September 2020

Plugging In:

Empowering communities to ensure digital literacy access for youth

brookfield institute
for innovation + entrepreneurship

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STEERING COMMITTEE

+ Actua
+ Boys and Girls Clubs of Canada
+ Canada Learning Code
+ Information and Communications Technology Council (ICTC)
+ Ministry of Education, Government of Ontario
+ Shopify
+ Toronto Public Library
+ United Way Toronto and York Region
+ University of Toronto
+ YMCA of Greater Toronto

SITE PARTNERS

Boys & Girls Clubs of Hamilton

Boys & Girls Clubs of London

tpl toronto public library

Belleville Public Library & John M. Parrott Art Gallery

Greater Toronto

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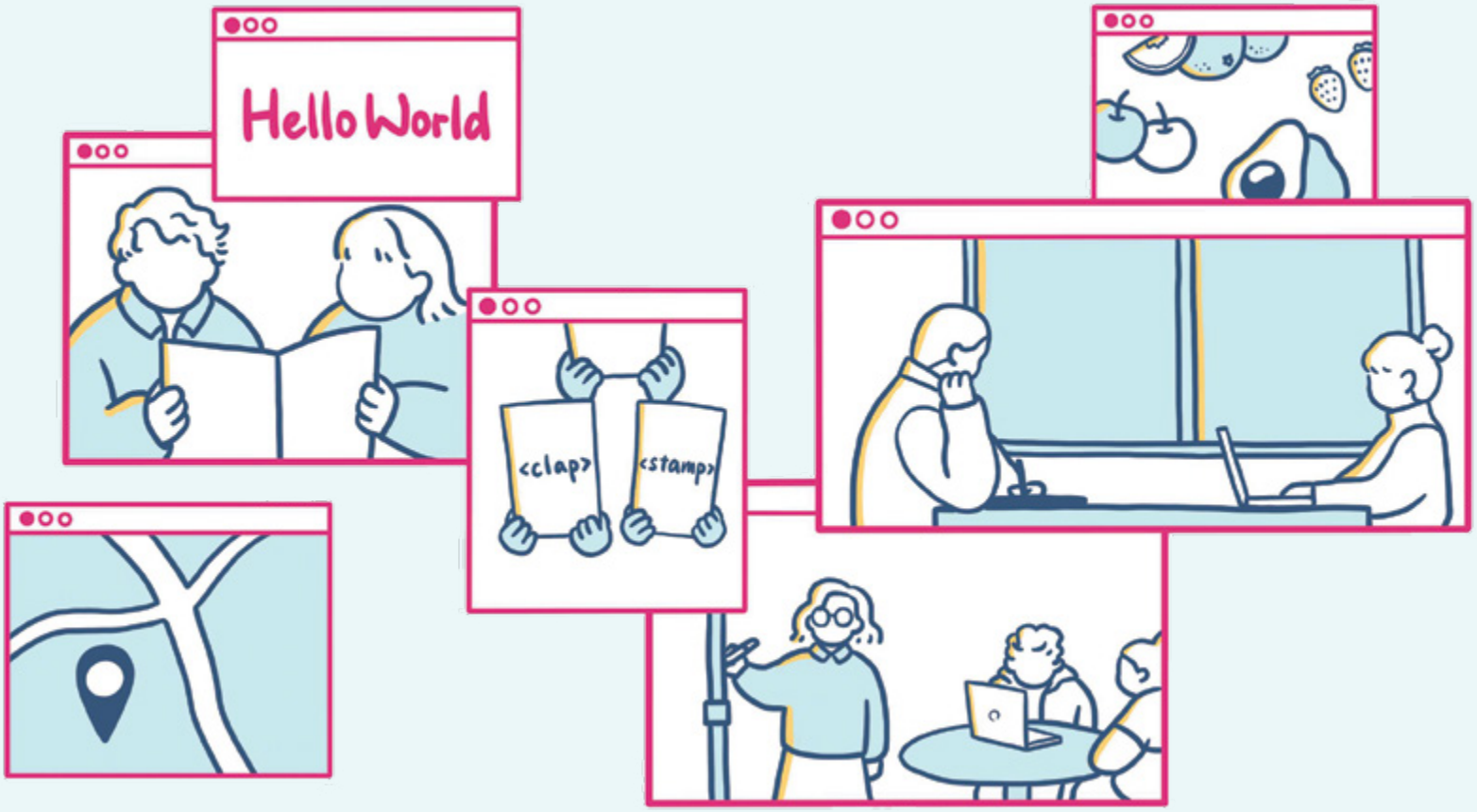


INTRODUCTION

The Digital Literacy + Coding Pilot tested a flexible, scalable model for delivering effective and accessible digital literacy and coding education in after-school settings in partnership with youth-serving community organizations across Ontario. The pilot reached over 2,400 youth between February 2018 and October 2019, many of whom were underserved by, disengaged from, and/or experiencing barriers to accessing formal digital literacy education.

There is a wealth of digital literacy programming in the province—however, the majority of it is offered through formal K–12 education, for-fee after-school, summer, and March break programs, or intended for more advanced or older learners.[1] Even within K–12 schools, the implementation of digital literacy and coding education remains fragmented and uneven. Variations between school boards, schools, and individual teachers can impact content, learner progression and confidence, and the availability of computers for in-class use. The Digital Literacy + Coding Pilot—later renamed "Digitally Lit" by participants—filled a vital gap in the ecosystem by using an informal after-school model at no cost to participants, operating out of existing community spaces rather than using a traditional classroom format, and focusing on introductory lessons with the flexibility to adjust to participant knowledge. This helped ensure that the program was welcoming and not intimidating, particularly for youth who are disengaged from or not regularly attending school, or those unlikely to seek out additional formal learning opportunities. The pilot was designed to reach youth facing a range of barriers, including those who are not usually able to access programs due to fees, a lack of local opportunities to which they can easily and safely commute, or obligations such as caregiving or part-time work.

The pilot convened experts in program delivery, community infrastructure, and industry to design a program to augment K–12 curriculum in an engaging recreation-based format, (re)engaging youth in digital literacy and encouraging further learning. Through hands-on activities, youth learned HTML and CSS coding, user experience design, digital citizenship, and privacy and security, all the while building confidence in their abilities to learn how to use and create technology. Some sites added supplemental material in 3D printing, programming, and video game design, reflecting instructor expertise and participant interest. To support program delivery, community sites were equipped with technology, classroom infrastructure, curriculum, skilled instructors, access to a central program coordinator, and the expertise of an external Steering Committee. Every site reported that without this funding and support, they would have been unable to run this program.

Community-based after-school spaces present a unique opportunity to drive increased access to digital literacy and coding education for youth. They excel at providing interest-driven learning opportunities and engaging youth who might otherwise not have access. They also offer a higher degree of flexibility in instruction, format, and modes of engagement than formal classrooms. Across six sites, five communities, and three types of youth-serving community organizations (public libraries, Boys and Girls Clubs of Canada, and the YMCA), this developmental pilot provides systems-level and programmatic insights into delivering digital literacy programming in the after-school space, and demonstrates the value of catalytic and ongoing funding. The pilot tested a unique partnership and supportive backbone model for augmenting technical infrastructure and program delivery capacity in community organizations. At the site level, the cohort model enabled iteration of the curriculum and delivery approach, testing different schedules, formats, outreach approaches, teaching styles, and additional content, achieved by accommodating localization to ensure youth engagement.

Through this final report, we share what we have learned about designing, testing, and implementing informal community-based digital literacy programming for youth. We outline what policymakers, funders, and program delivery organizations should know about how to support effective, accessible, and inclusive programs in the future.

This pilot and much of the Brookfield Institute's accompanying digital literacy research were supported by generous funds provided by the Fukakusa-Belbeck family and a matching contribution from the Government of Ontario.

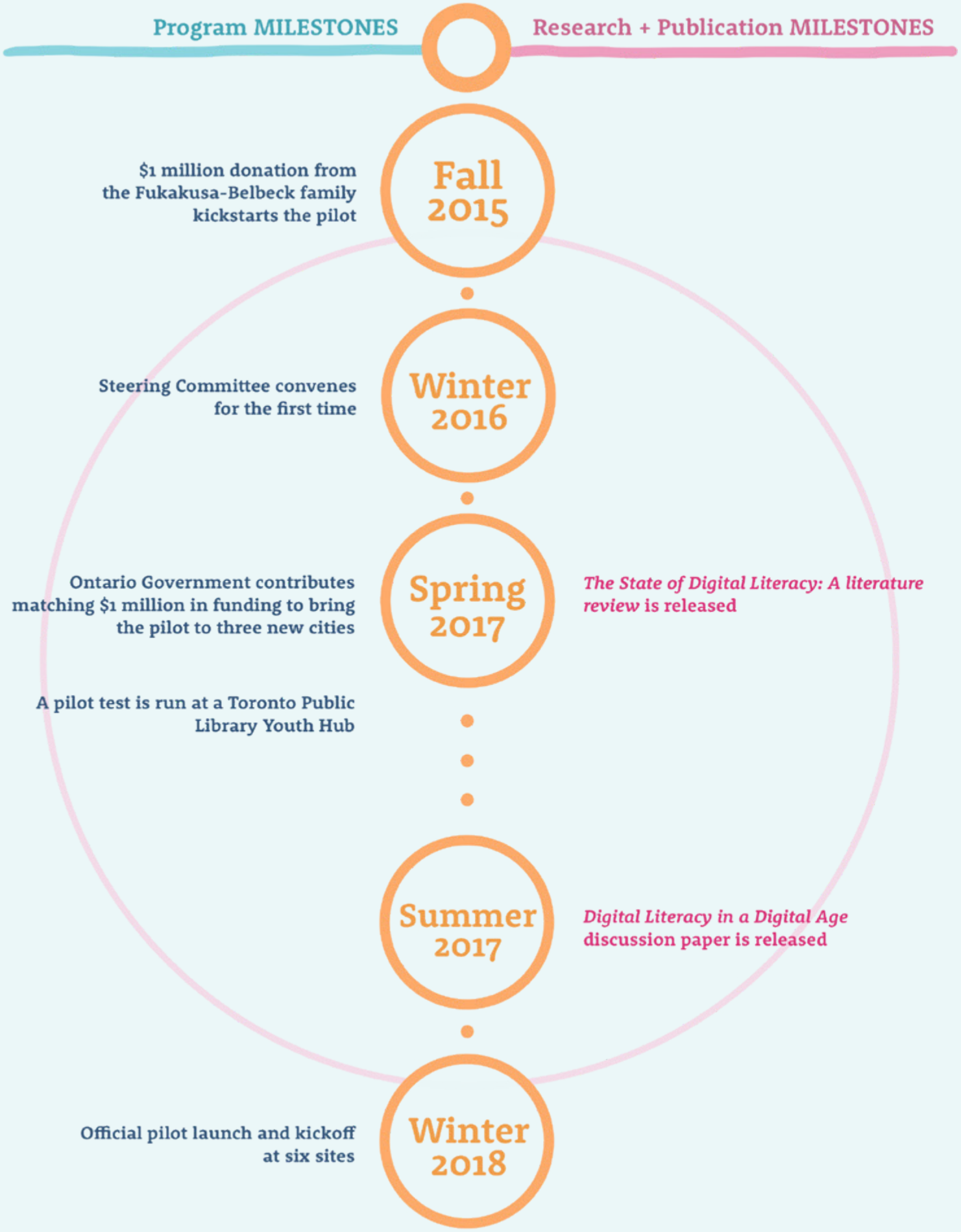
METHODOLOGY

The results discussed in this report are based on a formal evaluation of the Digital Literacy + Coding Pilot design and implementation conducted by the University of Chicago's Outlier Research & Evaluation team. Outlier has done extensive research on computer science education and the implementation of innovative educational interventions across the United States and Canada.

The evaluation used a multi-method design and multiple sources of data collected through site visits and video/telephone interviews, including the following:

+ Interviews with program instructors and partner organization leaders
+ Program instructor logs and observations
+ Focus groups with youth participants, and pre- and post-program questionnaires
+ Materials written about and for the program, including curriculum drafts and background policy papers
+ Interviews with the Program Lead and other Brookfield Institute pilot staff

Research was supplemented by exit interviews with community site partners and the Program Lead, Quarterly Insights Blogs which documented the pilot's progress, analysis from the Brookfield


Program MILESTONES
Research + Publication MILESTONES
$1 million donation from the Fukakusa-Belbeck family kickstarts the pilot
Fall 2015
Steering Committee convenes for the first time
Winter 2016
Ontario Government contributes matching $1 million in funding to bring the pilot to three new cities
Spring 2017
The State of Digital Literacy: A literature review is released
A pilot test is run at a Toronto Public Library Youth Hub
Summer 2017
Digital Literacy in a Digital Age discussion paper is released
Official pilot launch and kickoff at six sites
Winter 2018

Program MILESTONES
Research + Publication MILESTONES
Summer 2018
Formal program evaluation begins
Levelling Up: The quest for digital literacy report mapping digital literacy education and training in Canada is released
Level Up: After Digitally Lit(erate) zine is published to help participants navigate post-pilot program options
Fall 2019
Cohorts are completed at all six sites—over 2,400 youth participate in total
I, Human: The digital and soft skills driving Canada's labour market is published
Winter 2019
Program evaluation is completed and exit interviews are conducted with sites
Fall 2020
Final pilot report is published

Institute's research on the education and training landscape for digital literacy, and insights from the pilot's Steering Committee. This research design created space for the inclusion of differing perspectives and information held among the many actors involved in the pilot.

Data collection

It is important to note that the pilot was intended to test a unique delivery model and curriculum—it was not designed to track longitudinal data on post-program participant outcomes, or for comparisons between sites or between this program and others. Across the pilot, data collection for evaluation purposes was a challenge at the site level, in large part due to the distributed model and issues inherent in working with this demographic group through after-school programming. The pilot prioritized creating safe and welcoming informal spaces, and did not require youth to enroll or register in the program. This limited site-level data collection, including on participants' gender identities. The pilot evaluator reported that they were unable to effectively gather consistent participant data (including self-reported learning outcomes) due to site-level challenges in obtaining parental consent for the pre- and post-participation questionnaire. In response, they implemented a second post-participation survey, which expanded the response pool but ultimately faced similar challenges. Instructors were strongly encouraged to compile weekly online logs to document adaptations to the curriculum, challenges, attendance, youth participation, and ongoing reflections, but not all instructors completed these consistently.

REPORT STRUCTURE

This report is structured as follows:

1. We situate the Digital Literacy + Coding Pilot in the context of after-school spaces in Canada and our ongoing digital literacy and coding research, and describe the programming gaps that the pilot was intended to fill.

2. We describe the Digital Literacy + Coding Pilot model in detail: what it was, why we created it, what it intended to achieve, the partners we engaged, and the design decisions that went into its development.

3. We examine the pilot's results, impact, and how it was implemented across sites. This portion of the report also shares key insights and lessons regarding the design and implementation of the Digital Literacy + Coding Pilot and potential implications for future digital literacy programs for youth in Canada.

4. We propose recommendations for organizations that may be planning to design, implement, or fund digital literacy programs for youth.

2 years

February 2018 – October 2019

6 sites in 5 communities

across Ontario:

- Belleville
- Hamilton
- London
- Sudbury
- Toronto

2,406

participants overall from

48

cohorts

882

boys

335

girls

1

nonbinary participant

1,288

participants from

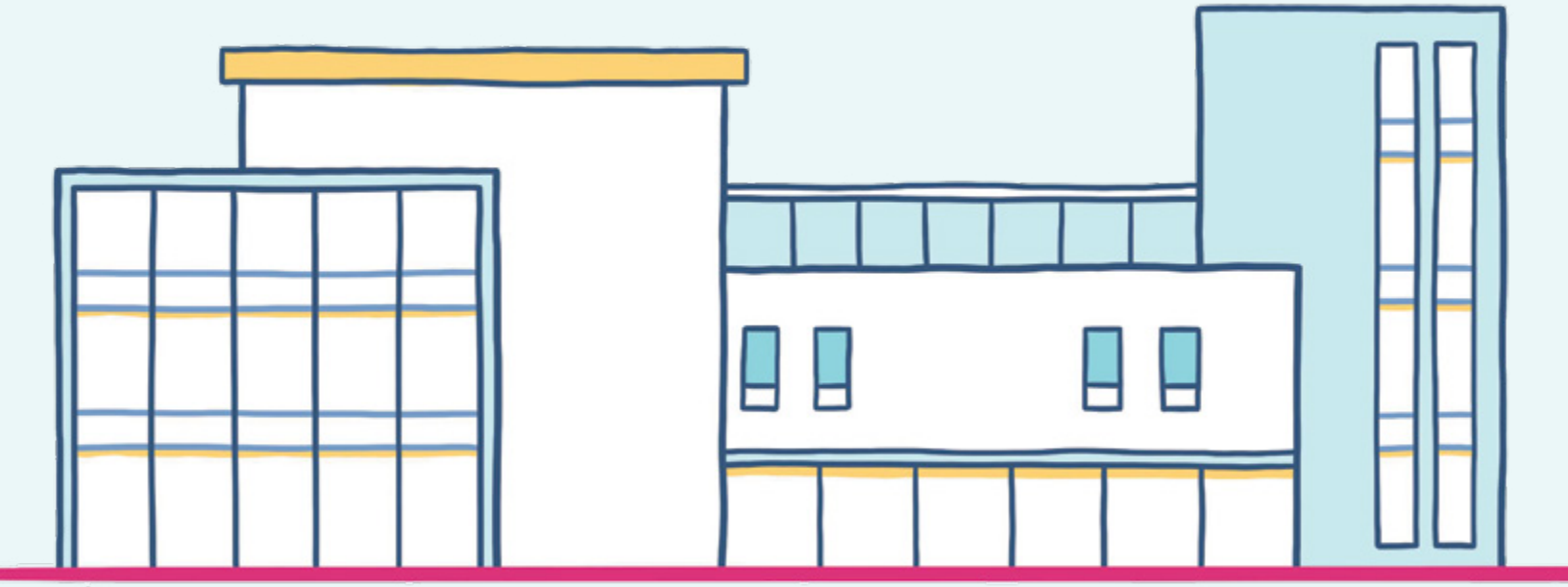
113

March break, summer break, and pop-up events*

**gender identity not tracked*

Skills taught

- Building safe spaces
- Introduction to and application of HTML
- Introduction to and application of CSS
- Introduction to user experience design
- Privacy and security awareness
- Introduction to digital literacy
- Digital citizenship



WHY RUN A PILOT?

DIGITAL LITERACY + SKILLS

A foundational level of digital literacy is critical for social, civic, and economic participation.[2] For youth, a combination of baseline, workplace, and professional skills are needed to engage online and perform well in middle and high school, particularly as curricula shift to online content, tools, and delivery models. However, young people engaging with digital tools and networks are not exclusively building digital skills—they are also developing skills related to social interaction, problem-solving, communication, artistic expression, and self-directed activity. This type of engagement also shapes their expressions of individual identity and creativity.

Digital skills are a complex network of related abilities and expertise that continue to evolve as technology advances. Individual learners can advance their skills through education, training, self-study, and practice, but development is not always linear—learners can develop and possess skills at varying levels of proficiency and in different combinations. For instance, some young learners build beginner "professional" coding skills and computational thinking alongside baseline skills through coding games and programmable robot toys. As adults, programmers might "catch up" on workforce skills and software, learning design software mid-career, while non-programmers might learn coding as a workforce skill for data analysis and website design. This process of gradually improving one's digital skills is reflected in the job market. For example, the digital skill most often sought-after in Canadian job postings—proficiency with Microsoft Excel—is often asked

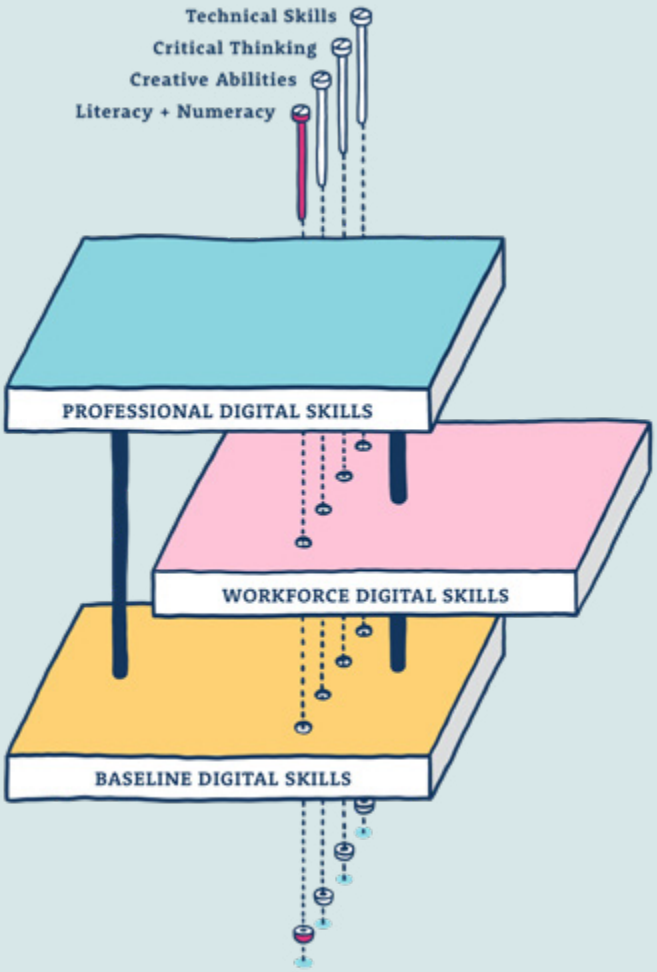
The Brookfield Institute's working definition of digital literacy

The ability to use technological tools to solve problems, underpinned by the ability to critically understand digital content and tools. This can include the more advanced ability to create new technological tools, products, and services.

Baseline digital skills: The skills needed by everyone to participate in an increasingly digital economy. This includes being able to confidently interact with technology, such as understanding how to find information, conducting a search on an online search engine, communicating with others, and using a variety of existing software and applications.

Workforce digital skills: The occupation-specific skills required by a rapidly growing proportion of the workforce. These skills can include tasks that use spreadsheets, digital design, and customer relationship management (CRM) software.

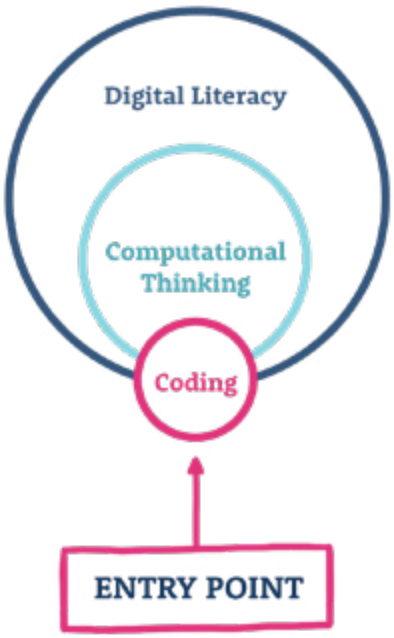
Professional digital skills: The skills needed to develop new digital technologies, products, and services. This includes, for example, skills used by software developers and data scientists.



for alongside SQL, a more advanced technology used for working with data. In turn, SQL proficiency is commonly asked for alongside JavaScript or Microsoft C# competencies, both of which are even more digitally intensive software development skills used.[3]

Importantly, these skills do not exist in a vacuum. Each category of digital skills in this framework is underpinned by traditional literacy skills (reading, writing, and numeracy) as well as critical thinking, creative abilities, and technical skills. They also depend on reliable access to the internet, digital technology, and learning opportunities. This is also reflected in the labour market, where job postings often seek both digital and non-digital skills that complement the business functions of technology.[4]

Figure 1: **Focusing on coding**



The pilot focused on exposing youth to introductory concepts of digital literacy using hands-on coding with HTML and CSS as the primary entry point to computational thinking. Coding is a technical competency of digital literacy that offers opportunities for hands-on learning and tangible educational outcomes. Examples of how this was applied in the pilot curriculum can be found on page 29.

Computational thinking is an approach to solving problems, designing systems, and understanding human behaviour that draws on computing concepts.[5] Drawing on logical reasoning, algorithms, decomposition, abstraction, and identifying patterns, using a computational thinking approach would break larger problems into smaller parts and plan specific steps to solve them.[6] Computational thinking is considered to be a bridge to understanding how computers and technology work—while programming languages will continue to change, the fundamentals of solving problems with computers do not.[7]

WORKING IN THE DIGITAL LITERACY + CODING EDUCATION LANDSCAPE

In Canada, formal education from pre-kindergarten to high school provides a substantial amount of digital literacy education. Opportunities include for-credit courses in computer science and digital creative arts and communication, after-school robotics and cybersecurity competitions, and the use of technology across the curriculum to support learning in other subjects (e.g., e-learning and online courses). However, implementation across the country remains fragmented and uneven. Differences between school boards, schools, and individual teachers can have a huge impact on learner progression, confidence, and even reliable internet access or the availability of computers for in-class use.[8] Young people may have limited access to technology and learning opportunities at school and at home.[9] Some young people may not attend school regularly or at all for various reasons, which further limits their exposure to digital literacy and coding training. It is also important to note that, across Canada, there is no universal agreement on how to introduce digital literacy and coding into the formal education system or how much youth need to learn.

In addition to digital literacy and coding learning led by schools, organizations outside of the formal education system offer after-school opportunities for youth. These programs have their own sets of benefits and challenges. They can offer more flexible formats, as well as different content and skills than schools, since formal curricula can be slow to change and the necessary resources and technology can be out of reach for underfunded schools.[10] After-school programs in the informal education system can more easily adapt to the continuously changing digital landscape, and reach learners who might not be engaged in digital literacy, coding, or STEM (science, technology, engineering, and math) education.

Barriers to accessing digital literacy education

However, barriers to access can be significant. There may not be any digital literacy and coding programs locally available for those who are interested in or need informal education opportunities. Where there are options, they might be inaccessible due to distance, lack of transit options, or financial barriers related to fees. Access to digital literacy and coding education can be difficult for those outside of major cities and those without the means to pay. Low levels of digital literacy tend to overlap with other aspects of socioeconomic marginalization, and there is a risk that those who are already being left behind as the economy digitizes will be further marginalized.[11]

Barriers to youth participation in digital literacy and coding education opportunities can include:

+ A lack of digital access (to the internet, data, hardware, and software at home or at school)
+ A lack of access to education and training opportunities (i.e., due to financial and geographic barriers, travel time to programs,

and obligations such as caregiving or part-time work)

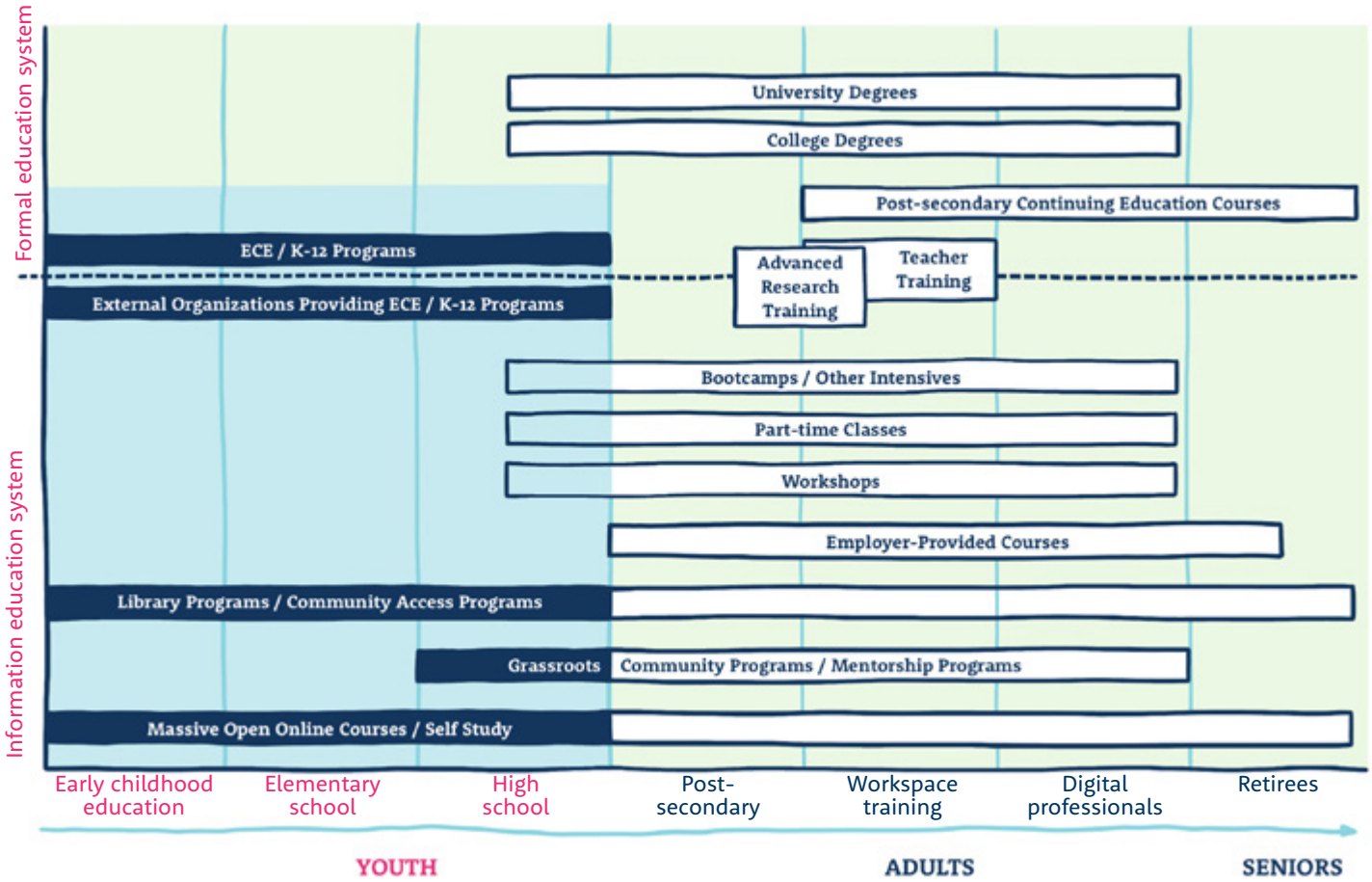
+ Low literacy or numeracy levels
+ A lack of support and encouragement from parents and caregivers
+ Not seeing themselves reflected in the field, or in the groups where learning opportunities are offered
+ Intimidation and fear of failure
+ A lack of clarity regarding how education and training opportunities fit together, and how a learner could progress from one to the other to create a learning pathway

FOCUSING IN ON THE AFTER-SCHOOL SPACE

Identifying and incorporating after-school programs and services, particularly in youth-focused community spaces, was central to the design and implementation of the Digital Literacy + Coding Pilot. It is useful to understand the diverse nature of after-school programs, including where they overlap with digital literacy and coding education, in order to better understand the context in which the pilot operated.

After-school spaces offer a safe and structured environment outside of home and school in which young people can decompress, exercise autonomy, build relationships, and explore and develop skills and tools that build on or extend beyond formal

Figure 2: **Situating the after-school space within Canada's education and training landscape**



education.[12] They may provide meals, physical activity, and mentorship from peers and adults. For youth in early and middle years, some structured community programs serve a childcare function, ensuring that youth have a safe place to be while their parents and guardians are at work.[13] Many after-school programs support participants in social, emotional, health, and academic realms.

In Canada, after-school programs range in the balance of services or programs they offer, who they serve, and how they support youth development and respond to local contexts.[14] Programs can be offered by private companies, the K–12 educational system, public libraries, and non-profit organizations, including grassroots, community, faith-based, and cultural organizations. Many of the programs receive funding or other support from federal, provincial, and municipal governments, and First Nations bands.[15]

Characteristics of high-quality after-school programs

After-school programs have a range of objectives, including providing care (particularly for school-age youth) and supporting young people's development.[16] They create safe, supervised spaces for youth, and encourage participants to reach their full potential in developing the skills and knowledge necessary to function well personally, socially, academically, and professionally.

Common characteristics of impactful and effective youth-serving community programs:

+ **Affordability** is central to providing learning opportunities and support to all youth regardless of economic status.[17]

+ **Physical and psychological safety**, which are essential to attracting young people to programs and driving consistent attendance. Implicit to safety is accessibility: facilities that are convenient, safe, and affordable to reach. This includes the cost of transit, transit coverage, and safe walking routes.[18]

+ A **clear and consistent structure**, rules, and expectations, as well as boundaries that take into account the age and developmental maturity of the youth involved. They have predictable guidelines for behaviour that often help participants feel safe and comfortable, and structures that are appropriate for the program's focus and curriculum.[19]

+ A **format that is appropriate to the content, focus, and target participants** improves participant retention. Some programs are designed as drop-in sessions where participants can come and go and participate in activities of their choice, while other formats require a greater commitment. Hours of operation that work

for young participants also matter. This includes balancing sufficient frequency to sustain interest while not overburdening participants, and not operating too late in the evening.[20]

+ Having **consistent staff who understand the cultural context of the local community** and the young people accessing programs and services can help build strong relationships with participants and encourage them to return.[21] A low ratio of staff to participants is also beneficial to ensure that learners have adequate individualized support.

+ **Leaders and staff who are able to engage parents and guardians, family members, and the broader community** to help young participants build community ties through programs.[22] For example, they could host orientation sessions for parents and guardians, inform them of participant progress, or provide opportunities for them to participate in special events as attendees, guest speakers, or volunteers.[23]

+ **Opportunities for skill-building** across subjects, including sports, art, music, academic improvement, and career preparation.[24] Many programs are designed to attract youth through their content or focus (e.g., digital literacy and coding), while the curriculum fosters the development of additional soft skills such as communication, creativity, and problem-solving.

+ **Monitoring and evaluating** progress regularly, which can help community programs ensure that lessons are captured and implemented.

BUILDING THE PILOT

The pilot's hypothesis was that by working with existing youth-serving community organizations (public libraries, Boys and Girls Clubs of Canada, and the YMCA), it would achieve two objectives: reaching more youth who would otherwise not have access to digital literacy and coding after-school opportunities; and reaching youth in spaces where they might already be using services and programs, where they feel comfortable, and where they have existing relationships with staff and community members.

Between February 2018 and October 2019, the Digital Literacy + Coding Pilot was offered to multiple cohorts of youth at six sites in five communities across Ontario. The goal was to ensure that over 1,000 youth who are underserved by, disengaged from, and/or experiencing barriers to accessing formal digital literacy education be involved over the two-year pilot period, with at least 50 percent being participants who identify as girls.[25] Ultimately, more than 2,400 youth received the curriculum through weekly, bi-weekly, weekend, and school and summer break intensive programs as part of the pilot.

The pilot model's core elements were:

+ Working with local community organizations that have existing relationships with youth in the target population (e.g., public libraries, YMCAs, Boys and Girls Clubs of Canada).

+ Focusing on the needs of youth currently

underserved by or experiencing barriers to accessing existing digital literacy programs.

+ Using coding as an entry point into a broader set of skills including web design, user experience design, digital safety and privacy, problem-solving, and critical thinking.

+ Providing technological resources and physical amenities, supported by site staff and instructors.

The Brookfield Institute's role was to develop, test, evaluate, and iterate a model for this pilot, as well as build partnerships and provide central support for partner delivery organizations, pilot sites and staff, and instructors.

Steering Committee members identified youth between 12–15 years of age as an underserved demographic and a key age group for sustaining or cementing interest in digital literacy and coding. The goal was to inspire and prepare participants for further learning and engagement in digital literacy education opportunities, and build their confidence in their abilities to learn how to use and create technology. Ultimately, the pilot aimed to encourage future participation in, for example, high school courses in creative communications and computer technology, helping to prepare youth for a wider range of post-secondary education opportunities and for workforce participation in a digitizing economy.[26]

WORKING WITH PARTNERS

The Steering Committee

At the outset of pilot planning, the Brookfield Institute convened a Steering Committee to advise on the overall scope, design, content, plan, and evaluation framework. To ensure that partners with a range of expertise were involved in the design and implementation process, among those invited were: organizations focused on digital literacy and coding education; community-focused organizations delivering after-school programs; and curriculum development, education policy, evaluation, and industry experts. Steering Committee members represented the following organizations:

+ Ontario Ministry of Education
+ Actua
+ Boys and Girls Clubs of Canada
+ YMCA of Greater Toronto
+ United Way Toronto and York Region
+ Canada Learning Code
+ Toronto Public Library
+ Shopify
+ RBC Capital Markets
+ Information and Communication Technology Council (ICTC)

Steering Committee members divided into working groups focused on program design, curriculum development, and evaluation. Throughout the implementation of the pilot, the Steering Committee met regularly to receive updates on the pilot and advise on pivots or content changes. They were also consulted on the final recommendations presented in this report to ensure that the analysis of lessons learned benefited from their diverse perspectives and expertise. A full list of Steering Committee members can be found in Appendix A.

Collaborating with community organizations

In order to understand the impact of the pilot across different locations and contexts, sites were chosen in both major urban centres and smaller communities. Two Toronto sites were selected in partnership with the Toronto Public Library and the YMCA of Greater Toronto. Pilot sites outside of the Greater Toronto Area were selected based on a number of factors. Drawing from the methodology in the Brookfield Institute's *Automation Across the Nation* report[27], the Brookfield Institute

identified Ontario Census Areas and Census Metropolitan Areas with high concentrations of occupations with the potential of being automated. Additional considerations included whether there were existing digital literacy and coding after-school programs in that area, specific site recommendations from Steering Committee members, and partner priority regions.

Table 1: **Pilot sites**

Organization	City
Belleville Public Library	Belleville
Boys and Girls Clubs of London	London
Toronto Public Library	Toronto
Kiwanis Boys and Girls Clubs of Hamilton	Hamilton
The YMCA Academy	Toronto
YMCA of Northeastern Ontario	Sudbury

More information on our partner organizations and sites can be found in Appendix B.

The pilot model: Partner roles + components

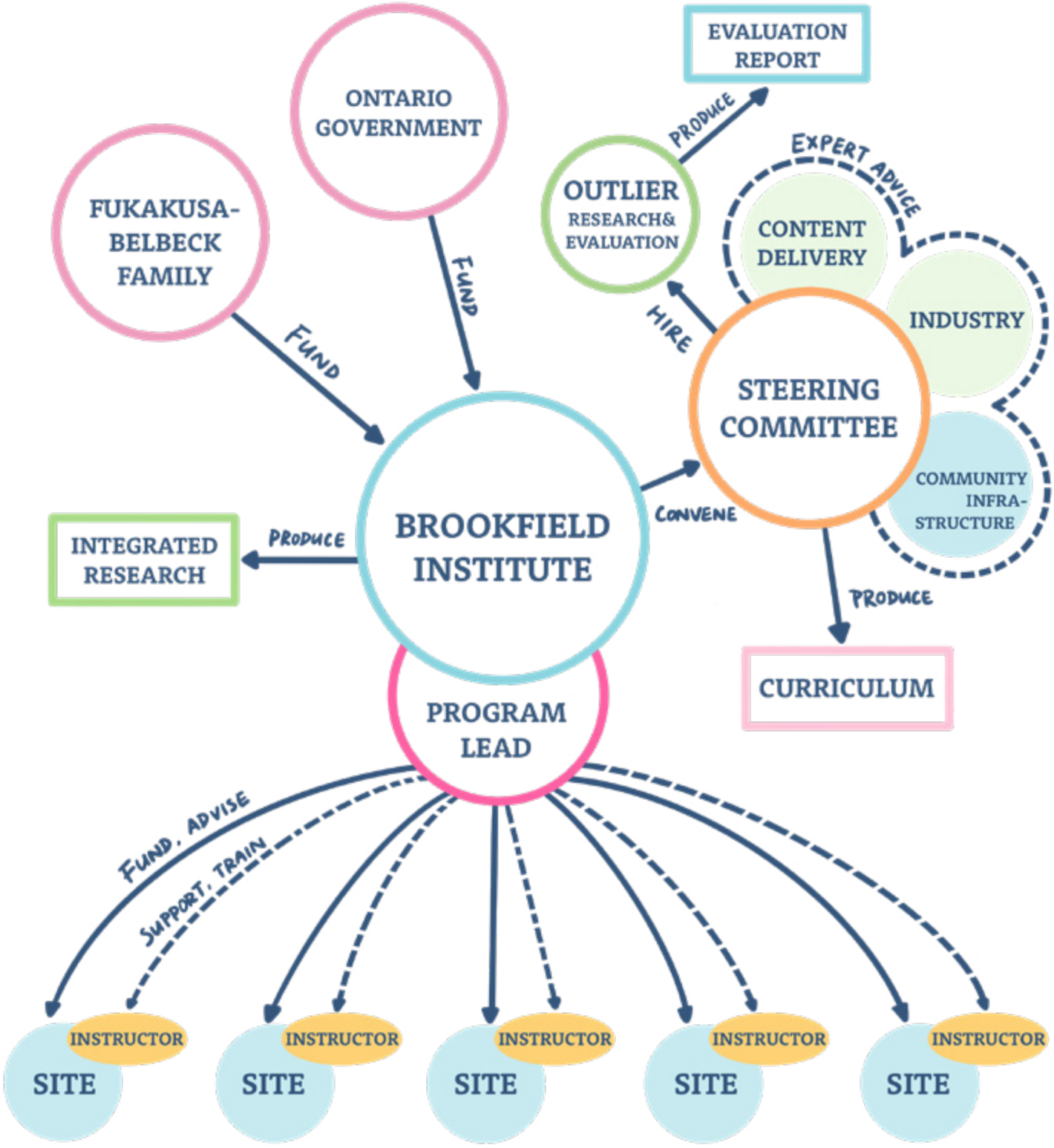
The Brookfield Institute hired a full-time in-house Program Lead to support overall management of the pilot, including curriculum development and iteration, assessment, refinement of model, and support for site teams at each location (e.g., hiring, training, and troubleshooting for instructors).

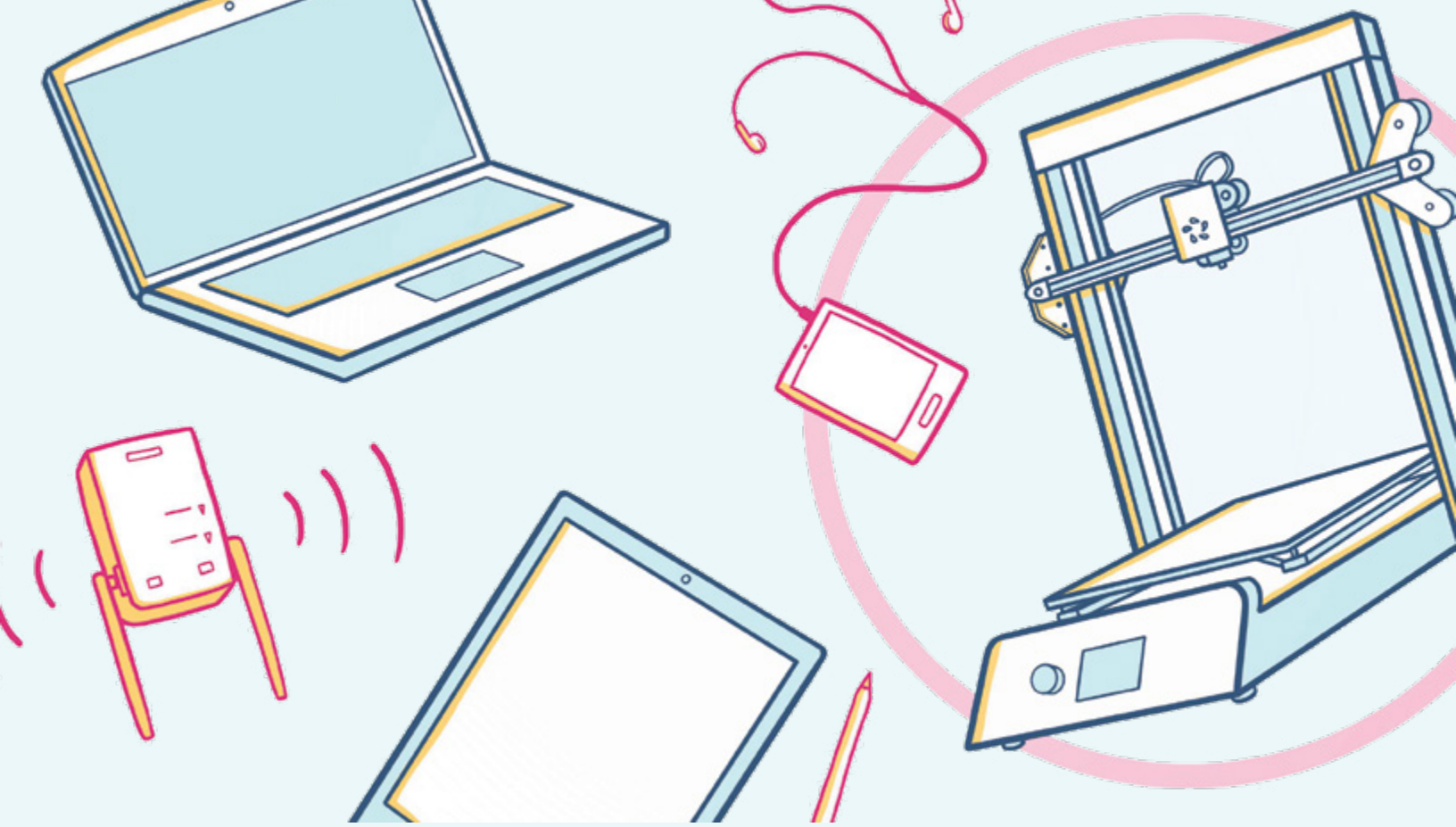
Each site team consisted of several key members: a part-time site lead (an individual already embedded in the community organization who could support the youth engagement component of the pilot), part-time operations support (also an existing community organization employee to support logistics), and a part-time program instructor to deliver the program. Instructors were employees of the community organization but were supported by the central Program Lead.

BUDGET AND RESOURCE ALLOCATION

Budgets were co-developed with each site and helped determine: staff time allocation; instructor salary; any supports needed to deliver the pilot; necessary technology and hardware (e.g., laptops, wifi boosters, 3D printers, Raspberry Pi boards[28], etc.); equipment to create comfortable after-school spaces (tables, chairs, and whiteboards, etc.); events and activities promoting the pilot; and food and transportation costs for participants. At minimum, most sites advertised that laptops, snacks, and bus fare would be provided to reduce barriers to participation.

Figure 2: **The pilot model**





RESULTS + LESSONS

The curriculum and pilot delivery were designed to be flexible and adapted by each community organization and site for their specific location's contexts, conditions, and service populations, learning and iterating from cohort to cohort. Taken together, these 48 cohorts provide valuable insights into delivering flexible and effective programming to this particular youth demographic.

> *"Being a pilot, you can't go through too many changes, but I really wish this was ongoing, especially as we landed on a formula that works. Keep providing resources that help instructors and educators teach digital literacy." —Site staff*

SUMMARY

About who the pilot reached

+ Flexibility in the target age range ensures that sites are not excluding existing participants
+ Recruiting and including girls needs to be built into program design and outreach
+ Recruiting and including participants with more significant socioeconomic constraints requires removing barriers to access
+ Coding can be an entry point for engagement and a recruitment tactic for digital literacy programs
+ Community organizations are well-positioned to engage youth who may otherwise face barriers to access
+ Cohort program models require ongoing recruitment

About participant learning + building pathways

+ Programs can help build youth confidence and interest in further learning
+ Programs can encourage youth to see themselves as technology creators
+ Youth need more guidance regarding the next steps they can take, including referral pathways, connections between programs, and available local programs

About who can teach digital literacy + coding

+ Having skilled, dedicated instructors is essential to program success
+ A co-instructor model could help build site teaching capacity
+ Instructor qualifications often vary
+ Instructor roles and responsibilities vary based on site needs and learner interests
+ The ideal instructor has a combination of technology and youth engagement expertise
+ Instructor recruitment and retention is challenging, particularly in smaller communities

About designing curriculum for after-school programs

+ Blending core digital literacy concepts with hands-on and online activities is a helpful strategy
+ Iterative curriculum development benefited from external expertise, as well as site and youth input
+ A structured, ready-to-teach, and flexible curriculum for after-school drop-in programs helps sites run digital literacy programming
+ Variation in participant skill level requires creative curriculum design and delivery
+ Supporting site capacity-building and ensuring open access to materials go hand in hand
+ Teaching in the after-school space needs to be recreation-based and not replicate a school environment

About what community sites need

+ Sites need dedicated space to run programming effectively
+ Sites need access to high-quality, reliable, and modern technology
+ New programs need to fit with how sites operate
+ Flexibility in delivery format enables sites to respond to participant needs

About supporting ongoing impact

ABOUT WHO THE PILOT REACHED

The pilot targeted youth aged 12–15, with an emphasis on under-served youth who might not otherwise have had access to digital literacy and coding education. In Ontario, youth identified as in need of more programming support include young women and girls, newcomers, Indigenous youth, Black youth, youth facing mental health challenges, youth involved with the criminal justice system, homeless youth, and middle-year youth aged 11 to 15. Additionally, minimal involvement from parents or caregivers—for example, due to long working hours or a lack of financial resources to support youth activities–can limit young people's engagement with after-school programs.[29]

By partnering with community organizations already running after-school programs, we built on many participants' existing trusted relationships with sites and instructors to engage them in new programming. We intentionally partnered with youth-serving organizations that were likely to work with youth who met our eligibility criteria. At the YMCA Academy, an alternative school offering wraparound special education support, participants were all enrolled day learners and some cohorts incorporated the curriculum into their school programming. Participants at the Hamilton Boys and Girls Club were part of "Abacus", an educational and leadership development program that supports high school graduation and post-secondary enrolment. At other sites (e.g., Belleville, Sudbury) outreach required external engagement including to local Indigenous organizations and the Chamber of Commerce, giving presentations at schools and libraries, and publishing articles in the local paper. Participant questionnaire data from the Belleville Public Library and the Toronto Public Library, which had the highest response rates, showed that most participants found out about the program from a parent, guardian, or other family member.

Overall, the pilot reached 2,406 youth in 48 cohorts and 131 intensive programs (which include March Break camps, summer camps, and Saturday drop-in programming[30]). Of sites that reported gender, 782 participants identified as boys, 335 identified as girls, and one identified as nonbinary. Overall, 29.96% of reported participants identified as girls or nonbinary. At the site level, participant gender balances varied from 22.83 percent to 44 percent, with some cohorts reaching as high as 50 percent.

Table 2: **Pilot participants' gender identity distribution**

Site	Cohorts run	Participants identifying as boys	Participants identifying as girls	Participants identifying as nonbinary[31]	Total participants	% of girls and nonbinary participants
Toronto Public Library	8	523	218	0	741	29.42%
YMCA Academy	8	28	12	0	40	30%
Belleville Public Library	9	28	21	1	50	44%
Boys and Girls Club of Hamilton	6	40	15	0	55	27.27%
Boys and Girls Club of London	5	65	40	0	105	38.09%
YMCA Northeastern	12	98	29	0	127	22.83%
Total (cohort only)	**48**	**782**	**335**	**1**	**1,118**	**29.96%**[32]
Belleville Public Library (Intensives)	131	Intensives run (March break camps, summer camps, and Saturday drop-in)			1,288	*Gender not tracked*
Total (with intensives)					**2,406**	

Flexibility in the target age range ensures that sites are not excluding existing participants

While the target population for the pilot was youth aged 12–15, some sites allowed older or younger participants to attend where there was an existing participant group, youth demand, and/or insufficient eligible participants. For example, the YMCA Academy's student body ranges from grades 7–12, so the age of participants skewed slightly higher to ensure that older learners were not excluded. The Toronto Public Library advertised to youth aged 12–16, and at the YMCA Sudbury site, interested local youth as young as nine years old were allowed to join program sessions.[33]

> *"We saw interest from older youth at the club and we did open up registration from them to attend." —Site staff*

Recruiting and including girls needs to be built into program design and outreach

All pilot sites and partner organizations struggled to achieve equal participation of boys and girls, despite trying a range of outreach and retention approaches. These included having female instructors as the local face of the program, conducting dedicated outreach at local all-girls schools, and creating a welcoming learning environment. At least one site tried to offer an all-female cohort in order to provide a more welcoming space for participants, but sign-up rates were low. Two others noted in their exit interviews that a segregated approach held potential to improve outcomes for future editions of the program.

Pilot participants reflect the demographics of existing programming for the most part, as many participants were already engaged in other activities on site. One site noted that girls are, in general, harder to recruit to after-school programming, which could be related to a range of socioeconomic causes. At the YMCA Academy, which provides specialized school programming, the student population was 70 percent male, which impacted the gender balance in the pilot cohorts.

Advertising for the program was gender-inclusive in language and visuals. The Brookfield Institute provided partner organizations with sample promotional materials which included colourful illustrations of youth designed by a female illustrator. Unfortunately, sites did not report drop-out or attendance rates which would help pinpoint whether retention was a challenge alongside recruitment. More information on data gaps and research constraints can be found in *Methodology* (page 3).

> *"I think we bumped up against incompatible world views! While we felt that we reduced barriers to girls participating internally (as part of existing site programming) we continued to find that young girls do not choose coding without some external 'urging'. Surely the hoped-for result is that boys and girls participate equally. But still more boys than girls voluntarily enrolled." —Site staff*

> *"Most of the cohorts were male-dominated. When a female walks into a room with a bunch of men [...] they feel uncomfortable. Space is very important. Creating an intentional space catered specifically to girls would be successful. My last cohort had a 50/50 split which is wonderful. Our users at our library, some of our girls are quiet and having this dedicated space made them feel comfortable. Having a female instructor and female role models on site was also helpful." —Site staff*

> *"It was difficult limiting the participants to the initial target demographic. We were not able to attract a large number of participants who identify as female, for example. Our age range was larger as well." —Site staff*

Recruiting and including participants with more significant socioeconomic constraints requires removing barriers to access

To reach our target population, the pilot was intentionally offered at no cost to participants in order to remove financial barriers to access. Participants were provided with on-site laptops and other technology, and the pilot was delivered through partner organizations that reach youth with low socioeconomic status. In evaluation interviews, sites used various terminology to describe the populations they sought to enroll, including "high needs," "vulnerable," and "diverse". Definitions and thresholds for the groups varied across organizations. Some sites had an existing focus on serving youth from lower-income families, or who were at risk of not completing high school or entering post-secondary education. Many already offered drop-in computer labs for youth who do not have access to computers or internet at home.

> *"A lot of—I'd say 50%, maybe more of the youth that I have in my cohorts—don't have access to being online. For a lot of them it's food or online, you know? Or there are lots of siblings in the family, so homework is the priority if there's a computer in the house. So to expect them to go on and do individual work, where and when are they going to be able to do that?" —Instructor*

> *"I think that's why they wanted to come back. It was acceptance and the community I created with the youth. I didn't care where you came from, who you were. I had people from private schools and also people from the West side, which is a high poverty area, together. And they are all on the same level. And I think that acceptance was really important to those youth, which is why they wanted to sign up again." —Instructor*

Coding can be an entry point for engagement and a recruitment tactic for digital literacy programs

The evaluation found that the main incentive for most participants to join the pilot program was learning to code. Participants had a range of prior experience with coding and digital privacy and security curriculum, both through K–12 education and personal exploration.[34] One instructor reported needing to explain the definition of code and coding to participants, while another noted that some participants had experience with Scratch[35], HTML, and CSS, and at least one knew Java and C++. Some had previous exposure to computing and coding through parents and older siblings, or had tried online and self-directed learning such as the Khan Academy.

> *"I thought many [participants] might know more about, for instance, HTML, but many really didn't. Depending on who you are, what school you go to, that will really dictate how much you know and what you know." —Instructor*

> *"If you take an online course you don't get much experience, but programs like these are more detailed and you can get experience." —Participant*

> *"I used to do JavaScript online (through the Khan Academy) but it got boring. It was just a computer talking to me. Working with an effective instructor was a very different experience." —Participant*

> *"[When asked if they had a prior interest in coding] "I did, but I didn't know how to do it. And I was like "Oh! Class! I'll take it and learn to code and impress my friends!" —Participant*

Community organizations are well-positioned to engage youth who may otherwise face barriers to access

The pilot design included a commitment to removing logistical barriers to youth participation such as registrations, fees, and Bring Your Own Technology (BYOT) requirements. The goal was to provide program spaces that were as barrier-free and flexible as possible. In addition to providing funding to ensure that programs were free to attend, sites received further financial support to allow them to provide laptops and other equipment, snacks, and bus fare for participants. The program also did not require formal registration, which can pose a barrier to participation with a youth population, particularly if it requires parental consent or other paperwork. These design choices were made to build a safe and trusted space for youth that was welcoming and inclusive.

From an operational standpoint, these choices came with trade-offs, primarily in the form of inconsistent attendance and participation (something partner organizations have noted is normal for informal after-school programming) and challenges in gathering participant data for the pilot evaluation.

> *"Kids are excited when they're here. When they come in, they want to come in early. They want to hang out. They want to keep those connections—whether that's with [the instructor] or with the other kids in the program. And so I think that sense of community is really important for them and they're excited to learn." —Site staff*

> *"We had a challenge of consistent attendance which is a reality of after-school programming." —Site staff*

> *[The Project Lead] "was one of the key reasons why the project worked so well. Before [she] joined, we had some growing pains ... we learned a lot about how programming for youth isn't just about parachuting in, it's about building connections with youth." —Site staff*

> *"Incentive was a challenge, some youth would drop in to just hang out." —Site staff*

Cohort program models require ongoing recruitment

Interviews and focus groups indicate that many participants were already active in programs on site, something that was intentional in the program design. However, at least one site did not work with youth in the target age range in their normal programming, and needed to do additional recruitment. The cohort model of the pilot created additional pressure on staff to continually recruit to fill new cohorts, reaching out beyond existing cohorts and youth engaged on site. The program was not built with repeat participation in mind, which was disappointing for some youth, who were looking for ongoing programming and/or progressive programming.

ABOUT PARTICIPANT LEARNING + BUILDING PATHWAYS

Programs can help build youth confidence and interest in further learning

A number of instructors and site staff reported that the pilot program enabled participants to build self-confidence in their ability to learn digital skills and sparked further interest in technology. The pilot evaluation noted that participants gained a new perspective on the technology already around them and on how they might access further learning opportunities. Across several sites, we heard that participants requested new content and activities outside of the curriculum to further their learning. Participants also valued the opportunity

to learn collaboratively with their peers, as well as having an instructor guide them through content and answer questions.

More than half of participant survey respondents indicated that they "agreed a lot" or "agreed a little" with the statement: "Digitally Lit made me want to learn more about using digital tools." The majority of respondents said that they were interested in continuing to learn, and instructors reported that being able to see the results of their coding immediately inspired participants to engage more. Overall, we found that the pilot program helped participants build comfort with digital skills, and played a role in inspiring participants to engage with and consider further digital literacy education opportunities.

> *"It's amazing how much confidence and kind of pride they're building on their own. Like as soon as they make a little bit of progress, I definitely see it as a confidence builder and that they're learning their interests and their strengths. So it's really exciting to see." —Instructor*

> *"...When I was doing youth work, a lot of the 'have-nots' had issues with, 'Am I worth it?' Confidence issues...But I'm hoping that I've gotten them [in the program] to a place where they know that everyone has an opportunity to express themselves. Everyone has an opportunity to say what they want to say or experiment with what they want to do." —Instructor*

> *"It's a safe environment and [I like] learning at my own pace. Not being pushed, but getting help, doing work independently. I made a website with animation and text scrolling and music. It took a week and a half, and I did some at home. It was challenging. My teamwork skills have improved—I don't usually like to work with other people. I'm more outgoing now." —Participant*

> *"As much as we think that youth are pretty tech savvy, the problem is their access. They might end up in a job and they have to use a Mac, but they've never touched one. Being able to work with different operating systems and tools, the kids were able to take away more than coding skills. It was base computing skills as well." —Site staff*

> *"HTML and CSS definitely are low-hanging fruit and they're able to see results right away. Like we created a 'Hello World' page on day one. And I think that helps motivate the students to learn more. Like, 'What else can I do with this?'" —Instructor*

Programs can encourage youth to see themselves as technology creators

While gaps in access to technology are at the heart of this pilot, so are the significant gaps between youth who identify as "content producers" and "content consumers."[36] In both existing literature and discussion with partners, this additional dimension to the digital divide has been noted as an essential consideration in program design—how youth interact with technology is a key consideration.[37] This highlights the need for access to digital literacy education as well as access to technology. Youth who face barriers to accessing these resources are also more likely to see themselves as technology consumers—for example, passively using technology solely to surf the web, watch videos, and use social media sites—rather than creators. Youth are more likely to see themselves as creators when they are not only given access to technology, but also presented with opportunities to be engaged in participatory learning and creating digital content such as websites, games, art, music, and zines. This also helps them develop stronger digital skills and competencies, as well as a deeper understanding of the digital tools they are using.[38]

> *"I think the program was an excellent introduction into what they could accomplish using technology. And I think it helps them think about the technologies that they were using every single day." —Instructor*

> *"I like struggling though it... and then it finally working. And I feel good about myself." —Participant*

> *[The highlight was] "seeing what you've created through learning everything." —Participant*

Youth need more guidance regarding the next steps they can take, including referral pathways, connections between programs, and available local programs

Given the limited length and scope of the pilot, creating extended programming was not an option. Also, the program itself was not equipped to support participants post-completion beyond the referral support that community sites provide to youth accessing programs and services. To influence youth pathways in the post-pilot phase, the Brookfield Institute produced a digital and print zine that highlighted in-person and online learning opportunities for youth based on their geographic locations and areas of interest, pointing them towards other learning opportunities.[39] For each participant, the zine was intended to serve as a record of what they learned in the program, and it used a colourful, comic-based narrative to help them explore possible next steps.[40]

> *"I had a lot of youth in the first couple of cohorts going, 'What now?' And actually signing up for the next one and me having to explain 'it's the same thing! You can't.' And them being really disappointed." —Site staff*

Building on landscape mapping done in *Levelling Up*, we conducted a scan of digital literacy and coding programs available in the cities where pilot sites operated. As we identified programs, we noted whether they were:

+ Youth-focused
+ Provided in-person or online
+ Offered as an after-school program, on weekends, or as one-off programming such as a summer camp
+ Free or low-cost to enroll
+ Offered financial support
+ Operated on a BYOT or technology-provided basis

We found that, outside of Toronto, there was a lack of youth-serving digital literacy and coding programs, particularly those that offered financial support or on-site technology. Therefore, we created two versions of the zine—one that recommended in-person program options in Toronto and one that highlighted free online learning opportunities for participants in other regions. The full zines can be viewed on the Brookfield Institute's website.

The effectiveness of the zine was limited in some ways. Primarily online learning opportunities were available in many communities where pilot sites were located, while many participants wanted in-person guidance in a physical space.[41] One instructor also noted that while the zine was presented in colour and a comic format, it was text heavy, which was a barrier for some participants. Instructors noted that ideally, youth would have access not only to an ecosystem of accessible educational programs through which they could progress, but also a supportive local community with whom they could learn and from whom they could receive guidance. This also points to the need for clearer learning pathways and navigational support for youth, including referrals between programs and between the K–12 and informal education ecosystem.

ABOUT WHO CAN TEACH DIGITAL LITERACY + CODING

Having skilled, dedicated instructors is essential to program success

Instructors were critical to the success of the pilot. Their roles in pilot implementation ran the gamut from teaching to recruitment, making curriculum adaptations, building relationships with youth participants, and building the capacity of sites to run the pilot. Many instructors went above and beyond to engage participants and made efforts to connect their teaching with youth interests. Sites tended to excel in delivering programming when instructor retention was steady and they were able to build deeper relationships with hired instructors.

A co-instructor model could help build site teaching capacity

The pilot was designed as a co-instruction model, with teaching and facilitation shared between a lead instructor with technology expertise and experience working with youth, and a co-instructor from the community site's own staff who had existing relationships with potential participants and community members, both supported by the Brookfield Institute's Program Lead. The instructor reported to the site manager and their role was integrated into the community site's operations. The intent was to build the capacity of site staff through working with an experienced instructor, positioning them to learn throughout the delivery process and enabling them to continue delivering programming at the site after the pilot's end should ongoing funding be available. Instructors were brought into site programs under varying models: some pilot locations put existing site staff into the role, while most hired an instructor specifically for the program. Of those that were hired for the program, some instructors were contract workers while others were made part-time employees of the site. Some focused solely on the pilot, while others were involved in delivering other site programming.

Instructor qualifications often vary

Instructor job posting qualifications included: experience delivering digital literacy, coding, or STEM programs or training; knowledge of and experience using technology to support digital literacy education; and an understanding of youth-led programming. In instructor job postings, the preferred background was post-secondary education with expertise in computer science or programming, a flexible schedule, and two or more years delivering digital literacy programs.

In practice, the instructors had a broad range of qualifications. Some instructors were post-secondary learners pursuing teaching degrees or certified teachers. Some had no teaching experience, but came with a strong technical background, including from the private sector, and others were hired because of existing relationships with site participants, including current part-time site staff.

At minimum, instructors were given two sessions of training by the Pilot Program Lead. Training sessions introduced instructors to the curriculum, including its content focus, how each module worked, and where modifications could be made. Instructors with less technology expertise also received training on the digital tools and platforms used in the curriculum. Other training topics included understanding how to navigate youth spaces, safety issues, and their relationships with respective sites. All instructors and facilitators also needed to receive vulnerable sector screenings to work with youth participants.

Instructor roles and responsibilities range based on site needs and learner interests

Instructor hours were capped at 20–30 hours a week, which included preparation and lesson planning, coordinating program logistics, and holding drop-in hours outside of delivering the core curriculum at minimum. However, instructor responsibilities ranged based on site needs, individual backgrounds, and expertise. Other responsibilities included: supporting participant

recruitment; making available space feel safe and comfortable for youth; developing individualized learning plans with participants; and working with site staff and the Program Lead to develop and test program content, document learnings, and improve on-site programming.

In many instances, instructors went above and beyond planning and teaching program sessions to ensure that their respective sites were able to run programming successfully. Many added topics and activities to the curriculum based on participant interests and their own expertise. When instructors did not have the relevant expertise but participants were eager to explore particular types of content, some instructors would research that content to cover it in program sessions. At one site, the instructor ran a session on designing web comics and tied it into the CSS lesson in the curriculum. In others, instructors introduced video game design elements and programming with Raspberry Pi boards. Sessions included a free period that participants could spend pursuing their projects based on what they were learning, which gave instructors more room to introduce additional concepts.

> *"I have to say, having a designated instructor really was convenient. There were some challenges, especially with the turnover. This year, just having [one instructor] was great. He was confident with the curriculum, it gave a lot of breadth and potential to what [he could] teach. He wasn't just doing everything he was asked to do." —Site staff*

Instructors acted as informal mentors in important youth development areas beyond those identified in the curriculum, including connecting them to resources and opportunities provided by the parent organization, such as library services and the co-located John M. Parrott Art Gallery.[42]

Across cohorts, site staff and instructors found that having additional facilitators in the room helped keep participants engaged in the material and allowed for one-on-one and small group instruction and troubleshooting. Whether staff facilitators had content knowledge or not, they could provide behavioural support and guide participants through problem-solving processes. Site staff, instructors, and the evaluation report emphasized the value of having facilitators in the room in addition to the instructor and noted that this should be a best practice. However, site constraints meant that supplying a facilitator in addition to the instructor was not always possible.

> *"A lot of the kids that were really keen about technology—this program brought them in. But during the course of the program, a lot of conversations surrounding mental health, physical you know, a relationship, how to find a job, career—all of these conversations kind of happened organically." —Site staff*

> *"They have no idea that's here, and they're just thrilled to see that and to be able to explore that space and realize there's an art gallery here at the Library and that it's free. You know, it's really great for them." —Site staff*

> *"I honestly wish there were two of me, it was so hard to get everyone on the same page, so to speak. There were instances of people doing their own thing instead of the activity." —Instructor*

The ideal instructor has a combination of technology and youth engagement expertise

Skilled and supportive instructors were crucial to running the pilot program. Teaching digital literacy and coding in an after-school space tends to require a combination of subject matter expertise, along with experience working with and guiding youth. Site managers, staff, and instructors had differing perspectives about the most important backgrounds and qualifications for an instructor. Instructors that have both a technology and youth engagement background are rare, and finding such instructors for each site proved challenging. Instructors with a youth program or teaching background were likely to be more successful at

connecting with and engaging youth, whereas instructors with a technology background were better able to help participants troubleshoot projects or provide mentorship to youth interested in future careers in tech.[43]

Different instructors' skills and backgrounds lent themselves to variations in the ways that program sessions were run. Instructors with limited technology knowledge tended to find it more difficult to address content in more depth than what was provided in curriculum materials. Relatedly, some followed curriculum instructions more closely in the way they enacted activities, whereas instructors with more technology expertise seemed to be more comfortable running program sessions in a more open-ended manner and making adaptations. At least one instructor reported researching program content on their own time and a number noted that additional training to support curriculum delivery would be helpful.

The evaluation report suggests that the ideal instructor would be equipped to build strong relationships with participants and act as a facilitator to help participants explore processes of discovery and problem-solving. Ultimately, the ideal balance of instructor qualifications depends on the roles they are required to take in program implementation and the needs of the site where they are situated. While instructors may not need to be programming experts, pilot results suggest that those who are both experienced in working with youth and willing to experiment with technology and teaching approaches are most likely to be effective.

> *"There were some aspects that I had to kind of relearn some things because I haven't coded since high school." —Instructor*

> *"I think the [instructor] who runs it and how much experience they have, not only with the technical aspect but the teaching aspect is so important." —Site staff*

> *[The instructor] "was very encouraging, very helpful when you don't understand things. Sometimes she doesn't know all of it, so we'll figure it out together. Like if there are some things kids know and the teachers don't know, you both can learn at one point. So like if there was a defect in the coding, we both figured it out—and she learned something and so did I. It was pretty cool. And she just encouraged you—doesn't want you to give up, to keep going." — Participant*

Instructor recruitment and retention is challenging, particularly in smaller communities

Recruitment and retention of qualified instructors was a significant challenge that impacted program implementation at many sites, sometimes causing delays between cohorts. In the context of informal community-based programming, instructor turnover can be a particular challenge because inconsistency in staffing runs counter to building trusted spaces and strong relationships between staff and participants.

Reasons for instructor turnover varied: some site instructors moved on to pursue full-time roles that aligned with their backgrounds and expertise, while others experienced shifts in their post-secondary class schedules. Echoing our findings from the learning pathways zine (which identified other local digital literacy and coding learning opportunities) we found that, in smaller communities, there are limited options for similar programming and, in turn, candidate pools for instructors are smaller. One intervention that helped ease instructor recruitment was working with sites to build partnerships with formal learning institutions such as universities and existing volunteer mentorship programs such as CoderDojo to increase potential candidate pools.

Another challenge was tied to bringing digital literacy and coding instructors into community organizations with existing pay scales and internal policies: sites were sometimes unable or unwilling to offer salaries that were competitive with what

instructors with a technology-related skill set might be earning in another role. This was true even with external funding available to pay instructors $25 per hour. Another consideration was a pay equity concern relative to other staff. The pay rates that community sites were able to offer were significant factors in instructor turnover. Throughout the pilot, hourly rates ranged from $15 to $25 per hour.

> *"We had a major issue with facilitator turnover as well as the challenges of implementing the program in an after-school setting. We had 3+ facilitators cycle through, which meant there was little continuity with the program." —Site staff*

ABOUT DESIGNING CURRICULUM FOR AFTER-SCHOOL PROGRAMS

Blending core digital literacy concepts with hands-on and online activities is an ideal strategy

The pilot program built baseline digital literacy (e.g., privacy and security awareness, digital citizenship) while introducing participants to future workforce and professional digital skills through hands-on workshops in coding and digital design (e.g., HTML/CSS and user experience design).

Working in partnership with community-serving organizations, the pilot introduced concepts of digital literacy with coding as a core technical competency. This included evaluating online sources and information, understanding online privacy practices, and principles of digital citizenship. Participants also had the opportunity to practice early prototyping and user experience design to create their own web assets or online games. Each session was designed to be no more than two hours in length and focused on the following core concepts:

+ Building a safe learning space
+ Introduction to and application of HTML
+ Introduction to and application of CSS
+ Introduction to user experience design
+ Privacy and security awareness
+ Introduction to digital literacy
+ Digital citizenship

This included activities such as:

+ Live, interactive HTML icebreakers, using signs with mark-ups such as <clap> </clap> and <stomp> </stomp> to learn about open and closed tags.
+ Creating simple websites about their personal superheroes, online personal data collection, and identifying fake news.
+ Mapping their digital identity, the sites they interact with regularly, and their experience and emotions about using them.
+ Using Mozilla's X-Ray Goggles, an educational and open source browser extension that lets users view and remix websites' HTML and CSS, to anonymize online information about their favourite athlete, artist, or musician.
+ Using human-centred design to redesign the classroom experience and wireframing digital prototypes.

Throughout the pilot, the program curriculum was hosted online on the pilot website. At the end of the pilot, we updated the curriculum to reflect more current tools (digital tools and platforms had changed over the two-year period since the pilot's launch[44]) and re-housed it on Google Drive with a ShareAlike license.[45] This was done so that the content can be more easily found and any edits, changes, or adaptations can be tracked. The full curriculum and an accompanying implementation toolkit can now be found on Google Drive.

Iterative curriculum development benefited from external expertise, as well as site and youth input

The initial curriculum framework was developed in collaboration with the Steering Committee's Working Group on Curriculum, including representatives from Actua and Canada Learning Code, and input from external advisors and some delivery partner organizations. This was revised, tested, and iterated before delivery and while in the field, in response to on-the-ground participant and instructor experience.

A structured, ready-to-teach, and flexible curriculum for after-school drop-in programs helps sites run digital literacy programming

According to site staff and instructors, having access to a structured, ready-to-teach curriculum with core subjects and optional modules (including lesson plans for less-experienced instructors) was a very helpful resource.[46] While there are a number of digital literacy curricula and teaching resources that exist, many focus on formal K–12 environments or more structured after-school programs. There are limited resources that support bringing digital literacy and coding learning practices into informal learning environments such as community after-school programs.

> *"I cannot explain how great it is...I have had the experience of going out and looking for a workshop to do with my teens or with the public or something. And it's very time consuming because you have to run through it, make sure it works, and that you understand it. But when it's already built and you can just kind of pull from it and just go—that's really helpful." —Instructor*

Flexibility to make curriculum and format adaptations was a key principle in pilot design; site staff and instructors were encouraged to make changes for participants as long as the basic curriculum was followed. Across sites, variations were implemented in how much time was spent on curriculum modules, the order in which they were taught, whether curriculum elements were swapped out, reframed, or new elements were introduced. For instance, based on the experiences and expertise of instructors and site staff, some sites explored 3D printing, robotics, and video game creation with participants to augment the core curriculum.

> *"I think you need to have an instructor or at least a curriculum that offers some flexibility. Otherwise you lose the interest of the kids pretty quick." —Instructor*

> *"I think this just comes down to individual youth interests. Some things they really enjoy in certain cohorts and then other things they find, you know, a little boring. I do find it a little challenging to try to get them to engage when you do have a set curriculum you have to follow." —Instructor*

This flexibility allowed sites to ensure that participants were excited by and engaged in the content. It also played an important role in highlighting where curriculum could be changed to work for local contexts and participants with different needs. One lesson that emerged from pilot implementation at the YMCA Academy was that the curriculum needed more built-in options for youth with different learning styles and modifications that could support participants with ADD/ADHD.[47]

> *"Providing young learners with an opportunity to experience a coding environment was great. Because tech needs were minimal it allowed a wide range of participants. For our site, with all students having 'learning style differences', it was important to leverage the school's understanding of the individual learners' styles. This worked well here." —Site staff*

Variation in participant skill level requires creative curriculum design and delivery

The curriculum was designed to provide exposure to technology and build interest in digital literacy

for participants who might face barriers to accessing after-school learning opportunities. Since participants varied in age and had a range of experience with digital literacy concepts and digital tools, instructors reported that it was sometimes a challenge to engage all participants in the curriculum topics as provided, particularly for sites without multiple instructors. Some of this variation in knowledge was based on exposure to these topics at school and at home, as well as the age and grades of participants and what curriculum they had previously covered.

> *"We're talking 12 to 15 year-olds. Those are big age differences and to expect them to all be on the same level is crazy—because they're not." —Instructor*

> *"If there was just one platform that was focused on for them to learn throughout the week—opposed to, flipping between different platforms—I think that would make it a little easier." —Instructor*

Mixed-age programming also meant teaching to participants with different reading comprehension levels. Several instructors reported that the language in the curriculum was too complex or otherwise inaccessible for some participants, including those with lower reading comprehension and/or learning disabilities.

> *"The way that the tutorials are set up, it's a lot of reading...I would say that the tutorial text is pretty...hard to jump into." —Instructor*

> *"It feels like a lot of nomenclature—it feels like we're throwing a lot to the kids. I think if we just simplify all that...the concept is always the same. Right? It's 'feedback, prototype, feedback.'" —Instructor*

Supporting site capacity-building and ensuring open access to materials go hand in hand

Early testing of the pilot at a Toronto Public Library Youth Hub[48] demonstrated the need for non-proprietary, open source curriculum that could be delivered and adapted by multiple community organizations and sites, as well as evaluated and distributed publicly. This approach was chosen to empower community organizations to deliver the program independently, with the help of trained instructors, increase the likelihood that the program would be delivered beyond the life of the pilot, support site flexibility, and avoid intellectual property concerns with borrowing and adapting existing curricula. The curriculum was built with open source tools in mind (such as free, browser-based code editors that can be used to learn and teach HTML, CSS, and JavaScript) that would allow participants to continue to learn beyond the pilot program if they have access to technology.

The result is an innovative contribution to the digital literacy ecosystem: a flexible, adaptable digital literacy and coding curriculum, including supporting materials for sites and instructors, now available on Google Drive under a ShareAlike license that allows anyone to share, copy, or redistribute the material in any medium or format and to adapt, remix, transform, and build on the material for any purpose.

Teaching in the after-school space needs to be recreation-based and not replicate a school environment

In testing the pilot, researching after-school programs, and gathering input from sites and instructors, we learned that programming that requires participants to be present at every session would not be effective with the target group and delivery plan. In order to build interest and engagement with youth participants, the pilot needed to be recreation-based. This decision was borne out of a recognition that many after-school programs in community spaces are intentionally designed to not feel school-like. It also reflected the particular learning needs of our participants, who were more likely to be engaged by and thrive in less traditional, less formal curriculum delivered in an adjustable and casual learning environment.[49]

After-school programming often serves as a safe space for personal decompression and relationship

building, and the pilot's curriculum design took this into account. Some instructors and site staff at pilot sites reported that while the curriculum aimed to be recreation-based, with modules that could be swapped out based on participant interest and a hands-on approach, it remained too formal. A draw for many participants was building relationships and community, having space to hang out with their friends, and making new ones. Programming that is too formal risks discouraging youth participants who are not interested in "going to school on a Saturday."[50]

Youth are often balancing a number of responsibilities, such as working part-time jobs, caring for younger siblings, attending school, and participating in extra-curricular activities, which can impede regular attendance for some. Instructors employed different strategies to ensure that all participants had access to a meaningful experience throughout the program and did not get left behind or disengage from the curriculum. This included weaving modules such as coding and digital safety throughout the program and offering drop-in hours or refreshers for those that missed a session.[51]

> *"Week-to-week or month-to-month, just having things available for people, it could go really well, and the consistency works really well in youth lives, they know it's going to be there and they can come in if it's helpful. They don't want to be chained down to anything, they want to come when it works for them." —Site staff*

> *"I thought this was going to be super boring, but it wasn't...I was like, 'I don't want to go to school on a Saturday.' But it's nothing like school. She keeps things fun...when we go on the computer, sometimes she'll incorporate places or what you find. She likes to take your opinion too, not just like—for instance in school, they tell you what to do...but she also wants to know what you want to do, too." —Participant*

> *"For participants who have been in school all day long, we want to give them a space where they're learning something, but they're learning things that they don't even understand that they're learning yet because they're going through something that's fun and engaging." — Instructor*

> *"How do you not make this into another school they have to attend, make it more fun, more engaging? Especially in the first session, we saw an up and down of participants. [What helped was] the community we developed with the youth, they wanted to come back for the familiar faces and projects they could come back to. That was a challenge, making it fun for them." —Site staff*

> *"Some sites...run review sessions in parallel to regular programming and weekend drop-in sessions for those looking to catch up on what they missed. Other sites have created buddy-systems or have adapted open computer time to include one-on-one time with the Digitally Lit facilitator if participants need extra support." —Pilot Program Lead, Quarterly insights blogs*

ABOUT WHAT COMMUNITY SITES NEED

Not all community organizations have the infrastructure needed to readily run digital literacy and coding education programs. Some organizations were challenged by space limitations and limited wifi[52], while others were challenged by limited numbers of participants in the target group and a lack of established approaches to recruit new youth participants.

Through the pilot, sites were supported with resources to update onsite technology or purchase new technology that was up to date and functional, equip spaces to be friendly to youth participants, and recruit instructors to

teach the curriculum. The Program Lead also provided centralized support for program delivery, balancing localization of the program for site and participant needs while offering adaptation and implementation advice, evaluation, and instructor training and support. In exit interviews and evaluation, a number of sites reported that without the pilot, they would not have had the capacity to run digital literacy and coding programs.

Sites need dedicated space to run programming effectively

The pilot called for spaces that were open, well-lit, flexible, and that made participants feel comfortable. Based on the rooms available at site facilities and space requirements of existing programs, the physical spaces where the pilot program took place varied widely. The funding provided allowed sites to purchase equipment such as laptops, wifi boosters, and 3D printers, along with furniture such as tables, chairs, rugs, and whiteboards to meet program needs and make spaces comfortable for participants. Laptops are ideal for this type of program because they are portable and allow spaces to be reconfigured easily, in contrast to desktop computers which require a fixed room layout.

The Belleville site used technology and equipment funding to renovate its computer lab to run the pilot program, replacing desktop computers with laptops and changing the seating layout to make the space feel less formal and encourage interaction between participants and the instructor. At this site, activities that were computer-based and those that were not computer-based took place in separate spaces. The evaluation noted that this was helpful to reduce distractions, set expectations, and give participants a physical break when they moved between spaces. The instructor also valued having two spaces for very different activities, for example, moving to a large room for running robotics races and allowing participants to be noisy without distracting others.

> *"I said, 'I have to move this around; this is not a school situation. And if we're bringing teens into this, they are going to hate it.'" — Instructor*

> *[One site] "bought tables and chairs ... and rugs for the floor. They didn't have any extra furniture on site to create a youth space. [The instructor] used the budget to pull together a rag-tag youth community space." —Pilot Program Lead*

Some sites struggled with securing dedicated space in which to run the pilot program because space was limited and needed to be shared with other on-site programs. At one Toronto Public Library branch, several cohorts were run in a shared space with an existing drop-in program, which created a noisy learning environment that was distracting for both the participants and the instructor. The last four cohorts were moved to a large dedicated space at the North York Central branch.

> *"On paper you want a location with youth.... But we learned you need a dedicated, isolated space to do this program where you don't have the noise and distraction of this other drop-in program." —Site staff*

Sites need access to high-quality, reliable, and modern technology

Sites had varying degrees of success with sustaining working technology, and needs varied from site to site. Before pilot implementation, many sites lacked the updated infrastructure and technology that would have been needed to run a digital literacy and coding education program. Some sites used the budget provided through the pilot to refresh outdated technology or equipment, while others added to what they already had on site. Some sites, which had trouble getting a consistent wifi signal for large numbers of users, purchased wifi boosters and laptops to replace outdated equipment. Another site already had some laptops but used the pilot's technology funds to purchase additional laptops to meet cohort

numbers, as well as Raspberry Pi boards, adding introductory robot programming to the curriculum.

Sites were empowered to determine their own technology needs, and to weigh these purchases against other expenses. Sites that did not need to purchase wifi boosters, had lower participant numbers, or already had a number of working laptops had more leeway to purchase more expensive laptops such as Macbooks or Windows laptops. Other sites chose to purchase cheaper Chromebooks in order to serve higher participant numbers.

Depending on staff and expertise available at each site location, sites did not always have access to support for technology troubleshooting of larger issues as well as more minor user questions. For instance, one site that used Chromebooks experienced challenges to accessing the right browser for one part of the curriculum. Chromebooks run on the Chrome operating system where the process for downloading software differs from Windows or Apple systems, which most users are more familiar with. At another site, the staff and instructor initially did not have access to the onsite wifi network because it was owned by another organization. Instructors and site staff who did not have the expertise to address user issues and bugs tended to rely on internet searches to fix them. While sites were able to contact the Pilot Program Lead for troubleshooting, remote assistance is not ideal, particularly for hardware issues. Sites required more direct and consistent tech support to run the program smoothly.

One site had been receiving tech support and equipment from a national program called Raise the Grade, which provided computers, high-speed Internet access and software to support youth learning and career and academic pathways to Boys and Girls Clubs of Canada, but the program at that site had ended just before the pilot launched.

> *"Technology, it becomes obsolete, it breaks down...This is something we struggle with as well—just that sustainability piece around the equipment." —Site staff*

> *"In [one site], they just needed more boosters because you can't have 30 kids on laptops and the wifi dying. The kids will get frustrated." —Pilot Program Lead*

> *"Technical support and technical know-how is needed to run any digital literacy program. They're needed on site to fix any bugs that happen." —Pilot Program Lead*

New programs need to fit with how sites operate

Embedding the pilot in existing community spaces presented an opportunity to reach youth who might otherwise not be exposed to digital literacy and coding programs. However, it also presented a challenge: adding new programming to a potentially already crowded schedule and venue, including existing activities that may be happening simultaneously. Youth-serving community organizations often must balance supporting young peoples' basic needs such as safety, health, and integration into their communities (e.g., programs that support meal and nutrition programs, physical and mental health, homework help, physical activity, social skills, English language learning, and newcomer integration) with helping them develop new skills and integrate into the workforce. Some sites addressed this by nesting the pilot inside their existing programming rather than offering it as a separate program; at least one site co-located the pilot in the same room as another program.

> *"Participants missed sessions because of other attractive activities at the club (e.g., talent show, dance) and in the community (football)." —Site staff*

> *"According to staff, this motivation to invest in digital activities must still compete with a range of other ways to most effectively meet the needs of underserved families." —Evaluation*

Flexibility in delivery format enables sites to respond to participant needs

Flexibility in how the curriculum is delivered can help enable sites to respond to local contexts, needs, and constraints. Sites leveraged this flexibility to run the program in different formats, and often shifted formats between cohorts to test what would be most effective and engaging for participants. Varying structures presented different strengths and challenges; over time, sites refined their approaches to reach more youth and better match the format to youth needs and interests. For example, some sites reported that running sessions once a week could make it more challenging for younger participants to remember material across sessions, whereas older participants appeared to benefit from weekly meetings.[53]

Outside of running cohorts, the Belleville site found that a pop-up format helped engage more local youth participants. The evaluation and the program lead noted that the Belleville site initially faced a number of barriers to reaching participants—in part, because the site did not already offer extensive programming for teens and adjoining neighborhoods did not have readily accessible public transport routes to the site. Belleville explored multiple formats, including offering the pilot as a 10-week course delivered in two-hour sessions on Saturdays, as an after-school program during the week, as a four-week mini-course at a local club, and as part of a full-day summer camp alongside other digital literacy content such as video making and stop-frame animation.[54]

In addition to offering the pilot as an hour-long session during an existing block of after-school programs, the London site also experimented with offering the program in a summer camp format. Summer camp participants took part in the program for three to four hours in the morning, and then had the option of spending the last hour of the day working on a supplemental digital project.

At the YMCA Academy, the program was offered as an after-school option for high school students who volunteered to participate and, in a later cohort, it was offered as a required course for middle school students. The Sudbury site offered the program in a weekly after-school format, running two cohorts at a time—one on Tuesdays and the other on Thursdays, and gave participants the option of attending sessions with the other cohort if they wanted more practice or had missed a session.

> *"There's potential for both [after-school and summer camp formats] but it's about understanding the community and being able to adjust for that. So I think flexibility [is important], and some of that comes from experience and learning what works and what doesn't." —Site staff*

> *"We've learned that summer months can be an easier sell because [youth] have more time, but it can be constraining, needing to run so many in a year. You only have so much optimal time. This winter we lost a lot [of participants] and it was twice a week, but in the fall we had huge attendance and the model was the same, but [another location] had the opposite happen. There's no rhyme or reason to why one summer could go really well but the next summer doesn't." —Site staff*

> *"Week to week or month to month, just having things available for people ... the consistency works really well in youth lives. They know it's going to be there and they can come in if it's helpful. They don't want to be chained down to anything, they want to come when it works for them." —Site staff*

ABOUT SUPPORTING ONGOING IMPACT

Continuing program delivery post-pilot

The pilot sought to understand what is needed to deliver digital literacy and coding education through after-school programs and in community

sites and libraries. This included a recognition that sites have different contexts and locations, operate with varying constraints, serve unique youth populations, and that community organizations generally do not have the resources to sustain free programs without external funding.

The intent was to position delivery partners to seek funding to continue if the program was successful and aligned with their ongoing priorities, while yielding lessons that could be applied to broader program and policy design. At the time of writing this report, one delivery partner organization—the Toronto Public Library—is planning to refine the program and run it at other sites.

The value of central support and coordination

In running distributed but cohesive programming such as the Digital Literacy + Coding Pilot, community sites benefit from centralized support to effectively and efficiently run digital literacy programming. Site staff and instructors reported that having access to a Program Lead for support was very helpful, particularly with tasks such as identifying ways to refine and adapt the curriculum to participant interests, hiring instructors, and providing training and troubleshooting. Sites noted that they will be able to use the technology and equipment purchased for the pilot to benefit future programs and youth users.

Leveraging technology, infrastructure, and expertise investments

In exit interviews, several sites highlighted the value of providing learning materials, as well as funding for technology, and physical infrastructure that could be leveraged even after the close of the pilot. At the Belleville site, which initially lacked infrastructure and expertise to support a digital literacy and coding education program for youth, an "extraordinary individual" was hired to teach the program.[56] With the support of this instructor, the library made a commitment to building an organizational ecosystem centred on digital learning. It invested in new technologies, consulted nearby organizations providing digital resources, committed to helping site staff learn the

Toronto Public Library: Youth-focused Digital Literacy Programming

As a result of experiences facilitating the pilot program, site staff from the Toronto Public Library—Teresa Leung and Aleksandra Majka—led a successful proposal to the Toronto Public Library City Librarian Innovation Challenge[55] titled "Youth-focused Digital Literacy Programming". This initiative will involve scaling the Digital Literacy + Coding Pilot work through one year of running digital literacy and coding programs out of Toronto Public Library locations, building on lessons from two years of running the pilot.

Using pilot resources as a base, this new project will continue to refine the pilot's curriculum materials with a focus on making adaptations for library staff who are seeking to deliver digital literacy programs for youth. Stakeholders such as the Toronto Public Library's Youth Advisory Groups will be consulted to identify opportunities to build on or modify the curriculum. Based on feedback from youth consultations, the delivery will shift to focus more on flexible project-based learning in order to increase youth engagement while curriculum topics will remain largely the same. One outcome of this initiative will be a new edition of the open source curriculum that will build on and refine the approaches taken in the pilot.

This initiative was planned to host eight week-long camps across eight Toronto Public Library sites across Toronto—two during March Break and six during the summer, led by Aleksandra and Teresa, who will be shadowed by other library staff to help build local capacity to deliver digital literacy programs. This extension of the Digital Literacy + Coding Pilot work is intended to build the Library's capacity to deliver digital literacy programs for youth, in line with strategic priorities to expand access to digital literacy training for all.

curriculum, and created new programs that would retain participants who completed the program to act as teen mentors.

> *"Funding for equipment and staff to lead the program was incredibly helpful. The initial support from the Brookfield Institute on how to implement the program was really helpful. We also used the curriculum in our March Break and summer school programming." —Site staff*

> *[In response to the question: Is your site/ organization likely to run digital literacy programs for youth in the foreseeable future?] "Yes. We feel it is an important and under-served area of knowledge and we want our students to be digitally lit!" —Site staff*

Additional support and resources

Site staff and instructors identified additional support that would have helped to run the program. Many sites, particularly those in communities outside of the Greater Toronto Area, noted that they would have benefited from additional support and resources for program outreach and recruitment, which could include videos, poster templates, and other marketing materials. A number of sites also noted that peer learning across sites and between instructors to support training and shared lessons around effective or ineffective approaches would have been helpful. Some sites also wanted more training support, which could be either in-person or remote, and additional materials alongside with the curriculum, such as a written or video guide.[57]

> *"I really do think the instructors could do with a guide. It would have been useful for me to go, 'This is the minimum and these are alternatives and if you're having this kind of issue, maybe try this.' Just that kind of a thing." —Instructor*

> *"Having a set curriculum and support from Brookfield Institute staff was helpful, and being able to give feedback and gain insight to help continue developing the program was really useful. The access to technology as well... Having it all pre-packaged was great, it was really helpful." —Site staff*

> *"Staff training would be helpful instead of hiring a facilitator. I believe that if we were to train a current staff member to deliver the programming, we would be able to continue the implementation of the program and have an in-house digital literacy facilitator that is known by youth who utilize our space." —Site staff*

> *[In response to the question: What would you need to run a digital literacy programs like the digital literacy and coding without the resources provided by the Brookfield Institute?] "We would need curriculum and some grant funds to run a free-to-participants program. We would be able to provide the space and tech required on our own." —Site staff*

RECOMMENDATIONS

ENSURING THAT ALL YOUTH IN CANADA HAVE ACCESS TO DIGITAL LITERACY AND CODING EDUCATION

Equitable access to digital literacy and coding education that cuts through barriers and meets the needs of all youth in Canada will require a concerted and collaborative effort, along with funding support. Fully integrated digital literacy education for youth across the country must include closely networked participation from governments, community organizations and libraries, K–12 schools, and program delivery organizations. Each of these partners has an important role to play in supporting the development of youth digital literacy. Partnerships with organizations specializing in digital literacy programs can provide cutting-edge expertise, K–12 schools have a wide reach and extensive structures to engage youth in formal settings, while community organizations and libraries are in unique positions to deliver accessible informal programs to local underserved youth.

Realizing this goal will require:

1. **Funding to equip and empower community organizations and libraries across Canada to deliver digital literacy and coding programming.**

   Governments should enable community organizations to deliver digital literacy education, focusing on filling programming gaps in geography, demographic distribution, content, and skill level. Community organizations and libraries can leverage their existing spaces, community connections, participant networks, and expertise in reaching and supporting youth. This will broaden access to and engagement with digital literacy education, better preparing learners for future

education and employment opportunities. To do so, they need resources to create welcoming, safe, informal, and engaging learning environments for youth-focused digital literacy and coding programs. These resources include:

a. Tuition-free programs with wraparound supports where needed (e.g., transit tickets, food, etc.) that are held in easy-to-commute locations and in dedicated spaces with room for group and individual learning.

b. Physical infrastructure, such as programming space and flexible furniture, that is safe and welcoming for youth.

c. Modern, functional, and well-maintained internet infrastructure, hardware, and software along with access to tech support, with consideration of the start-up and ongoing maintenance costs of technology.

d. A competitive wage for instructors, along with onboarding and training in the curriculum content and delivery, and in engaging the youth population in question. Instructor consistency within programs is vital to driving youth engagement; providing competitive wages and other supports can help attract instructors with the right mix of technical and youth engagement expertise and reduce turnover.

e. Incentivizing collaboration across community organizations, K–12 schools, and youth digital literacy programming providers outside of school in order to share lessons learned, support recruitment of underserved participants, and enhance complementarity (i.e., connect expertise in youth development with digital literacy content expertise).

2. **Centralized backbone support to coordinate instructor training, provide open source curriculum and materials, and support the sharing of best practices.**

Encouraging the development of an open source curriculum[58] and coordinated centralized support—within government or in the form of a small, focused, dedicated centre of expertise—would help enable efficient and effective scaling of this community-based model. Ideally, this backbone support would be informed by the expert advice of digital literacy and coding education delivery organizations. A key factor for program success across sites in varying locations, contexts, and populations is a flexible program delivery model—providing centralized advice and materials will go a long way towards enabling community sites to adapt their program models to the needs of local youth. Centralized backbone support for community-based digital literacy and coding education programs would:

a. Deliver regularly revised and iterated curriculum that is up to date with technology, relevant to youth participants, and developed with their input.

b. Allow sites to adapt, iterate, and build on the curriculum, offering schedules, formats, outreach approaches, and additional content best suited to their participants' needs and interests.

c. Update and share open source and non-proprietary curriculum and materials to ensure broad access and public benefit, and to enable curriculum to be updated and adapted by other organizations and for different youth populations.

d. Provide resources and guidance for regular external evaluation to ensure that youth learning outcomes and program effectiveness can be measured across programs, and that lessons learned can be shared.

e. Build referral pathways between community organizations, libraries, schools, and program delivery organizations to encourage further learning pathways that are clear and easy for participants to access.

Government

funding to support...

- Federal
- Provincial
- Municipal

convening + funding...

- **Tuition fees + wraparound supports**
  - *Program fees*
  - *Food costs*
  - *Transit costs*
- **Physical infrastructure**
  - *Comfortable learning spaces with flexible furniture e.g., whiteboards, chairs*
- **Modern + functional technology**
  - *Technology purchase + maintenance e.g., laptops, wifi boosters*
  - *Tech support*
- **Incentivizing collaboration**
- **Instructor support**
  - *Competitive wages*
  - *Onboarding + training*

Backbone support

to provide sites with...

- **Open source curriculum + resources**
  - *Learning materials that are relevant to youth and up to date with technology*
- **Sharing of best practices**
- **Referral pathways across programs**
- **Expert advice + guidance**
  - *On adapting the curriculum, formats, and schedules to youth needs and local contexts*
  - *On recruiting + supporting underserved youth*
  - *On building learning + referral pathways across programs*
  - *On regular program evaluation*

- K–12 school boards — *Link to formal education*
- Community organizations and libraries — *Youth networks and engagement expertise*
- Program delivery organizations — *Digital literacy + coding content expertise*

Community

Existing low-barrier programs and services to meet the needs of local youth

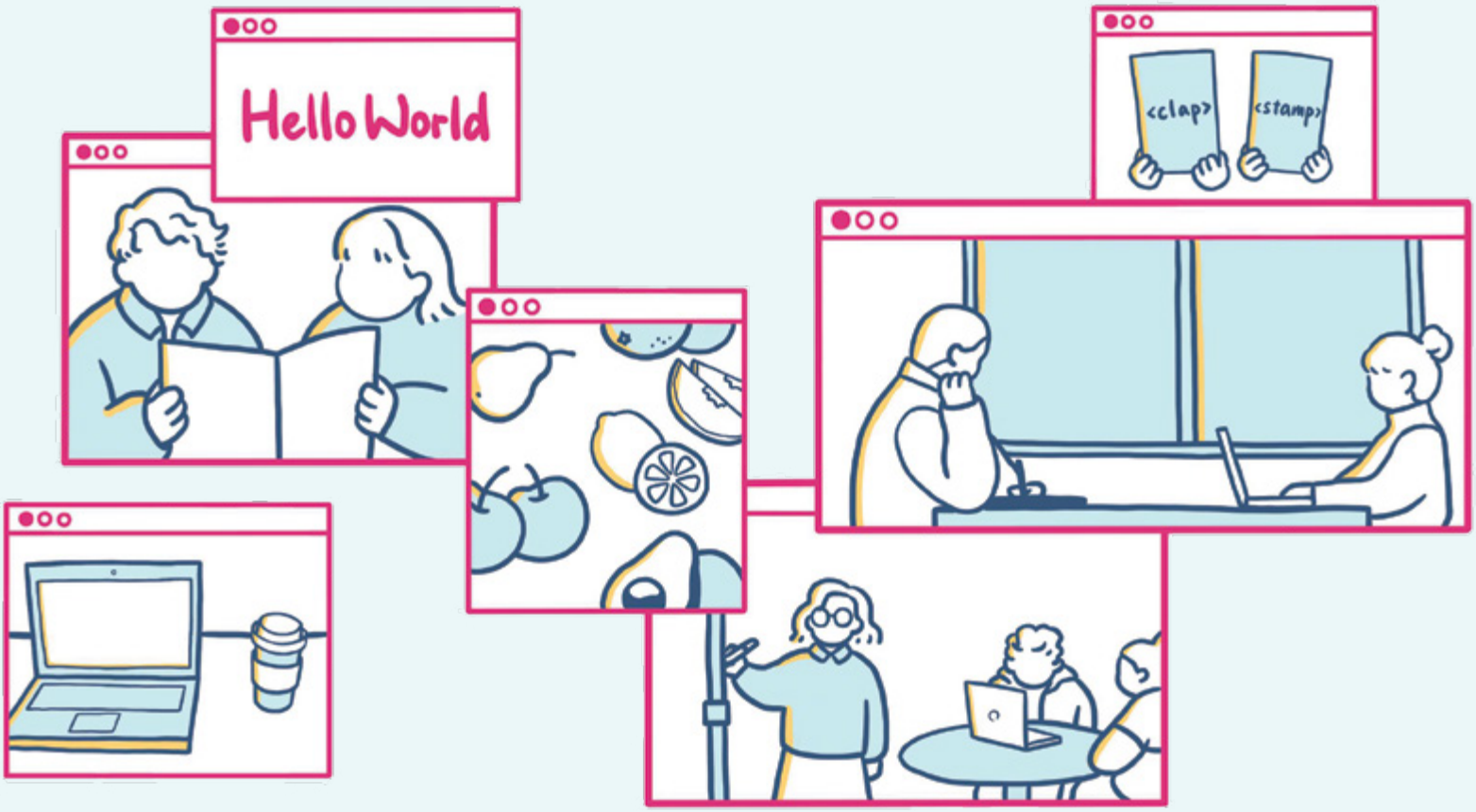
Comfortable, informal learning spaces outside of home and school

Community organizations and libraries

Learning + referral pathways

K-12 school boards

Program delivery organizations



CONCLUSION

Through a unique partnership and delivery model, the Digital Literacy + Coding Pilot reached over 2,400 youth, many of whom were underserved by, disengaged from, and/or experiencing barriers to accessing formal digital literacy education. Upon finishing the program, the majority of participant survey respondents reported that the program made them want to learn more about using digital tools, demonstrating the value of engaging youth in learning outside of formal education. Across six sites, five communities, and three types of youth-serving community organizations (public libraries, Boys and Girls Clubs of Canada, and the YMCA), this developmental pilot provides systems-level and programmatic insights into delivering effective and accessible digital literacy programming in the after-school space.

The pilot demonstrated the value of catalytic and ongoing funding. It also tested a unique partnership and supportive backbone model for augmenting community organizations' technical, infrastructure, and program-delivery capacity. This catalytic funding enabled sites to significantly upgrade their capacity (including spaces, technology, and staff expertise) and lowered costs for further delivery of the program. The pilot

also resulted in an innovative contribution to the digital literacy ecosystem: a flexible, adaptable digital literacy and coding curriculum, including supporting materials for sites and instructors, that could be used by other sites and organizations.

The pilot yields important lessons for extending digital literacy access across Canada, leveraging community organizations to reduce barriers to access and engagement, and building an effective, flexible, and replicable delivery model. It highlights the importance of enabling community organizations to deliver digital literacy programming, the challenges in reaching the youth population, and the significant opportunity to build their skills and confidence—and to spark their interest in pursuing further learning opportunities, moving more people along a path to inclusion in a digitizing economy. Lessons learned during the pilot illustrate the value of a number of design considerations: building a welcoming, safe, informal, and engaging learning environment for youth, including free programs, modern technology and infrastructure, and an up-do-date curriculum; flexible program delivery, including site-level adaptations and open source curriculum; collaboration across the sector and coordinated centralized support; and external evaluation.

APPENDICES

APPENDIX A: ACKNOWLEDGEMENTS

The Digital Literacy + Coding pilot benefited from the generous expertise and involvement of many: partner organizations, site staff, and instructors; Steering Committee members; and external advisors, consultants, and collaborators. Titles and organizations listed reflect individual affiliation at the time of their involvement in the pilot. Some collaborators may have moved on to other organizations or their titles may have changed.

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Sarah Naqvi, Britney Oberfeld, and Gail Carmichael, Shopify Computer Science Team

Ian VanderBurgh, Professor, Mathematics, University of Waterloo

Paul Gries, Professor, Computer Science, University of Toronto

Eric Craven, Community Development Librarian, Atwater Library and Computer Centre

STEERING COMMITTEE

Over the span of three years, Steering Committee membership shifted. Some organizations stopped participation early, while representatives from others changed.

All Steering Committee members who participated in the first iteration of the committee are marked with an asterisk.

Name	Organization
Brenda Sherry Education Officer Greg McLeod Education Officer	Ministry of Education, Government of Ontario
Jennifer Flanagan* President Tracy Ross* Director of Network Membership	Actua
Melissa Sariffodeen* Chief Executive Officer Mike Jarrell* Director of Partnerships Krystal Laframboise Content Coordinator Amber Knabl Youth Program Manager Michael Estalila Youth Programs Manager	Canada Learning Code
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Andrea Niles-Day* Director of Project Governance and Performance Measurement	RBC Capital Markets

Name	Organization
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Sandra Saric* Vice President, Talent Innovation Maureen Ford Program Manager	Information and Communications Technology Council (ICTC)
Dawn Britton* Associate Director, Engineering Outreach Office	University of Toronto
Jessica Thornton* Senior Projects Designer Simona Ramkisson Senior Projects Designer Mark Hazelden* Senior Director Sean Mullin* Executive Director Sarah Doyle* Director, Policy + Research Annalise Huynh* Policy Analyst + Designer Andrew Do* Policy Analyst	Brookfield Institute / Ryerson University

APPENDIX B: DELIVERY PARTNER ORGANIZATIONS AND SITES

BELLEVILLE PUBLIC LIBRARY

The Belleville Public Library and John M. Parrott Art Gallery is a community meeting space that offers free and equitable access to physical and digital collections, artwork, and technology. It also offers services and programs, provided free for residents of Belleville, that aim to meet the educational, recreational, and information needs for adults, teens, and children to support lifelong learning and success. The library and adjoining gallery is the sole Belleville Public Library location in the City of Belleville.[59]

TORONTO PUBLIC LIBRARY

The Toronto Public Library provides free and equitable access to services that meet the changing needs of people in Toronto.[60] Across 100 branches, it offers programs and services that support children, youth, and adults that include but are not restricted to newcomer and language services, health and wellness programs, computer training, personal finance workshops, hobbies, and building small businesses. Over the lifespan of the pilot, programs ran first at the library's Maria A. Shchuka Youth Hub, then at the Centennial branch, and finally at its North York Central Branch.

BOYS AND GIRLS CLUBS OF CANADA

The Boys and Girls Clubs of Canada is a national non-profit that has a mandate to provide safe, supportive places where children and youth can experience new opportunities, overcome barriers, build positive relationships, and develop confidence and life skills.[61] The Clubs offer programs and services that support healthy and active living, learning and career development, leadership, parenting, youth engagement, and academic pursuits. Club locations are located in neighbourhoods where there is a defined need for youth support and programming, and programs are designed around local needs, participant interests, and community context. There is a small fee for Club memberships, although subsidies are available for those who need them.

+ The **Boys and Girls Club of London** is a recreational facility that provides activities and services for children and youth in the time they spend outside of school. While its focus is primarily children and youth, this location also runs recreational and fitness programs for seniors. It also offers free busing to the Club throughout the school year, as well as a nightly Supper Club at a low cost.

+ Of the **Boys and Girls Clubs of Hamilton** locations, which serve children, youth, adults, and seniors, the pilot was offered at a site that placed a particular emphasis on programs and services for children and youth. The Kiwanis Boys and Girls Club location also offers an early learning and child care centre. It also has a range of drop-in programs for school-age children and youth that includes a Dinner Club.

YMCA OF GREATER TORONTO

The YMCA of Greater Toronto is a charity that supports children, teens, young adults, and families through childcare services, education and training services, employment and immigration services, family and youth services, and health and fitness programs.[62] The YMCA typically charges fees for memberships, although financial assistance is available for those who need it.

+ The **YMCA Academy** is an alternative middle and high school that serves students in grades seven to nine, located at the Central YMCA in downtown Toronto.[63] It serves youth with learning disabilities and learning style differences to prepare them for college and workplace level courses. The Academy is for-fee, although financial aid is available. Enrolled students are provided with a number of supports that include small class sizes and individual education plans, life skill and socio-emotional counselling, and experiential learning opportunities such as workplace internships and co-op placements.

+ The **YMCA of Northeastern Ontario** offers services and programs in the cities of Sudbury and North Bay, and operated the Digital Literacy + Coding Pilot out of its Sudbury location. The pilot was offered for free for both YMCA members and non-members.

APPENDIX C: INTEGRATED RESEARCH

Throughout the pilot planning process, we produced a series of reports on digital literacy and skill development and education, ensuring the pilot was grounded in comprehensive research, sharing our work iteratively, and using our research to inform the pilot design.

The State of Digital Literacy: A literature review focused on drawing meaning from educational and pedagogical research and work on technology and the economy to understand digital literacy as it pertains to the changing nature of work. The review included Canadian and international research and best practices in order to explore definitions of digital literacy, the skills it comprises, and its importance.

Digital Literacy in a Digital Age: A discussion paper summarized the key issues and questions that appeared regularly in debates about digital literacy. It set out our initial thinking on the need for digital knowledge and skills, tested a definition of digital literacy and the skills and competencies it comprises, and shared a framework for understanding digital skills.

Levelling Up: The quest for digital literacy mapped the digital literacy education and training landscape in Canada. It highlighted the types of digital skills that people in Canada are pursuing, shed light on barriers to access, and identified existing gaps and potential opportunities to improve the development and supply of digital literacy skills.

I, Human used data scraped from job postings collected by Burning Glass Technologies to identify the digital (skills that involve the use of and/or production of digital technologies) and non-digital (including soft) skills that employers in Canada are seeking.

RESEARCH IMPACT

As well as supporting the design of the pilot, the Brookfield Institute's digital literacy and skills research has been used as a resource by Canadian governments, non-profit service providers, and educators to inform digital skill development policies and programs and technology plans, and

by researchers around the world. Our definition and framework for digital literacy was adopted by the City of Toronto, supporting the design of the City's annual Digital Literacy Week, and has been used by a number of organizations including the City of Hamilton Literacy Plan, Sidewalk Labs' Master Plan, and the Montreal Declaration on Responsible AI. Our research publications are taught in several Ontario universities. They have been featured on CBC Spark, Metro Morning, and Radio Canada International; in *The Globe and Mail*, National Post, Policy Options, Apolitical, the Ryerson Review of Journalism, Techvibes, CIGI, and BetaKit; and through invited talks to the Ontario Digital Inclusion Summit; National Digital Access Day; RightsCon; Polytechnics Canada's Education and Skills Symposium; EDIT: Expo for Design, Innovation & Technology; The Ontario Association of Adult and Continuing Education School Board Administrators (CESBA); Humber College; and George Brown College. *Levelling Up: The quest for digital literacy*, our landscape map of the digital literacy education and training ecosystem in Canada, and *Digital Literacy in a Digital Age,* our initial definitional white paper, have been viewed online over 3000 times.

ENDNOTES

1. Annalise Huynh and Nisa Malli, "Levelling Up: The Quest for Digital Literacy" (Toronto, ON: Brookfield Institute for Innovation + Entrepreneurship, 2018), https://brookfieldinstitute.ca/wp-content/uploads/Level-Up-report-FINAL-online-1.pdf.

2. Annalise Huynh and Nisa Malli, "Levelling Up: The Quest for Digital Literacy" (Toronto, ON: Brookfield Institute for Innovation + Entrepreneurship, 2018), https://brookfieldinstitute.ca/wp-content/uploads/Level-Up-report-FINAL-online-1.pdf.

3. Viet Vu, Creig Lamb, and Rob Willoughby, "I, Human: Digital and Soft Skills in a New Economy" (Brookfield Institute for Innovation + Entrepreneurship, 2019), https://brookfieldinstitute.ca/wp-content/uploads/I-Human-ONLINE-FA-1.pdf.

4. Viet Vu, Creig Lamb, and Rob Willoughby, "I, Human: Digital and Soft Skills in a New Economy" (Brookfield Institute for Innovation + Entrepreneurship, 2019), https://brookfieldinstitute.ca/wp-content/uploads/I-Human-ONLINE-FA-1.pdf.

5. Jeannette M. Wing, "Computational Thinking," *Communications of the ACM,* 49, no. 3 (2006), https://www.cs.cmu.edu/~15110-s13/Wing06-ct.pdf.

6. Teachers Learning Code, "Digital Toolbox: Quick Start Guide" (Toronto, ON: Canada Learning Code), accessed January 29, 2020, https://www.canadalearningcode.ca/wp-content/uploads/teacherslearningcode-quickstartguide.pdf.

7. Annalise Huynh and Andrew Do, "Digital Literacy in a Digital Age" (Toronto, ON: Brookfield Institute for Innovation + Entrepreneurship, 2017), https://brookfieldinstitute.ca/wp-content/uploads/BrookfieldInstitute_DigitalLiteracy_DigitalAge-1.pdf.

8. Annalise Huynh and Nisa Malli, "Levelling Up: The Quest for Digital Literacy" (Toronto, ON: Brookfield Institute for Innovation + Entrepreneurship, 2018), https://brookfieldinstitute.ca/wp-content/uploads/Level-Up-report-FINAL-online-1.pdf.

9. Daniel Munro, "Coding the Future: What Canadian Youth and Their Parents Think about Coding" (Actua, 2019), https://actua.ca/wp-content/uploads/2019/08/Actuas_Coding_the_Future_Survey_Report.pdf.

10. Annalise Huynh and Nisa Malli, "Levelling Up: The Quest for Digital Literacy" (Toronto, ON: Brookfield Institute for Innovation + Entrepreneurship, 2018), https://brookfieldinstitute.ca/wp-content/uploads/Level-Up-report-FINAL-online-1.pdf.

11. Annalise Huynh and Nisa Malli, "Levelling Up: The Quest for Digital Literacy" (Toronto, ON: Brookfield Institute for Innovation + Entrepreneurship, 2018), https://brookfieldinstitute.ca/wp-content/uploads/Level-Up-report-FINAL-online-1.pdf.

12. The Boys and Girls Clubs of Canada describes after-school as the time before and after school, evenings, weekends, and school breaks (Source: https://www.bgccan.com/index.php?securefile=2018/05/After-School-The-Time-of-a-Childs-Life-2018.pdf)

13. "Benefits for Youth, Families, & Communities," (Youth.gov, n.d.) https://youth.gov/youth-topics/afterschool-programs/benefits-youth-families-and-communities.

14. Jacquelynne S. Eccles et al., eds., *Community Programs to Promote Youth Development* (Washington, DC: National Academy Press, 2002), https://files.eric.ed.gov/fulltext/ED465844.pdf.

15. Minister of Children and Youth Services, "Stepping Up: A Strategic Framework to Help Ontario's Youth Succeed" (Government of Ontario, 2014), http://www.children.gov.on.ca/htdocs/English/documents/youthopportunities/steppingup/steppingup.pdf.

16. Susan Bodilly and Megan K. Beckett, "Assessment of Quality in OST Programs," in *Making Out-of-School-Time Matter*, 1st ed., Evidence for an Action Agenda (RAND Corporation, 2005), 61–74, https://www.jstor.org/stable/10.7249/mg242wf.12.

17. BC Recreation and Parks Association, "Addressing the After-School Hours" (Burnaby, BC: BC Recreation and Parks Association, 2010), https://www.bcrpa.bc.ca/media/61189/addressing_after_school_report.pdf.

18. Jacquelynne S. Eccles et al., eds., *Community Programs to Promote Youth Development* (Washington, DC: National Academy Press, 2002), https://files.eric.ed.gov/fulltext/ED465844.pdf.

19. Jacquelynne S. Eccles et al., eds., *Community Programs to Promote Youth Development* (Washington, DC: National Academy Press, 2002), https://files.eric.ed.gov/fulltext/ED465844.pdf; BC Recreation and Parks Association, "Addressing the After-School Hours" (Burnaby, BC: BC Recreation and Parks Association, 2010), https://www.bcrpa.bc.ca/media/61189/addressing_after_school_report.pdf.

20. Jacquelynne S. Eccles et al., eds., *Community Programs to Promote Youth Development* (Washington, DC: National Academy Press, 2002), https://files.eric.ed.gov/fulltext/ED465844.pdf.

21. Faye Mishna et al., "The RBC Foundation After-School Programs Evaluation" (University of Toronto, 2013), http://www.rbc.com/community-sustainability/community/after-school-grants/RBC-Foundation-After-School-Programs-Evaluation.pdf; Joel A. Lopata and Cynthia Grundmann, "Toronto After-School Programs: What Really Matters?" (Toronto, ON, 2015), https://static1.squarespace.com/static/57b5d00df5e231c2f3c354ea/t/57b6326b893fc004c00184d9/1471558253524/Lopata_TASP+2015.pdf.

22. Agnes Meinhard, Ailsa Henderson, and Steven D. Brown, *Best Practices in School Community Service Programs: Evidence from Canada and Abroad* (Toronto, ON: Imagine Canada, 2007), https://books-scholarsportal-info.ezproxy.lib.ryerson.ca/uri/ebooks/ebooks0/gibson_cppc/2009-12-01/6/206609.

23. Joel A. Lopata and Cynthia Grundmann, "Toronto After-School Programs: What Really Matters?" (Toronto, ON, 2015), https://static1.squarespace.com/static/57b5d00df5e231c2f3c354ea/t/57b6326b893fc004c00184d9/1471558253524/Lopata_TASP+2015.pdf.

24. BC Recreation and Parks Association, "Addressing the After-School Hours" (Burnaby, BC: BC Recreation and Parks Association, 2010), https://www.bcrpa.bc.ca/media/61189/addressing_after_school_report.pdf.

25. Our use of the term "girl" is trans-inclusive. Participants included youth who identified as boys, girls, and nonbinary people.

26. The Ontario high school curriculum offers courses in Computer Studies, beginning in grade 10 with *Introduction to Computer Studies*. This course introduces learners to computer programming, hardware configurations, software selection, operating system functions, networking, safe computing practices, and the social, environmental, and ethical issues related to the use of computers. *Media Arts* (grade 11) teaches introductions to digital

animation, digital imaging, and video as well as traditional art forms. *Information and Communications Technologies*, first offered in grade 11, includes word processing, spreadsheet, database, desktop publishing, presentation software, and website design skills (Source: http://www.edu.gov.on.ca/eng/document/curricul/secondary/descript/descri9e.pdf).

27. Creig Lamb and Matthew Lo, "*Automation Across the Nation: Understanding the potential impacts of technological trends across Canada*" (Toronto, ON: Brookfield Institute for Innovation + Entrepreneurship, 2017), https://brookfieldinstitute.ca/wp-content/uploads/RP_BrookfieldInstitute_Automation-Across-the-Nation.pdf.

28. A Raspberry Pi is a small single-board computer designed to teach programming through building robots and other programmable devices.

29. Tazim Virani et al., "Toronto's Youth Serving System: Fragmented Paths to Youth Development" (Toronto, ON: United Way Greater Toronto, 2008), http://ceris.ca/wp-content/uploads/virtual-library/United%20Way_2008a.pdf.

30. While many sites incorporated pilot cohorts into March Break camps, summer camps, and drop-in programs, the Belleville site ran altered programming to condense the curriculum and reach more youth on site and in community, including local schools and other community organizations in nearby counties, in order to address a lack of transportation in the area. For example, the instructor at that site redesigned the curriculum to fit into two day-long weekend sessions to reach participants who were unable to travel to the library during the week, or as short drop-in programs in schools. These altered programs were delivered by one instructor rapidly and opportunistically, and gender was not tracked as a result of site constraints.

31. Individual sites were responsible for participant data collection, including gender, and were not provided with guidelines on how to do this. As far as we are aware, most and potentially all sites did not include "nonbinary" as an option.

32. The final percentage of girls and nonbinary participants reflects a percentage of participants where gender was tracked (which excludes 1,288 youth who participated in Belleville intensives). Outlier Research & Evaluation, "Brookfield Digital Literacy Pilot Final Evaluation Report" (Chicago, 2019).

33. The Ontario curriculum includes information and privacy supported by guides developed by the Information and Privacy Commissioner of Ontario for grade 5, 10, 11, and 12.

34. (Source: https://www.ipc.on.ca/wp-content/uploads/2017/10/dce-working-conference.pdf)

35. Scratch is a block-based visual programming language for children that can be used to create interactive stories, games, and animations.

36. Laura Fokkena, "Moving Beyond Access: Class, Race, Gender, and Technological Literacy in Afterschool Programming," *The Radical Teacher*, no. 90 (2011): 25–35.

37. Ibid.

38. "Digital Media & Learning in Afterschool" (Afterschool Alliance, 2013), https://www.afterschoolalliance.org/issue_briefs/issue_digital_learning_58.pdf.

39. A *zine* is a non-commercial publication that is often self-published, with a small circulation, and focused on a particular subject.

40. Simona Ramkisson, "Digital Literacy + Coding Pilot: Quarterly Insights," *Brookfield Institute for Innovation + Entrepreneurship* (blog), October 1, 2018, https://brookfieldinstitute.ca/commentary/digital-literacy-coding-pilot-quarterly-insights-2.

41. Outlier Research & Evaluation, "Brookfield Digital Literacy Pilot Final Evaluation Report" (Chicago, 2019).

42. The John M. Parrott Art Gallery is co-located alongside the Belleville Public Library. More information can be found at https://bellevillelibrary.ca/johnmparrottartgallerys9.php/gallery-hours.php.

43. Outlier Research & Evaluation, "Brookfield Digital Literacy Pilot Final Evaluation Report" (Chicago, 2019).

44. For example, the curriculum was rewritten to use Glitch in place of Thimble, which was run by Mozilla and is no longer maintained. Both Glitch and Thimble are free, browser-based code editors that can be used to learn and teach HTML, CSS, and JavaScript.

45. A ShareAlike License permits anyone to a) share (copy and redistribute the material in any medium or format), and b) adapt (remix, transform, and build upon the material, for any purpose, even commercial). (Source: https://creativecommons.org/licenses/by-sa/4.0/)

46. Outlier Research & Evaluation, "Brookfield Digital Literacy Pilot Final Evaluation Report" (Chicago, 2019).

47. Outlier Research & Evaluation, "Brookfield Digital Literacy Pilot Final Evaluation Report" (Chicago, 2019).

48. There are 13 Toronto Public Library Youth Hubs situated in community libraries. Hubs are "welcoming drop-in spaces for teens after school and in the summer" that provide snacks, access to technology (laptops, iPads, gaming equipment, etc.), activities and workshops, and homework tutoring. More information can be found at https://www.torontopubliclibrary.ca/services/youth-hubs.jsp.

49. Simona Ramkisson, Pilot Program Lead, interview by authors, February 2020.

50. Outlier Research & Evaluation, "Brookfield Digital Literacy Pilot Final Evaluation Report" (Chicago, 2019).

51. Simona Ramkisson, Pilot Program Lead, interview by authors, February 2020.

52. Wifi signals needed to be strong enough to support a large group of participants all accessing the internet at the same time, as well as any other simultaneous usage on site.

53. Outlier Research & Evaluation, "Brookfield Digital Literacy Pilot Final Evaluation Report" (Chicago, 2019).

54. Outlier Research & Evaluation, "Brookfield Digital Literacy Pilot Final Evaluation Report" (Chicago, 2019).

55. The Toronto Public Library Innovation Challenge is an annual initiative that invites all Library staff, at all levels and locations, to submit ideas for pilot projects focused on topics highlighted in the Library's strategic plan. Staff with approved projects receive time to work on their proposed project, a budget, mentorship, and opportunities to share lessons from their work. (Source: https://torontopubliclibrary.typepad.com/files/innovation-strategy-booklet_final.pdf)

56. Outlier Research & Evaluation, "Brookfield Digital Literacy Pilot Final Evaluation Report" (Chicago, 2019).

57. Outlier Research & Evaluation, "Brookfield Digital Literacy Pilot Final Evaluation Report" (Chicago, 2019).

58. Open source curriculum and other open educational resources are "materials that reside in the public domain or have been released under an intellectual property license that permits their free use and re-purposing by others." (Source: https://aurora-institute.org/event/oer-instructional-materials-and-promising-practices-for-teachers/)

59. "About Us," The Belleville Public Library and John M. Parrott Art Gallery, n.d., https://bellevillelibrary.ca/hourss24.php.

60. “Vision, Mission & Values,” Toronto Public Library, https://www.torontopubliclibrary.ca/about-the-library/mission-vision-values/.

61. “Mission & Vision,” Boys and Girls Clubs of Canada, https://www.bgccan.com/en/who-we-are/mission-vision/.

62. “About Us,” YMCA of Greater Toronto (GTA), n.d., https://ymcagta.org/about-us.

63. “About the Academy,” YMCA Academy, July 9, 2015, https://www.ymcaacademy.org/ymca-academy-program/.

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