

# Webinar Transcript: Digital Mathematics: Bringing Google g(Math) into the Classroom

Presented by: Keirsten Pugh

## [SLIDE - WEBINAR: Digital Mathematics: Bringing Google g(Math) into the Classroom]

[Image of ipad with the word *g(Math)* written on it

*Text on slide:* JUNE 1<sup>st</sup> 3:30 – 4:45pm EST

Presented by:

Keirsten Pugh, OCT

Associate Regional Coaching Manager, LEARNstyle Ltd.

Image of LD@school logo

Image of Twitter logo

@LDatSchool

#LDwebinar]

[Amy Gorecki]: The LD@school team is very pleased to welcome our guest speaker Kiersten Pugh whose presentation this afternoon is entitled Digital Mathematics: Bringing Google g(Math) into the Classroom.

## [SLIDE – Funding for the production of this webinar was provided by the Ministry of Education]

[Image of LD@school logo

*Text on slide:* Please note that the views expressed in this webinar are the views of the presenters and do not necessarily reflect those of the Ministry of Education or the Learning Disabilities Association of Ontario.]

[Amy Gorecki]: The Ministry of Education provided funding for 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 or the Learning Disabilities Association of Ontario.

## [SLIDE - Don't forget to use our social media hashtag!]

[*Text on slide:* #LDwebinar

Image of Twitter bird using megaphone

@LDatSchool]

[Amy Gorecki]: We will also be tweeting throughout the webinar so if you would like to participate you can send us a tweet by using our handle @LDatSchool, or the hashtag #LDwebinar.

## [SLIDE – WELCOME]

[Images of Keirsten Pugh

*Text on slide:* Keirsten Pugh, OCT

Associate Regional Coaching Manager, LEARNstyle Ltd.]



[Amy Gorecki]: That takes care of our housekeeping for this afternoon so let's get started. It is now my pleasure to introduce our speaker Kiersten Pugh who is an associate regional coaching manager at Learn Style Limited. Kiersten's passion for education started at a young age, which led her to pursue an OCT designation. Technology is a passion of Kiersten's which drew her to Learn Style, the largest education technology training company in Ontario based out of Toronto. With Learn Style Kiersten began as a field technology consultant where she had the opportunity to design and implement personalized plans to integrate assistive technology and learning strategies supporting learners with LDs. Kiersten loves sharing and collaborating with others to continuously stretch her practices. Welcome Kiersten, and the cyber floor is now yours.

**[SLIDE – Digital Mathematics]**

[Text on slide: Keirsten Pugh]

[Keirsten Pugh]: Thank you Amy. So welcome to all the teachers, educators, and change makers that have joined us for today. Thank you so much for welcoming me this evening and I'm honoured to be sharing and collaborating with all of you to continuously stretch my practices. With Learn Style I am provided the opportunity to design, implement, and carry out personalized plans to integrate assistive technology and learning strategies supporting the LD learner on a daily basis. My hope for tonight is that we can expand our mindset when it comes to the world of mathematics and approach questions a little differently. Growing up mathematics was a challenging subject for myself. I was constantly needing to word questions differently and approach them from an angle that truly made sense to me. I'm a very visual, kinaesthetic learner so I needed to constantly see the change that was happening or be able to manipulate the thinking that was going on in my head. A constant development in technology now provides us the opportunity to make more accessible for all our learners and I hope to help bridge that gap tonight.

**[SLIDE]**

[Image of word cloud made up of words depicting 21<sup>st</sup> century learning and technology]

[Keirsten Pugh]: In our increasingly connected 21st Century world technology takes a prominent place in our daily lives at school, at work, and at home. The rapid technological changes of our time have implications for how educators teach and how students ultimately learn. It is proven that our brains grow when we make a mistake in math. Synapses actually fire in the brain when we are incorrect. This information can help us teach students to believe in their unachieved potential changing their frame of thinking, going into a question or an activity can actually positively increase the outcome for their individual learning.

**[SLIDE – 21<sup>st</sup> Century Learning]**

[Text on slide:

- Increase student engagement and achievement
- Assist in assessment practices
- Facilitate communication and collaboration]



[Keirsten Pugh]: Technology can be a powerful tool to enhance students learning and promote mastery of 21st Century competencies. Because of their ability to increase student engagement and achievement by providing ways to situate learning in the real world as well as multiple and varied representations of complex concepts. It can assist in assessment practices particularly assessment for learning and assessment as learning which facilitate instructional decision making and lastly facilitate communication and collaboration among students, and parents, and staff.

**[SLIDE – 21<sup>st</sup> Introduction to g(Math)]**

[Text on slide: Welcome Teacher, Educators and Change Makers!

"By making math accessible for the first time in Google Apps, we are transforming the way students with dyslexia and other learning difficulties learn and practice math."

– John McGowan - founder of g(Math)]

[Keirsten Pugh]: So to start with a quote that I have listed on my slide there, John McGowan who is the founder of f(Math) states "by making math accessible for the first time in Google apps we are transforming the way students with dyslexia and other learning difficulties learn and practice math." Now John chose to reference dyslexia specifically but g(Math) is also relevant for all students with learning disabilities. The accessibility of digital math is important because we have tried making the integration of technology so seamless for students living with learning disabilities and providing them further tools in order to have equal opportunities to be successful. One of the most difficult skills can be transferring thinking from and out of your head down onto the page and a tool such as helps to differentiate the instruction as well as the opportunity for these students to show their work. They have the option of speech to text if physically typing out their work is something that's more challenging. Students also have the option to draw out their thinking using pictures and images if they maybe can't express it through words. My hope is that after today's session you will feel confident where to find and use the add-on within both Google docs and Google forms as well as pick up some creative ways from myself and hopefully through our sharing that we can incorporate the use of technology into your math lessons and can further encourage the students you work with to be accountable for an increased independence within the subject of mathematics. So before jumping straight into through today's meet as I can see some of you have already listed where you are from I'd like to get a feel for what your current roles are in the world of education. So if you wouldn't mind sharing with us your position within your school or even in the field of education. I can see already that we have two instructional coaches from Ottawa which is great. So you can let us know--a special education teacher, perfect. Just so I have an idea of maybe where you'll be taking this learning back to your school or to your classroom. Grade 6/7 teacher. Special ed teacher. I'm liking the variety already. A numeracy coach. Great a grade 8 teacher as well. I appreciate all of you that are taking the opportunity to share who are playing around with today's meet. I will be referencing it throughout the presentation as Amy mentioned so please feel free to continue jumping in and sharing information. So was created as a way to make math for the first time in Google apps. It helps to ease the input of math language and it provides the opportunity for auditory learners to continue utilizing read and write's text to speech capabilities. Is also not a one size fits all approach. So students still need to find what tools and how those tools maybe work best for them and suit their accommodations and needs. There are many tools available out there and tonight I'm just hoping to preview a few for you. So g(Math) is currently a Google doc add-on for docs, sheets,



and forms. It creates rich math expressions and graphs for direct insertion into your Google doc sheet or form. So during today's webinar I will be focusing mainly on the functions just in docs and forms as I feel through my experiences that those are the most accessible and useful firsthand for students, and as well I'll be discussing some ways that I bring mathematics to the computer during my daily work in sessions with students.

**[SLIDE – g(Math) – Making Math Digital]**

*[Text on slide: What Is It?]*

- g(Math) is a Google Add-on for Docs, Sheets and Forms. It creates rich math expressions and graphs for direct insertion into your Google Doc, Sheet or Form.]

[Keirsten Pugh]: So another question for you on today's meet, how are you currently making math digital in your classrooms, in your schools, or in your learning environments? Again if you feel comfortable please take a moment to share some ideas on our forum. Great, already I have Google classroom smart boards, iPad apps and digital manipulatives perfect. Video lessons. Interactive sites, more Promethium Board, more videos. As we can already see and as a main theme for today differentiation is going to be huge. So again I'm hoping to share and gain some insight from those of you as well. Math apps, smart boards, those seem to be popular. Great, so what can you use for? Big question is how to integrate it into the classroom or how to make it accessible for you as a teacher/educator, or for your students as well? So I know some of us are currently active on today's meet and if you could just row in there any currently familiarity that we may have with . So are some of us brand new to it? Are we moderately familiar? Or are there some of us that are using it already in our classrooms? Brand new, great. Thank you, Nancy. Used it to make handouts and tests, brand new, brand new, never heard of it. Excellent. So, so far I'm seeing a lot of new or never heard if it, so that's great for me..

**[SLIDE – g(Math) – Making Math Digital]**

*[Text on slide: What Can I Use It For?]*

- Reading your math
- Creating math expressions
  - Simple or Advanced
  - Voice Recognition
  - Math Writing Tips
- Creating a graph
- Creating a handwritten entry]

[Keirsten Pugh]: Today will be an introduction to its uses but hopefully as well some ideas for those that may be a little more familiar how they can continue using it or maybe change the way that they've thought about using it in the past. So g(Math)'s biggest functions are reading your math. So this utilizes the text to speech and partnership with Google Read and Write. It creates and inserts math expressions so for those of you that have used it on handout sheets or tests these are the features you would be using in both docs or forms. It can create simple and advanced expressions. It can create expressions through voice recognition, and it also allows you as the creator to learn a



little bit of our Latex code through some accessible math writing tips that are available. g(Math) can also be used to create graphs for linear expressions and lastly it can be used for creating a handwritten entry. And I've seen some more brand new posts on today's meet so that's great for me. Today as mentioned I will be mainly focusing on the reading of our math, the creating and inserting expressions through both text and voice and where to find the support in writing your math, and we will also take a look at how and when a student might find it useful to create a handwritten entry and also a quick how-to to collect data and insert that as a linear expression for a graph to insert in docs.

### [SLIDE – Accessing g(Math)]

[Text on slide:

1. Open a New Doc
2. Give it a title
3. Click Add-ons menu
4. Get add-ons...
5. Search g(math)
6. Click '+ free' to install
7. Allow access and permissions
8. You're ready to go!

[Keirsten Pugh]: So g(Math) functions as an independent add-on within each Google app. The following eight steps provide you on how to find and add g(Math). So for all the brand new learners who may not have explored, and if you already have it installed then these steps have already been followed. I've listed them here on this slide for your reference. As Amy mentioned once you receive these slides following the webinar.

So being completely upfront about g(Math) some of its features can be finicky and may not perform the exact same every time. There are a lot of new users from what I've seen to but if there are any users who are currently using it do you find that you often have to troubleshoot? Or that you run into issues where it's not functioning the same every time? And just to be aware of that as well. I may be demonstrating something on my end and if you are following along or choosing to participate on your end you may find that you run into some of these roadblocks. I will be trying my best to offer troubleshooting support along the way and in turn these can be really, really great teaching opportunities for when you're working with students as well. The one nice thing about is that there's generally at least two ways to do everything so we can always usually find a way to work around it. And I just see a quick comment there that I have run into some issues where I had to close the work and reopen it. So hopefully that is something that I'm going to touch on as well tonight. Hopefully we can find a way to work around that as well.

### [SLIDE – Let's Explore]

[Text on slide:

- Create math expressions
  - Simple/ Advanced



- With Voice Recognition
- Read your math]

[Keirsten Pugh] So we're gonna get started exploring now and I'm just gonna pop over to a doc.

**[Demonstration of Google g(Math): creating and inserting math expressions into a Google doc]**

[Keirsten Pugh]: So with g(Math) being an add-on it launches as a side toolbar for you and all of those features are available for you to use on your side panel. Starting off in our simple tab we will explore some ways to find and insert just basic text into your Google docs. So I can start by writing out my expression and in that sidebar panel your left arrow inserts over to your doc. now the one thing to mention is that wherever your cursor is placed on your Google doc at the time of insertion is where your image will appear. Does insert expressions as images so when clicking on them this gives us the option to resize, maybe according to the needs of our learners. A student with visual impairments may benefit from larger text and image size in order to see, read, and follow along with that image. The link that you can notice as well that's attached to the image is something we can remove. Some of my students tend to get distracted by it, but the only downside in doing so we lose the ability to edit our math. So if I delete what's on my sidebar here and click on my image I can reinsert that expression to my side panel. So we also call it bringing our math back, and I can edit or make changes to that expression and then simply by reinserting the expression it actually updates the image instead of giving me a duplicate copy. By removing the link that's provided there--and this is often something I see with students who just choose to remove the link not knowing its features or its purpose, when you try to re-edit that math you will get a null message. So if you're ever thinking that that's a troubleshooting issue, it's simply because your student has removed that image expression from your side panel. Once we have our image on our Google doc I'll enlarge it a little for viewing. You can open your Read and Write toolbar and again including that text to speech select your image and simply press play.

[Google g(Math) text-to-speech function]:  $4+5=10$ .

[Keirsten Pugh]: And it will read that expression out loud to you. I've found some of my students with learning disabilities work through a handout sheet or a quiz when they are utilizing text to speech maybe a little faster than they would if they're working through it independently. So continues with that consistency for students who use this text to speech as a regular practice. I would also like to draw your attention to in the simple tab at the bottom we have some math writing tips. These math writing tips will be key for our new users. So I like to call it my cheat sheet. It actually explains to you the keyboarding features that you will need to use in order to create a specific expression. So at the bottom you can see I'm on exponent already so I will continue with that feature and I can insert A and it shows me the up arrow which on my keyboard is located above the 6. So I would do a shift and that bumps my cursor up to superscript and that's where I would insert my power. Now the right side arrow key is what shifts me back down to my middle level where I was inserting my expression and I can continue with that pattern, shift up arrow to superscript, and insert my power, right arrow to bring me back to inserting my basic expression. And then once that expression is completed and I'm happy with it I can click with my cursor where I'd like



to insert it and then simply shift that over to the side panel. The right and left arrow take you through a variety of different features and expressions that you may need to write. They are mainly the most common ones that are used, and those features can all be found on the simple toolbar page. So clearing that expression and flipping over to the advanced tab we also have the option of choosing from pre-existing operators, symbols, functions, and Greek letters. So this'll actually insert the Latex into the editor at the bottom. So if I demonstrate an example with a simple fraction you will see the visual above. So that's what's going to insert onto my doc on the left and then you will see the Latex code underneath which is what I need to manipulate in order to populate the numbers that I would like to use. So in this case I'm replacing my letters with the numbers that I want for my fraction in order to populate that fraction above. And whatever you see in this advanced tab at the top is what's going to populate into my panel on the side. now if I flip back to my simple tab I can also go through and find my fraction and I can write the same fraction using a backslash to enter my numbers as I did on my advanced tab using my Latex. So both populate the same image. It's just preference to you as a user or as a student users whichever one is easier for you. And I can see that Kat has picked up on today's meet that  $4+5=10$  which is an area that we would be able to then re-edit our math and it has said null because I have removed that image. So I was showing it in a way that we could re-edit the math and then make any changes to it. So yes, it was purposely done that  $4+5=10$ . Students don't actually have to know the math language in order to write and express the symbols that they would like to use. The advanced tab just gives you as a teacher or them as a student pre-existing code. It can sometimes get confusing to a student as to where they're supposed to insert their numbers, or you as a new user what information you need to add. So I do suggest that using the math writing tips which are hidden in the bottom panel but you can reveal them to follow along and begin learning how to write some of those math expressions for easy insertion. As well on both tabs you will notice that there is a microphone. We have that option in simple and advanced. And our trashcan which I have been using to clear my text box at any time. So our microphone is equipped to only pick up math vocabulary and chooses from its best selections of symbols for you. So for example if I was speaking in power, A to the power of 2 plus B to the power of two equals C to the power of two. Now g(Math) has picked up 8, and I was intending on saying A to recreate the same expression as before. So I can simply edit what was been inserted through voice. Often with the student they may get frustrated that it's not hearing what they want it to hear, or I didn't say that so I usually tell them just hit the trashcan and clear that panel and let's try it again always reminding them to talk in a nice, even paced voice as clear as possible and taking any wait time that they need in between as g(Math) will only pick up the al terminology that it hears. So to give that another try  $4+9=13$ . So any wait time that the student may need to solve math or to wait for that math to populate they can take a pause and as long as that microphone is green it will continue listening to them. Now the microphone I'm currently using in the advanced tab because we can see it populate and make changes in the Latex editor but I can flip back over to the simple tab, activate the text box with my cursor,  $4+9=13$ . Once you turn off your microphone you lose the text box at the bottom but you can still make any changes that you would want in the text box above and reinsert that math into your Google doc on the left. So it does work in both the simple and the advanced tab. You just remain having two text boxes if you're working with any advanced symbols, or equations, or operators as well.



### [SLIDE – Google Docs: Connect the Tech]

[Text on slide: Word Processor: Saves automatically, communicate with teachers and peers, collaborate with others, access anywhere & anytime

- Insert drawings - access to shapes, can be used as a manipulative
- Creating tables - KWC chart for solving word problems]

[Keirsten Pugh]: So during my session times with students I have found the following two tools on Google docs most often useful in mathematics. I like to utilize the Google drawings within docs to allow students to access shapes which can be used as a manipulative, a way for students to visualize their thinking and or for you to use when creating a resource for students that may need that visual component. I also utilize tables with a strategy that we at Learn Style like to call the KWC chart and we introduce this for solving word problems or dissecting questions. I believe as Amy mentioned there was an emailed blank KWC chart sent out to all of you yesterday but if you did not receive that or can't access it right now there is also a handout available on the got webinar and you can access the PDF there. So if you'd like to take a moment to open that or access that handout it is something that we are going to talk through and demonstrate how to utilize that for a sample word problems. The problem that I have chosen to illustrate is targeting at an elementary student's school level. So with the KWC, KWC stands for K, what we know, W, want to know, and in terms of math we use C for conditions or our rule. Which ultimately will be any actual math that we're creating during, or operations that we're using during that question.

[**Demonstration of Google g(Math):** how to use a KWC chart and tools in g(Math) to solve word problems]

[Keirsten Pugh]: And so I as well will open my blank KWC. So yours should hopefully look something like this. I'll give you a moment to read through the question at the top and then if you're comfortable using today's meet I'd like you to share your first steps in what you would use for identifying key information from that word problem. So if you were introducing this word problem or working through it with a student or your class what information would you point out to them or would you try to have them see as the key information in this question? And once you've had an opportunity to read through that you can share that with me on today's meet. So that's as well reading through from the front of the bike rack Ricky counts eight wheels. Some are bicycles and some are tricycles. Ricky does not want to ride a tricycle. If there are 19 wheels in all how many bicycles does Ricky have to choose from? So from that word sample problem what is some of the key information that you would identify to your students or class that you are maybe working with? Great, so I already have bicycles, two wheels, and tricycles three wheels. I'd have them use read and write to read the question and use the highlighting features to highlight the information they feel is important. And that is perfect. So to also start us off to demonstrate what was just read through from today's meet we can play the verbal expression.

[Google g(Math) text-to-speech function]: From the front of the bike rack Ricky counts eight wheels. Some are bicycles and some are tricycles. Ricky does not want to ride a tricycle. If there are 19 wheels in all how many bicycles does Ricky have to choose from?



[Keirsten Pugh]: Perfect, and then I can use those highlighters, and there's been some more options for eight possible wheels from the front, so eight options, and we also had bicycles as well as tricycles. We can also add that there are 19 wheels in all. And how many bicycles does Ricky have to choose from? So looking in our know column, and our first suggestion that was put up on today's meet, information that we know. So we know that there's two wheels on bicycles, and we know that there's three wheels on tricycles. We also know that Ricky counts eight wheels from the front. We know that there's 19 wheels in all. And then we can jump over to what we want to know. And that's the actual question that the word problem is asking us. So in this case it would be how many bicycles does Ricky have to choose from? And then we would move over into our condition or our rule. And this column is neat because this is where you will see students differentiate their approach. Using the math that is most comfortable to them depending on how they see or visualize the problem. So for example one student may choose to use division is that's something they are comfortable with where another may just choose to use subtraction. As long as their work backs up their thinking really there's no incorrect answer for this column. So for any options that you could put into today's meet what would be some suggestions mathematically for a rule or a condition that we could use in this specific expression? Knowing that we need to find out how many bicycles Ricky has to choose from. And I may start it off by saying multiplication. Do we have any other thoughts or ideas as to how to approach this word problem mathematically? Adding, skip counting, system of equations. Guess and check. Perfect, so these are all excellent examples and as you can start to see--division, it's how you as an individual start to see or approach the question, or how our student may think to approach their way of thinking or their answer. So the next thing that I would like to show now that our question is set up for success. So I would walk through listening to the question first, having the student highlight that important information, and then moving down to extracting that information from our word problem and placing it in our chart. Really separating our thinking and laying out a nice plan of success for your student to then approach the problem mathematically. So I would not introduce my student to--and I believe it was Nancy that mentioned in today's meet to have my student draw out their thinking. So this is where I would introduce inserting a drawing and this allows student a blank piece of paper to begin working with shapes, symbols, counters, to kind of express themselves or show their thinking visually. It's up to them what they choose to use as counters, or you as the instructor or educator can guide them into something that may match what they are working towards. So today I'm going to use these little circles. I like to see them as kind of bike spokes and they're my wheels on my bicycle. SO I can insert those into my drawing. And then selecting both images at the same time I then have the action of grouping those together. What that does now is that allows me to copy and paste, and move with that as a single counter. I may then use the same symbol, but this time copy and paste that image three times. And for me this is my tricycle. Again, individual thinking individual ways of viewing and seeing the math or viewing and seeing the change happen. I then like to use the scribble line as it acts as a pen so students can start to draw, or put in numbers, words, they may even want to add dividers between their groups that they're creating. Helps with that trial and error or keeping track of the information that they are using. Again I can group the three with my symbols and I can copy and paste that as an additional counter. So really your student or yourself as an educator have the freedom to personalize this for your individual thinking. The other nice feature as well as our text box, so students can also add word's this kind of sums up that thinking that we always use in the world of mathematics showing



pictures, showing numbers, showing words, incorporating all three of those ways of thinking in order for a student to really express how they're approaching a problem or what's going on mathematically in their own brain. And then we have the option to save and close whatever we've been working on, on that doc. And mine is a little big so it will insert on the page below. It is an image. Everything that they've created on that Google drawing. So I can resize and bring it all up onto one page. Or I can expand it to show even more of my thinking if it was a more elaborate drawing. So I'm just going to flip over to a more completed KWC and as you can see there, there's an expression of different pictures, numbers, words, counters, really a whole picture as to what went on in my head to help me answer that math. And then because this is a g(Math)Google doc I then inserted my thinking into my concluding sentence. And highlighted my final answer to what my question was which was how many bicycles does Ricky have to choose from? The expressions that you can see in what I know, where I chose to put them were created with g(Math) so I opened that expression panel from the side. And then I was able to insert  $2 \times 5 = 10$  and  $3 \times 3 = 9$  and then I was able to insert those expressions into my chart as well. So what we kind of end up with could seem like a complex way of answering a mathematical word problem, but it's also very differentiated form of responses. So not that all of these have to be done in one, but it gives you a nice variety of options. So scrolling down underneath I have also shown some handwriting entries. So this is another feature that we can use called Creating a handwriting entry and these are some student samples that I have found most recently and leading up to current and recent EQAO. Students were approaching different word problems, or working through different thinking. Now the ones that I've put here are three different students doing the same problem. So there was some long division and we wrote out the conditions or the rule that we were using as well as used some of the different pens on the handwriting feature to really show our thinking and differentiate the steps that we were doing. So that handwriting entry gives students that pencil and paper feel. So you saw the product that was just produced and this is the page that we started from. Some basic tools, our green exit door is always to place your math into your Google doc, we have a back arrow and forward arrow. That will erase or redo one step at a time. So the most recent thing that you've done on the blank page. And then I have my different pen size options, so differentiating that instruction. Multiple different colours that students can choose from to show off their thinking as well. Now this feature can be ideal if your students are using a Chromebook because it does have that touchscreen feature which works really well with the handwriting entry. It can be difficult for some students to use a trackpad or even an external mouse but it is something that they get used to. They generally have to trash and clear the page just once and then they kind of get a hang of either what size pen they want to use, or what colour they may need as well to do any of their drawing or thinking. The nice thing about the current handwriting entry is that it allows you to insert exactly the colours and the choices of pen that you were doing on this blank page here and it simply inserts that exact expression into your Google doc. Now one quick troubleshooting that those who have been exploring or even who go to choose to explore g(Math) may find is the window we were just on with the blank handwriting entry has been known to think, and think, and think, and think and it never really leaves this page once you try to insert your math. So a tip for what you can do is close out with the X. Once you have pressed the button to insert and you're waiting for it to process close out of the window and each one of these residual images populates in the student's Google Drive as well. So if you go to your student's Google Drive and you look in their recent tab it will populate an image of the drawing that they've just created. So that is a place that they can then insert an image and they can pull that from



their Drive to insert it into their doc. So that's kind of our backdoor approach if you're frozen on that screen or stuck with a student.

### [SLIDE – Let's Explore]

[Text on slide: Handwriting Entry]

- Undo/Redo
- Pen size
- Pen Colours
- Delete
- Insert]

[Keirsten Pugh]: So quickly to bounce back over to today's meet. Any of those who are listening, could you see this handwriting feature being useful to any of your students? Or beneficial to any students in particular with learning disabilities that you work with? So maybe benefits of it definitely that's great. IF you have any specific scenarios or a student in particular you can think of? The mouse can definitely be something that is frustrating the first go. I will attest to the fact that I have used it with students and given a second or third shot they are able to see how to kind of maneuver the mouse around to write out the math that they are looking for but I will agree that it can be a frustrating moment for them to try to get over. It's something that I would suggest exploring if you feel like that's a feature that they can benefit from and see how they do with maneuvering either on their track pad or on their mouse pad as well.

### [SLIDE – Google Docs: Connect the Tech]

[Text on slide: Show your thinking]

- Using a handwritten entry to work through long division
- Draw a visual to enhance a written expression]

[Keirsten Pugh]: So lastly for Google docs I would just like to show from an existing graph X and Y plot tables.

### [Demonstration of Google g(Math): how to plot graphs using tables]

[Keirsten Pugh]: So this is a big one that I've had commonly asked from teachers and new users. Either they've seen a colleague use it, or they've heard about it but they just weren't sure exactly how to do it. So if you launch your for creating a graph and you scroll all the way down to the bottom in the optional features there is a text box to get points from your table. So this is where I would take the expressions that I had already created in my X and Y table, I would highlight and select all the values not including my X and Y labels, and once that information is highlighted I can tell g(Math) to get the points from my table and as you can see those have been inserted for me and they are already formatted to appear as plots on my graph. Now a few of the confusing features of functions is that in the functions tab at the top there is already some preloaded functions and constant that we can see there. So what we want to do is delete those if they are not values that you want to see on your graph, and in this case I'm going to inset my linear expression with was  $2X+1$  and then I'm going to simply preview that chart and you can see the graph there as my points have



been plotted as well as the line from my linear expression. Now if I remove that expression from my function and I re-preview my graph you will simply just see the points plotted from my table and you won't see the additional line put in there. Again if I select where I'm going on my Google doc and insert that math the chart will appear for you underneath my table. So I would say pulling from especially as a new user plots from a graph or any values from a table are the easiest way to plot those X and Y as a linear expression.

### **[Demonstration of Google g(Math): how to use g(Math) with Google Forms]**

[Keirsten Pugh]: So next I'd like to jump over to Google forms and as I mentioned before g(Math) does function independently within each Google app so you will need to repeat the steps of adding on as well to your Google form. Now I know some said that they had been using g(Math) already to create different forms and quizzes. So as you can see here two different ways that I find it the most useful is students to input the expression or teachers to input the expression in the question as well as input the expression in the answer. So to add a new question in the question box we need to ask the students to solve for, or even just solve and then you will see the image populate beside. This is how we are going to insert our math expression so that it's attached to the question that we are trying to ask our students. So if I launch g(Math) for forms and I'm going to use it to create a math which is one of the features that functions the best and the most efficiently within Google forms and then I will insert in my advanced tab. So advanced tab is the key when working on Google forms. And I can then choose for this example a fraction to insert my values. Now the image portion of Google forms is key with the fact that g(Math) inserts as an image into our doc or our form. So what we actually need to do is highlight our image and copy our image address, and then heading back over to our form inserting an image by url gives us the option to insert that address that we copied and then you can see there that the image has populated as my fraction. So that's again kind of our backdoor way to still utilize g(Math) in forms with the functionalities that it has right now. And if I select for that to enter you'll see it populate underneath the question that I asked my students to solve. If you insert it on its own and not as an image it will still insert but you'll find that it separates the two and one question is on its own and then underneath a whole new question will populate with your image or your expression. So copying that image address is the exact same for entering as I just showed as we would use for an answer. It would just simply be the image that you are adding in the answer key as opposed to the question area.

### **[Introductory Demonstration of EquatIO]**

[Keirsten Pugh]: Now the other little symbol that's popping up on my Google form, and if I click to preview my form especially is this little blue symbol. And every time I've been launching g(Math) an ad for what's called EquatIO has been popping up on my sidebar and EquatIO is actually a new Chrome extension that John McGowan our founder of g(Math) has created in partnership with Text Help. So a lot of the features--I'm not going to go into it too much today. It's just basically for a little introduction for you to explore as you get more comfortable with g(Math). When selecting on it to launch it launches as a toolbar across the bottom and it is then my choice to choose how I'm going to work with my math, or insert my written expression. So the handwriting entry is something that



we've been using, and with EquatIO the handwriting entry actually populates as math, and we simply insert that math and it populates on your form. Now forms did have or does have responses for forms that you can launch but I know that there's been a lot of issues with inserting that math and the fact that it inserts as an image with a link, and EquatIO has really been created as that extension to allow students to respond in forms with ease. It simply requires you to open the extension as you saw and it always populates at the bottom of your page. This can be beneficial because it automatically organizes the math that you've written or the thinking that you've had going into those numbers and that text which you can then insert onto your form. It does populate as well from my little blue diamond in the top corner as an extension on Google docs and of course with technology it's being finicky at the moment so it would've populated the same way that it populates on forms with the option for you to insert that math as well with any expressions that you have written. And like Google Read and Write click to turn on and click to turn off, a common theme in the assistive tools that they use as well. The microphone does also allow for that speech input, and once you are done your recording or expression you can insert that math as well into your doc.

**[SLIDE – Thank you]**

*[Text on slide: “Visual questions promote rich discussion and bring students to a deeper understanding of the math”*

– Jo Boaler (TEDxTalks)]

[Keirsten Pugh]: So just to wrap up I would like to say that thank you to all of you who have joined me this evening as well as all of those who have helped to put it on. It has been a great experience for myself and I would like to share that the knowledge that I have shared with you this evening is just what I have found successful with the students that I have had the privilege to work with. My hope was that after this evening you just feel more confident about exploring the functions of g(Math) as well as some of the additional add-ons such as EquatIO that are a little newer to the scene and the world of education. So to rephrase again g(Math) and EquatIO are just two of the tools that are out there for accessibility and they both still require the mathematical knowledge and understanding to be used but they do play a key role in making that communication accessible for all styles of learners. I hope you are able to reflect on the information shared and have some new ideas brewing for the world of digital math and for our students with learning disabilities. I would now like to turn things over to Amy for any questions that may have arisen during the presentation or just any further information sharing that can take place this evening.

**[SLIDE – BONUS Resources from TELO!]**

*[Text on slide:*

1. How can I support my grade 2-8 Mathematics Learners?
2. EQUAO Quizzes (grades 2, 6 & 9)
3. Fathom
4. Geometer's Sketchpad
5. GIZMOS
6. Homework Help
7. Mathies
8. How can I support my grade 9 Applied students?
9. mPower



## 10. The Ontario Educational Resource Bank (OERB)]

[Amy Gorecki]: Hi, Kiersten, thank you so much again for providing our participants with an opportunity to deepen their understanding of g(Math). Before we move on to the Q&A part of today's webinar I just wanted to let everyone know that our friends at Technology Enabled Learning Ontario (TELO) have given us permission to share these 10 great resources that are up on my screen now with you. So in the email sent after today's webinar that contains a copy of today's slide deck and a link to the feedback survey we'll be sending you the resources that are on this slide as well. So a big thank you to our friends at TELO for sharing this with you all today.

### [SLIDE – Q&A]

[Image of hands raised]

[Amy Gorecki]: So now it's time for the Q&A part of today's webinar. If you have any questions you can type them into the chat box on your got webinar dashboard and I will read your questions to Kiersten. Please note that we'll only be answering questions asked through got webinar and not through today's meet. However if you do have a useful tip or comment to share to expand on Kiersten's answer from your own experience then please do share it with the webinar participants using today's meet.

So Kiersten we've had a few questions come in while you were doing your presentation. So the first one I have is how can g(Math) be used to support English language learners or learners with LDs who may have more limited vocabularies. Just wondering if you have any thoughts on that one.

[Keirsten Pugh]: Definitely, so as I said before wrapping up, g(Math) does still require the mathematical knowledge but the visual components of the math writing tips I feel can be very useful. They're very use friendly and students don't necessarily need to have the knowledge of that vocabulary if they're able to visually I guess I could say pick out or recognize the expression or the math that they're trying to create by simply following those math writing tips on your simple tab of g(Math) students can hopefully recreate their thinking if they're not able to say it or if they're not quite sure I guess the math to write it out r to pick it out from one of the pre-existing operators they can hopefully follow along visually through those pictures that are at the bottom of that simple tab.

[Amy Gorecki]: Great, thanks so much Kiersten. I know that a couple of users asked during the presentation in today's meet about the voice feature and one question that I saw come up was that does the voice feature work better in advanced? Just wondering if you can?

[Keirsten Pugh]: Yeah, absolutely. It is a feature that's available in the advanced tab as well as the simple tab. The advanced tab only difference I wouldn't necessarily say it works better. Students just have the option depending on the complexity that they're creating they have the option to choose from some of the pre-existing factors or operators that are there for them in the Latex text box and then the speech to text feature, they can choose to expand on through voice recognition the expression that they would like to insert. So the advanced tab just allows you to create I'm gonna go with more complexity of an expression. The simple tab I would suggest using to either my teachers,



educators or students who are just inserting maybe at a basic math level and if they want to jump to the advanced tab they can put operators in there and then expand on them through voice recognition to make their expression longer or more complex. Hopefully that kind of answers that question.

[Amy Gorecki]: I think that was great but if anybody wants any clarification please do submit your questions in the question box. Our next question is from Christine and her question is what if your board is only using Word Q or Thought Q with the Google apps as well as the speech recognition tool and Google docs. Is it operational with these?

[Keirsten Pugh]: Sorry Amy, I just need that question one more time.

[Amy Gorecki]: Absolutely, what if your board is only using Word Q, Thought Q with the Google apps as well as the speech recognition tool in Google docs. Is it--so I'm assuming g(Math)--operational with these?

[Keirsten Pugh]: So g(Math) will be operational as long as you're functioning on Google docs. So it is simply a Google docs add-on. So if your board is allowing those add-ons through Google docs I know in the York Regional School board g(Math) was approved this past school year, but depending on the board that you are working in the other option--it would function as long as you're on Google docs. The other option would be to explore the Equatio Chrome extension. It doesn't have as many features as g(Math) so it's a little bit more limited but it's more user friendly and as long as the students are on Chrome you can access that extension from the web store.

[Amy Gorecki]: Okay, great. The next question is at what student age or grade level would you suggest introducing g(Math)?

[Keirsten Pugh]: So this one I do get often and my response is generally always it really depends on the student that you are working with. So some of the features of actually using g(Math) can be a little tricky, or seem a little bit more advanced but there are features of g(Math) like the simple math expressions or the handwriting entry that are really accessible at any level depending on a student's familiarity with the technology, or the computer. So I wouldn't necessarily say there's an age to introduce it at, or to not introduce it at. I think it's really on the learner that you're working with and as long as they are introduced to it and walked through it at a pace that's individual to them then I feel that any age level can really find some uses out of the add-on as well as the extension.

[Amy Gorecki]: Okay, next question, does Google provide online tutorials for educators wanting to explore g(Math)?

[Keirsten Pugh]: They absolutely do. So you can find--there's also a YouTube channel that's really great with tutorial videos for g(Math). So that would be my first point of direction. I would direct you to YouTube and try and find their channel for text help and explore some of those features of g(Math) and how to's. They walk you through a variety of the tools and how to physically use them. More of the application part would be your intake as an educator or as a teacher.



[Amy Gorecki]: Okay great, thanks, Kiersten.

[Keirsten Pugh]: Thank you.

[Amy Gorecki]: Okay, last question. What other free digital tools are available to support students with LDs in math?

[Keirsten Pugh]: Off the top of my head I will say that there are lots. I don't have a list in front of me as it is that large. My everyday practices and uses and being with Learn Style we follow board software. So my main every day uses are with g(Math) with the new extension Equatio, and then pulling in different aspects of Google Drawings. But there are manipulative software and apps as well that are available out there. Maybe, Amy, it's something that I could provide a list to you if you'd like to share that out with the other notes in a few weeks.

[Amy Gorecki]: That would be fantastic, I think people would love to receive that.

[Keirsten Pugh]: Great.

**[SLIDE – Other Questions?]**

*[Text on slide:*

EMAIL: [info@LDatSchool.ca](mailto:info@LDatSchool.ca)

TWITTER: #LDwebinar

Image of three multi-coloured question marks in bubbles]

[Amy Gorecki]: Thanks, Kiersten. All right, so that's all the time we have for today. So we're gonna end our Q&A session at this time. If anyone does think of any further questions you can either email us at [info@LDatschool.ca](mailto:info@LDatschool.ca) or you can use our hashtag on twitter #LDWebinar and we'll insure that your questions get answered.

**[SLIDE – LD@school educators' INSTITUTE]**

[Image of Educators' Institute logo

*Text on slide:* August 22nd & 23rd

Hilton Mississauga/Meadowvale

Mississauga, ON

#LDinstitute

PUBLIC REGISTRATION IS NOW OPEN!]

[Amy Gorecki]: And finally please join us at LDatSchool's fourth annual educator's institute which will be held on August 22nd and 23rd in Mississauga. Public registration is now open and the last three years have been a sell out so register now while there's still space available. Check out the LDatSchool website for information on the program, registration, and hotel accommodation.



**[SLIDE – THANK YOU!]**

[Amy Gorecki]: On behalf of the LDatSchool team I'd once again like to thank Kiersten for her presentation and thank you to all of our participants for joining us. Please remember that we will be sending out presentation slides, the KWC handout, the resources from TELO, a short survey and as promised by Kiersten some additional supports for students with LDs for math and they will be going out following today's webinar. The feedback we get from the survey provides us with important information for producing future webinars so if you could please take a few moments of your time to fill it out we would really appreciate it and finally we will be sending out a link to this recorded webinar in approximately three weeks. Thank you again everyone for participating and enjoy the rest of your day.

