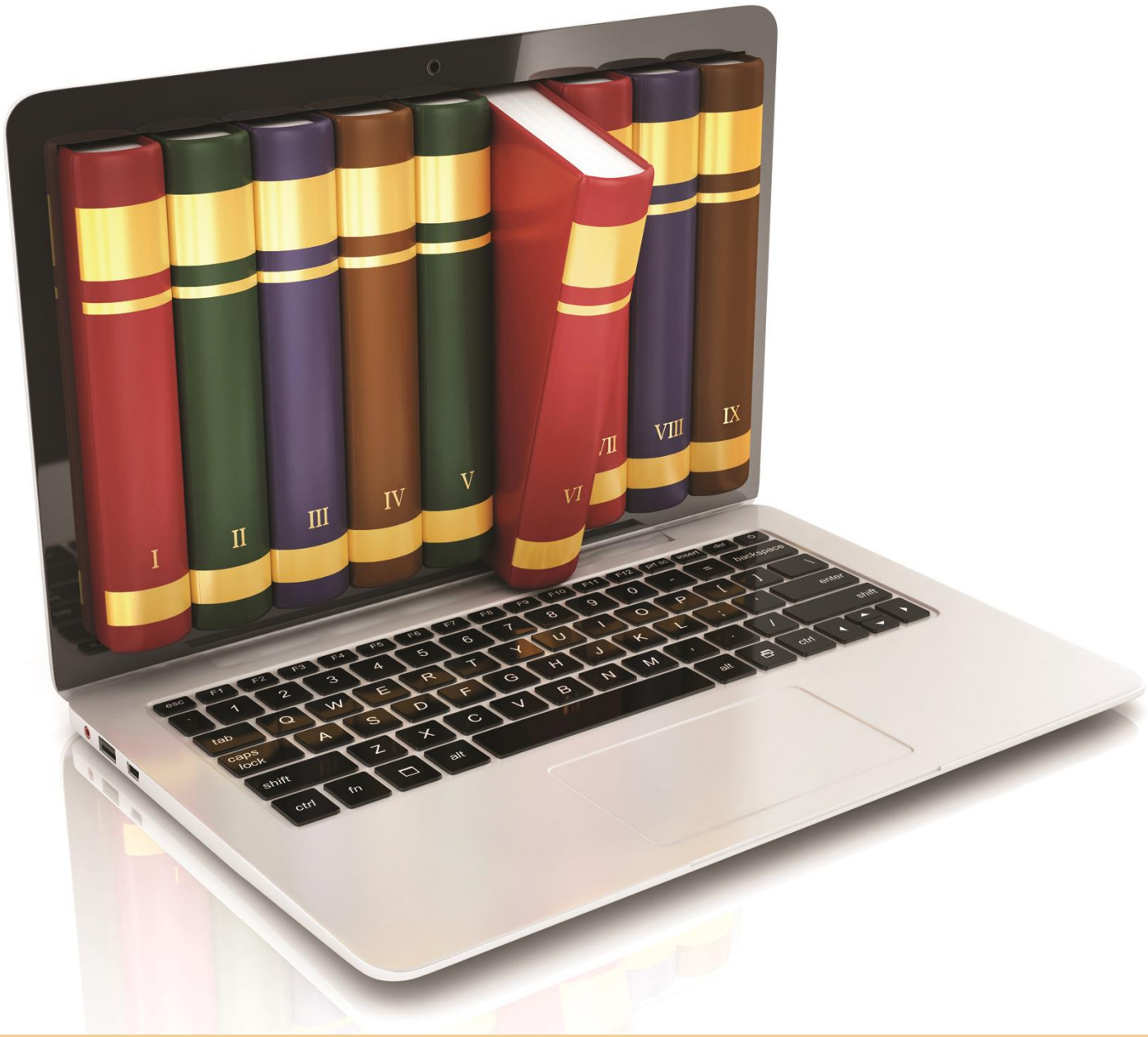

Online Education: One Step Forward, Two Steps Backwards

Filling the Gaps for Canadian Children with Learning Disabilities in E-Learning Using Apple's K-12 Educational Tools

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Executive Summary

In response to the coronavirus pandemic, Ontario has made the dramatic shift from tradition in-person education to e-learning environments. This change has left children with learning disabilities to experience unique problems learning behind a screen from home without the accommodations they have been provided with until this point in traditional schooling.
Research shows that children with learning disabilities are not being set up with the required tools they need to be successful in this new and unconventional way of learning. A look into the specific learning disabilities and statistics of children affected by each expose the challenges and difficulties children with learning deficits have been enduring and suffering through in this means of education.

Problem Statement

Children with learning disabilities experience many issues through e-learning that impact them and their learning negatively. E-learning methods do not provide these children with the proper accommodations and personalized learning experience they need to be properly equipped for learning in front of a screen. With new coronavirus variants being discussed in the news and media, changes to the current e-learning experience must be made to make learning more effective for children with learning disabilities if in-person education will not be resuming this upcoming school year.

Required Tools for Success

At the bare minimum, children with learning disabilities– LD's for short– must be equipped with the proper tools for success in e-learning. "Initially, online learning focused on high-achieving students, but programs have expanded to include a broader range of students" (Cavanaugh et al., 2013). High-achieving students can function in e-learning environments and motivate themselves independently to get used to online learning communities without additional tools or guidance. This is not the reality for all students.

The human-touch element in education is removed from e-learning and the connections students make with peers and teachers becomes very difficult in these online environments. This factor and others that impact e-learning effectiveness can be identified in a review of previous research across multiple disciplines (Repetto et al., 2010). Repetto and their colleagues identified and grouped these terms into what they call the 5 C's of Student Engagement Framework.

Figure 1 shows a visual take on the 5 C's, outlining how they build on one another. Each layer is built upon the other; if there is a crack in a inner level's foundation, a student with a LD will experience issues in all outer levels from there on out.

Figure 1: The 5 C's of Student Engagement Framework.

Table 1 (next page) provides insight into how each of the 5 C's function as the required tools for children with LDs to be successful in e-learning through research of their applications in online schooling.

	Applications in E-Learning for Children
Control	• The student's ability to take control of their behaviors and learning (Repetto et al., 2010). • Cause children to develop self-determination methods, metacognitive strategies, and create goals in social, academic, and behavioral areas (Cobb et al. 2006).
Curriculum	• Design of learning outcomes with research-based practices and progress to meet individual student needs (Repetto et al., 2010). • Scaffolding learning to promote positive experiences and using interdisciplinary means to make e-learning most effective for all children with special needs (Bost & Riccomini, 2006).
Climate	• Key to fostering a safe space to learn for diverse student populations. • Set by uniform rules and regulations applied across courses.
Caring Community	• Ensures learners feel cared for and are being accommodated. • Support of teachers and parents are directly linked to student success and ensuring individual needs are met (Menzies & Lane, 2011). • Real-time message systems in virtual courses for dialog between students, tutors, and teachers (Jakobsdóttir, 2008).
Connections	• Teaches students skills they will need beyond education, for life, and for post-secondary institutions (Repetto et al. 2010). • Contributes to student motivation; essential for success and prerequisite for the independent tasks of e-learning (Keller, 2008).

Table 1: Repetto and colleagues' 5 C's of Student Engagement Framework 5 Explained.

Challenges for Children with Learning Disabilities in E-Learning

Children in e-learning experienced many challenges that contribute negatively to their learning experience prior to any learning being done. Table 2 outlines the challenges for children with learning disabilities that take place prior to and after online learning sessions take place and simple solutions to eliminate these problems.

Challenge	How?	Why?	Possible Solutions
Navigating complex and unfamiliar platforms	E-learning platforms are difficult to grasp for all children and even more difficult for students with learning deficits.	Explanations on how to use e-learning platforms may not be grasped the same way by all students.	Show and tell strategies, videos, and extra help sessions on what areas of these platforms are expected for students to engage with and use.
Making connections with teachers and other students	Positive connections enhance e-learning experience and lead to better academic success.	Making these connections in e-learning environments are difficult without one-on-one time with teachers and peers.	Use of breakout rooms and dedicated one-on-one time, even as a portion of regular class time, to check in with students and allow connections to develop.
Finding help after class	The ability for students to connect with teachers for help after class can be difficult for children to accomplish.	Young children cannot contact teachers the way older students can through e-mail, etc.	Outline clear, concrete, and simple means for students to get in contact with teachers if needed for assistance after hours.
Personal learning styles not being accommodated and self-motivation	Learning styles and teaching methods impact a student's self-motivation to complete required work after class and put in their full effort.	If students are not comfortable with the materials they learn uniformly, they are not motivated to take the necessary steps to complete corresponding work.	There is no one-size-fits-all learning style. Teachers can use multiple teaching methods to cater to different learning styles to ensure students understand lessons and complete assigned work.

Table 2: Challenges for Children with LDs in E-Learning.

Statistics on Canadian Children with Learning Disabilities

Children with learning disabilities is a complicated statistic to unpack. The Learning Disabilities Association of Ontario states "LDs one or more of the ways that a person takes in, stores, or uses information. LDs come in many forms and affect people with varying levels of severity. Between 5 and 10 percent of Canadians have LDs" (LDAO, 2015).

> Statistics Canada explains that "some types of disabilities are not identified before age 5 and that disabilities in children [even beyond this age group] can often only be described as a delay in development, whether physical, intellectual, or other" (Stats Canada, 2006). They also explain that most school-aged children with LDs have multiple disabilities and that learning deficits often go undiagnosed for years, if ever diagnosed; this occurs when children are not assessed properly, there are accessibility-issues related to receiving assessments, being overlooked by teachers with large class sizes, or parental denial upon discussion of concerns (Stats Canada, 006; Ontario Psychological Association, 2018).

In additional, early detection varies and barriers can be difficult to observe and disability difficult to detect for children not yet in education (Stats Canada, 2006). Table 2 below shows the numbers from a statistics Canada profile of children with LDs and developmental delays which may affect their learning in 2006 up to age 14. A 2012 learning disabilities profile amongst Canadians aged 15+ was consulted to fill gaps on statistics in children for that age demographic (Statistics Canada, 2012).

Age Demographics of Canadians	Percentage of Boys vs. Total Canadian Age Demographic	Percentage of Girls vs. Total Canadian Age Demographic
0-4	3.1% (24,940)	2.1% (16,150)
5-14	6% (118,650)	3.1% (59,560)
15+	2.9% (782,800)	

Table 3: Canadian Statistics on LDs & Developmental Delays that can Result in Learning Deficits Presented in Children According to Statistics Canada.

It is important to understand the constant changes in these numbers due to diagnostic problems and the issues related to locating up to date information on this topic which should be accessible given all Canadian children are currently learning through e-learning.

The International Disability Association of Canada uses the most up to date publicly available research to show additional findings regarding statistics for Canadians with LDs (IDAC, 2007). The IDAC states:

- "More children in this country have a LD than other types of disabilities combined"
- "Of all children with disabilities in this country, 59.8% have a LD"
- "3.2% of Canadian children have a LD- equivalent to one child in every school bus full of children"
- "Between 2001 and 2006, LDs in Canadians increased by almost 40%".
- "The LDAC (Learning Disabilities Association of Ontario) continues to use the statistic that roughly 1 in 10 Canadians have a LD."

Learning Disabilities and Associated Difficulties in E-Learning

> LDs are also known as neurodevelopmental disorders. The Diagnostics and Statistical Manual of Mental Disorders V (DSM-V) describes neurodevelopmental disorders as "a group of conditions with onset in the developmental period [which] typically manifest early in development and are characterized by developmental deficits that produce impairments of personal, social, academic, and/or occupational functioning".

Difficulties Overview

A majority of difficulties for children with learning disabilities in e-learning environments are caused by accessibility issues and translation to e-learning teaching methods (Kumar et al., 2011). Kumar and their colleagues identify these difficulties as caused by lack of adherence to what they classify as the 4 Design Principles for Effective E-Learning Measures:

Table 4: Kumar and colleagues' 4 Design Principals for Effective E-Learning Measures Explained.

Design Principals	Applications to E-Learning Experience for Children with LDs
Perceivability	• Text alternatives for non-textual content (i.e: images). • Synchronized alternatives for multimedia. • Presentation of content in different ways without losing formation, structure, or information quality. • Making it easiest for students with disabilities to see and hear content (including separating foreground from background).
Operational Elements	• Make all functionality available from a keyboard. • Provide additional time to read, use, and understand content. • Provide ways to help users navigate, find content, and determine where they are.
Understandability	• Make text content readable and understandable. • Make webpages appear and operate predictably. • Help users avoid and correct mistakes that do occur.
Robustness	• Maximize compatibility with future user agents.

Difficulties in E-Learning by Learning Disability

To represent all neurodevelopmental disorders presented in the DSM-V, umbrella terms are used to represent broader learning disabilities that present in children with associated symptoms (American Psychiatric Association, 2013). Sub-headings below represent each of these umbrella terms and the difficulties children with each face in e-learning environments in addition to previously mentioned challenges and difficulties:

Communication Disorders

DSM-V Symptoms	Difficulties in E-Learning
• Persistent difficulties in acquisition and use of language across modalities (verbal, written, or other) due to deficits in production or comprehension. • Reduced vocabulary, speech-sound production, stuttering, limited sentence structure, grammar and morphology deficits, discourse impairments, and/or functioning limitations in effective communication, social participation, academic achievement, or occupational performance.	• Communicating verbally and written (grammatically, comprehension of language, and production of language). • Reading and reaching conclusions from written topics. • Showing understanding of topics. • Excelling in social engagements. • Maintaining motivation. • Operating independently. • Showcasing understanding of course content.

Table 5: Communication Disorders DSM-V Symptoms and Associated Difficulties in E-Learning

Intellectual Disabilities

DSM-V Symptoms	Difficulties in E-Learning
• Deficits in reasoning, problem solving, planning, abstract thinking, judgement, academic learning, and/or learning from experience. • May also include deficits in adaptive functioning or onset of intellectual deficits during development.	• Absorbing information. • Exercising independence and motivation • Drawing conclusions • Completing homework and understanding concepts • Grasping course information over time.

Table 6: Intellectual Disabilities DSM-V Symptoms and Associated Difficulties in E-Learning

Autism Spectrum Disorders

DSM-V Symptoms	Difficulties in E-Learning
• Persistent deficits in social communication and social interactions across multiple contexts. • Deficits in social-emotion reciprocity, nonverbal communication behaviors used for social interaction, and developing, maintaining, and understanding relationships. • Restricted, repetitive patterns of behaviors, interests, or activities in stereotyped or repetitive motor movements, instances of sameness, fixated interests abnormal in intensity or focus, unusual interests in sensory aspects of the environment.	• Issues communicating with others. • Feelings of social awkwardness, inclusivity, and confusion. • Unable to sit through lengthy classes. • Dealing with distractions at home from behind their screen. • Maintaining independence and self-motivation. • Children with autism may present other learning disabilities; in which difficulties in that/those additional umbrella terms apply.

Table 7: Autism Spectrum DSM-V Symptoms and Associated Difficulties in E-Learning

Attention-Deficit (ADD) /Hyperactivity Disorders (ADHD)

Difficulties and DSM-V symptoms here are grouped, each symptom translates to self-explanatory difficulties for children with ADD and ADHD. Main difficulties for children that present with these surround focus and maintaining attention.

DSM-V Symptoms and Associated Difficulties in E-Learning
• Persistent patterns of inattention and/or hyperactivity-impulsivity. • ADD: Deficits in attention to details, difficulty sustaining attention, issues listening, failure to follow instructions, difficulty organizing, avoids difficult tasks, loses things necessary for tasks, and are easily distracted and/or forgetful. • ADHD: Often found fidgeting, not remaining seated when required to, runs about in inappropriate situations, engages in leisurely activities loudly, "on the go", talks excessively, difficulty waiting their turn, interrupts or intrudes on others, and answers questions before they are asked in their entirety.

Table 8: ADD and ADHD DSM-V Symptoms and Associated Difficulties in E-Learning

Specific Learning Disorders

DSM-V Symptoms	Difficulties in E-Learning
• Difficulties using and learning academic skills. • Deficits with reading orally, understanding what has been read, spelling, written expression, mathematical reasoning, or mastering number sense, facts, and/or calculations.	• Learning content and cultivating skills. • Mathematics and understanding numbers. • Expressing themselves through means of communication. • Understanding lessons and concepts.

Table 9: Specific LDs DSM-V Symptoms and Associated Difficulties in E-Learning

Other

DSM-V Symptoms	Difficulties in E-Learning
• Repetitive and purposeless motor behavior, experiencing tics (sudden, rapid, nonrhythmic motor movement or vocalization). • Interdisciplinary symptoms of any learning disabilities or disorders that do not meet the required criteria for diagnosis but persist in a child that may or may not be listed in this table.	• Sitting still. • Focusing on content and class. • Any other difficulties not listed in any umbrella term difficulties.

Table 10: Other LDs DSM-V Symptoms and Associated Difficulties in E-Learning

Proposing a Solution

With uncertainties regarding when in-class learning will resume and discussions about the rise of new coronavirus variants in the news and media, e-learning may be here to stay for the foreseeable future. E-learning must be better prepared this upcoming school year to accommodate students with LDs to ensure their success in education.

Apples K-12 Educational Tools

Apple's K-12 Education Tools are being utilized through e-learning and are filling these gaps in the educational institutions that chose to use them (Apple, 2010). Teachers can choose which of the hundreds of approved educational applications are best suited for their classrooms and diverse student populations grouped conveniently by subject (Apple, 2010). Since the launch of these tools, worldwide use of the iPad in education and subsequent research on the millions of classrooms that utilize these tools shows that it leads to:

- Significant improvements in academic performance
- Increase in engagement and motivation
- Rise in cost savings and resource efficiency
- Integrated focus on the content quality and design.
    - To see more worldwide results of these educational tools, click here.

Filling the Gaps for Students with LDs

The most dramatic shift in educational institutions that use Apple's K-12 Education Tools are the challenges and difficulties for children with learning disabilities that no longer exist. By using these teaching tools, students with learning disabilities will get the accommodations they deserve. It then becomes easier for parents to keep on top of their child's education and to determine themselves if their teacher is delivering the proper special help to them.

The use of these tools and the individual feedback teachers can view at any time assist them in catering to the needs of students with special needs more effectively than though any other means of online learning. For example: if three students in a teacher's class have a learning disability, the teacher can see specifically where they are struggling with activities on these tools and investigate why that is happening and be able to hypothesize changes that need to be made to better reach these students. This also assists in showing teachers if specific app platforms these tools are used on need further clarification for students to grasp and use them.

Use of These Tools in E-Learning

What makes these tools unlike any others in e-learning is the unique combination of educational apps teachers can adopt for their specific classroom to accommodate the diverse student populations they educate (Apple, 2010). They offer grouped apps by associated subjects for teachers to implement into their curriculum. Teachers can attach handouts to specific apps for students to be able to open and complete handouts, assessments, etc directly from the application on their Apple device.

To make the transition for teachers using these tools for the first time, it is a seamless transition through pre-set up subject starter packs. The use of the Classroom and Schoolwork app is very important to showcase as a reason to use these tools.

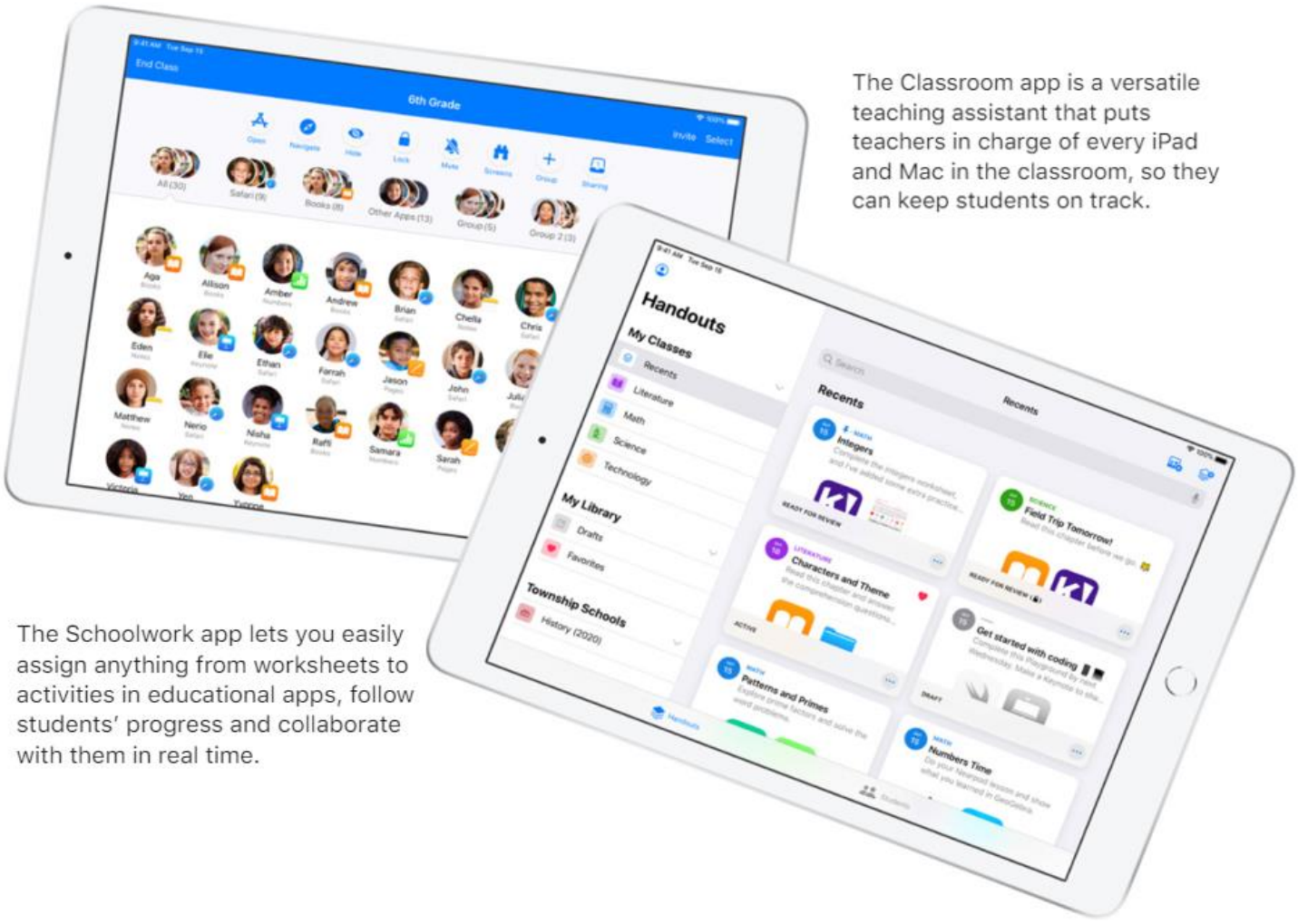

Figure 2: Apple's K-12 Educational Tools Classroom and Schoolwork Apps in Use

For more information on these tools, click here.

Elimination of Challenges and Difficulties for Students with LDs

Based on the challenges and difficulties outlined in this paper, almost all issues that may arise as a problem become solved through using Apple's K-12 Teaching Tools which outline to a teacher what accommodations need to be made for a student in each individual subject. The reasons why these tools should be adopted through all e-learning measures is best shown through a list of pros as to why educational institutions should adopt Apple's teaching tools:

- Technology may be supplied to students from Apple.
    - Apple offers packages that include rentable iPads for education. With learning happening at home, it is easy for institutions and parents to find a method to get this technology for their child that is cost-effective and realistic.
- Navigation becomes familiar and less complex.
    - Students are familiar with Apple products very early on through technology at home.
    - Teachers can post videos of how to use each app they chose to use for students to reference at any time from anywhere and be able to complete their work.
- Learning becomes more personalized.
    - Different educational tools can be assigned to specific students on top of what is assigned class-wide to help keep students with special needs accommodated.
    - Endless options for ways to personalize individual students learning.
- Increased independence and self-motivation.
- Allows connections with other students to develop through group assigned tasks and activities that have students working together on something.
- All learning styles can be accommodated through use of different tools.
- Additional accommodations for success can be assigned specifically to students with or without special needs in the areas they require those for.
- Enhances teacher tools and ways for them to comprehend issues with learning.
- New methods for teachers to improve learning experience for all students.
    - Teachers can see what app platform specific students need additional guidance using.
    - Teachers can stray away from apps students find difficulty using.
    - Offers organized view of every student's progress and activities completed or not completed to notice issues with learning teachers need to put more time into:

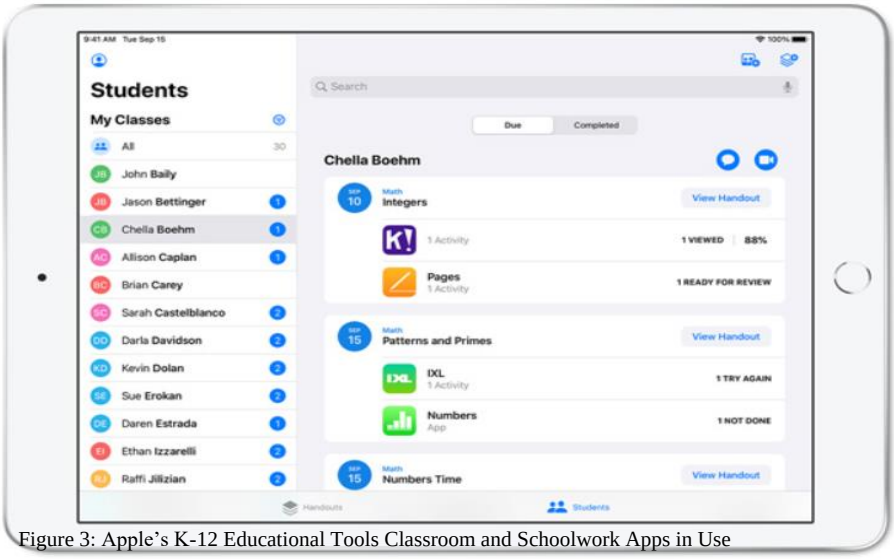

Figure 3: Apple's K-12 Educational Tools Classroom and Schoolwork Apps in Use

Conclusion

Children in e-learning environments are being expected to learn online in response to the coronavirus pandemic as all students in Canada are. Children with learning disabilities encounter various problems, challenges, and difficulties using these platforms and learning from behind a screen without additional accommodations.

The use of Apple's K-12 Teaching Tools proposes a simple and extremely effective solution for an enhanced learning experience that eliminates most challenges and difficulties for children with learning disabilities upon the teachers notice of them and prompts changes being made to how their class functions to solve all problems students can encounter and provide the accommodations they need to be successful.

Works Cited

American Psychiatric Association. "Neurodevelopmental Disorders". *Diagnostic and Statistical Manual of Mental Disorders, 5th, ed.* American Psychiatric Publishing, 2013. *DSM-V*. Retrieved from https://dsm-psychiatryonline-org.libaccess.senecacollege.ca/doi/full/10.1176/appi.books.9780890425596.dsm01 on June 5 2020.

Bost, L., & Riccomini, P. (2006). Effective instruction: An inconspicuous strategy for dropout prevention. *Remedial and Special Education, 27,* 301–311.

Cavanaugh, Cathy, et al. "Online Learning for Students with Disabilities: A Framework for Success." *Journal of Special Education Technology*, vol. 28, no. 1, Mar. 2013, pp. 1–8, doi:10.1177/016264341302800101.

Cavanaugh, C. (2008). Distance education success factors. In L. Tomei, (Ed.), *Online and distance learning: Concepts, methodologies, tools, and applications* (pp. 686–692). Hershey, PA: Information Resources Management Association.

Cobb, B., Sample, P., Alwell, M., & Johns, N. (2006). Cognitive behavioral interventions, dropout, and youth with disabilities: A systematic review. Re*medial and Special Education, 27,* 259–275.

"iPad in Education Worldwide Results". *Apple,* August 2017. Retrieved from https://www.apple.com/ca/education/docs/ipad-in-education-results.pdf on 14 June 2020.

International Disabilities Association Canada. (2007). "Prevalence of Learning Disabilities". Retrieved from on https://www.ldac-acta.ca/prevalence-of-learning-disabilities/ 2 July 2020.

"K-12 Education". *Apple,* 2021. Retrieved from https://www.apple.com/ca/education/k12/ on 10 June 2020.

Kumar, Kodihalli Ramanna Anil, S. Ravi, and S. K. Srivatsa. "Effective e-learning approach for Students with Learning Disabilities." International Journal of Scientific & Engineering Research 2.11 (2011): 1.

Learning Disabilities Association of Ontario. (2015). "LDs/ADHD" and subsequent webpages. Retrieved from https://www.ldao.ca/introduction-to-ldsadhd/what-are-lds/ on 5 June 2020.

Ontario Psychological Association. (2018). "Ontario Psychological Association Guidelines for Diagnosis and Assessment of Children, Adolescents, and Adults with Learning Disabilities: Consensus Statement and Supporting Documents." *Ontario Psychological Association*. Retrieved from http://www.ldao.ca/wp-content/uploads/OPA-Guidelines-for-Diagnosis-Assessment-of-Learning-Disabilities-Sept.-7-2018-1.pdf on 5 July 2020.

Jakobsdóttir, S. (2008). The role of campus-sessions and face-to-face meetings in distance education. *European Journal of Open, Distance and E-Learning, 2008(II)*. Retrieved from http://www.eurodl.org/?p=archives&year=2008&halfyear=2&article=348 on 8 June 2020.

Keller, J. M. (2008). First principles of motivation to learn and e-Learning. *Distance Education, 29*(2), 175–185.

Menzies, H.M., & Lane, K.L. (2011). Using self-regulation strategies and functional assessment-based interventions to provide academic and behavioral support to students at risk within three-tiered models of prevention. *Preventing School Failure: Alternative Education for Children and Youth, 55*(4), 181–191.

Repetto, J., Cavanaugh, C., Wayer, N., & Liu, F. (2010). Virtual high schools: Improving outcomes for students with disabilities. *Quarterly Review of Distance Education*, 11 (2), 91–104.

Savidis, Anthony, Dimitris Grammenos, and Constantine Stephanidis. "Developing inclusive e-learning and e-entertainment to effectively accommodate learning difficulties." *Universal Access in the Information Society* 5.4 (2007): 401-419.

Statistics Canada. "Disability in Canada: A 2006 Profile". *Statistics Canada*, 2006, retrieved from https://www.canada.ca/en/employment-social-development/programs/disability/arc/disability-2006.html#s3 on 14 June 2020.

Statistics Canada. "Canadian Survey on Disability, 2012: Learning Disabilities Among Canadians Aged 15 Years and Older". *Statistics* Canada, 2012, retrieved from https://www150.statcan.gc.ca/n1/pub/89-654-x/89-654-x2014003-eng.htm on 2 July 2020.

Statistics Canada. "Profile of Disabiity for Children: 2006 Participation and Activities Limitation Survey". *Statistics Canada*, 2006, retrieved from https://www150.statcan.gc.ca/n1/pub/89-628-x/2007002/4125020-eng.htm on 8 June 2020.