

Grades 2-5 Lesson 7 (27:20)

YUE-TING SIU: "An Introduction to Nemeth Code Symbols, Used in Grades 2 to 5, and Strategies for Supporting Elementary Students in Building Math Skills. This is Lesson 7: The 3Cs of a Digital Workflow: Capture! Convert! Cloud! with me, Dr. Yue-Ting Siu. In our Lesson 7, we will define what a digital workflow means for blind and low vision students. We will look at how to capture print media in a digital format, and then look at how to convert digital media into accessible formats. And finally, how we can share instructional materials in real time via the cloud.

A digital workflow is an efficient, electronic system for accessing, processing, sharing, and storing work. This definition is taken from my textbook recently published from APH Press called Access Technology for Blind and Low Vision Accessibility. So what does the digital workflow actually mean?

Well, back in the olden days, you would be hounding that teacher for a worksheet, you get it right as class is beginning, and you were furiously brailleing in the back of the room, getting this worksheet ready for the student. Well now, with a digital worksheet, yes, you're still going to be hounding that teacher for the worksheet, but now that it's in a digital format, that classroom teacher can actually put it into a shared working folder with a student, and there is no TVI running to the back of the room to braille it. But actually, the teacher could then get that worksheet directly from the classroom teacher. And as the TVI or paraprofessional or alternate media specialist, we're just there to support and make sure that that digital worksheet that's shared from the teacher is now formatted so that it's actually readable with a refreshable braille display and/or screen-reader by the student.

Throughout this lesson, I'm also going to reference where you can find more information on various content in this book. What are the advantages of a digital workflow? Well, just having digital media can provide greater flexibility, portability, and efficient multimodal access to information. So even just having digital media available to our students can be very powerful for our students. Having things in a digital workflow can empower students to utilize their tool of choice with maximum independence and flexibility to change their method of access.

So this means that students can at any time make their choice of which technology and which tool to use to engage with whatever learning media that is provided in the digital workflow. By empowering students to make this choice, and it's really the student's choice, not the TVI's choice, not the parent's choice, we are assuming that they have bought into the technology from the very beginning.

There is no longer this issue of getting students to use a technology, when we can just help them make informed choices, and ultimately, the students decide for themselves. Because a lot of people are working in the digital workflow, this empowers general ed support of our VI students as well. So this makes it very easy for classroom teachers, classroom aides, resource specialists, inclusion specialists, parents, paraprofessionals, alternate media specialists. It really becomes that small village who can support the digital workflow and support our blind or low vision students.

Digital workflows can also support access to the Core Curriculum. And this is relevant whether you have a student who is on a high academic track, approaching grade level, working towards grade level, or working on functional skills that align with a Core Curriculum. But for those students who are college-bound and working towards competitive employment, digital workflows really model college and professional workflows. So we are essentially preparing our students for the future.

The digital workflow is dependent on infrastructure. We need an infrastructure for cloud computing. So yeah, this does mean that there needs to be a system of support for Wi-Fi and internet access. There also needs to be an infrastructure for training. And this includes training for teachers, but also training for students to get them to be informed decision-makers when they're deciding between different tools in their tool box.

You know, that leads us to the infrastructure for developing that technology toolbox and having those resources and savviness to figure out how to get demos and loaner tools so that students can try out different devices before purchasing and being able to justify the purchase of more than one device for a student. We have all touched multiple devices in our lives, and we do that throughout every day without even thinking about it. And students need to have that same sort of equitable choice-making and access to the tools. So we really do need to make sure that they have a variety of technology in their toolbox at their disposal.

You know, the student must have the appropriate technology that allows them to navigate this digital workflow. That includes multiple devices. And given the multiple devices, the students must know how to select, use, and efficiently switch between the tools as needed. I mean, we don't even have to worry about the buy-in when the students are making those informed choices.

And finally, this is a pretty big emphasis in the digital workflows, is understanding what accessible media are, and understanding what digital multimedia accessibility is. And this means understanding what accessible text, images, and video are, because these are all the different types of content that go into the digital workflow.

I've developed an accessibility tip sheet over the years, and you can download that. Please use it. You know, share it freely with your parents, IT people, you know, AT specialists, technology directors, anybody who might be a partner in making sure those infrastructures are there for our student. You can download this tip sheet at bit.ly/a11ytips-siu. A current version of this document is in the resources section for this course.

However, know that I update this document from time to time, so be sure to check the link. And also, in the AT book, you can look at Chapter 3 for more specific information about "Technologies for Accessing Digital Text," and then Chapter 6 for "Strategies for Accessing Multimedia and Data. We have warmed up now, and drumroll, we are ready to talk about the three C's of a digital workflow: Capture! Convert! and Cloud!

So on the graphic on the slide, we've got a cloud in the middle. And inside the cloud, there's different icons for all the different media types that go in the cloud. So we've got videos,

pictures, we've got people, because we collaborate with others in the cloud, documents, folders, music, messaging, all that sort of data is saved in the cloud.

And then, we've got arrows from all these different multiple devices that point up and feed into the cloud and connect to the cloud. And some of these possible devices might be a tablet or a camera or a desktop computer or a smartphone or a laptop computer. So any of these number of devices can pull down that media, pull down the information that's saved in the cloud. And this is really what helps our students be able to work between multiple devices.

When that information is just saved in the cloud, then it can be synced, meaning you can start working on one device, and it syncs to the cloud, and then you can pick up and finish the work on a different device. Just imagine how flexible that can be and how portable a student's workflow can be when you can do that. Let's take a look at that first C, Capture!

You know, we've got all this paper media in classrooms that are now being disseminated digitally when we are teaching in a remote format. But even before that, you know, capturing the paper media and putting it in a digital format, that's the first step in the digital workflow. So how do we make that happen? We've got a number of camera and scanning apps available.

So some of these scanning apps include Scanner Pro, Microsoft Office Lens, Claro PDF. And you might just take a look at these different apps, and there's always new ones coming out, and just see what features work for you and how well these different apps integrate with taking a picture of a document and then being able to integrate for easy saving up to a cloud storage app.

The next type of app that helps capture paper media is using something called Artificial Intelligence, so AI. I love the Seeing AI app, because it allows you to have a paper document, or even something like a menu. And you point your camera at it, and the technology, you know, AI, recognizes whatever image is coming in through the camera and basically renders it into a digital format that is then read aloud. Or you can plop it into a document for audio or tactile access with a braille display.

The third method of capturing media is with a digital snapshot or screenshot. You know, with a digital snapshot or screenshot, this is a little bit different from a scanning up, because you might already have a digital document such as a PDF. But you don't need that whole thing, or maybe you just need a little math problem out of a larger worksheet. Because then you've got to take that math problem, and then convert it into some other format. And we're going to talk a little bit more on that later. But just know that there are a variety of different tools for doing a screenshot or snapshot of a digital document.

And then finally, sometimes we need to recreate, because no matter how much you scan it or screenshot it, it just doesn't come out well. Given the time investment, sometimes it's just faster to recreate it. I wanted to share just a couple sample worksheets, and you can imagine that these would be worksheets handed out in a paper format.

The one on the left is a worksheet on identifying 2D shapes. And we've got a couple of different shapes where a student is asked to name the shape, and they can use any of the vocabulary words

from a word bank. And some of the words in this word bank include circle, square, rectangle, parallelogram. And you can imagine students are asked to take these words and plop it on a label of the shape.

The worksheet on the right has 24 subtraction problems that are all three-digit minus three-digit. The first one reads 710 minus 488. So these are pretty common worksheets, I think. And we can get pretty creative on how we want to capture these print media. So let's take a look at the worksheet on the left, and how this could be reimaged if you need to recreate it.

So one strategy for turning those paper notes into a digital format gives you flexibility to actually become more efficient and have the students learn the content or take notes so that it's very easy for them to study it back. Okay, so some of those note-taking apps include Notability, Evernote, Microsoft OneNote, GoodNotes, or Quizlet. And Quizlet has an asterisk next to it, because Quizlet is technically a flash card app, but you can use it to take notes, because then you're making your study materials as you're taking the notes.

Okay, so let's take a look at the photo on the slide. Connected to the monitor, and actually the computer, is a QWERTY keyboard with a keyguard on top. And to the left of that QWERTY keyboard is a big track roller ball mouse. So the system has been adapted so that a student who's a switch user or needs some assistive technology, who, without a digital materials, he would be fully dependent on his paraprofessional to do all the writing, all the clicking, all the studying, and all the navigation through his work.

But since his work is now in a digital format, he's able to click through independently and use this switch and use keyboard shortcuts to navigate this content. So on the left side, we've got one side of a digital flash card. And this was made using Quizlet. And it just says, parallelogram. And you can imagine he's studying through his shapes and what is a parallelogram, and with one switch click, he can now flip the digital notecard to the other side, and that's the right side of the photo where we now see that photo, the parallelogram, and the definition. So this could be used just as well to take notes to learn about the parallelogram, but it also makes that boring worksheet a little bit more interactive.

So then remember that other worksheet with all the subtraction problems? Let's take a look at how that can get a little bit more exciting when you recreate that. So on this slide, we've got an example of math worksheets. In this particular worksheet, it's been recreated in Google Docs, and it's titled "2.4 Math Lesson: Subtraction." As you can see, we've got two math problems. The first one is $576 - 246 = 330$. The second one is $398 - 235 = 163$.

Now, both problems are laid out in a spatial manner so that all the ones are, you can imagine, are in a column in a grid, all the tens are in a column, and all the hundreds are in a column. So we've basically got a 3x4 grid where the top row of the grid is this beige color. And that's really that placeholder section for if you're having to subtract and carry over and borrow. You've got 576 in the second row, 246 in the third row, and then that bottom row of the 3x4 grid is 330. That's the difference of this math problem.

So this is a nice format for a student who's really truly a multimedia learner. It's very low vision friendly, but this is a student who also needs some auditory access because sometimes her low vision makes it such that she needs the auditory access to confirm what she's seeing. And remembering that when you've got a screen reader turned on, whatever the screen reading is reading, that will show up on your braille display.

So because this is in Google Docs and you're just entering numbers in a gridded pattern, it allows for navigation with the screen reader. You know, you can skip from grid to grid, or, in this case, from the ones column to the tens column to the hundreds column. And as you navigate through the problem on this grid, it will also show up on that braille display.

So true math accessibility happens when the math problem can be inserted as readable data, and it could be read as math with a screen reader, and it can render on a braille display. So the technology is almost there. It's very, very close. In this video that I'm going to play in just a second, we're using the program EquatIO in this video. And EquatIO is helping us get a little savvier in supporting math in the digital workflow.

Just as an aside, Desmos is another great platform out there. It's accessible graphing calculators. And Desmos does give full braille and screen-reader support. So in this video, you'll see how AT Neal has figured out a way to take a snapshot of equations from a PDF and be able to insert it into a Word document so that it is readable with a screen-reader and braille display. I think this technology is almost there, and it's only going to continue to get more seamless and more efficient for us to use.

SPEAKER 1: EquatIO snapshot tool. Grab equation, copy lot x. Paste into equation editor. Click on Insert Math. Now, let's save the document. While I'm compiling this, my computer is also remotely connected to the student using the team viewer app on my computer and connecting to the quick support app on student's Polaris Notetaker. Since we are connected remotely, I am able to see the student's Polaris, and even a virtual braille refreshable display in real time. If you add your favorite teleconferencing app, then as the student works through the problem, the TVI or classroom teacher would be able to give real-time feedback.

YUE-TING SIU: Obviously, it's a higher level of math than what you're probably working on with your second to fifth graders. But you can imagine how this would work with any level of math, even if it's a simpler worksheet with arithmetic problems. You could train transcribers, paras, or even teachers or parents to support, anybody who really wants to be engaged in supporting math media for a student.

So we also realized that in this video, the capture and convert kind of gets squished together. And you will find that oftentimes, the three C's start getting squished together, where you might capture and convert all in a swoop. We've got convert digital media to accessible formats. Very similar to what you saw in that video, you know, once we've got it in that digital format, we have to make sure it's then readable.

The technology that renders these images as readable texts or readable numbers is called Optical Character Recognition-- OCR. So OCR sometimes runs invisibly, and we don't even know it's

happening. And this happens when you have maybe like, a Microsoft Word document in Google Docs, and you click to "Open with," and then it opens it in Google Docs, and then you find out that you can all of a sudden type and edit the Google Doc. When it converts from that Microsoft Word format into the Google Doc, Google basically just read OCR on that document and made it readable and editable.

So that's a great tool that's needed when you need to be able to edit the document and access it with a screen-reader and/or braille display. In that video that we just saw, the student was using a Polaris NoteTaker. But you could also use just a peripheral braille display connected with a laptop or a computer as well.

Now, there are a number of other different apps where once you've converted the worksheet, it converts it into an image that you can then write or type on. So these tools are more useful for our low vision students, because it does require vision to use the app. However, it does allow that low vision student to magnify the content as much as they need.

So, you know, with the understanding that these annotation apps are really for low vision accessibility and it limits a student to only visual access, they can still be pretty great for that low vision student who needs that magnification. So some of these examples are Adobe Fill & Sign, SnapType, Skitch, Claro PDF, iBooks, and VoiceDream Reader. And yeah, iBooks and VoiceDream Reader, we know of them as book reading apps, but you can also load documents in them. And they've got some nice annotation features. These sorts of elements in different apps are something that you might look for if you're comparing and contrasting different apps to use.

So the cloud is available for us to share instructional materials in real time, you know, remembering that it allows us to save material to the cloud so that it can be synced across different devices. Students can then access the materials via secure log-in. And it also supports collaborative work with teachers and peers. Some of the examples of cloud storage apps that are available are Dropbox, Google Drive, iCloud. Your school district or county might have its own system or own learning management system. So it could be something like Schoology, where documents are stored in the centrally located virtual filing system. You can think about it.

That concludes our 3Cs. And if you're thinking about, man, this seems like a lot. How do I figure out a workflow for the different students? And remember, this is really just the briefest of intros to the topic. For more information, you can look at the AT book in chapter 8.

So the Needs Assessment Template is something I've been working on over the last couple of years. I found it to be a helpful approach to aggregate all that rich data you get from your Functional Vision Assessment, or FVA, and from your Learning Media Assessment, the LMA. And it's a way to distill all that information to capture what a student really needs, to identify what their sensory access needs are, to identify the areas for improved independence or efficiency, to identify the technology features that would benefit a student, and which instructional priorities are there, and where your instruction will have the highest impact.

Going through this process of figuring out and assessing a student's needs, I find can also be helpful in helping me figure out what are those IEP goals that are going to have the broadest

impact on the student's learning needs. The second form is the digital workflow planning tool. So this is also one of the appendix items in the book. And with this tool, it's just a nice form that lets you have a place where you can identify the student's infrastructure.

So remembering that infrastructure is really huge in supporting the digital workflow. We have to understand what's available from the school, what technology is there, what the Wi-Fi is like, what infrastructure is already there and how well it works. It also gives a place to identify needs for training or support. And this is training for staff and student as well. And, you know, what are these peripheral supports to make sure that everything is there for the toolbox?

And then finally, it gives a space to identify those future considerations. Because we all know that although we are prepared for today, we're also planning for tomorrow, planning for the next year, for the next school placement, and for the future transition placement. This form is just great, because it gives you that space to figure out what all those different pieces are.

How data literacy happens, and considerations for helping students develop their data literacy. For more information, you can also look at chapter 8. In this short video, you will see a great example how AT Neal has shown how he makes a tactile graphic. And this tactile graphic is made using a PIAF or a Swell machine.

He basically just made a tactile graphic of the Google Drive interface. So you can imagine you can use a tactile graphic to introduce a student to where all the icons are, so that when you have the student move to navigating this virtually with a screen reader, that student already has a mental map. OK, let's check out this video.

SPEAKER 2: 11x17 high contrast tactile representation of visual layout of the Google Drive main page as it would look on a computer screen. Pictures in a flash allow all icons and braille labels to be raised and felt in order to accompany a screen-reader lesson on Google Drive navigation.

YUE-TING SIU: Alright. Pretty cool, right? So if you think about these little baby steps to scale up a student's digital literacy skill, it really is a process. I cannot overemphasize how important it is to introduce technology to our students early so that they've got the time to ramp up their digital literacy skills so that when they actually need to lean on technology for learning, they can really focus on the learning and not the technology.

What does this process really look like? On this slide, we've got a graph. And this is one of my favorite, favorite graphs. It's also featured with more information on how to scale up digital literacy skills in Chapter 10. I give huge credit to Sasha Casper, who created this graph and gave me permission to use it freely. So thank you, Sasha. I love this graph.

On this line graph, we've got x-axis time, and y-axis experience. And it starts at 0,0, and it rises sharply when you're like, ooh, new tech, this looks like fun. And then that line graph dips a little bit, because you realize, ooh, this is hard. But then that line rises sharply again where you're like, hey, you know what? No idea what I'm doing, but I'm going to keep doing it. We have a nice

peak where you feel like, oh, I get it. But then the line slips down a little bit when you're like, ooh, maybe I don't got it.

And then we reach this little dip where it's like, ooh, I don't know my stuff. But then the line rises and it just continues to rise as the technology starts making sense. And you think to yourself, Okay, this actually makes sense. And then you're like, wait, did I do that? And then finally, you reach the peak of the graph when you're like, yes. I did it. I got it.

And practitioners, teachers, and students together, we can reach that peak together and celebrate where you're like, yes, I got this. I did it. And what's next, right? There's never enough information about technology. There's always more to learn. And with that, that brings us to our final slide of the lesson. These are my go-to YouTube channels for technology. Number one, AT Neal, you know, he is really figuring out a lot of these distance access, screen-sharing, remote tips, remote teaching tips. ViteacherJes is tied for my number one favorite with AT Neal. Jes does a lot of really quick, two, three-minute videos about supporting the 3Cs and the digital workflow. So how do I capture and convert things and get them up to the cloud?

And, of course, Diane Brauner, the mastermind of past technology. Diane's got a robust YouTube channel of her own, lots of Apple accessibility videos, lots of stuff on just non-visual techniques and data literacy. Luis Perez is the go-to guy in Apple accessibility. I really like Dr. Denise Robinson's YouTube channel. She does a lot of information about just working on PCs and non-visual accessibility, working with screen-readers, you know, how to access information online.

And then we've got the VI program for SF State, San Francisco State University, where we host Tech Talks a couple of times a semester. And it's always just a demo of technology devices or tools or strategies. And then lastly, there is a link here to some vignettes. It can be difficult to get an administrator or IEP team's buy-in to either the number of technology a student needs or getting their buy-in to making sure those materials are provided in advance.

And it can be very, very powerful to share a vignette of students talking from their own voice and their own perspective of how digital workflows helped them become successful students. You'll find six different guest interviews where I'm interviewing different college students or adults who are very savvy technology users, and they have taken control of their learning and work as mediated by digital media.

So the link to those vignettes is another bit.ly link. bit.ly/coursea11y. All lowercase. All right, well, thanks for watching, you guys. And I hope you'll have just as much fun learning more about this content as I do. Thank you.