Kim Kilpatrick

Good afternoon everybody. My name is Kim Kilpatrick. I'm on the Board and Secretary of Braille Literacy Canada. Welcome back. Why that was an interesting discussion in the break, all about old slates and styli. But we're going to talk about something much more modern now. I will say my first math tool was an abacus. But Peter Tucic is not going to talk about Abacus, I don't think.

His title is An Instant Translation; Creating Printed Math Output on the BrailleNote Touch Plus. I'm just going to introduce Peter Tucic. I have had the great pleasure of meeting Peter several times, when he was working with students here in Ottawa, and sitting in on his workshops. He's a wonderful presenter, I will say, and really, is a braille user himself. So, he’s very passionate, as we are, about braille. I'm surprised he didn't join into this lively discussion we were having.

Peter graduated from the University of Illinois at Chicago with a Bachelor of Arts degree in History. And he's currently the Brand Ambassador of Blindness Products for HumanWare. He travels throughout the US and Canada, supporting teachers and students, and presenting at State and National conferences. He's presented at the conferences, National Federation of the Blind and American Council of Blind, and also in many other conferences, as well. It's a great pleasure for us to welcome Peter here to present for us today.

Peter Tucic

Oh, rock and roll Kim, thank you so much. And I will say I was going to jump in but I was scared that my; so, I have two things, one, is I'm on a microphone. So, I feel like I would have overpowered everybody. And generally, when you're on zoom, that'll happen. I didn't want to do that. And secondly, that music was just captivating me with all that nice conversation going on and there's just some ambient techno going on in the background. I was really enjoying that; I was taking it in. And then also, I have a four and a half month old here who was letting me know that she too, wanted to be on the presentation. We may hear her at some point. But I appreciate the kind words and I love being here.

And honestly the other piece is I'm happy to talk Abacus. Now, the real question there is, and I'll give everyone time to think about this, because I am going to be talking about math. But it's about methods. So are you a ‘secrets user’ or a ‘logic user’; I'll leave that for later discussion. And maybe you can tie that into trivia later on Natalie, ‘secrets’ or ‘logic’, or ‘counting’, are you, a ‘counting method user’? All of which I am definitely familiar with having done all kinds of abacus and braille sorts of pieces growing up.

And as Kim said, I am the Brand Ambassador of Blindness Products for HumanWare. I'm no stranger to Canada, although I miss it; I have not been on the road for about 15 months. And I know, I believe it was Mike, who was speaking previously, said they closed on March 14th of last year and that is essentially when I closed, in terms of being able to be out and about. So, I have been home, I’ve been presenting all over the place and doing all sorts of presentations and pieces. But definitely miss being on the road and having the chance to interact with everybody in person. Because doing it this way, is great as it is that I can come join you from my house in Chicago, at five o'clock or four o'clock eastern on a Friday, that's very neat, but at the same time, I can't put anything in your hands. It's very hard to have a more hands-on demonstration or discussion that we're used to having when things are kind of flowing.

But I will share my screen, I do have slides and again, I'll talk my way through them. For those of you who are light dependent, the slides will mean something to you. For those of you who are not unlike myself, the slides will mean nothing. And that's okay. So, I'm going to share my screen here. And we will jump on through; give me one second. And we'll really look and talk a lot about math. And I know again, this will be relevant in different spaces, not necessarily something that is going to be relevant to everybody here today. But it will let everyone know what's going on and where we stand and also what we need to be working with. So, in the future, how are we going to bring this stuff forward?

Alright, the screen is shared. And I am going to come over here. And we're going to look at this from the point of view, just a few slides here. And I will be, if we have time, doing a short demonstration.

In terms of math content. What I want to talk about is high tech and low tech; I mean the importance of both. There is always going to be a place, and I love the segue we were talking about slates over the great music that was on – the slate discussion. And in talking about still using slates and in hardcopy braille, is really what that equates to, as well and how useful that still is. You know, I work at HumanWare, we are very much into technology, and I feel we do a great job of leading, that sort of being on that cutting edge of technology trends.

It is something that I believe a ton in and I love the importance of working in that very tech-centric environment. But it doesn't mean there isn't room for a Perkins brailler, does not mean we overlook the importance of hardcopy braille, and the use of braille all over the place. We certainly believe in branching that into technology, and we're going to talk a lot about math and science. But when it comes to those subjects, when it comes to STEM, or as a lot of people say now, STEAM, right, we have to include art. So, it's not just the STEM side, we're going to include science, technology, engineering, art, and math. So, feel free to say STEAM, I guess, is what I've learned in the last few months where I was always saying STEM.

It does come down to low tech options. And we know especially in art, especially when we look at 3d printing or some of the pieces that give us tactile information, low tech is essentially our in-road into that sort of space. So, using a piece of paper cut to a certain way, or using a clay molded into a model or using something that is just laying around to give us a tactile representation is extremely important. In this first slide. I talked about high tech, low tech and sort of the options for producing braille.

I do have the Perkins brailler here; I don't have the slate listed because primarily, especially in all of the travel I do outside of the adult populations, the slate is still relevant, but I don't see it much being taught unfortunately. But believe me, there are places where I don't see braille being taught, which is extremely unfortunate. But the Perkins brailler is still something that is very relevant. We're going to use it to teach and learn spatial concepts, we're going to use it quite often, especially in that math side of things as a means of producing an understanding how problems are solved and laid out. You know, as all of the fancy tech that I'll be showing, a Braille display is one line. And until we have a nice solid way of not having just a linear product on a refreshable Braille display, we still need to use these pieces when we're building foundations of math and science.

I also have the Mountbatten brailler listed here. And that comes into play as it provides auditory content, but also is great for younger braille readers or writers, because it does require less effort. Again, from that muscle standpoint, a lot of times we learn in three, four or five year old kiddos are pushing with all their might on those braille keys and some just don't have the dexterity to do that, so the Mountbatten brailler also plays a significant role in producing hardcopy braille. And there are other devices out there that do that, pieces like the smart brailler and others, but it's certainly in there.

The other piece I have listed here is embosser, or braille translators, able to create braille translated documents in hardcopy documents by embossers. Extremely important, especially again, when we're doing math, we need to be reading that information in hardcopy braille, it's very important that we have access to it.

We are able to create Nemeth or UEB math using braille translation programs, like Duxbury or the free braille translator from APH called Braille Blaster. There are probably some hardcore Braille 2000 fans possibly in here as well, and you can certainly do that there also. But it is something that is extremely important; we want to be utilizing and using hardcopy braille when it comes to math. And we certainly support that here at HumanWare, not only in the products with the embossers, but also with what we're trying to do behind the scenes and collaborating with companies like Desmos, collaborating with folks like APH, to build new products and really push the boundaries of what we're going to see on hardcopy as well as digital refreshable braille.

The final piece here is the BrailleNote Touch Plus that I have listed and again, you know, I'm always in that constant push and pull and I'm always asked the questions about the notetaker versus braille display versus what should we be using? And the question is, in the answer that it leads to is, it is going to be a very individualized sort of question that we ask ourselves, ‘what are we using, and when’. Right now, I'm using a Braille display to run the slideshow, I could certainly use a notetaker to do it, I could certainly use many pieces of technology to efficiently and effectively present visual content. The common theme, though, is that I'm using braille and braille is going to be what's going to help me do this.

When it comes to math and science, we do see a differentiator and then it won't always be this way, but a constant differentiator in the ability to create content visually on the notetaker. So, something like the BrailleNote Touch Plus being able to create visual math output on the fly is something that is very hard to do elsewhere. It's not impossible. There are environments using screen readers where we can create visual math; there environments using screen readers where we can consume visual math. But it's going to be heavily dependent on those contexts that you find yourself in. So really, we're trying to create a complete package, and we still have work to do. But the BrailleNote Touch Plus does give us the ability to bring that content to our teachers, to our sighted peers, to anybody who is sighted, for our parents to look over our work, and give us real time feedback. And that is something that is extremely important, which I'll talk about.

In terms of KeyMath, what is it? So KeyMath is my slide just totally went crazy. So, give me two seconds here, while I refresh myself.

What is KeyMath? It’s really something that we came up with about four years ago but the ability to take that math content, and create and go from braille math, to that visual, perfect print, in real time.

And this is something that, as I'm totally blind, I've been a braille reader since I was four years old, I have used braille all the way through school, was a very confident math student until I wasn't. And the reason why I wasn't, is because I could not keep up anymore. I was getting to algebra two, I was getting into math where my teacher, my TVI, my teacher of the visually impaired was not as confident, and she knew what I was writing, and was able to translate it but by the time I got my work back from the math teacher, I was falling behind because I wasn't showing my work and getting real time feedback.

And when we developed KeyMath, our goal was, our first most overarching goal, was to be able to create that math in real time. So that a parent, a teacher, or a peer could see what that blind kiddo was producing, in a visual way, that was in their medium, in a printed math output. Not just the words, MathSpeak is great, but it is words, we need to be able to show it visually, so that a blind kiddo could participate in higher level math in real time.

KeyMath is something we built in; it's directly integrated into KeyWord. So, KeyWord is our braille first word processor, very similar to how MathType is; it can be integrated on top of Microsoft Word, or the equation editor in Microsoft Word. It's a very similar sort of concept. The students are creating math documents in the same way that they're creating all their documents in other classes.

So, you're using KeyWord, but when you're doing math, you're inputting your work into this document as an image or a picture, that is going to be easily readable or consumable to that sighted teacher.

When you want to put in math, it's a matter of pressing backspace with M. When you are in that KeyWord document, you are able to push that command, you come into a new blank KeyMath window, you write your math, every time you press ‘enter’ that visual math is generated. So, you're creating that visual image.

This is not just for math, I mean, I obviously it's called KeyMath. But I've worked with many students who are successfully balancing equations in chemistry, who are doing other things than just making math per se, and showing that 2x+4 = 8, and solving for x. There are other ways that this is being used. When the student has done creating those images or creating those equations showing their work, you'll press backspace with E, you will export that image and paste it into your document.

The nice thing about that, is it is a braille sort of experience; when we're in our KeyWord document the braille is there for us to read. But the print, when we share or save or print the document, whether that's into a shared folder in the Cloud, whether that's via email, or whether that's printed onto hardcopy paper, that document is showing that visual math, correctly.

As we walk forward and look at what KeyMath is, just a little bit of a deeper dive; we do support, I know this is very Canadian, so I know UEB math is the standard. There might be some old timers who are still working with Nemeth Code, here in the States we do work with both depending on the State you're in, so we do fully support Nemeth code and UEB math.

UEB math is a matter of, or Nemeth is a matter of, setting up your preference within the KeyMath settings.

We also have the symbol selector. This is something that’s been with HumanWare products for a long time. But if you're unsure of, and nice, I've done very good and I'm very fortunate because I work in this sphere. Learning UEB to me, even though I did not learn it in school, I forced myself to learn it because that's what I was going to need to use, especially when I do presentations in other countries.

I do a lot of pieces for the UK, for Australia, for places where Nemeth Code isn't being used. So, I have had to force myself to learn UEB and use UEB and also UEB math.

And in doing so, we have the symbol selector which allows us to look up or refer to a place. The word I'm looking for escapes me, of course, at this exact moment, but it's, ‘think of it as a resource’ that is built in, that allows you to search for and correctly determine what various symbols are. So, if I'm unsure of the superscript or the subscript or the pi sign, I can come into the symbol selector and I can find what that is. Then I can input that into my KeyMath equation. So, you're able to use it. It's not a teaching tool, it is certainly not a teaching tool but it is a reference tool that you can use.

You're also able to put in templates. And this is very relevant. Actually, I worked with a kiddo in Ontario on this quite a bit, prior to my not traveling, you're able to create templates and you can insert templates into your KeyMath document. For instance, the polynomial equation, or some other commonly used templates that you want, if you're reusing something over and over and over, you can drop in a BRF, or really, it's a BRL template into KeyMath, and then just fill in what you need to.

I make these, especially for the sales team, but if you're graphing things, and we'll get to graphing in a bit, you might want a template that is of a circle template or other templates that you can drop and then fill.

So, it is a very sort of niche within a niche. They're a very advanced type of feature, but it's something that's used a lot, especially when you're re-inserting the same types of equations over and over and over. And something that we we've kept in there.

The other piece about KeyMath is it does retain the print image, as well as that math braille. So that again, as I said, when you put that into KeyWord, you're not losing that braille math for yourself because you are the braille reader, you're the braille user. We want you to read that as you wrote it, you can certainly edit those images later, but we're keeping that braille almost at the same time giving that print output there.

When it comes to created math, and this is something that we really need to clean up. When we developed KeyMath, we did a phenomenal job of bringing KeyMath in; we did a great way of creating math content, we did a great way to solve that problem of being able to create math in real time and getting that feedback so that you're not falling behind.

Where we fell short and where we are working on, and we will see some improvements, is how do we consume math content on the device.

So, as it currently stands, the teacher or parent or instructor would create math using MathType or the equation editor, let's say found in Microsoft Word. The teacher would save that file as a docx file, and then would open it up or import it right open it using a braille translator like Duxbury or Braille Blaster. Once opened in the braille translator, you could save it as a BRF file, so you would translate it to BRF and save it. And you'll have a braille document or a BRF file that you can send to your user, to your Touch Plus user.

Once you do that, the student would get the document would open that BRF file using the key BRF application, which is really, that key BRF application, is how we would think of it as just working on a raw brailler. It essentially takes what we type and keeps it in raw braille. So, you're able to create music, you're able to create math, you're able to take notes in grade three, (if you're someone who has your grade three down), or you just want to do various types of shorthand or whatever it may be, it's not going to translate into anything keeps it in raw braille.

So, you can open up that document containing the math, you're able to select the equation that you would like, you're able to paste that into KeyMath, and then that it will take it and turn it into a visual, you solve your equations and put them into the document.

So again, that process and it sounds daunting, and it can be at first, it's very daunting. And we need to find a way to better clean that up. So that, when a student receives a document containing math in it, it will be workable and editable and usable straightaway in KeyWord. And that's something we're very much aware of. And we're working on.

I have created lots of videos that walk us through this process. Andrew Flatres and I, Andrew is our Braille Product Manager, we did a webinar on this. If you look at our HumanWare Live Channel, which I will link to later in the presentation.

On October 15, I think of last year, we went through all of these steps; how would a student consume this content and actually turn the math they received in that mirror file into print and then solve for those equations.

What I have here is a picture of what it looks like when you want to create the math.

So, what happens in Word, how do you put that into Word, and then convert it. And once you do convert it, you're going to be able to then take it, and this picture here will show us what it looks like when you open it up in Duxbury. And then what happens when you open it right up in Key BRF. So again, being able to do that, and then the student will put it in, will solve the equations and the output or the finished product is here; and this is again the visual printed math appearing alongside literary math such as your heading literary braille, that you've typed in the document previously. So, my name, my date, the topic of the assignment, and then boom, all of this visual math in there. And you can certainly mix literary braille within those images as well.

So, the benefit of this is that the teacher can type comments directly into the document, either at the top of the bottom, and the student can then go in and edit that work in real time. We've seen this used very successfully throughout the pandemic with remote instruction. It's been a game changer, because again, we don't have the ability to get that math ink printed. That just isn't existing right now, although it isn't in many spaces as things open back up. But we've learned a lot about the importance of how we're able to use technology to keep up during these times. And, you know, hopefully, we won't get back into these sorts of situations again, anytime on any of our lifetimes. It's been wild for many students, we've had a lot of loss of learning, but at the same time, those who have had access to pieces of technology, such as this have been able to keep up during this time. And that's been a major, major difference.

Talk about the math breakthrough here. And again, I'm flying through the slides, I know I'm not here; we could spend all day on some of this stuff. And I don't even think I'll do a live demo, just for time sake, and what the time we're working with here.

But when it comes to this math, it's not just about creating math type creating two plus two equals four, or the square root of nine equals three. It's not just about inserting fractions or creating that visual output.

It's also something, we worked with Desmos, to be able to create graphs and be able to, not only create two plus two equals four, but also y equals 4x plus three and show that we've solved for that graph, and create for our teacher in real time. And our teacher can give us that feedback of what we did, did we solve for our slope equation or y equals mx plus b? Or did we solve sort of those pieces properly.

And again, this is a step in the right direction, but we're not done. We need to find, and this is still something very challenging, but we need to find a way for a braille reader to extrapolate the same content that a print reader or someone who is sighted gets when they look at a graph. And I'm not saying that's easy. There have been many steps and stabs at this, we've seen some really neat things during the pandemic with accessible charts and, you know, COVID numbers and all sorts of things that have been really neat. A lot of the work that has been done, that Penny has done with the weather watch and other pieces. We’ve seen some really neat things in terms of consuming this stuff but we know that that still is another step.

So, we can create graphs, we can share them immediately with our teachers, we put them into KeyWord, you can even emboss them if you have the right embossers. But you're still not going to take a scatterplot and perfectly emboss that onto or create that into a tactical graphic.

This comes back to, I think this comes up every time I speak, but I was in here during the previous presentation and the whole piece of making something accessible, is very different from making that usable. And we hear this all the time, and accessibility can be a buzzword, as I believe Mike said, it's very true, right? Okay, this is accessible but where's the usability aspect of this?

And so, we are making these graphs, we can create them, but the usability to the end user still leaves something to be desired. We want to be able to work with this, to work in both creating more graphs and better create different types of graphs, but also get creative with how we can consume those graphs. And I can tell you that there are some pieces coming that will be very intriguing when it comes to working with that sort of tactile output. And that side of thing when it comes to math and science.

Again, you know, we do have a method on the device to explore a tactile graph, it is very ‘trippy’, if I can use that word here. It's not the cleanest thing when you're looking at a diagonal line on a linear braille display but it can be done. And I we've demonstrated that in various videos in places. But it's something that that that we need to put some more time into when it comes down to the consumption side of things, not just the content creation.

I have a slide here that says, Let's See It In Action! I'm going to skip this slide because I was going to come in and do some things, but with the time we have, I do have a couple more slides with some important information that I want to get to. And then I certainly can take questions but I'm going to reserve this Let's See It In Action! for the next time you find me or track me down and say, Peter, I want to See It In Action. Or you can see all of this on pre-recorded webinars as well.

I do have a link here to KeyMath demonstration videos. This is in slide number 11. We try to create snapshot tutorials, webinars, resources at HumanWare that are useful to everybody. I know for a fact and I know many of you here are blind braille readers as I am. We learn differently, right? We can learn things on our own and do all this and take the time to sit down with a full audio tutorial or a full user manual or a full resource guide. A lot of times though, the teacher, the parent, the peer doesn't have that same type of time. They're not working with the devices at home, they're not using these every day. And something, these pieces can be very, very daunting. So, we try, myself and Andrew, previously, Greg Stilson, who was here, who is now at APH, is a very close friend of mine who started this whole trend years ago. To create small, we call them snapshot tutorials, small videos that will illustrate a concept or illustrate a point. And let us bring things to you in a very short sort of piece, very digestible; so, it's three to five minute – five to six minute videos.

We also have other pieces that I'll get to in the HW Buddy App that are more text based. We also have audio tutorials, and all sorts of things. But we definitely do have snapshot tutorial videos available for these various pieces.

We also have webinars that we've worked on extensively, that are found on the support page; on the HumanWare Live page.

I'm going to come to the next slide here. And this looks at again, the HW Buddy App, and we'll get into the resources. But the HW Buddy App is a means of looking at HumanWare, our website all in one place. It’s on iOS and Android, it gives you the ability to come into all of our pre-recorded webinars, it gives you the ability to look at our snapshot tutorial videos, as well as tons of ‘how to’ guides. The ‘how to’ guides are very text based. And they will let us efficiently work through step by step instructions without needing that video side of things.

We're trying to create multiple levels of content. The app is for teachers, the app is for TVIs, for parents, for everybody; we really want that app to be something that you have, that is always there for you. In your pocket, you can pull it out when you need it, you can certainly search for keywords and filter by product, you can always do that sort of thing as well, and come in and just explore all of the products that are offered in there with the ‘how to’ guides. And you can share them, if you need to, or bookmark them.

Further resources. I have a link here to the HumanWare Live Webinar Series. There’s a lot of webinars up there that myself and Andrew have done. We've certainly have continued to do them but as things have picked up, we have not done as many as we were previously. We were doing two a week at one point went down to one a week. Now we are doing about one a month. But we certainly have one coming on braille displays. We will kick this back off in the fall with a lot more educational content, dealing with math and science. Because we are on the cusp and we are at that beginning stages of looking at how we're going to be changing this KeyMath program to be more efficient when it comes to consuming content. And that is something we've heard a lot of feedback on; creation is great, but the consumption needs to improve.

So, something that we'll be working with, I always appreciate webinar suggestions and ideas. I certainly try to be as informative and go as slow as I can when I'm doing these. I know I'm kind of rushing through these slides here today. But we're here and we wouldn't be here without feedback, not only listening to teachers and kiddos in the classroom, but listening to what the needs are out there. In terms of what's needed for this type of stuff, for all of this STEAM content.

What else do we need to be doing? There are some things that are deep down, being worked on, that are certainly very exciting, that I think we'll see in the next while that are going to really change the way we consume math and science.

Again, the HW Buddy App is listed here as well.

<https://www.humanware.com/en-usa/buddyapp>

And my email address is here, which is [peter.tucic@humanware.com](mailto:peter.tucic@humanware.com)

You can always email [support@humanware.com](mailto:support@humanware.com) if you have specific supporting questions.

If you have product suggestions, you can email [info@humanware.com](mailto:info@humanware.com)

And certainly, we want you to be able to reach us and to be as accessible to you as we can be and to continue to provide materials.

I am going to stop because I babbled for 29 minutes. I try to keep myself in my allotted time, always. But I certainly want to take questions because I know there may be lots of questions, and I really appreciate the invite.

Thank you, Natalie. And always, it's great to see a lot of familiar names here. So, thank you, Kim, and thank you to everybody who is here. And hopefully I'll get to see all of you sooner than later. And that's kind of, you know, our dream, right. It's, it is Friday. So, I hope everyone has an awesome weekend and I will certainly be here for questions.

Kim Kilpatrick

Thank you so much, Peter. We're going to turn it over to Natalie one more time we I think we have a very exciting door prize.

Natalie

We do, we do! It's one that's those of us who have known the secret have been dreaming about for sure. Peter, let me start by thanking you for another great presentation. I'm sure that this is not the last time that BLC will reach out to you for these really, really helpful workshops. I feel that even just having a workshop on braille and math and STEAM in the same sentence just helps to push against that idea that these are visual subjects, that they're too difficult for blind people to learn, and just working towards increasing that inclusion in those fields. So, thank you for working towards that.

Peter Tucic

No, thank you so much. And I will also say as we go forward there's more to it, we really want to push the envelope. When it comes to coding, when it comes to programming, the math and science field is the start. to, There are so many jobs, there's such a need for programmers, there's such a need for people in these fields. And there's no reason blind people can't exist in those spaces. And there are many that do, but we need to be able to increase access. And we know that, so I think you'll continue to see us in this space. In various ways; whether it's on notetakers, whether it's on different types of braille displays, whether it is developing programs that make coding languages and other pieces, not that they're not accessible now, but they make them more easy to understand, easy to work with.

So, I don't think we'll be leaving this this sort of space anytime soon. We always we want to push this forward and I'm sure you'll be you'll be hearing from me at some point somewhere. I'm always happy to share what I know and help anybody with any questions. So, it's great.

Natalie

Definitely. And I know this is definitely an area of interest and priority for BLC. So, thank you, Peter.