you're reading? How do you use the chapter summaries or study guides? There's also another app that's free. It's from Microsoft, and it's called the "Seeing AI APP". It was originally developed for people who are blind or low vision, but one of the things it does is it allows you to, it will scan a room for you, it'll read barcodes, but more than that, it will look at a face, and it will tell you, "This is a person who is smiling, "or looks happy, or looks sad." It's really, really cool. The other thing you can do, and again, just remember you're only, you only have so much time, but you can help them learn self-regulation and social skills. So help them identify signs of overstimulation or frustration. So, you know, so Susie, what tells you, or how do you know that you're feeling anxious? Like, what, is there a feeling you get in the pit of your stomach? Or do you notice your hands are getting wet? How do you know when you're worried? Like, what tells you you're worried? 'Cause the more they can identify those things, the better able they'll be to learn and apply some of the strategies to help reduce those emotional overreactions. Teaching them some learning skills to cope with anxiety, like breathing. Social rules, such as how, like, the rule is you can only stand this close to people when asking questions, if you don't know them. The other one that I really like, and this helps with kids with autism as well, is helping them, 'cause often they get so overwhelmed by all the visual signs, like the motor movements, and they can't really read facial expressions. They don't like looking people in the eye. Try this trick. Have them, say, look right there when you're talking at someone. Right there at the top of their nose in between their eyes. 'Cause you can't tell the difference. If you think, as the receiver, you think they're looking you in the eye. But then if they look there, they don't get overwhelmed by all those other visual

movements, and they can focus on what you're saying. You can also help them create and use social scripts for basic conversations. So here's the rule, it's kind of like saying, here, if you're playing tennis: you hit the ball over, and now the other person hits it back, so what do you do next? And social advocacy like telling people right up front that they don't pick up on non-verbal cues or indirect comments. So if you want me to understand something, you need to tell me in direct language. And I had one student I worked with a number of years ago who had told his girlfriend this. And when she broke up with him, she accused him of not picking up on hints. And he said, "Well, but I told you that I can't do that. "I said to you, be direct with me, and you weren't." And she at least had the decency to say that yes, that was true, that she had just sort of hoped you would read her mind, and pick up on her non-verbal cues. The very last thing I want to leave you with is career paths, 'cause I see lots of students with NVLD who've gone down the wrong career path, and spent a lot of money and time that got them even more in debt, and more frustrated, and more anxious. So they don't, they do not do well in jobs that require lots of problem solving, interpretation of body language or non-verbal cues, inferential or deductive reasoning, or doing math. So, well-meaning as they may be, I've seen students who were encouraged to go into things like early childhood education. That is probably the worst place for students with NVLD to go. They don't pick up on non-verbal cues from the kids, or from the parents, they aren't good at problem solving. That's a place where you get all these novel situations happening, and you know, they really struggle there. Or personal support worker, healthcare aide, nursing, political science, teaching. They don't do well in those careers in my experience. What are the best ones? Ones that require a lot of rote learning and memorization. Ones that require predictable routines, a large vocabulary, good spelling, good knowledge of grammar and punctuation, knowing and quoting the rules. So again, in my experience, the students that I've seen with NVLD who have done best have been library assistant, museum assistant, programming or coding, paralegals, law clerks, court transcriptionists, or people who get jobs editing and proofreading. Those are all things that I've seen people with NVLD do very well in. So, that's the whirlwind tour of NVLD. And now I think, we've got a little time for some questions.

- [Susanna] Yeah, that was wonderful. Thank you so much, Dr. Harrison, for sharing your knowledge, and your expertise, and helping expand our understanding of NVLD, both the diagnosis and ways to intervene. We do have a few questions have already rolled in, but if anyone has additional questions, you can type your questions into the question box in the dashboard on your screen, and I'll read the questions out to Dr. Harrison. So the first question I have: We went over how a lot of times NVLD is misunderstood. How would an educator best explain that diagnosis to a student? Because I have a feeling if we're misunderstanding it, then the students are also misunderstanding it.

- [Dr. Allyson Harrison] Well, that's a great question. And the problem really is, it goes back to my very first slide. Just because you've got a student who's been given that diagnosis, it doesn't mean they actually have NVLD. They could have any of those other, they could have ADHD, they could have



developmental coordination disorder, they could have Asperger's, they could have just a math disability. So I don't, again, this is my opinion, I don't think that it's your job to help them understand what that diagnosis means so much as saying, well, let's explore. Like, what are the things that you really have trouble with, and what are the things you're good at? And so let's try and make sure that you can identify situations where you're gonna struggle, and whether there's any support, or compensatory techniques, or accommodations that could maybe help you function more effectively in those situations. And let's help you expand upon and develop more fully some of the skills you've got.

- [Susanna] Sounds great. Focus on the strengths and needs, like we always say.

- [Dr. Allyson Harrison] Yeah.

- [Susanna] All right. Now I have a question from a secondary school teacher. The challenges for secondary students are larger when it comes to NVLD. There's social difficulties, there are more transitions, there are often significant issues with the more difficult math classes that are necessary in order to graduate. Do you have any specific instructions or help for secondary teachers that they should know?

- [Dr. Allyson Harrison] Oh, God bless you. That is, you know, those are all really tough things. I think, you know, usually they'd have a resource period. So I think the first thing is knowing that that's a stable place they always can go to get help and get support is a big one. Helping them especially with social scripts for what you can do. Helping them find one friend. There's been all sorts of good research saying if you've got one good friend, if you've got one teacher who cares about you, you can, you'll do okay. Helping them find a niche somewhere with, you know, even with one person. With math in particular, the, if you haven't seen that PhotoMath app, please go try that out, because it's great. My experience with a few students who had NVLD trying to get through math is they need, and it may be outside of what you can do, and so recommending to the family to get a tutor who can help translate that math into language. 'Cause math really is a language. Having someone who can give math to them in their preferred medium, which is language, really helps. And I had one student... The other thing I can say is, and I don't mean this badly, especially in light of what's going on in the teacher's strike at the moment, but I've seen kids with NVLD do much better with online math courses, because they can take their time, they don't get overwhelmed by all the other non-verbal cues that are happening in the classroom, they can listen to the lecture over and over again, they can just focus on the words, and they can go at their own pace. So not saying that I think that's the answer for everything, but that I

have seen as being helpful. But also really finding someone who understands math and can translate it into a language for these students can help them function. At least, and really, the goal is let's get you to pass that course so you can move on to some of the things you're better at.

- [Susanna] Yeah, thank you so much. I think we have time for one last quick question. Seeing that there are issues with social skills, and that might lead to problems fitting in, are there any mental health issues that educators should be sort of on high alert for when it comes to a student with that diagnosis of NVLD?

- [Dr. Allyson Harrison] Well, students with NVLD are often at risk for mental health problems, and more specifically anxiety. Again, as I was saying before, if you go through life, and everything is this 10,000 piece puzzle, and you have no idea where the edges are, or how you're doing, or what you're supposed to look at, it can get overwhelming and pretty anxiety producing. And if you aren't good at dealing with novel problems, or novel situations, most of us know in our daily lives, things come up out of the blue that we weren't expecting, and you've got to find some way to cope. And if you don't know how to cope with those situations, it's really anxiety producing. So a lot of these kids do have anxiety problems. Helping them, so if there is some support that they can get within your school from a mental health counselor, that would be, or even getting some, letting them have time with the school psychologist to learn some strategies to cope with anxiety, that's really helpful. They may need an outside counselor to help them learn strategies to cope and deal with their anxiety. And of course, the more anxious they get, the more likely they are to withdraw, which is only going to perpetuate some of the social skills problems they have. So again, the more you can do to help them have structure, and a framework, and predictability in their life, and the more that you can help them make the links about what's going on in the class you teach, the less anxiety they're likely to feel. And then teaching them some ways to identify when they're getting anxious so that they can recognize it and put into place some of the strategies they're hopefully learning with a counselor before the anxiety gets too severe, and they just aren't processing anything. But that's, those are really difficult things. And that's why I said on my slide, you're only one person. And especially in high school, you're only one person in their life for just a small sliver of the time they spend in that whole day. And there's only so much you can do when you also have other students in your class that you're responsible for.

- [Susanna] Well, I think that's a great message to end things on. Just on the topic of anxiety, I want to plug the website again, of course, <https://www.ldatschool.ca> has many articles on anxiety, on recognizing stressors in your classroom. So if you're looking for more resources, always turn to us. All right. That's all the time we have today. So we're going end our question period now. But if you do still have a question for Dr. Harrison, please email us, or send us a message on Twitter, or reply to one



of our tweets from today, and we will do our best to get your question answered. We also want to encourage you to stay tuned for our next LD at School webinar. The best ways to hear about upcoming webinars are to check out our resources on the website, follow us on social media, or sign up for our monthly newsletter, which you can see the link for there. And again, I will be sending out these slides tomorrow, so you'll be able to click on that as well. On behalf of the LD at School Team, I'd once again like to thank Dr. Allyson Harrison for this presentation, and thank you to all of our participants for joining us. Please remember that we'll send out the presentation slides and a short survey following this webinar, so probably tomorrow morning. The feedback we receive on those surveys is really helpful, provides us with really important information for producing future webinars, so if you do have the less than five minutes it takes to complete that survey, we really highly encourage it. And we will be sending out a link to the recorded webinar in approximately three weeks. Thank you again for participating, and enjoy the rest of your day.

