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The Impact of a School Board's One-to-One iPad Initiative on Equity and Inclusion

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This paper examines the impact of a school board's one-to-one iPad initiative on equity and inclusion. Data include: questionnaires from Grade 7–9 students, teachers, and administrators; focus groups with inclusion coaches; and interviews with classroom teachers. The results show that the iPads have supported equity among students in the district; there is now less disparity in terms of access to technology on the basis of families' socio-economic status. The results show that the iPads have also supported the academic and social inclusion of students with exceptionalities; themes that arose across the data sources include: differentiation of content, access to grade-level curriculum, the appearance of sameness, communication and collaboration among students with and without exceptionalities, and positive student affect. Negative implications included the potential for students who struggle with self-regulation to be negatively affected and the potential for the technology to be used in socially exclusionary ways.

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Abstract

This paper examines the impact of a school board's one-to-one iPad initiative on equity and inclusion. Data include: questionnaires from Grade 7–9 students, teachers, and administrators; focus groups with inclusion coaches; and interviews with classroom teachers. The results show that the iPads have supported equity among students in the district; there is now less disparity in terms of access to technology on the basis of families' socio-economic status. The results show that the iPads have also supported the academic and social inclusion of students with exceptionalities; themes that arose across the data sources include: differentiation of content, access to grade-level curriculum, the appearance of sameness, communication and collaboration among students with and without exceptionalities, and positive student affect. Negative implications included the potential for students who struggle with self-regulation to be negatively affected and the potential for the technology to be used in socially exclusionary ways.

The purpose of this paper is to examine the impact of a school board's one-to-one iPad initiative on equity and inclusion. The school board with whom we worked implemented the one-to-one iPad initiative for a variety of reasons including providing more equitable access to technology and determining whether technology could be used to facilitate inclusion in classrooms in the district. There are indeed disparities in access to technology, but research on one-to-one programs remains very limited. Research also shows that technology can be used to support students with a variety of exceptionalities, but research on technology for inclusion is much more limited. In this paper, we review relevant literature and then present data from a variety of sources and participant groups, demonstrating that the one-to-one iPad initiative had a significant and positive impact on both equity and inclusion among students within the district. Difficulties are also discussed.

Literature Review

Technology in Education

Technology use has increased tremendously over previous decades. The Canadian Internet Use Survey shows that 83% of Canadian households have access to the Internet (Statistics Canada, 2013). Among those that have access, 69% accessed the Internet with more than one device (Statistics Canada, 2013). As technology use has grown, so too has technology use for educational purposes. Students now have access to computers in 99% of Ontario elementary and secondary schools (Chen, Gallagher-Mackay, & Kidder, 2014). In 2007, 80% of students used the Internet for educational purposes. iPads in particular are increasingly being used in school settings (Alberta Education, 2012).

Meyen and Greer (2010) offered nine ways in which technology has the potential to support teacher and student needs:

> Technology provides the capacity to (a) provide immediate feedback to teachers on the performance of learners individually, and in aggregate, to facilitate data-based instructional decisions; (b) provide feedback to students as they engage in Web-based instruction; (c) present skills and concepts in graphics and animation for clarity; (d) offer opportunities for students to interact with the delivery of instruction in a manner that is engaging; (e) deliver instruction aligned with standards and formative and summative assessments; (f) embed assessments in instructional applications; (g) provide instructional opportunities in non-school settings; (h) employ features that enhance motivation; and (i) monitor student progress. (p. 51)

Regarding iPads specifically, Melhuish and Felloon (2010) used theory and existing literature to argue that iPads offer the following benefits: portability, affordable and ubiquitous access, situated just-in-time learning opportunities, connection and coverage (e.g., to other people and networks), and individualized and personalized experiences. Challenges related to the incorporation of technology in education include a need for professional knowledge (Alzrayer, Banda, & Koul, 2014) and a

potential shift toward entertainment rather than education (Alzrayer et al., 2014; Melhuish & Falloon, 2010).

Seeking to provide students with the perceived benefits of technology, some school boards have moved to one-to-one programs, in which all students are expected to have a device or are given a device by the school board. Although the prevalence of these programs is increasing, research on them is still emerging and remains limited (e.g., Alberta Education, 2012; Harper & Milman, 2016; Ifenthaler & Schweinbenz, 2013).

Technology, Equity, and Inclusion in Education

One potential challenge for schools, in terms of using technology for educational purposes, is the fact that students have different access to technology. Although technology use is pervasive, technology and Internet access are not equitable. Among families in the top income quartile, 98% have access to the Internet; among families in the bottom quartile, 58% have Internet access (Statistics Canada, 2013). People in urban areas are more likely to have access to the Internet (85%) than people outside those areas (75%; Statistics Canada, 2013). Among families who do not have Internet access, some report that they do not need the Internet (61%) and others report that they do not have it due to economic reasons (20%; Statistics Canada, 2013). A People for Education report (Chen et al., 2014) describes how different Ontario school boards are addressing inequalities in access. One option—the option chosen by the board with whom we are working—is to provide a device for every student. As noted, research on such programs is limited (e.g., Alberta Education, 2012; Harper & Milman, 2016; Ifenthaler & Schweinbenz, 2013).

Inclusion—in which students with exceptionalities are educated primarily in their regular classroom—is becoming the expectation in schools in Ontario. Indeed, the Ontario regulation *Identification and Placement of Exceptional Pupils* (2016) reads that if "placement in a regular class would meet the pupil's needs and is consistent with parental preferences, the [IPRC] committee shall decide in favour of placement in a regular class" (s. 17(2)). A report from Alberta Education (2012) presents data from teachers who voluntarily chose to use iPads in their classroom. One of the most frequent reasons given by teachers for using iPads was that they can offer more differentiated and personalized instruction. Teachers felt that they could thus support the needs of all students in keeping with the principles of Universal Design for Learning (CAST, 2017; Ontario Ministry of Education, 2013). For example, teachers noted that technology might be used to offer remedial material for students who are struggling or more advanced material for students who require more challenge. They felt that specific applications (e.g., larger text size to declutter screen for students with dyslexia, visual options for deaf students) offer options to students with particular learning needs. Teachers noted that students generally like to use technology, which is important because such engagement can mean that students persist despite difficulties, when they otherwise might not. In terms of teacher workload, technology may also support inclusion in that it can easily support the tracking of students' progress toward annual education goals and can support the sharing of files with other professionals (Lavay, Sakai, Ortiz, & Roth, 2015). Although the Alberta Education (2012) research

is promising, much more is needed to determine whether and how iPads might be used to support students with exceptionalities in an inclusive setting.

Technology and Special Education Support

Much of the research on the use of technology for education with students with exceptionalities examines the use of a particular application with a group of students with a particular exceptionality. In most of such research, students are in a setting other than the regular classroom (e.g., special education classroom at a regular school, special education school, clinical setting). Although this research is not focused on inclusion, it demonstrates the potential of technology to support students with exceptionalities in a variety of domains. It thus raises possibilities for ways in which technology might be used in an inclusive setting.

For students with autism, technology can be used as augmentative alternative communication (AAC). AAC refers to strategies that support existing speech or replace natural speech or written communication; these include manual signs, picture exchange systems, and speech-generating devices (Alzrayer et al., 2014). As an example of technology as AAC, a student could touch an icon on a device to request a desired item (Alzrayer et al., 2014). Technological AAC can thus support students' communication and decrease their challenging behaviours (Alzrayer et al., meta-analysis, 2014; Lorah, Parnell, Schaefer Whitby, & Hantula, review; 2015). Technology (iPads) can also be used to share social stories, resulting in desirable changes in behaviour (Flores et al., 2014). iPads (via math applications, self-modelling videos) can be used to support the development of math and language skills for students with autism (Burton, Anderson, Prater, & Dyches, 2013; Fan, 2012; O'Malley, Lewis, & Donehower, 2013). In many of these studies, students enjoyed using the devices and worked more independently when using them (Burton et al., 2013; Fan, 2012; Lorah et al., 2015; O'Malley, Lewis, et al., 2013). Some studies show that individual effects vary greatly (Alzrayer et al., 2014; O'Malley, Lewis, et al., 2013). Devices using an iOS operating system (e.g., iPads) have been shown to be preferred over other devices; this may be because of appeal, portability, and cost effectiveness (Alzrayer et al., 2014).

For students with moderate to severe intellectual disabilities, O'Malley, Jenkins, et al. (2013) showed that technology can also be used to support basic math skill fluency. In that study, teachers of the ten Grade 7–9 students felt that the technology supported students' engagement and skill, and felt that it was acceptable and effective.

Computer-assisted instruction on iPads also can support the math skills and engagement of students with behavioural and mental health needs (Haydon et al., 2012). Working with three 17–18 year-old students, Haydon et al. (2012) found that compared to hard-copy worksheets, iPad applications resulted in a higher number of correct responses, higher engagement, and more questions answered in less time; teachers and students also preferred the iPads to the worksheets.

A significant potential advantage of technology for students with literacy-related learning disabilities is that it can be used as assistive technology to support reading

and writing. This includes text-to-speech and speech-to-text software, as well as word-processing programs, word prediction software, outlining and concept-mapping software, and so on (see MacArthur, 2009; Ray & Atwill, 2004; Skylar, Higgins, & Boone, 2007). These programs offer support for planning, transcription, and revision, as well as the chance for more meaningful publication (MacArthur, 2009). Challenges that remain include those associated with reading and writing (e.g., determining what information is important, Evett & Brown, 2005) as well as challenges with student use of technology (e.g., reluctance to use because of perceived stigma or ineffectiveness; Barden, 2014; Cawthon & Cole, 2010). Though research in the area is limited, it generally supports the use of assistive technology for students with learning disabilities (MacArthur, 2006).

In addition to reading and writing, technology has the potential to support the self-monitoring of students with learning disabilities and students with ADHD in the regular classroom, by prompting for on-task behaviour (Wills & Mason, 2014). Assistive technology also can improve students' self-efficacy for academic tasks (Young, 2013) and working with the Internet may be empowering, engaging, and motivating for students (Asplund, 2007; Henry, Castek, O'Byrne, & Zawilinski, 2012).

The research cited above demonstrates how technology can be used to support students with exceptionalities, both academically and socially. Much more research is needed to determine how these benefits might be realized in the regular classroom.

Methods

Our research adds to the literature discussed above by investigating the impact of a one-to-one iPad initiative on equity and inclusion. Multiple forms of data from multiple participant groups allow for a thorough understanding of the initiative.

Overview and Context of the Research

The research presented in this paper was conducted in conjunction with a program evaluation completed for a school board. The 160,000-person school district is in a largely rural and small-town area of southwestern Ontario. There is considerable diversity among students, particularly with regard to socio-economic status and cultural and religious beliefs. The district achieves high standing in provincial test scores, and the board has made commitments to full inclusion, to technology, and to incorporating research into its practices.

The overall purpose of the program evaluation was to determine the impact of a one-to-one device program in which all students in Grades 7 and 8 were given an iPad to use for the duration of their time in the district. Grade 6 students in Grade 6/Grade 7 split classrooms also received the iPads. Some initial participants had progressed to Grade 9 at the time of our study. Thus, most students with iPads were in Grades 7 and 8, but there were also Grade 6 and Grade 9 students involved in the initiative.

This focus on equity and inclusion arose for three reasons: First, the research literature suggests these as areas in which technology might have an impact; second, board administrators were interested in these areas; and third, informal conversations

with stakeholders (e.g., teachers, administrators, students) suggested there were impacts in these areas. The equity and inclusion research unfolded in three phases: questionnaires with students, teachers, and administrators; focus groups with coaches who specialize in special education and inclusion; and observations and interviews with classroom teachers. Each phase of this project has been reviewed and received ethical clearance from Research Ethics Boards at the University of Alberta and at the school board. Each phase of data collection is discussed in detail below.

Phase 1: Questionnaires

Design. All students, teachers, and administrators involved in the one-to-one iPad initiative were sent an email with an invitation to complete a questionnaire. The questionnaires were hosted by Qualtrics.com. They were accessible through a link in the email and were compatible with multiple devices (e.g., laptops, smartphones). No identifying information was collected; all responses were completely anonymous.

There were three questionnaires: one for students, one for elementary and secondary teachers, and one for administrators. The student survey consisted of 21 questions about the iPad initiative. There were no questions that prompted students explicitly about equity or inclusion. However, two of the questions—"Tell us a little bit about how learning is different at school now that everyone has an iPad" and "The iPad helps my learning because…"—drew responses related to equity and inclusion; thus responses to these questions are discussed here.

The teacher survey consisted of 46 questions about the iPad initiative. The administrator questionnaire consisted of 26 questions about the iPad initiative. Both groups received the same three questions about equity and inclusion: (a) "Do you believe that distribution of the iPads has affected equity in your school?" [*yes*, *no*, *unsure*]; (b) "Do you believe that distribution of the iPads has affected inclusion in your school?" [*yes*, *no*, *unsure*]; and (c) "If you answered *yes* to either of the above, please describe how."

Participants. Approximately 2,000 students were involved in this initiative. Teachers of those students were provided the link to the survey and asked to share the link with students. There were 704 student respondents. Students were in Grade 6 (6%), Grade 7 (44%), Grade 8 (45%), and Grade 9 (5%). Recall that data from two questions was analyzed for this paper; 604 students responded to the question about how learning is different with the iPads, and 612 students responded to the question about how the iPads help their learning.

Approximately 135 elementary teachers were invited to participate in the survey; 101 did so. The elementary teachers were teaching Grades 6 (9%), 6/7 (12%), 7 (14%), 7/8 (42%), and 8 (23%). In the elementary system, many teachers teach multiple subjects. Respondents were teaching: Art, French as a Second Language, Health and Physical Education, Language, Mathematics, Native Languages, Science and Technology, and Social Studies. Of the 101 elementary teachers who responded to the survey, 83 answered the first and second questions about equity and inclusion and 42 provided responses to the third about equity and inclusion.

Approximately 60 secondary teachers were invited to participate in the survey; 17 did so. Respondents were teaching a range of subjects: Canadian and World Studies, Classical Studies, English, French as a Second Language, Health and Physical Education, Mathematics, Native Studies, Science, Social Science and Humanities, Technological Education, Library, and Special Education. Of the 17 secondary teachers who responded, 14 provided responses to the first and second questions about equity and inclusion and 10 provided responses to the third question.

Approximately 60 administrators were invited to complete the survey; 23 did so. Of these, 58% worked in Kindergarten–Grade 8 schools, 32% worked in Grade 7–12 schools, and 11% worked in Grade 9–12 schools. Of the 23 administrators who completed the survey, 14 provided responses to the questions about equity and inclusion.

Analysis. The primary researcher (Kirkpatrick) read through all students' responses and coded responses related either to *equity* or to *accessibility and inclusion*. A research assistant coded 30% of the data to establish inter-rater reliability. There were many instances in which one had coded responses as one category (e.g., equity) and the other had coded it as another (e.g., inclusion). The two were thus collapsed into a single category: *equity and inclusion*. The definition is presented in Table 1. To calculate inter-rater reliability, instances in which one or the other coder had used the *equity and inclusion* code were considered and the number of these instances was divided by the total number of times either coder used the code (agreements on occurrence / (agreements + disagreements on occurrence)); responses which had not been coded as *equity and inclusion* by either coder were not considered to avoid inflating inter-rater reliability with all the negative instances.

Table 1

Code Definition and Inter-rater Reliability for Student Questionnaires

Code	Definition	IRR
Equity and inclusion	Reference to more equitable access to technology, reference to more equity or fairness on the basis of SES or exceptionality status, reference to students with exceptionalities who benefit academically or socially from iPads	80% (question 9) 76% (question 11)

Note: IRR = inter-rater reliability; SES = socio-economic status

The primary researcher (Kirkpatrick) read through all of the teachers' and administrators' responses regarding how the iPads had affected equity and inclusion. Seven codes were developed on the basis of the responses: (a) *access to technology*, (b) *curriculum access*, (c) *appearance of sameness*, (d) *increased communication and collaboration*, (e) *more positive emotional affect*, (f) *negative implications,* and (g) *more access than with previous Special Education Amount (SEA) equipment*. Definitions are presented in Table 2. All responses were coded using these seven codes.

To establish inter-rater reliability a second, independent coder categorized all of the qualitative data from teachers and administrators. An inter-rater reliability ratio

was calculated for each code for each group of participants as follows: agreements on occurrence / (agreements + disagreements on occurrence). Negative instances were not considered, as above. The reliability ratios are presented in Table 2.

Table 2

Code Definitions and Inter-rater Reliability for Teacher and Administrator Questionnaires

Code	Definition	IRR
Access to technology	Increased access to technology (particularly in reference to cost and SES)	83%, 100% 80%
Curriculum access	Increased curriculum access, especially for students with exceptionalities	88%, 100%, 83%
Appearance of sameness	No apparent difference on basis of SES or exceptionality	82%, 67%*, 83%
Increased communication and collaboration	More communication and collaboration among students	100%, n/a, 100%
More positive emotional affect	More positive emotions on part of students	86%, n/a, 67%*
Negative implications	Any reference to a negative effect of the iPads	100%, n/a, n/a
More access than with previous SEA equipment	More students now have access to technology than would have had access to SEA equipment	n/a, n/a, 100%

Note: IRR = inter-rater reliability; SES = socio-economic status. IRRs are for elementary teachers, secondary teachers, and administrators, respectively. *This code was used twice by both raters and once by the first rater; the researchers believe that the low IRR is a result of the low frequency of use and resulting large impact of a single discrepancy.

Phase 2: Focus Groups

Design. As part of a day on which coaches (see Participants, below) had come to the school board office for meetings and activities related to their position, members of the research team provided an overview of this project and discussed the focus on equity and inclusion. To support the discussion about equity and inclusion, the board definitions were provided to the group, as follows:

> [Equity is] a condition or state of fair, inclusive, and respectful treatment of all people. Equity does not mean treating people the same without regard for individual differences (Ontario Ministry of Education, 2014).

> Inclusion is defined as a person or thing that is included within a larger group or structure. In the case of all [our] schools, it is the educational practice of teaching children with disabilities in classrooms with children without disabilities— teaching ALL students together (citation removed to protect anonymity).

Following an overview of the purpose of the project, researchers invited the coaches to participate in focus groups about the impact of the iPads on equity and

inclusion in the district. Participants were divided into three focus groups, each of which was facilitated by a member of the research team. The focus group questions were:

(a) What words or ideas come to mind when you think about equity and inclusion with iPads in the classroom? [put a word on the wall.] What does this wall make you think about?

(b) Tell us a story about how the iPads have affected equity OR inclusion. We are interested in both academic and social inclusion.

(c) We are particularly interested in students with learning disabilities and students with developmental disabilities. Tell us about how the iPads may have changed the experiences of these students in the classroom.

(d) What could be learned in terms of best practices?

(e) (OPTIONAL) Are there particular applications that have been helpful in promoting equity and inclusion?

(f) Photo elicitation: Take a quick look at these pictures and choose one that will help you speak to how you see iPads influencing equity and/or inclusion in the classroom. If you do not see a picture that speaks to you, there are blank cards available for you to draw/sketch your own. It's also okay if more than one person chooses the same image. Please tell us why you chose that image and what it speaks to, in terms of equity and inclusion. If there are others that would like to respond to your image choice, we would love to hear that as well.

Participants. The school board with whom this project was conducted uses a coaching model, in which teachers with expertise become coaches to support inclusion and special education within the district. Classroom teachers at the elementary or secondary level can request to work with a coach, in order to support their inclusive classroom teaching. Coaches work in a variety of ways with teachers, including in the classroom itself. Coaches can thus provide an additional perspective on how the one-to-one initiative has impacted students in terms of equity and inclusion. Eleven coaches took part in the activities described above, and all eleven chose to participate in the focus groups and have their data shared for research purposes.

Analysis. The focus group dialogues were transcribed by a research assistant. Each transcript was then segmented into utterances: Each time one participant finished speaking and another started, a new utterance was marked. A research assistant then read through the transcripts and developed a set of codes based on the data. The themes that arose from the data were: (a) *appearance of sameness,* (b) *better curriculum access,* (c) *more choice,* (d) *communication and collaboration*, (e) *positive emotional affect,* (f) *negative implications*, (g) *access to technology,* and (h) *improved organization*. Definitions are presented in Table 3.

The research assistant then coded each utterance with one or more codes. The primary researcher coded 30% of the data to establish inter-rater reliability. The codes for *appearance of sameness, better curriculum access,* and *more choice* could not be

reliably distinguished; thus, they were collapsed into the category *academic inclusion.* Reliability ratios for the codes are presented in Table 3.

Table 3

Code Definitions and Inter-rater Reliability for Focus Groups

Code	Definition	IRR
Academic inclusion	Increased academic inclusion of student with exceptionalities (e.g., because of choice, willingness to use technology for assistive purposes, differentiated materials and instruction)	83%
Communication and collaboration	More communication and collaboration among students	88%
Positive emotional affect	More positive emotions on part of students	87%
Negative implications	Any reference to a negative effect of the iPads	100%
Access to technology	More, or more equal, access to technology (references to income, SES, affordability, "all" students, etc.).	100%
Improved organization	Students' organization is better	100%

Note: IRR = inter-rater reliability; SES = socio-economic status.

Phase 3: Observations and Interviews

Design. The coaches in the district were asked to nominate teachers who the coaches felt were using the iPads to support equity and inclusion. The coaches sent the names and contact information for nominated teachers to a staff contact at the board, who then forwarded the names to the research team. The research team invited those teachers to participate. The research team did not report back on which nominees participated; thus, there was a degree of anonymity provided to teachers.

For each teacher who had agreed to participate, a researcher visited their classroom for approximately 75 minutes. The researcher observed the classroom, took notes according to an observation template, and took photographs of students' work. The researcher spoke to students if approached by them, but did not otherwise engage directly with students.

Following the observation, the researcher interviewed the teacher according to the following interview protocol:

1. Can you tell me a little bit about your classroom?
   a. Do you have students with exceptionalities?
   b. Can you describe the socio-economic background of your students?
2. How do you think the iPads influence issues of equity and inclusion in the classroom?
3. Describe how issues of equity and inclusion factored into your lesson planning today.
   a. If not, why not?

4. Can you walk me through the lesson today and highlight any decisions you made concerning the iPads?

5. How have the iPads supported both academic and social inclusion? Can you describe an experience of each?

6. How have the students' attitudes and beliefs about inclusion or equity in the classroom changed since the introduction of the iPads?

7. How do you think the students' learning experiences have changed—specifically in terms of equity and inclusion—as a result of having iPads in the classroom?

8. How have the iPads influenced the inclusion of your students with exceptionalities?

Additional questions were asked according to what was observed in the classroom. The researchers also sent a link to an anonymous survey through which participants could share additional ideas or experiences that came to mind after the interview. Minimal responses were received and they did not contain new information; thus, they are not discussed here.

Participants. Nine teachers were nominated for this phase of the research. Of those nine, seven agreed to participate. The teachers included both males and females and were drawn from different schools across the district. Although our intention was to observe each classroom for one period, some teachers invited researchers to stay longer; thus, there are more than seven periods represented. The classes observed were: Grade 7 French, Grade 7 Mathematics, Grade 7/8 Mathematics, Grade 8 Mathematics, Grade 8 Mathematics, Grade 7/8 Language Arts, Grade 8 Language Arts, Grade 8 Current Events, Grade 8 Art, Grade 8 Science and Social Studies, Grade 9 Art, and Grade 9 English. All classes observed were inclusive classrooms; that is, they included students with exceptionalities. All teachers indicated that students' homes represented a range in terms of socio-economic status.

Analysis. The observation field notes were taken electronically. The electronic observation notes and interviews were read through by the first author. Codes were developed that reflected the themes present in the data. What was most apparent in the observations, and in the codes developed, was that visible issues specifically related to equity and inclusion were extremely rare. As an example, there were times when students were working on leveled content, but it was not apparent to a researcher in the room. It only became apparent in the interviews. For this reason, we have decided to focus on the interviews alone in this paper.

The interviews were transcribed electronically and were then read by the primary researcher (Kirkpatrick). Codes were developed by the primary researcher to reflect the themes that arose in the interviews: (a) *equity,* (b) *academic inclusion,* and (c) *social inclusion.* Definitions are presented in Table 4. A research assistant then coded all of the interviews using these codes. To establish inter-rater reliability, the primary researcher coded approximately 40% of the interviews (3 interviews). Teachers often spoke several sentences that were coded using the same code. For example, they

would tell a story related to equity. In order not to inflate reliability, each section of text that was coded using the same code was counted as one instance. We calculated inter-rater reliability, shown in Table 4, as (agreements on occurrence / (agreements + disagreements on occurrence)).

Table 4

Code Definitions and Inter-rater Reliability for Interviews

Code	Definition	IRR
Equity	Less disparity (in terms of SES) in access to technology	82%
Academic inclusion	Increased academic inclusion of students with exceptionalities (e.g., because of choice, willingness to use technology for assistive purposes, differentiated materials and instruction)	75%
Social inclusion	Increased social inclusion of students with exceptionalities (e.g., friendships, interactions inside and outside of class)	100%

Note: IRR = inter-rater reliability; SES = socio-economic status.

Results

Phase 1: Questionnaires

Students. The first prompt that drew responses related to equity and inclusion was, "Tell us a little bit about how learning is different at school now that everyone has an iPad." Of the 604 responses, 33 responses related to equity and inclusion. Some responses highlighted the fact that all students now have access to technology, suggesting that access was previously inequitable. For example, "Now that everyone has an iPad we ALL can do something productive not just the people who can bring electronics to school and are allowed now everyone has an electronic for learning purposes." Other responses highlighted increased group cohesion and success; for example, one student wrote, "Now that we have the iPads we can all learn together and nobody can fall behind." Numerous responses indicated specific areas with which the iPads could help; for example, "Spellcheck and auto correct help the people who find spelling challenging … listening to articles instead of reading them which helps the auditory learners or the people who have troubles reading." Other responses addressed the choice that comes with the iPads: "Learning is different because the iPad let us use the apps we need to learn in our own way." The responses rarely referenced equity or inclusion explicitly; the responses were more specific to particular classroom practices and scenarios.

The second item that drew responses related to equity and inclusion was, "The iPad helps my learning because…" Of the 612 responses, 40 responses related to equity and inclusion. Some responses highlighted the fact that access to board-provided technology had eased students' ability to complete work at home; for example, "You can take your work home and finish it even if you do not have a computer." Numerous responses highlighted how the iPads have helped with specific difficulties students have; for example, "the Ipad [sic] helps my learning because there are apps that can read the questions to me if I ever get stuck on a question and also I

can search up strategys [sic] on how to solve stuff." Responses also spoke to the fact that students feel more comfortable with the iPads, because they afford students' privacy in their approaches. For example, one student wrote,

> I am a student who isn't as great with school as everyone else. I need to show my work, or use a calculator more than other people. It's great because I can do all this without having to worry about wasting paper or being embarrassed, because no one will be able to tell I'm doing it.

Such responses speak to an interplay between academic and social inclusion. That is, because the iPad allows privacy in the use of accessibility features, students feel as though they can access academic material using technology without having to worry about negative social implications.

Teachers and administrators. Elementary teachers, secondary teachers, and administrators were asked to indicate whether they believed the iPads had affected equity and inclusion in their schools. The majority of people in each of those groups believed there had been an impact on equity. Elementary teachers and administrators also thought there had been an impact on inclusion; only about one third of secondary teachers believed there was an impact on inclusion. The results are presented in Table 5.

Table 5

Educators' Perspectives on Whether the iPads Have Affected Equity and Inclusion

Participant Group		Equity			Inclusion		
		Yes	No	Unsure	Yes	No	Unsure
Elementary teachers	(*n* = 83)	76%	6%	18%	72%	14%	13%
Secondary teachers	(*n* = 14)	64%	14%	21%	36%	21%	43%
Administrators	(*n* = 17)	88%	0%	12%	88%	6%	6%

Recall that participants who answered *yes* when asked whether the distribution of the iPads had affected equity or inclusion were asked to describe how. Participants indicated a range of ways in which the iPads had affected equity and inclusion; the elementary teachers and administrators indicated a wider range of effects than did the secondary teachers. The frequency of codes assigned to their responses is presented in Table 6, and each theme is explored below.

Access to technology. Elementary teachers, secondary teachers, and administrators noted that the one-to-one device program increased equity in terms of socio-economic status: "All students regardless of socio-economic status have access to an electronic device." Teachers noted that "students feel and are equal without the barrier of not having the money to afford these devices." Socio-economic realities also mean that "bring your own device [an alternative to one-to-one] would not have worked for them."

Table 6

Educators' Perspectives on How the iPads Have Affected Equity and Inclusion

Code	Frequency*		
	Elementary Teachers (*n* = 42)	**Secondary Teachers** (*n* = 10)	**Admini-strators** (*n* = 14)
Access to technology	36%	80%	57%
Curriculum access	36%	30%	71%
Appearance of sameness	21%	20%	36%
Increased communication and collaboration	17%	0%	7%
More positive emotional affect	14%	0%	14%
Negative implications	7%	0%	0%
More access than with previous SEA equipment	0%	0%	21%

Note. A response could be coded using more than one code, thus the cumulative percentage is greater than 100%.

Curriculum access. Elementary teachers, secondary teachers, and administrators all noted that the iPads have allowed for more differentiation and more independent access to curriculum. One teacher wrote, "With the accessibility options provided by the iPads, the students are able to change their response method. I am also able to offer more choice to students when it comes to how they want to present their learning." Another teacher wrote, "Students who have challenges with reading can now more easily access and understand classroom materials." The connection to positive emotional affect was also made in some of these comments. For example, a teacher wrote, "Those students who are not very strong writers can now record their voice and the iPad will convert it to text which has boosted many students' confidence." Sometimes, specific types of applications (e.g., word processing, speech-to-text, text-to-speech) were noted as playing a role in curriculum access.

Appearance of sameness. This theme was noted by elementary teachers, secondary teachers, and administrators. Comments noted the fact that "all students appear the same" now that everyone in the room has technology. This is in contrast to the past: "Before, students with assistive technology looked different in the classroom, but now, you cannot tell just by looking at the room." Another teacher commented, "Everyone has an iPad, so it's unclear what each student is working on. There is a privacy that the iPads allow to each student." Some responses specifically noted that students appear to be working on the same content, when in fact some may be differentiated or modified.

Increased communication and collaboration. Elementary teachers and administrators noted that the iPads have increased communication and collaboration. For some students, the iPads are their only means of communication. For others, the iPad plays a facilitative role. For example, one teacher wrote, "It [the iPad] has helped my student with autism develop better social skills by communicating with peers through chat and email." Collaboration has also increased. An elementary teacher noted, "It is easier for students with significant learning needs to collaborate with their

peers [with the iPads]." Teachers also noted increased collaboration and communication between students with and without exceptionalities. Secondary teachers did not comment on communication and collaboration.

More positive emotional affect. Elementary teachers' and administrators' comments addressed this issue. Comments included the observations that students "feel included and equal," "feel 'part of the loop'," "seem engaged and willing to try," and "never want to miss class." In particular, responses noted that "our identified students are more comfortable using iPads to meet their educational needs." These comments referred both to students with exceptionalities and students who would not previously have had access to technology. Secondary teachers did not comment on the emotional impact of the iPads.

Negative implications. Three elementary teacher responses had sections that were coded with this theme. One addressed the negative impact for particular students. The elementary teacher wrote,

> Some of our least mature students struggle the most with the self-regulation and appropriate use of the iPad. For some of those students, it may be arguable that their level of engagement in learning activities is regularly usurped by their inability to independently remove themselves from self-selected apps and activities.

Two other responses addressed socio-economic issues: First, some students may still have additional devices; and second, full iPad access at home does rely on home Internet access (this issue was also raised by administrators, as they noted that some families have gotten Internet access as a result of this initiative). Secondary teachers and administrators did not otherwise comment on negative impacts.

More access than with previous SEA equipment. Administrators raised the issue that compared one-to-one iPad access with access to technology in a previous program. Special Equipment Amount (SEA) equipment refers to equipment (e.g., computers) that has been recommended for a student with special education needs by a qualified professional and that has been bought and paid for through special funding from the Ministry of Education to the school board (Ontario Ministry of Education, 2016). Administrators felt that the one-to-one model provided access to students who did not qualify for SEA equipment under the guidelines, but who nonetheless benefited from using it. From the perspective of the administrators, these included students with learning disabilities as well as students with developmental disabilities and mild intellectual disabilities. The administrators noted that these students were benefitting from the iPads both in terms of accessing information and being able to demonstrate their knowledge.

Phase 2: Focus Groups

Focus groups with the coaches who specialize in inclusion were conducted in order to gain their insights about how the iPads have affected equity and inclusion. Coaches' responses indicated impacts in the following areas: (a) *academic inclusion*, (b) *communication and collaboration*, (c) *positive emotional affect*, (d) *negative*

implications, (e) *access to technology*, and (f) *improved organization*. The frequency with which each code was used is presented in Table 7 and each is discussed in more detail below.

Table 7

How Inclusion Coaches Felt That iPads
Had Affected Equity and Inclusion

Code	Frequency
Academic inclusion	54%
Communication and collaboration	14%
Positive emotional affect	9%
Negative implications	8%
Access to technology	3%
Improved organization	2%

Note. Not all responses were coded (some were not relevant to the topic), thus the cumulative percentage does not reach 100%.

Academic inclusion. This theme arose most often in the focus group discussions. Coaches found that students with an Individual Education Plan (IEP) were now being given tasks that more closely paralleled those of their peers. Additionally, with the use of the iPads, coaches reported that differentiated and parallel tasks were both easier and faster to make for teachers. As an example of a differentiated task that is relatively easy for a teacher to use, one coach described a news website (newsela.com) that allows teachers to adjust the same article to be suitable for a Grade 4 to a Grade 12 reading level. The article contains the same essential content, and the same pictures and captions. The site can also read the article aloud. The coach noted that this allows all students in the class to focus on the same material, but in a way that is suitable to their skill level, allowing for a rich class discussion in which everyone can take part. Those students who do not require differentiated tasks (for example, in order to bypass an area of difficulty) have also been found to enjoy and benefit from these differentiated tasks. Coaches also noted that increased curriculum access resulted from greater accessibility of texts and improved writing abilities of students with the use of text-to-speech and speech-to-text features on the iPad.

There also is more academic inclusion in terms of assessment. Coaches reported that students are being given more choice with regard to how they complete an assignment and are therefore better able to show what they know. Coaches reported that because of this, students are being more creative with their completion of assignments—often making videos or using interactive presentation formats such as a Prezi. Students can also customize their iPad with apps, personalized font sizes, and/or keyboards to make the device more useful and accessible for themselves.

One reason why students are taking advantage of differentiated material and a range of assessment options is that all students are using technology and working with different media and materials, so students with exceptionalities no longer stand out for

doing so. In the past, technology served to mark students in various ways. Students with assistive technology were immediately perceived by visitors to the class and by other students as students with special education needs. Because all students now have technology, students on Individual Education Plans are afforded more privacy. Privacy is also enhanced when support materials, traditionally provided in hard copy, can be offered more discreetly in digital format. One coach explained,

> I think of specific examples where students need scheduling, visuals, and like a Velcro and paper schedule that made them stand out, whereas now everyone is carrying around an iPad and we can include those kinds of tools on the devices and no one has to know that they need those reminders or visuals.

In addition to students with exceptionalities looking the same as other students in the room, coaches noted that providing the iPads to all students has removed having an iPad for personal use as a marker of economic privilege. That is, the fact that all students have a device means that students who could not afford a device no longer stand out for not having one.

Communication and collaboration. Coaches reported that students can collaborate online, in school, or at home with the iPads. Furthermore, coaches reported that students with learning disabilities and developmental disabilities have been taking a larger part in group work and have been more socially involved with their peers. One coach shared the following example:

> There was a lesson done on what the student's disability is. What it is, what does that mean, what is the stigma around it, and dispelling some of the myths. This student uses Proloquo2go [an augmentative and alternative communication application; http://www.assistiveware.com/product/proloquo2go] as their communication device. The students were all taught how to program questions in that device as well. So that they could have conversations with this student or add lingo that only students would use with each other. From that, this student has been involved in I can't even count how many projects and presentations with the entire class. Because people are now— it's not just some EA and the student and everyone else is blocked off—but students are feeling much more capable and want to sit beside this student and learn more with and from that student. They want that student with their group and take a picture of what they are creating and adding to their presentation and can add in words and phrases so that this student can be part of the verbal presentation to the class. It's just been wonderful. It's just a wonderful piece of technology that is helping this student. Using iPads they can do a presentation and bring this person into the presentation and she stands up with the group and does her verbal bit. It's wonderful. It's beautiful. It's truly inclusion both academically and socially.

Note again in this example the interplay between academic and social inclusion. Here, using technology to facilitate the social inclusion of students with exceptionalities meant that those students were then included more in group academic activities.

Positive emotional affect. Coaches indicated that the iPads have helped students feel more independent by allowing them to look over and complete their work by themselves without fear of having missed a mistake in their work. Coaches reported that this has led to an increase in students' confidence in their work. Coaches report

that all students are more engaged in learning tasks as well as more engaged in the presentations from their peers.

Negative implications. One negative impact noted by the coaches was teacher discomfort with using the iPads to support teaching and learning. One coach noted that some teachers were initially uncomfortable with having to let go of control a bit with the iPads, but that they grew more comfortable over time. Another negative implication noted by one coach was that there was sometimes disagreement between school and home values regarding technology, a disagreement that might result in students feeling "caught in the middle." A third issue noted was that students sometimes had to navigate between different platforms for each class, depending on the workflow applications that teachers had chosen. A coach noted that this could be difficult for anyone, but might be particularly difficult for some students with exceptionalities. A final issue noted was the need for self-regulation on the part of students, in terms of what they do on their iPads and when and how much they use them.

Access to technology. With the iPad initiative, more students have access to technology and all students have access to more technology (e.g., iPads in addition to classroom desktop computers). The access to technology has affected students both academically and socially. One coach shared:

> All students are able to be gaming at the same time, which is maybe something that isn't ideal, but then again the students who did not have the device are now able to interact with their peers in playing whatever the popular games are so they feel included that way.

In terms of academics, coaches noted benefits of the iPads and the fact that students now all have access to those benefits (e.g., differentiated material, collaboration opportunities, and increased organization).

Improved organization. Coaches reported that rather than keeping track of papers, students are storing information digitally and are better able to access and organize their files. Students use applications to help not only organize their files, but also their ideas for assignments. Coaches noted this benefit for many students, including students with exceptionalities.

Phase 3: Interviews

Equity. In interviews, teachers described positive effects of the iPads on equity. Primarily, this had to do with the fact that prior to the one-to-one initiative, differences in family income and priorities resulted in some students having a device for personal or school use while other students did not. As one teacher described, "[The initiative has] impacted equity especially—in a huge way. There's no 'I have it, you don't.' Everybody has the technology; it's the same for everyone." Teachers noted that those who would not have had a device have particularly appreciated the initiative. One teacher said,

> You can really see the kids where this is their new toy or a prized possession for them. They're downloading music. Keeping it for their walk home. I find they're a little more responsible for it that way because they're more excited for it. Where kids that had a computer at home or had an iPad at home—this is just another

thing that we're doing at school. Maybe economic-wise it's helped them feel included because everyone is just the same.

Teachers noted that they thought personalization of the iPads (e.g., with decorative cases) might be a marker of difference between students, but that has not been the case.

Teachers noted that small issues related to equity remain. One teacher noted that she always ensures that applications are free to download, so that no students are excluded on that basis. Other teachers noted that not all students have access to the Internet at home, and that some students may have two devices whereas other students only have the one board-provided device. All teachers agreed, however, that the impact of the one-to-one device initiative on equity has been significant and positive.

Academic inclusion. All teachers indicated that the iPads supported academic inclusion. One teacher noted, "Academically, I think that shows that everybody is capable of doing something—using the iPad for academic purposes." There were several ways in which they felt this occurred. First, teachers noted that the iPads allowed them to differentiate more easily. Sometimes this differentiation was in terms of choosing from among the iPad and a variety of other tools (e.g., pen and paper), and at other times it was in terms of choosing a modality (e.g., written or video) on the iPad. As one teacher described,

> The iPads allow us to complete things in a number of different ways—all the time. We have all these tools available to us. Versus before as a student you'd have one—maybe two options of how you complete something. But now there's ten different ways—options you can do to show your learning and to show your understanding. To do it in a way that's best for you. For example, with math this morning. The difference between "I need the paper to write my answers down" and some of the students were using an app called Notability (an app that combines photographs, handwriting, and note taking; http://gingerlabs.com/) where they can write it in or they can type it in and make notes all over it and make the calculations and stuff like that. To larger project-based things, where if we're doing an inquiry about cells, things range from kids who are researching stem cells to cancer treatments. All researching different things and showing their knowledge in different ways. Some kids made physical models. Some kids made videos. Some chose to do more of a research paper and that was completely fine. They're all still showing their science knowledge in that unit. But, it's all available on the software right there.

Teachers also felt that the iPads allowed them to assign particular material to students more easily and more discreetly. One teacher described:

> So, in the app if you have—could be a math assignment, could be a reading assignment, something you want a certain group of kids to do. Maybe some kids are working on doing or creating a summary—others are working on making connections in their reading. You can assign that particular piece only to those specific students you want to target. And nobody sees what anybody else has— they just know that's their assignment, that's where they are, and that's what they need to go and work on.

At other times, students could choose the level they felt was most appropriate to their current level of understanding and/or their next goals (e.g., in terms of high school choices).

The specific accessibility features on the iPads also supported students with exceptionalities. Teachers noted that because most documents are now online—for example, in a Google Classroom (for sharing course content, providing feedback, and distributing assignments; https://edu.google.com/k-12-solutions/classroom) or similar file-sharing space—it is easy for students to use accessibility features to access material. Specific examples noted were that students with learning disabilities and students with mild intellectual disabilities can use text-to-speech functions to access material from the teacher. They can also use speech-to-text functions to produce classroom work. In addition, the iPads allow students to return easily to classroom material as necessary (e.g., to review material at home).

As with differentiation more generally, the fact that accessibility features were available to and could be used by all students was important. One teacher explained,

> As far as inclusion goes, especially for kids such as those with learning disabilities—it looks the same. Everybody has access to the tools. If somebody without an identity on occasion wants to have the text read to them—the tool is there for everybody—rather than have to go off to another classroom or corner and put on your headphones and have your big laptop in front of you. It's all right there—looks the same—it's available to everyone.

Teachers noted that in cases where accessing accessibility features would distinguish a student as having an exceptionality, students were reluctant to use them and "stand out in class."

Interestingly, many teachers noted that differentiation and the use of accessibility features also are easier for them with the iPads. As an example, one teacher said, "I don't have to make careful notes, plan, or ensure that I have photocopied the text or uploaded it to Kurzweil [assistive technology for use in the classroom to provide literacy support for those who need it; https://www.kurzweiledu.com] or something like that—it's just there. As long as it's in PDF [format], which 90% of stuff is—they're good to go." That is, because it is common to have all material online, specific creation of electronic material for students who need it is no longer necessary. The material is already in an electronic format, which can be enlarged on the screen or read aloud by a screen reader.

Teachers also felt that the iPads allowed them to modify more easily. One teacher used the example of the quiz application Kahoot! (a learning quiz app that offers take home and in class activities; https://kahoot.it):

> Over the course of the term we've played kahoots together and they [students on modified programs] have done well. In history we were looking at pictures and asking questions about those pictures. Well, I'm asking the Grade 7 class as a whole to reflect deeply on this picture of the execution of Lois Riel and tell me something. With [the students on modified programs] I'm saying, "Who's in the picture?" They are saying, "Oh, there's a man in the picture." They're still included and hovering over the same picture like everyone else. The question is

different but they're still included. So they [the iPads] are incredible tools for leveling the playing field.

Crucially, teachers noted that many of the adaptations and modifications initially made for students with exceptionalities assisted other students as well. A teacher explained,

> I think what I notice the most and it's more so, not just the students, but my own practice—when I do things that I think will benefit certain individuals in my class (perhaps with higher needs) and I try those things—I usually realize those are good practices for everybody.

Specific examples include the use of drag and drop applications to support vocabulary learning and the use of word-processing features (e.g., spelling and grammar checkers) to support writing.

Another feature of the iPads that supported inclusion was the capacity for feedback and different types of assessment. One teacher discussed the classroom management application iDoceo (an all-in-one planning app for teachers with functions such as a grade book, seating plan, and schedule; http://www.idoceo.net) and said that it had completely changed her practice, in that she had far more formative assessment taking place:

> My iDoceo is my tracking—my classroom management system. I use colour coding with that. So if I'm assessing whether they know how to simplify fractions, they do various tasks for me, including things that I just observe as I'm walking around and then I colour code the bar beside their name as to whether they understand it, need a little help, or are completely lost. Green, yellow, and red. They can see that and I can see that as well. So I keep track of their work. We do little quick formative assessments every few days and I shift them—hopefully—from red to green over the course of the unit. Because they'll come back to it several times over the course of the unit. If I realize a kid can now add fractions and they couldn't do it before, I can now go back to iDoceo and quickly change that so I now know that they know how to do that—and I don't have to worry about that anymore.

Many teachers noted that they could provide more ongoing feedback to students, as it was easy to provide feedback electronically on the iPads. Some applications or websites could also be used that provide immediate and ongoing feedback to support student learning. Teachers felt that this increased both students' learning and students' engagement.

The iPads also supported students in assessments of their learning. For example, students with learning disabilities might be able to refer to notes (on the iPads) during tests, or use an application that simplifies fractions to compensate for weak knowledge of multiplication tables while still allowing students to demonstrate their ability to add and subtract fractions.

Finally, one teacher provided a detailed description of what she perceived as a positive impact of the iPads on students' sense of self, because of the increased academic inclusion.

> I think it's ownership. They feel that they have in their hands a tool that allows them to be accountable for their learning and to take ownership for their learning.

> They can say, "Well, if my teacher is not available right now to help me with this—what tool do I have on my iPad—that she may have given me—to go back." Like those notes in Schoology or a Kahn Academy video in math. It really turns the learning back to them and allows them to feel more empowered. I think that's a big thing. The empowerment of students—at this age especially. There's nothing worse than the teenager that doesn't think they have control over what's coming next in their learning. Or being stuck and having no answer. That's where you have behaviour issues. I don't have any behaviour issues in this classroom. I almost never have a behaviour problem in this classroom. Because they've all got something to do. We're at their level.

It is important to note that although these teachers overwhelmingly noted positive aspects of the iPads in terms of academic inclusion, there was a potential problem noted. One teacher said,

> Some who are bad with organization to begin with can't keep track of where things are stored. It looks nice and neat, but inside they might not know where things are. It has its pros. It has its cons. I think it's beneficial for students to use it in the classroom, but students who struggle with organization or keeping track of things may struggle in this new forum as well.

In such a case, the iPad has the unintended effect of actually masking a student's difficulty.

Social inclusion. Many teachers noted that the iPads had facilitated social inclusion in the classrooms. For instance, one teacher described:

> Simple things like on the first day of the semester a girl was using her iPad—and I had everyone in the room say their name and one thing they hoped to learn about art—but she was—she's non-verbal, so she was able to use Proloquo [an augmentative and alternative communication application; http://www.assistiveware.com/product /proloquo2go] to say "Hi, my name is …"

Another teacher described the fact that students who might feel a bit isolated or alone in class can text with friends, and thus feel more "connected and comfortable." Of course, this might be happening during instructional time, which raises other issues.

Unfortunately, the ease with which students can communicate also sometimes created problems in terms of social inclusion. One teacher described a case of a student with a mild intellectual disability:

> Because she so wanted to be social with the kids, but she didn't go about it the right way. Just constant messaging. If she found out what your email address is that's connected to your iPad, she'd be like, "Hey, hello. Hello. Talk to me." Ten messages later the kids are like, "Block. I don't want to talk to you."

Another teacher noted that the multimedia messaging application Snapchat can be used in a socially exclusionary way. For example,

> Someone might say something in class that they think is funny, then all of a sudden that's going out [on Snapchat] and they're sort of mocking that person. So it might even be a conversation between two people that's about someone else. So, yeah, that's—because you can then take a screen shot of it—we've had issues in the past of things being on social media and twitter groups that are made about silly things that a student says.

In the first instance, the teacher noted that she worked with the student and the class as a whole around appropriate social use of the iPads. In the second instance, the teacher noted that she is very careful about monitoring what is on the students' screens. In a classroom observation, the researcher also noted posters about digital citizenship. Both teachers noted these issues are new to them and they are not always sure how to handle them. Such issues prompted one teacher to note that the social impact of the iPads has been more difficult than the academic impact.

Discussion

Summary of Results

The results from the surveys, focus groups, and interviews were very similar. Students noted that the iPads had changed learning in terms of increased equity and inclusion, and/or had helped their learning because of the impact on equity and inclusion. The majority of elementary teachers and administrators felt that iPads had increased equity and inclusion; secondary teachers were less sure of the impact. Note though, that secondary teachers were newer to the initiative and there were fewer of them. Elementary teachers, secondary teachers, and administrators noted specific benefits such as increased equity, curriculum access, perceptions of sameness, communication and collaboration, positive emotional affect, more access than with SEA equipment, and increased access to technology, including more access at home. A negative impact was potential difficulty for students who struggle with self-regulation. The focus groups with coaches spoke to themes of better academic inclusion, increased communication and collaboration, more positive emotional affect, improved access, and better organization, as well as some negative implications. The interviews with teachers spoke to the themes of academic inclusion, social inclusion, and equity. The interviews also revealed the potential for iPads to be used in socially exclusionary ways.

Impact of the iPads on Equity

Students, teachers, coaches, and administrators indicated that the iPads had increased equity in their schools. That is, students who would not have been able to afford a device prior to this initiative now had the same access to the Internet and iPad features as did their peers. Given differences in access to technology and the Internet in Canada (Chen et al., 2014; Statistics Canada, 2013), creating more equitable access is important. It is important because it allows all students the same access to the potential benefits of technology (Melhuish & Falloon, 2010; Meyen & Greer 2010), and also because students no longer feel that they "look different" from their peers because they cannot afford common devices. Indeed, small markers of difference that teachers thought might still play a role, such as decorative iPad cases, did not turn out to be an issue.

Impact of the iPads on Academic Inclusion

Data from this study shows that students, teachers, coaches, and administrators believe that the iPads can be used to support the academic inclusion of students with

exceptionalities through differentiation, choice, and student engagement in learning. In terms of differentiation, teachers were able to represent information for students in a variety of ways, and students were able to express their learning in a variety of ways (see CAST, 2017). The level of difficulty of material could also be adjusted to meet each student's need. In terms of choice, the iPads facilitated teachers' ability to offer a range of options to students, both in terms of representation of content and expression of learning, and in terms of topics, level of difficulty, place of work, applications used, and so on. Such choice has the potential to support students' learning, as it allows students to choose in accordance with their own strengths and weaknesses (CAST, 2017; Evans & Boucher, 2015). Student choice is also an important component of self-determination and thus supports self-regulated learning (Perry & Drummond, 2002) and motivation and engagement (Evans & Boucher, 2015). In order to have these positive effects, choice must be meaningful, relevant, and not overwhelming (Evans & Boucher, 2015; Perry & Drummond, 2002). Finally, in terms of engagement, the iPads increased student engagement both because of the engaging nature of the technology itself and because of the increase in differentiation and choice.

Our study expands on the Alberta Education (2012) report, which presented teachers' perspectives on why they use iPads in the classroom, by probing in multiple ways (questionnaires, focus groups, interviews) and with multiple groups of people (students, teachers, coaches, administrators). Our study also provides quite detailed data about specific approaches (e.g., differentiation, leveled content, formative assessment, and facilitation of communication) to support teaching and learning in an inclusive classroom. Another difference is that the context for the two studies is quite different; the teachers in the Alberta Education report were those who had voluntarily chosen to use iPads in class, whereas teachers in this study were part of a district-wide initiative. The teachers in this study thus represent a broader group, in that they likely include people who would not have chosen to include iPads on their own initiative.

Students, teachers, coaches, and administrators in this study believed that technology can be used in the regular classroom to support the academic inclusion of students with exceptionalities through the use of particular applications for students with particular exceptionalities (e.g., text-to-speech applications for students with learning disabilities; communication applications for students with autism and/or developmental disabilities). The current study adds to the body of special education research on the use of technology for students with exceptionalities (Alzrayer et al., 2014; Haydon et al., 2012; Lorah et al., 2015; O'Malley, Jenkins, et al., 2013) by documenting how the technology can be used in inclusive settings. It should be noted that students were not tracked individually in this study, as they were in most of those studies, but the same benefits were noted in aggregate form.

There were some indications of potential negative impacts from the iPads. These included greater difficulties for students who struggle with self-regulation and a masking of difficulties (e.g., making students' work look organized when in fact it was not). These are significant issues, which need to be acknowledged in research and also need to be addressed in   professional development about technology. Researchers and teachers might both consider how to reduce these negative impacts in the classroom environment.

Impact of the iPads on Social Inclusion

Most of the data from this study indicates that the iPads have had a positive impact on social inclusion. Sometimes this increased social inclusion followed from increased equity and academic inclusion. That is, students were no longer stigmatized for not having or having technology. Note that the responses demonstrate how technology can be seen both as a positive marker (for students who can afford to have one for pleasure) and as a negative marker (for students who use it as assistive technology). Students who now had a device, who could not have afforded one previously, did not stand out on that basis any longer. Students who previously had technology for assistive purposes may have felt uneasy using it beforehand (see Barden, 2014; Cawthon & Cole, 2010). Students, teachers, coaches, and administrators noted that these students were no longer distinguishable from their peers, in that everyone had technology. Moreover, they noted, the iPad allowed a certain privacy in that students could no longer tell what classmates were working on.

Interestingly, in several instances our data documents an increase in students' communication and collaboration with one another since the introduction of the iPads; this includes communication and collaboration between students with and without exceptionalities. It seems that the iPad—through specific applications, the "cool" factor, and perhaps by disrupting existing routines and assumptions—has facilitated such social inclusion.

Some of the data also captures instances in which the iPads had actually exacerbated social exclusion. One instance had to do with a student sending what her peers perceived to be too many messages via the iPads, with the result that they blocked her from communicating with them. This issue was resolved by the teacher and students involved. The other instance had to do with students using instant communications to make fun of students in class as events occurred. These communications were not directed at any students in particular, on an ongoing basis, but rather occurred frequently among various members of the class. The teachers involved in both instances noted that the devices would require ongoing support and instruction regarding their appropriate use. None of the data we collected indicated any instances of ongoing social exclusion or bullying, even when we prompted for problems or challenges associated with the iPads. That is not to say that instances did not occur, but they were not mentioned in any of the data.

Limitations of the Research

One of the limitations of this research is representativeness. For the surveys, we had a variety of response rates, from approximately 75% (elementary teachers) to 28% (secondary teachers). In the cases in which the response rate was low, it is less clear how representative the results are of the stakeholder group as a whole. For the classroom observations and teacher interviews, we asked coaches to nominate teachers based on their use of iPad practices that support equity and inclusion. This was an intentional choice, made in order to capture positive pedagogical practices with the iPads, but the data were not intended to be representative of the ways in which the iPads are being used across the district. The fact that there is significant convergence

of the findings, from across participant groups and data sources, suggests that despite limitations related to representativeness, we have indeed captured the ways in which iPads can be leveraged to support equity and inclusion as well as the potential difficulties associated with this undertaking.

A second limitation has to do with social desirability bias. That is, many participants would plausibly know the types of responses that might be considered desirable and undesirable. The questionnaires were completely anonymous, which should mitigate that issue somewhat. For the focus groups, participant identity was kept confidential in research and professional reports, which might mitigate that issue. In the interviews, every effort was made to maintain an open dialogue that would allow for negative issues to be raised. The fact that negative issues associated with the iPads arose in every data source provides some evidence that participants did feel comfortable sharing these perspectives, as well as those that highlighted more positive findings.

Future Research

Future research should continue to investigate the impact of large-scale (e.g., district-wide) technology initiatives on equity, and especially on inclusion. This study represents an initial investigation into such an initiative, but more research is needed. One avenue of research might be to follow particular students in detail and with depth to get a nuanced picture of how they use technology to support their learning throughout the day (e.g., in a variety of ways and through a variety of subjects). Another avenue of research might be to take a closer look at the relationship between reported benefits of technology, in terms of inclusion, and changes in achievement results or changes in specific skills and competencies. A third avenue of research might be to investigate the professional development of pre-service and in-service teachers with regard to the use of technology to support equity and inclusion. Research could investigate current professional development opportunities regarding technology, equity, and inclusion; the effectiveness of such professional development; and what types of professional development would be valuable in the future.

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Disclosure

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