Evaluating Squiggle Park’s effectiveness in raising literacy skills for English Language Learners in Canada
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EXECUTIVE SUMMARY

In January 2018, Squiggle Park launched a pilot to study the effectiveness of their innovation in helping English Language Learners master early literacy skills. The pilot was launched in partnership with the Department of Immigration, Refugees and Citizenship Canada (IRCC), who were the federal sponsoring department. Implementation was carried out through settlement organizations and school districts across Canada who support these newcomers. The goal of the pilot was to measure the effectiveness of Squiggle Park in improving literacy skills.

This report presents the results of the pilot, including an analysis of the effects on the literacy skills of the participants and the benefits the pilot had on players, educators and families. The report focuses on the four following hypotheses:

1. That English Language Learners who play Squiggle Park will master reading skills at a pace that is comparable to their English as a Native Language peers.

2. That Squiggle Park can successfully teach adult ELLs early reading skills.

3. That the organizations will find Squiggle Park to be an effective resource for their English Language Learning programs.

4. That users of Squiggle Park exhibit higher levels of engagement compared to average EdTech programs and products.

The findings from surveys and interviews with organization and district leads indicate that participation in the pilot has benefitted players, both young and old, in their mastery of literacy skills. The program has also proven to support the educators in their ability to support the newcomers they serve. The Pilot leads reported their staff felt better able to deliver important literacy programming for English Language Learners for which they were not formally trained. Participation in the Pilot proved to provide additional benefits such as increased confidence and enjoyment in reading and increased digital literacy. All four hypotheses were confirmed.

Sharoize Sultan, from the Learning Enrichment Foundation shared:

“I have a boy in my room who looks forward to coming to school everyday so he can play with Squiggle Park!”

When asked whether the organizations would like to continue using Squiggle Park post Pilot, 100 percent of organization leads responded a resounding “Yes.”
INTRODUCTION

In Canada, only 52 percent of the population over 16 years of age reads at or above the level determined to be essential for living and working in a modern society. It is known that people with low literacy skills struggle to find a job or make more than the minimum wage in today’s information-based economy.

Canada is one of the leading countries in welcoming new immigrants and refugees. While certain immigrants to Canada generally have more education than the average Canadian, refugees often arrive with little or no formal education experience. As the number of refugees has risen over recent years, there has been an increasing strain on the public education and settlement-support system to effectively support the efforts of these new Canadians in developing their English (or French) communication skills and becoming literate.

Squiggle Park is an innovative Canadian EdTech (Educational Technology) company using the power and engagement of video games to help close the literacy gap in North America and around the world. Their app for Pre-K to Grade 3 and English Language Learners combines music, poetry, phonics, and the principles of gaming with a unique pedagogy proven to master reading skills 5 times faster than conventional classroom instruction alone. The innovation includes scientifically backed adaptive games and interdisciplinary learning methods which make it possible for players of all kinds to learn how to read through play.

In 2017, the Build in Canada Innovation Program awarded Squiggle Park a contract to integrate the latter’s innovative application on learning early literacy skills with newcomers to Canada who are classified as English Language Learners. With the Department of Immigration, Refugees and Citizenship Canada (IRCC) acting as the federal sponsoring department, Squiggle Park implemented a pilot partnership with 11 organizations focused on supporting newcomers.

3. The Build in Canada Innovation Program is a competitive, first-purchase program offered by the Canadian government for proven, innovative, pre-revenue products or services that have the potential to improve the efficiency and effectiveness of interactions with the government and/or Canadians.
The pilot focused on the following four goals.

1. **To establish Squiggle Park as a leader in digital English Language Learning.**
   To solidify Squiggle Park's position as a leading provider of digital tools in the global English Language Learning market.

2. **Measure the efficacy of Squiggle Park for English Language Learners.**
   To test whether Squiggle Park assists English Language Learners from diverse backgrounds and cultures, and who speak different languages, accelerate their mastery of early reading skills.

3. **Provide support to educators and families.**
   To determine how the program can support educators, staff and families in delivering literacy programming to English Language Learners.

4. **Commercialize a Canadian innovation.**
   To commercialize Squiggle Park through a mutually beneficial relationship with the government and third-party testing organizations, and identify partnerships for future commercialization.

The rest of the report details the success and challenges of implementing this Pilot Program. Pilot participants were given reading assessments at the start and end of the Pilot, and an analysis of the results is included. The report concludes with recommendations on how IRCC and other government programs can work with Squiggle Park to support these learners.
LITERACY IN CANADA

There are approximately five million school-age students in Canada. One of the main predictors for students not graduating is their proficiency in reading by the end of Grade 3. Those who are not proficient are four times more likely to not graduate.4

Grade three is an incredibly important year for students, as it is the transitional year where students go from learning to read, to reading to learn. It is around this age that students no longer receive direct reading instruction, as it is assumed they know how to read. Instead, these students are expected to now be able to learn from their reading. A study at the University of Chicago found that students’ Grade 3 reading ability is highly predictive of their grades in Grade 8.5

Just over half of Canadians have acceptable reading skills for today’s economy. Closing the gap for those who struggle most is a current challenge for Canada. Low literacy rates affect Canada’s economic capacity, as a literate, educated workforce is needed for Canada to be able to compete in knowledge and information-based fields.

English Language Learners (ELL)

English Language Learners, or ELLs, are people who are not yet proficient in communicating in English where English is not their native language. ELLs come from non-English-speaking homes and backgrounds, and typically require specialized or modified instruction in both the English language and their academic courses. ELLs are the fastest-growing segment of the school-age population in North America; they are a tremendously diverse group representing numerous languages, cultures, ethnicities, nationalities, and socioeconomic backgrounds.6 Appendix 1 provides additional information on the unique characters of ELLs and Appendix 2 contains information on the ELL market.

Many ELLs can be further categorized as Students with Limited or Interrupted Formal Education (SLIFE).7 This designation is especially relevant to refugee populations, as their learning opportunities are often sparse and sporadic. The SLIFE population is generally older (middle school through adult) and requires additional support in learning how to learn.

5 http://www.paschoolperformance.org/doc/11
7 This is also sometimes referred to as SIFE—Students with Interrupted Formal Education
The link between literacy skills and economic growth

A Statistics Canada study used data to investigate the relationship between educational attainment, literacy skills and economic growth. The study found that investment in human capital, that is, in education and skills training, is three times as important to economic growth over the long run as investment in physical capital, such as machinery and equipment. The results also show that literacy scores are more important than years-of-schooling when explaining growth in output per capita and per worker.

One of the study's key conclusions is that human capital accumulation matters a great deal for the long-run wellbeing of nations. In fact, the study suggests that differences in average skill levels among OECD countries accounted for 55% of the differences in economic growth over the 1960 to 1994 period. This implies that investments that raise the average skill level of a population will yield large economic returns.

Furthermore, the study finds that the average literacy score in a given population is a better indicator of growth than one based solely on the percentage of the population with very high literacy scores. In other words, a country that focuses on promoting strong literacy skills across its whole population will be more successful in fostering growth and wellbeing, than one with a large gap between the high-skilled and low-skilled groups.

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SQUIGGLE PARK

Squiggle Park is an application designed to teach early reading skills by harnessing the power of video games and combining them with a strong reading curricula. The innovative pedagogy was designed by game developers, researchers, teachers, and literacy experts. They leveraged the latest in game design techniques and combined them with the latest reading research to empower children to be able to move faster from practice to mastery of the critical reading skills needed to become successful, confident readers.

The curricula is divided across 24 Worlds (World 25 is a recap of all content) and presented in small bite-size stages using eight different mini-games. Squiggle Park collects data from each play session and uses it to offer teachers real-time reporting on progress, allowing teachers to provide just-in-time instruction. The program also uses custom algorithms to move a player to more or less advanced-learning content based on their demonstrated mastery. This enables players to play independently, which increases motivation, while reducing frustration of attempting content that is too challenging.

“One student was able to learn and retain many sounds and words that he didn’t know or want to learn, but Squiggle Park made this enjoyable for him on his literacy journey.”

Marnie Mackenzie, Surrey Schools

Since the games are designed for independent play, players build a sense of confidence as they progress through the game. This independent play and personalized instruction provides educators with time to provide one-on-one instruction with individual players. In the current system, educators face an increasing struggle to meet the needs of students who have an ever widening range of skills. The modern classroom requires scalable solutions that enhance instruction to support educators and promote student achievement.

“The kids who achieved many stars were so pleased to share their own success by showing me what they already practiced.”

Hasana Naam, Afghan Women’s Organization

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9. A white paper on Squiggle Park’s pedagogy can be accessed online: https://squigglepark.com/squiggle-park-pedagogy-paper/
How does it work?

Academics and educators have been working for decades researching how to provide effective, efficient reading instruction. Squiggle Park combines this research with the experiences of educators in the classroom to create a solution that works.

It is clear that it is important for students to develop phonemic awareness as well as phonics. (Phonemic awareness is the ability to understand the sound components of words; phonics is the mapping between letters and sounds in order to decode unfamiliar words). However, there are many common words (usually referred to as high-frequency words, sight words, or Dolch words) that are either not decodable or not easily decoded, based on the phonics young children are taught. For these words, it is actually more beneficial for students to learn to recognize these words automatically.

It is clear that there is not a single “magic” method for teaching reading. Instead, the best methods take pieces from all the popular methods and mix them together. In particular, there are two components that when combined together, allow students to make faster progress in their reading ability. The first component is focusing on the grapheme-to-phoneme correspondences (GPCs) with the highest frequency within words, and the second is focusing on the top 100 high-frequency words.

At Squiggle Park, the goal was to enable readers to read more complex text faster and more confidently. The app was designed around these two main skills -- the most impactful grapheme-to-phoneme correspondences and the top high-frequency words.

Pedagogy

The pedagogy behind Squiggle Park can be broken down into two main sections - Grapheme-to-Phoneme Correspondences and High-Frequency Words. Appendix 3 contains two short videos explaining Squiggle Park’s pedagogy and why it works.

Grapheme to Phoneme Correspondence

Research performed by Janet I. Vousden and Jonathan Solity found that readers should focus on the 64 most frequent GPCs.10 This set of 64 GPCs contains all but one of the traditional letter-to-phoneme sounds as taught in a classroom. The “x as in x-ray” is not a top 64 GPC, but x = /ks/ as in fox is. The letter Q appears only as part of qu, on the list, which is actually how most teachers approach it anyway (Q = /kw/ = queen).

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Within the top 64, there are many instances of the same grapheme being associated with multiple phonemes. For example, “s” shows up twice representing first the /s/ sound as in sit and second as the /z/ sound as in pins. Other ones on the list include “ed” as both /d/ (stopped) and /t/ (passed), and “ow” as in now and know. Similarly, the same phonemes appear multiple times attached to different graphemes such as “ow” (now) and “ou” (out) or “ck” (duck), “c” (cat), and “k” (kite) as in /k/. The fact that one letter can make more than one sound can be confusing for young children to navigate as they are learning to read.

Starting in World 3, players are exposed to decodable spelling words. Throughout Squiggle Park, the spelling word list for each world only contains the GPCs the player has learned from the current and earlier worlds. By the time players have completed the first 13 worlds (half of Squiggle Park), they will have been exposed to 26 GPCs and be able to decode 312 spelling words as well as recognize 52 of the 100 high-frequency words. By the end of Squiggle Park, players will be able to decode over 1500 spelling words and recognize all 100 high-frequency words.

**High-Frequency Words**

Janet I. Vousden and Jonathan Solity analyzed approximately 850,000 words of text taken from both fiction and nonfiction adult books. They discovered that just 100 unique words accounted for 53% of the text; 16 of these words accounted for almost a quarter. These words are generally the building blocks of sentences such as: the, and, to, what. By learning to recognize and understand these 100 words, readers are already able to decode a large volume of text and many of the remaining words (especially for early readers reading picture books) can be figured out by using the surrounding context (such as pictures) as clues.

**Squiggle Park Team**

Squiggle Park was co-founded by Leah Skerry and Julia Rivard Dexter in 2014. In 2016 the first games were released for educators, and today over 76,000 players use the program both in educational settings and at home. They lead a team of 12, consisting of teachers, developers, customer success, and customer support specialists. A full list of the collaborators involved in the pilot and report is shared in Appendix 4.

http://news.bbc.co.uk/2/hi/uk_news/education/4514106.stm
THE PILOT

The focus of the Pilot was to examine the efficacy of Squiggle Park in teaching early reading skills to ELLs. The Pilot was started with the following four hypotheses:

1. That English Language Learners who play Squiggle Park will master reading skills at a pace that is comparable to their English as a Native Language peers.
2. That Squiggle Park can successfully teach adult ELLs early reading skills.
3. That the organizations will find Squiggle Park to be an effective resource for their English Language Learning programs.
4. That users of Squiggle Park exhibit higher levels of engagement compared to average edtech programs and products.

Immigration, Refugees, and Citizenship Canada reached out to their partner organizations requesting those interested to apply to the pilot. Partner organizations were selected based on those who were:

- mostly likely to benefit,
- had the adequate technology to play Squiggle Park, and
- had appropriate support to run the pilot.

As the pilot required significant investment from each partnering organization, it was important that those selected would be able to meet the following requirements:

Support staff:
Each organization was required to have one contact that would lead the pilot.

Training:
A training webinar was required viewing for all staff involved in supporting the program participants.

Technology:
Three technology components are required.

1) Devices (iPads or computers) capable of running Squiggle Park.
2) Enough devices for each player to have access to them for at least 30 minutes per week.
3) A reliable internet connection.
Play:
The organizations committed to having participants play for 30 minutes per week, over 12 weeks.

Feedback and assessments:
To be able to assess the effectiveness of the game, organizations were required to provide feedback through student and staff questionnaires, and to complete reading assessments at the beginning, middle (optional), and end of the pilot.

Timeline

Once the Pilot was approved, the first step was to reconfirm the commitment of the 11 partner organizations. The Pilot ran from January through June, 2018.

In January, each organization participated in training on Squiggle Park. They were asked to finalize their participant list, and the player accounts were created.

In February, all participants were required to complete a reading assessment and student questionnaire. A similar assessment would be completed at the end of the Pilot, with an optional midterm assessment in April.

After completing the initial assessments, participants started playing Squiggle Park. The kind of play varied by organization and was based on variables such as the devices available, the amount of time available to play each week, the play environment, and the ability of players to access Squiggle Park from home.

Players continued to play until the final assessment was completed in June. The number of participants varied throughout the Pilot, as some programs have a continuous intake system. The analysis of the Pilot data focused on players with initial and final assessments.

12 The Squiggle Park licenses the organizations have are valid for one year, so the participants can continue playing until February 2019.
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<th>Month</th>
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<td>January</td>
<td>Squiggle Park and reading assessment training webinars for all organizations</td>
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<td>February</td>
<td>Start of initial reading assessment and weekly game play, distribution of additional resources (see Appendix 5)</td>
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<td>March</td>
<td>Weekly game play continues and site visits to four of the organizations take place</td>
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<td>April</td>
<td>Weekly game play continues, mid-term report is created and mid-term assessments are completed by the organizations</td>
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<tr>
<td>May</td>
<td>Weekly game play continues</td>
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<td>June</td>
<td>Final reading assessment completed by organizations, and game play ends</td>
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<td>July</td>
<td>Data analysis and report creation</td>
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<td>August</td>
<td>Final report, presentation, and specific organizational reports created and shared</td>
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Participants

GRAND ERIE DISTRICT SCHOOL BOARD
Lead: Atala Andratis, ELL ESL/ELD Teacher Consultant
Environment: Grand Erie District School Board\(^\text{13}\) is located in Brantford, Ontario, and the surrounding area and consists of 85 schools. The school board rolled out Squiggle Park in their schools with staff that travel between schools supporting English Language Learners in classrooms. They joined the Pilot to provide extra support to struggling students and try a Canadian-based learning tool. They piloted with 231 players in Kindergarten to Grade 7.

NEWCOMER CENTRE OF PEEL
Lead: Beiyi Day, Settlement Workers in Schools (SWIS) Program Manager; Fransisca Tjandra, Settlement Workers in Schools (SWIS) Administrative Assistant
Environment: Newcomer Centre of Peel\(^\text{14}\) is a multi-service, charitable, non-profit organization that assists the entire newcomer family with settling and integrating into the Region of Peel, Ontario. The Newcomer Centre of Peel played Squiggle Park with 330 English Language Learners in Kindergarten through Grade 12 in Peel district schools, through the support of their Settlement Workers in Schools (SWIS) program and teachers in the district. During the pilot, they also expanded Squiggle Park to their daycare program.

AFGHAN WOMEN’S ORGANIZATION
Lead: Ivanka Gotcheva, Supervisor, Care for Newcomer Children
Environment: Afghan Women’s Organization supports refugees and immigrants to lead self-sufficient and dignified lives in an inclusive society.\(^\text{15}\) The Organization played Squiggle Park with 52 children aged 3-5 years at their Mississauga preschool location, and expanded to their Toronto location during the Pilot. They played Squiggle Park with the goal of benefiting all of the children in their program, ensuring that they were getting exposure to the alphabet and learning to read.

MOSAIC
Lead: Zarghoona Wakil, Manager Settlement and Integration Program (SIP)
Environment: MOSAIC\(^\text{16}\) is a registered charity that has served immigrant, newcomer and refugee communities in Greater Vancouver for the past 40 years. Their settlement workers recommended 7 children for the Pilot; however, due to their late Pilot start date they will not be included in the data.

NIAGARA FOLK ARTS MULTICULTURAL CENTRE
Lead: Marion Campbell, Care for Newcomer Children Coordinator
Environment: Niagara Folk Arts Multicultural Centre\(^\text{17}\) is a community based non-profit charitable organization whose team of professional staff and volunteers provide vital settlement services to newcomers as they strive to create a rewarding life in Canada. They played Squiggle Park with 6

\(^{13}\) http://www.granderie.ca/
\(^{14}\) https://www.ncpeel.ca/
\(^{15}\) http://afghanwomen.org/
\(^{16}\) https://www.mosaicbc.org/about/
\(^{17}\) http://www.folk-arts.ca/
children aged 2-4 years old in their daycare program. Niagara Folk Arts used the program to help players prepare and feel accomplished before they started school, and to introduce technology into their program. It was their first exposure to gaming and tech in the classroom, and they will continue to expand their use.

**REXDALE WOMEN’S CENTRE**

**Lead:** Guadalupe Herrera, Director of Programs  
**Environment:** Rexdale Women’s Centre\(^{18}\) is an independent, non-for-profit, voluntary agency that serves high-need women and their families residing in the Greater Toronto Area, and that supports immigrant, refugee, and newcomer women and their families. The Centre played Squiggle Park to help prepare children for starting school, to expose them to technology, and to raise confidence in their skills. They played with 14 preschool-aged children in their daycare program, with the support of Early Childhood Educators.

**INTER-CULTURAL ASSOCIATION OF GREATER VICTORIA**

**Lead:** Aly Essa, Training Facilitator; Amanda Gaunt, Training Coordinator  
**Environment:** Inter-Cultural Association of Greater Victoria\(^{19}\) helps individuals and organizations to connect across cultures. They provide information, support and tools to help immigrants and refugees reach their goals. They started to play Squiggle Park to support their literacy instruction in their Language Instruction for Newcomers to Canada (LINC) adult classes and teach foundational technology skills. They started with 65 adult learners, and expanded play to the youth participants during the Pilot. They encouraged play at home, which is notable in viewing the amount of time played.

**THE LEARNING ENRICHMENT FOUNDATION**

**Lead:** Iryna Golubyeva, Language Training Manager  
**Environment:** Learning Enrichment Foundation\(^{20}\) offers employment services, skills training, language training, childcare services and supports for children and families, newcomer services, youth programs and community enterprises programs. They played Squiggle Park in their preschool program with 15 children aged 2.5 to 5 years to help them prepare for entering school. The educators noticed players’ progress improve day to day while sharing during group circle time, and kids really enjoyed receiving recognition through the stars after each stage. This group did not complete the reading assessments; therefore, organization-specific data are not available.

\(^{18}\) [http://www.rexdalewomen.org/](http://www.rexdalewomen.org/)  
\(^{19}\) [http://www.icavictoria.org/](http://www.icavictoria.org/)  
\(^{20}\) [http://lefca.org/about_us/index.shtml](http://lefca.org/about_us/index.shtml)
YWCA TORONTO ENGLISH LANGUAGE SKILLS AND DEVELOPMENT

Lead: Maria Yonzon, English Language Skills and Development (ELSD) Manager

Environment: YWCA English Language Instruction for Newcomers to Canada (LINC), offers no-cost English classes to women to enable newcomers to fully contribute to life in Canada. The YWCA played Squiggle Park with 21 women in their adult LINC class. Although Squiggle Park is a program targeted to children, the adult learning centre was eager for their participants to gain digital literacy skills, as well as literacy skills. They were surprised at how quickly their players adapted to the system of play, despite never having worked on a computer.

IMMIGRANT SERVICES ASSOCIATION OF NOVA SCOTIA

Lead: Tayitu Sebsibie and Baseera Khan, Early Childhood Education Leaders

Environment: Immigrant Services Association of Nova Scotia (ISANS) is helping immigrants build a future in Nova Scotia as the largest immigrant-serving agency in Atlantic Canada. They played Squiggle Park with 60 children at their two Early Childhood Education centres locations. They joined the Pilot to offer the children every opportunity to try using technology for the first time and help prepare them for school.

Their biggest learning moment occurred when the the normally quiet-and-shy students started to recognize and vocalize the alphabet.

SURREY SCHOOL DISTRICT

Lead: Analisa Feuz, District Learner Support Team Coordinator (West Zone)

Environment: Surrey School District has the largest student enrollment in British Columbia with 70,736 students in K-12 and approximately half of the students attending school live in a household where a language other than English is spoken. These students represent more than 187 languages. They were motivated to try an effective tool that was funded by the federal government to support English Language Learners with a direct link to K-12 education. They played Squiggle Park at 31 schools in the Surrey School District with 390 children in Kindergarten to Grade 7, implemented by Settlement Workers In Schools (SWIS) staff.

Read this ISANS Feature about Squiggle Park being used in their programming.23

21 https://www.ywcatoronto.org/ourprograms/employmentandtraining/amane newcomerorrefugee/englishclasses
22 http://www.isans.ca/
24 https://www.surreyschools.ca/About/Pages/default.aspx
DATA COLLECTION

Four types of data were collected during the Pilot. First, the educators who were interacting with the players collected demographic information. Second, these educators assessed the players on up to five different reading skill assessments (how many assessments a player completed was dependent on their scores). Third, these educators collected qualitative data from the players. And fourth, Squiggle Park collected data during each play session.

Demographics

As part of the initial assessment, educators were asked to collect the following demographic information on each participant:

- Age
- Grade
- Gender
- If English is their first language
- Where the player was born
- Reading level (above, below, average)
- If English is the primary language used for communication at home

Assessments

The main assessments came from a well known third-party assessment tool called PALS. PALS is an externally validated tool that is used in schools around the world to assess literacy skills. It was developed by Marcia Invernizzi, Ph.D. and colleagues at the University of Virginia. PALS has a range of tools designed to assess reading skills from Pre-K through grade 8. In consultation with the company, four of their Quick Checks tools were chosen, as these lined up most closely with the skills that Squiggle Park focuses on developing.

The four tools used were:
- Upper-Case Alphabet Recognition,
- Lower-Case Alphabet Recognition,
- Letter Sounds,
- Spelling 1-3.

While this Pilot was designed for players with low early reading skills, the actual range of skills of the participant group was not known ahead of time. Under advisement of PALS, cutoffs were implemented for each assessment. If a player scored above the cutoff, they proceeded to the next assessment. If they scored below the cutoff, their assessment ended. The goal of the cutoffs was to reduce any
frustration and/or lowered confidence among the players. For Upper, Lower and Sounds, the cutoff was correctly scoring a minimum of 16. For Spelling, the cutoff was correctly answering all 12 questions in a single set.

For Upper and Lower, players were presented with a grid of the alphabet showing all 26 letters randomly ordered in either uppercase or lowercase form. Players were asked to name all 26 letters.

For Letter Sounds, players were asked to identify the sound corresponding to 23 letters and 3 digraphs. The three digraphs were Sh, Ch, and Th. The vowels and the digraph Th have two corresponding sounds, and assessors were directed to mark the answer correct for identifying either sound. The three letters missing from the assessment were M, Q, and X. The sound for ‘M’ is used in the instructions to the players. Q and X are special cases for letter sounds. Q is usually only seen as part of ‘qu’ which uses a combination sound of /kw/. X is usually seen in two forms either at the start of words with e (for example excel or extra) or at the end of words like fox, in which case it is also a combination sound similar to Q, in this case it is /ks/.

The Spelling 1-3 Quick Check consists of eight different spelling sets labelled from A to H. Under PALS advisement, only four of the sets were used (A, D, F, and H). Each set consists of a list of 12 words that focus on three different characteristics (four words per characteristic). Unlike a traditional spelling test, players are not assessed on spelling the entire word correctly. Instead, each word has a characteristic that is being tested, and an answer is considered correct if that characteristic is included, even if the word as a whole is wrong. For example, one of the test words is “big” and the characteristic is the short vowel ‘i’. Players who wrote big would be marked as correct, but so would a player who wrote bij, as they included the ‘i’ in the correct location.

For the final assessment, an additional assessment was included which consisted of a list of the 100 high-frequency words that are taught in Squiggle Park. Players were asked to read each word aloud. Educators were instructed that a student could end the assessment early if an entire group of words was incorrect. The words were grouped based on the world they are introduced in Squiggle Park.

**Qualitative Feedback**

Throughout the pilot, Leads, Educators and Players were all asked to provide qualitative feedback. Some of the questions were open-ended while others were multiple choice.

For the players, questions focused on what they liked and disliked about the game, as well as how frequently they read or are read to, their opinion of reading, and if they identify as a reader.

For educators and leads, the questions focused on their thoughts about the program, their perception of the players opinions on the program, specifics about how they played the program in their organization, and their perceived outcomes from the pilot. The questions regarding the manner in which players used Squiggle Park include whether they are receiving support on the technical or questioning aspect of the game, what type of devices they play on, and what other reading instruction they were receiving. Educators and leads also provided additional feedback around whether they noticed players using the skills they’ve learned in Squiggle Park outside the game, if they see value in
continuing to play Squiggle Park, and if they are gaining literacy and digital literacy skills through the program.

“Part of the learning was learning how to use a computer comfortably.”

Maria Yonzon, YWCA

Squiggle Park Player Data

Squiggle Park collects data during every play session. The main data collected are around players interaction with individual stages. Each stage attempt is recorded and includes information as to what stage, the total time of the attempt, the number of questions asked, and the player’s accuracy. Each player also has a data object called Stage Progress connected to their account that contains a list of all stages attempted and the number of stars the player has earned for each stage (they can earn a max of 3 per stage).

The data collected by Squiggle Park are featured on the Squiggle Park teacher dashboards to provide educators with an overview of each student’s interaction with the game. Educators can see what stages a student has attempted, what stages they’ve mastered, and what world they are currently working in. A link to a video of the teacher dashboards is provided in Appendix 6.

“It was a positive learning experience and children in the group were excited to show mom when she came in how many stars they received.”

Marion Campbell, Niagara Folk Arts Multicultural Centre

Complications with Data Collection

As with any study, especially a large one like this Pilot, complications arose with the data collection. These complications primarily affected the amount of paired data (initial and final assessment results) that was collected.
The main complications were the following:
1. Players leaving mid-way through the pilot
2. Communication of the instructions from the organization leads to the educators, who were doing the assessments
3. Incorrect or inconsistent inputting of assessment data
4. Spelling assessment issues

In the end, setting the cutoff for the spelling assessment at 12/12 on the initial assessment meant that there were very few players who attempted more than the initial spelling set ‘A’. This resulted in very few paired data sets, though those for whom there is paired data generally scored highly. It is also difficult to directly relate the spelling assessments to the ordering of GPCs taught in Squiggle Park. The PALS Quick Checks were chosen in order to use a pre-validated test. However, should a similar study be conducted in the future, it would be better to use a different spelling test more closely related to the curriculum of Squiggle Park.

PILOT DEMOGRAPHICS

While the pilot focused on teaching player early reading skills (those usually taught in Pre-K to grade 2), the age of the players ranged from two years old to adults. There were 1,565 player accounts created for the pilot, and 1,184 of them were used to log time on Squiggle Park.

The goal of this pilot was to evaluate the efficacy of Squiggle Park. Since it is not reasonable to expect to correlate player learning (or lack of learning) to Squiggle Park for players with little interaction with the app, the analysis focused on those players who logged a minimum of 60 minutes of play time. The average player on Squiggle Park requires between 30 - 60 minutes to master a world. Of the active players, 879 of them (74%), logged over an hour of play time, and 92% of these players met or exceeded an average of 15 minutes per week.26

Collectively, the active players on Squiggle Park:
- answered over 1.75 million questions (average 1995),
- earned over 191,000 stars (average 218),
- attempted over 151,000 stages (average 172),
- mastered over 5,000 worlds (average 5.7),
- logged almost 166 days worth of play time (average of 272 minutes or 4 hours and 32 mins).

26 It is important to note that Squiggle Park only logs time when a player is playing a stage as play time. Time spent opening, logging in, and choosing a world or stage is not included in this time. Sixty minutes of logged play time represents closer to an average of 120 minutes of time on the app.
While 951 players did the initial assessment, only 594 completed the final assessment. Of those players, 420 who completed both the initial and final assessments also logged over an hour of play time. General demographics were collected on the initial assessment.

- The participants were split 55% male and 45% female.
- 56% between 6-8 years old.
- 58% were primarily in Grades 1-3.
- 83% are English Language Learners (ELL) and 84% were identified as reading below grade level.
  - However, only 2% were not in the grade expected for their age.
- 54% were born outside of Canada in a country where English is not the primary language.
  - 41% were born in English-speaking areas within Canada.
- 77% of the players speak a language besides English at home.
- Just under 3% of players were identified as special needs.

DATA ANALYSIS

The analysis presented in this section only includes players who have data for both initial and final assessments of each assessment type. Each assessment type (Uppercase, Lowercase, Sounds and Spelling) was completed by a different numbers of paired players. This is partly a result of the cutoffs and partly a result of incomplete and/or inaccurate completion of the assessments.

“They don’t consciously know that they’re learning, they feel like they’re playing.”

Maria Yonzon, YWCA

Uppercase

Key Finding

The average Pre-K player almost tripled the number of letters they knew by the end of the pilot.

As the Uppercase assessment was the first assessment, it has the most data. The table below presents the average results on both the initial and final assessments across the organizations, along with the total number of players for which data are available.
All organizations saw an increase in results from initial to final. Noticeably, the biggest increases occurred for the Pre-K groups (Afghan and ISANS). Afghan saw an increase of 8.87, followed by ISANS with 5.85. However, it is important to acknowledge that the other organizations started with considerably higher scores and therefore had less room to progress from initial to final.

For many of the Pre-K players, Squiggle Park was their first introduction to letters. By the end of the Pilot, the average Pre-K player had almost tripled the number of letters they knew. Thirteen of the Pre-K players started the Pilot not knowing any letters. These same players had a final assessment score average of 7.23. Some of these players made dramatic strides forward. For example, one Pre-K player (7AYJ4MGPCD) increased their score from 0 on the initial uppercase assessment to 24 on the final. On the final assessment, this player also correctly identified 23 sounds!

To preserve player anonymity, players are identified in this report using a Squiggle Park ID and not their name.
“My students have enjoyed playing Squiggle Park and they always come into my classroom asking to play the game.”

Janelle Martens, Surrey Schools

**Lowercase**

**Key Finding**

*Uppercase knowledge is closely tied to lowercase knowledge*

In examining the Lowercase results, it became clear that the cutoff used on the uppercase assessment prevented useful data collection. Upper and Lowercase letters are usually presented as a pair (Aa) and not in isolation. In Squiggle Park, the letters are divided into five groups. Mastering the set of stages associated with each group requires mastering Uppercase, Lowercase and the connection between Upper and Lowercase (A = a).

The cutoff on the uppercase assessment meant that only players who had an initial score of at least 16 completed the initial Lowercase assessment. In examining the results it becomes very evident how closely understanding Uppercase letters is tied to Lowercase letters. While players scored an average of 21.62 on the initial Uppercase assessment, dividing them into two groups (above and below the cutoff) shows the wide range between these players’ abilities. Those who scored below the cutoff had an average of 5.36, while those who scored above had an average of 24.76 -- a difference of 19.4 letters!

In comparison, the average score of players who completed the initial Lowercase assessment (those above the uppercase cutoff) was 24.47. The average difference between uppercase and lowercase scores for these players was only 0.4. On the final assessment, the average between these two values was similar at 0.5.

**Letter Sounds**

**Key Findings**

• Players averaged an increase of 3.25 new letter sounds, approximately equivalent to mastering one world of entirely new content.
• The largest gains were made by the kindergarten and adult players.
• There was no statistical difference between the male and female players.

The results from the Letter Sounds assessment are particularly interesting, as mastering letter sounds represents a majority of the stages in Squiggle Park. Instruction in Letter Sounds (or GPCs) varies widely from school to school and teacher to teacher. In Squiggle Park, players potentially encounter a different ordering from what they are currently receiving at school (or have received). This means
that it is possible for a player to already know half of the letter sounds on the assessment and still encounter all new content in Worlds 2-5, as those worlds may contain the half they do not know.

In order to increase a player’s knowledge of upper and lowercase letters, they only needed to play and master stages in World 1. The Letter Sounds used on the assessment, however, are introduced across worlds 2 to 15 (and re-used through to World 25). Each world introduces a small subset (ranging from 2-5) of new letter sounds.

The table below presents the average results on both the initial and final assessment across the organizations, along with the total number of players for whom data are available. Players averaged an increase of 3.35 new letter sounds. This represents mastering a minimum of one world in Squiggle Park that contains all new sounds.

<table>
<thead>
<tr>
<th></th>
<th>≥ 60 minutes</th>
<th>Average of Initial</th>
<th>Average of Final</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall</strong></td>
<td>336</td>
<td>19.24</td>
<td>22.59</td>
</tr>
<tr>
<td><strong>Grand Erie</strong></td>
<td>94</td>
<td>19.46</td>
<td>22.36</td>
</tr>
<tr>
<td><strong>Peel</strong></td>
<td>71</td>
<td>18.82</td>
<td>21.70</td>
</tr>
<tr>
<td><strong>Surrey</strong></td>
<td>151</td>
<td>19.60</td>
<td>23.03</td>
</tr>
<tr>
<td><strong>Victoria</strong></td>
<td>8</td>
<td>17.00</td>
<td>25.00</td>
</tr>
<tr>
<td><strong>YWCA</strong></td>
<td>12</td>
<td>17.25</td>
<td>22.67</td>
</tr>
</tbody>
</table>

The change from initial to final for the letter sounds is higher than the change for Uppercase letters. Because Letter Sounds are one of the main focuses of Squiggle Park, it was hypothesized that Squiggle Park would have the greatest impact on these scores.

A likely contributor to the strong increase in Letter Sounds is Squiggle Parks’ method of reinforcing earlier content in later worlds. Should a player start at World 7, but not already know the letter sound for “P” (World 4), they will still encounter this sound as they play. Players in World 7 will primarily encounter content from World 7, but it will be augmented by content from Worlds 2 to 6.

Many players made impressive gains from the initial to final assessment. For example, player RHBUMTBXSF from Peel increased their score from 2 on the initial assessment to 26 on the final assessment. Twenty-eight players had increases of at least 10 new letter sounds from initial to final.
Similar to the Uppercase scores, YWCA and Victoria started with the lowest average initial assessment score (outside of the Pre-K organizations). And again, these organizations had the strongest increase in scores, both finishing with the largest gains.

As letter sound knowledge is spread across many worlds, more play time is required to make progress. The players from these two organizations who completed this assessment averaged 11.53 hours during the Pilot, over double the average of the other organizations, who averaged 4.86 hours. With this extra time, these players were able to complete on average 3.9 more worlds than the other players.

### Results By Grade

The table below breaks down these results by player grade, focusing on Kindergarten through Grade 3. The results of the adults (18+) are included as an interesting comparison. Based on their average initial scores, they fell somewhere between the Kindergarten and Grade 1 players.

<table>
<thead>
<tr>
<th>Grade</th>
<th># Players</th>
<th>Initial</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kindergarten</td>
<td>13</td>
<td>13.85</td>
<td>17.77</td>
</tr>
<tr>
<td>Grade 1</td>
<td>91</td>
<td>19.73</td>
<td>22.81</td>
</tr>
<tr>
<td>Grade 2</td>
<td>82</td>
<td>20.15</td>
<td>23.27</td>
</tr>
<tr>
<td>Grade 3</td>
<td>54</td>
<td>20.11</td>
<td>23.31</td>
</tr>
<tr>
<td>Adult</td>
<td>20</td>
<td>17.15</td>
<td>23.60</td>
</tr>
</tbody>
</table>
The kindergarten and adult groups showed the most progress, with the group averages increasing by 3.92 and 5.75, respectively. These two groups also showed the most progress on the uppercase assessment, which can be seen in the chart below.

These results, combined with the increases seen in Uppercase knowledge by the Pre-K players, strongly indicate that Squiggle Park can successfully assist players of all ages with strengthening and developing their early reading skills.

**By Gender**

The table below presents the average scores on the sound difference for the Grade 2 and 3 players divided by gender. These grades were combined into a single set, as they had overall similar initial and final scores.

<table>
<thead>
<tr>
<th></th>
<th># Players</th>
<th>Initial</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Male</strong></td>
<td>83</td>
<td>19.7</td>
<td>23.12</td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td>53</td>
<td>20.81</td>
<td>23.55</td>
</tr>
</tbody>
</table>

While the initial score for males was just over a point lower than the females, they made strong gains over the Pilot and cut the difference down to less than 0.45. A two-sample equal variance T-Test shows no significant difference between either the initial or final scores of the two groups.
The Impact of Playing ≥60 Minutes

Key Findings

• Players with ≥ 60 minutes made larger gains than those who did not use Squiggle Park.
• Players with ≥ 60 minutes learned almost twice as many new sounds than those with 0 minutes.

A number of potential players who completed the initial assessment ended up not using Squiggle Park. For the final assessment, their educators were encouraged to assess these non-players, as they are similar to a control group. In the end, 54 players who did not play Squiggle Park had both initial and final assessments.

The table below presents the average scores of players with ≥ 60 minutes and those who did not use Squiggle Park (0 minutes) for the initial and final assessments for the uppercase and sounds assessments. Both groups showed an increase on both assessments. This result is expected, as all participants in the Pilot were involved in organizations that are providing support and/or instruction in learning English and reading.

<table>
<thead>
<tr>
<th></th>
<th>0 minutes</th>
<th>≥ 60 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Uppercase</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td># Players</td>
<td>54</td>
<td>406</td>
</tr>
<tr>
<td>Average of Initial</td>
<td>25.09</td>
<td>21.62</td>
</tr>
<tr>
<td>Average of Final</td>
<td>25.69</td>
<td>23.39</td>
</tr>
<tr>
<td><strong>Sounds</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td># Players</td>
<td>53</td>
<td>330</td>
</tr>
<tr>
<td>Average of Initial</td>
<td>21.36</td>
<td>19.18</td>
</tr>
<tr>
<td>Average of Final</td>
<td>23.15</td>
<td>22.43</td>
</tr>
</tbody>
</table>

However, when comparing these two groups, the players with ≥ 60 minutes made larger gains from initial to final assessments across both tests. The largest gains were found in the sounds assessment, which is also the assessment where both groups started with lower averages. In this assessment, those who played Squiggle Park learned almost twice as many new sounds than those who did not. These gains strongly suggest that Squiggle Park had a positive impact on players’ abilities during the pilot project.

However, it is important to note that there were very few zero play time players who completed both the initial and final assessments and so the error margins in this group are much higher. Also, it is not known why some players did and some players did not play within the same class. Based on some of the assessment results, some of the zero play time players were likely identified as being too advanced for Squiggle Park. This is supported by this group generally starting with higher initial averages.
Spelling

Key Finding

• All organizations showed an increase in scores from initial to final assessment.  
  (The design of this assessment impacted the number of completed assessments.)

Spelling, a skill known as encoding, is often one of the hardest reading skills to master. Unlike decoding, where readers can use the rest of the sentence and any accompanying images to help them understand a new word, spelling is done in isolation. Therefore, it was expected that the spelling assessments would be the most difficult for the players.

Research by Graham et al. found that literacy programs that balance reading and writing instruction resulted in significant gains in both the reading and writing skills of the students. While phonics instruction is important, many words do not use the most common GPCs, making them more difficult to learn how to spell. By combining reading and writing instruction, students are exposed to these words through their reading and are able to exercise this knowledge through writing.

In Squiggle Park, starting in World 3, with the introduction of the first vowel (short i), players are exposed to spelling. There are two forms of spelling activities. The first activity has players “spelling” words by ordering phonemes, while the second activity has players spell by ordering graphemes. Players are further exposed to spelling of many non-decodable words through the high-frequency stages.

The spelling assessment consisted of four spelling sets (A, D, F and H). However, under recommendation from PALs, players only continued onto the next spelling set if they received a perfect score (this was lowered on the final assessment to a minimum of 10/12). The combination of the difficulty of spelling and the strict requirements for progressing accounts for the sharp decrease in

the number of players who completed set D after set A. (Too few players completed sets F and H, and those results are not included.) The following table provides the breakdown of the number of players who had ≥ 60 minutes of play who completed the initial and final assessments on spelling sets A and D.

<table>
<thead>
<tr>
<th></th>
<th>Set A</th>
<th>Set D</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>221</td>
<td>48</td>
</tr>
<tr>
<td>Grand Erie</td>
<td>64</td>
<td>19</td>
</tr>
<tr>
<td>Peel</td>
<td>48</td>
<td>7</td>
</tr>
<tr>
<td>Surrey</td>
<td>100</td>
<td>22</td>
</tr>
<tr>
<td>YWCA</td>
<td>9</td>
<td>-</td>
</tr>
</tbody>
</table>

The chart below shows the average increase in scores across spelling sets A and D. All organizations recorded an increase in scores from initial to final.

**High-Frequency Words**

**Key Finding**
- The 46 players who mastered Squiggle Park, scored an average of 93%, with 17 of them (36%) correctly identifying all 100 words
As part of the final assessment, educators were asked to have players who had mastered World 2 (or any higher world) to complete a high-frequency words assessment. The assessment was completed by 244 players who had the minimum 60 minutes of play.

For this assessment, the high-frequency words were ordered by world. Therefore, by looking at the highest world a player mastered, it is possible to estimate the minimum percentage of the words they should know. In the end 225 of the 244 players (92%) attempted, at minimum, the number of words expected. The results of the 19 who did not, were generally thought to be those of outliers. For example, one player who should have attempted all 100 words stopped after thirteen. In addition, these players were grouped under only a few educators, which suggests that there were other issues with completing this assessment.

The 225 players obtained an average score of 81%, 178 of them (79%) attempted more words than expected, and 155 of them (63.5%) met or exceeded expectations.

Forty-seven players completed Worlds 24 or 25 and therefore mastered the content in Squiggle Park.

Three of these players did not attempt all 100 words, including the outlier mentioned above, who only attempted 13 words. After removing the outlier, the remaining 46 players scored an average of 93%, with 17 of them (36%) correctly identifying all 100 words.

**Adult Learners**

**Key Findings**

- Adult learners made the largest average gains.
- Six of the 10 most prolific players during the pilot were adult learners.

As far as is known, this was the first time that Squiggle Park was used with adult learners. As the app was designed for Pre-K to Grade 2, the graphics, voices, characters and music were designed to appeal to this age group. Because of this, it is particularly interesting to look at the results of the adult learners. Three organizations in the pilot had adult learners, but only two (YWCA and Victoria) completed the assessments and are used for the analysis below.

The chart below illustrates the average increase each organization\(^3\) made on the Uppercase and Sounds assessments. The YWCA and Victoria players made larger gains on both assessments compared to the other groups. The only group that outperformed the adult learners were the two Pre-K organizations (ISANS and Afghan) on the uppercase assessment (not shown on the chart).

Six of the 10 most prolific players during the Pilot were adult learners. These results show that the adult learners found that the benefits of Squiggle Park more than compensated for any potential drawbacks of the look of the game.

\(^3\) Only organizations that had uppercase and sound results are included.
“Teachers may automatically rule out a resource because it doesn’t look age appropriate out of respect for their learners.”

Analisa Feuz, Surrey Schools

ELL Pilot Players vs General Squiggle Park Players

Key Finding

- Pilot players (ELLs) were learning and mastering content at similar rates to general Squiggle Park players (and in some cases exceeding them).

The table below presents four general metrics for general Squiggle Park players with a minimum of 30 minutes of logged play time and pilot players. The general data set consists of over 20,000 players and covers a time period from August 2017 through the end of May 2018. For the Pilot data, the data set was increased from the above analysis to similarly contain all players with a minimum of 30 minutes of time. This resulted in data from 1,010 pilot players.

<table>
<thead>
<tr>
<th></th>
<th>General Players</th>
<th>Pilot Players</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong># of Players</strong></td>
<td>&gt;20,000</td>
<td>1,010</td>
</tr>
<tr>
<td><strong>Average Total Time</strong></td>
<td>192 minutes / 3 hours 12 minutes</td>
<td>242 minutes / 4 hours 2 minutes</td>
</tr>
<tr>
<td><strong>Average Total Stars</strong></td>
<td>141</td>
<td>196</td>
</tr>
<tr>
<td><strong>Average Stars Per Hour</strong></td>
<td>~44</td>
<td>~49</td>
</tr>
<tr>
<td><strong>Average Stars Per Week</strong></td>
<td>20.5</td>
<td>26</td>
</tr>
</tbody>
</table>

31 Stars earned are directly correlated with content mastered in Squiggle Park. Players can earn a maximum of 3 stars per stage and are required to earn 2/3 of the stars in a world to unlock the next world. There are 915 possible stars in Squiggle Park.

32 Calculated by dividing total stars earned by a player by the number of weeks the player played.
The Pilot players outperformed the general players by averaging more time played, more stars earned, more stars earned per hour, and a faster rate of Stars Per Week (SPW). The difference in the Pilot statistics from the general player for average time and average total stars can likely be attributed directly to their participation in the Pilot. The educators involved in the Pilot were more motivated to use Squiggle Park with their players, resulting in more time logged. While it is expected that players will earn more stars as they increase their total time, the Pilot players were actually able to earn stars at a faster rate, based on their stars per hour. The difference in the SPW results may also be connected to their participation in the Pilot, as these players had a shorter time frame to earn their stars. The time period for the general players is more than double the length of the Pilot.

Stars Per Week is a particularly interesting metric because it correlates most directly to player mastery. It is possible for a player to put in a lot of time on Squiggle Park and not increase their skills by replaying stages they have already mastered. In these cases, a player’s total star count will remain unchanged, and their average SPW will drop. On the other hand, every time a player masters additional content in Squiggle Park, their total star count increases. Players can only earn a maximum of 3 stars per stage, and stars are only earned once (a player replaying a stage they’ve already earned 3 stars on does not affect their total star count).

Replaying stages is not inherently a bad activity. In fact, there are two cases where players are actively encouraged to replay stages. The first case is at the start of a new play session. Replaying a stage already mastered can be a confidence booster, setting the player up for a successful session. The second case is to earn any missing stars. Once a player has earned 1 star on a stage, it is possible for them to proceed to the next stage. However, in order to master a world, they need to earn two thirds of all the stars available in the world. This means players may need to replay earlier stages to earn missing stars. When players are replaying a stage for those missing stars, they are also increasing their mastery of the content as the number of stars rewarded is directly tied to their accuracy and error rate. Three stars are only awarded for perfect play.

“I have a boy in my room, who [is] looking forward to com[ing] to school everyday so he can play with Squiggle Park.”

Sharoize Sultan, Learning Enrichment Foundation

To more closely examine the rate at which players earned stars, the players were grouped by average time played per week in four 15 minute increments (<15, 15-30, 30-45, 45-60) and a fifth group for all players over 60 minutes. The chart below shows the spread of SPW across each group. The y-axis indicates the percentage of players who earned that SPW rate, while the x-axis ranges from 0 to 155 SPW.

The chart shows that players who averaged less than 15 minutes per week (the blue) averaged very few SPW, as the curve is far to the left. On the other hand, the red (15-30 minutes per week) shows a shift to the right and a wider spread. The shift shows an increase in average SPW and the wider spread shows higher variance across the players. The chart shows that the average number of SPW increases with each group, as the charts slowly shift to the right.
The same chart is re-created below using the results of the pilot players.

The main difference between the two charts is the smoothness of the lines, though this is simply a consequence of there being far fewer players in the pilot data than the overall data. More importantly, it is clear that the trends noticed in the general data exist in the pilot data as well.

It is very positive to see similar trends between both groups of data, as it suggests that the ELL players using Squiggle Park in the Pilot were benefiting and learning at similar rates to their peers. With the support of the Pilot and the increased time by the Pilot players, the Pilot players are, in some aspects outperforming their peers. As one of the goals of the study is to assist ELL readers in catching up with their peers, these charts strongly suggest Squiggle Park is succeeding in doing exactly that.
Reading Trends

Key Findings

- Players increased the frequency they read (or are read to).
- Players neutral or positive feelings toward reading increased.

On the assessments, players were asked about their feelings toward reading and how frequently they read (or are read to). The below analysis, again, focuses only on the players with a minimum of 60 minutes of play.

The reading frequency of the 418 players with paired data is presented in the table below. This question focused on the reading activity of the player outside of school. The number of players who were reading (or being read to) “rarely” dropped by almost one quarter. The remaining three groups (weekly, a few days a week, and daily) all saw increases.

While it is not possible to claim a direct correlation for this increased activity to Squiggle Park, the increases in reading frequency are likely a combination of playing Squiggle Park, increases in individual reading skills, and an increase in focus on literacy resulting from participating in the Pilot.

<table>
<thead>
<tr>
<th></th>
<th>Initial</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rarely</td>
<td>35.89%</td>
<td>27.75%</td>
</tr>
<tr>
<td>Weekly</td>
<td>12.44%</td>
<td>16.27%</td>
</tr>
<tr>
<td>A few days a week</td>
<td>27.03%</td>
<td>28.95%</td>
</tr>
<tr>
<td>Daily</td>
<td>24.64%</td>
<td>26.79%</td>
</tr>
</tbody>
</table>

Readers were also asked to indicate how reading makes them feel by choosing from one of five sad or happy faces. The table below shows the results for the 426 players with paired data. The number of players identifying reading with a negative emotion (the red and orange faces) dropped, while the numbers who expressed a neutral or happy emotion increased.

<table>
<thead>
<tr>
<th></th>
<th>😞</th>
<th>😞😊</th>
<th>🙂</th>
<th>🙂😊</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>3.52%</td>
<td>3.52%</td>
<td>20.42%</td>
<td>23.71%</td>
<td>48.83%</td>
</tr>
<tr>
<td>Final</td>
<td>1.88%</td>
<td>1.41%</td>
<td>21.36%</td>
<td>24.65%</td>
<td>50.70%</td>
</tr>
</tbody>
</table>

On the final assessment players were asked if they believed the following line applied to them: “I am a reader.” Players were given the options of Yes, No and Unsure. Of the 418, just over 62% of players chose Yes, while the No and Unsure categories both received similar responses of approximately 19% each.
Feedback from Organizational Leaders

Key Finding

- Eight (of ten) organizations ranked the value of Squiggle Park as 10/10.
- All organizations will be continuing to play Squiggle Park in the fall.

At the end of the pilot, the organizational leaders were asked to provide feedback regarding the pilot and skills players did (or did not) develop.

All ten organizations that played during the Pilot are going to be continuing to play Squiggle Park in the fall. And seven of the ten organizations have indicated that they will be expanding their use of Squiggle Park to other programs and participants. All ten organizations said the value of Squiggle Park is very high (eight out of ten organizations ranked this 10 out of 10).

On the development of digital literacy skills, five of the ten organizations agreed that Squiggle Park improved players digital literacy skills. It was specifically noted that the adults and children who did not have prior experience with computers or tablets gained confidence in using them by playing Squiggle Park.

Another benefit that was reported was that Squiggle Park helped the youngest players, the two to three years old, improve their fine motor skills.

As a result of the feedback, two main recommendations emerged. The first recommendation from eight organizations was that a game for learners who have mastered the skills in Squiggle Park would be beneficial for their participants. The second recommendation was to create a version of Squiggle Park that was graphically appropriate for older learners (youth, adults, and seniors).

Additional feedback provided by organization leaders is provided in Appendix 7 through a letter of support.

“Our childhood educators don’t come in with any experience in ELL instruction. This type of programing both removes a great burden on our staff and also gives us confidence our children are learning the most important fundamental skills.”

Susan Hoo, Manager
The Centre For Newcomer Children
REVISITING PILOT HYPOTHESES

How did the four hypotheses presented at the start of the pilot hold up over the course of the pilot?

1. That English Language Learners who play Squiggle Park will master reading skills at a pace that is comparable to their English as a Native Language peers.

Game play data showed that compared to the general Squiggle Park population, Pilot participants earned more stars per week and more stars on average. While the general Squiggle Park population also contains ELLs, they represent a much smaller percentage than in the pilot.

This hypothesis is confirmed.
2. That Squiggle Park can successfully teach adult ELLs early reading skills.

One of the goals of this pilot was to test the success of Squiggle Park with an adult ELL group. The reading assessments showed that the adult group of learners from the YWCA made the most progress in letter sounds across all groups. These players improved across all assessments. The results also show that the adult ELL group not only tolerated playing Squiggle Park but that they found it a valuable use of their time, averaging double the play time of the average pilot participant.

This hypothesis is confirmed.

3. That the organizations will find Squiggle Park to be an effective resource for their English Language Learning programs.

100% of organizations who played Squiggle Park during the pilot period confirmed they will be continuing to use Squiggle Park in their literacy programming in September 2018. This shows that the staff and educators believe it is an effective resource for ELL programs.

This hypothesis is confirmed.

“For these children this was a great experience for them. Knowing when they came here to Canada they had either no language or very little. They are both leaving our program and going into Junior Kindergarten in the fall, we as staff feel that squiggle park has definitely helped in giving them the language to help them.”

Marion Campbell, Niagara Folk Arts Multicultural Centre

4. That users of Squiggle Park exhibit higher levels of engagement compared to average EdTech programs and products.

A study done by Lea(R)n, Inc. examined the engagement rates of EdTech programs and products. The Pilot had 76% of licenses activated, well above the 63% industry standard reported by Lea(R)n.

The prescribed usage goals for the Pilot was 12 weeks of play at 30 minutes per week. Even though the Pilot ran from February to June, there were many factors that impacted weekly play. For example school or program breaks, continuous intake programs where players come and leave during that time, and technical difficulties. However, 18% of the active Pilot players fully met the prescribed goal, over three times higher than the industry standard of 5%.

This hypothesis is confirmed
CONCLUSION

As Canada continues to keep its doors open to immigrants and refugees, the number of English Language Learners will continue to grow. Being able to provide effective support to these ELLs continues to be a strain on the public education and settlement-support communities. However, apps like Squiggle Park can assist these organizations with developing English (or French) communication skills in these learners.

Through this Pilot, Squiggle Park demonstrated that it can be effectively used by newcomers of all ages to improve their mastery of early reading skills. Not only was it effective, but the Pilot participants progressed at a rate that was comparable to (and in some cases better than) the general Squiggle Park user base.

While all participants benefited from the Pilot, the Pre-K and adult player groups stood out as definite successes. Through use of Squiggle Park, the Pre-K players on average almost tripled the number of letters they know. Students are increasingly expected to start Kindergarten already having mastered skills such as letter naming. For many of the students growing up in a home where English is not the first language, there are no parents or guardians who are able to teach them these skills. Squiggle Park can help close this skill gap.

Before the pilot, Squiggle Park had never been knowingly used by adult learners. As the program was designed for young kids, it was unclear if the adult community would accept and embrace the program. In the end, 6 of the 10 most prolific players during the pilot were adults. The adults also showed the largest gains in skills across all organizations.

The third-party settlement organizations and districts in the pilot reported that participation in the pilot has provided benefits to their programs and participants in regards to skill mastery and engagement. They also reported that the program has increased the organization’s ability to better serve their students.

Squiggle Park has achieved these results by connecting their innovation, which is based on leading research and education practice, with service providers on the front line of newcomer settlement who benefited from technology which allows them to accelerate the development of language skills.

At the beginning and end of the Pilot, players were asked how frequently they read or are read to. By the end of the pilot, the number of players reporting “rarely” had decreased, while the number that reported “weekly”, “a few times a week” or “daily” had all increased. Increasing the literacy rates of these participants increases the likelihood that they will graduate high school and become full and productive members of Canada and able to actively contribute to the information-based economy.

While the Pilot officially finished in June, many Pilot participants have been continuing to actively log-in and use Squiggle Park over the summer.

“If we implement innovations like Squiggle Park that meet the individual needs of immigrants in a personalized way, then we are doing our job for Canadian immigration.”

Effat Ghassemi
Executive Director | Newcomer Centre of Peel
RECOMMENDATIONS

Recommendations for the IRCC

1. There was a unanimous recommendation by all third parties to re-skin a version of Squiggle Park that leverages the investment and efficacy from the existing core innovation to provide games that meet the expectations and needs of older learners. This involves a collaboration with experts in adult English language learning to create content for the end of world poems that provides context relevant to their daily lives. It also involves changes to the graphics to present a more mature visual design. This version of the innovation will fill the current gap identified by all third parties of available digital resources for adult ELLs focused on basic skills. It will also support the growing demand for basic language learning programming for adults (levels 0-1, 1-2 and 2-3) which settlement organizations are struggling to meet with current levels of resourcing.

Note: Leadership at a number of the third party organizations see an opportunity to embed Squiggle Park in the LINC curriculum.

2. The second recommendation is to introduce the Squiggle Park: Dreamscape program which teaches more advanced literacy skills such as vocabulary, comprehension and syntax. This will support players who master basic literacy and can move on to more complex reading and writing tasks.

3. The third recommendation is to extend the licensing and pilot of Squiggle Park for an additional two years to follow the progress of the active players over a three-year total period and provide a longitudinal study of the success and impact of the program, including the transition from Squiggle Park to Squiggle Park: Dreamscape.

It’s important to extend the current licensing of the Squiggle Park program to be accessible until the end of the 2019 school year (June 2019), as the current license will end after February, mid-way through the school and program year.

“If IRCC were interested in providing this program to make sure our newcomer kids are prepared to enter school on par or ahead of their peers, we would be 100% on board to make it happen. This is a really easy and valuable project to implement through The Care for Newcomer Children (CNC) model.”

Susan Hoo, Manager
The Centre For Newcomer Children
Other Federal Government Recommendations

There is an opportunity to partner with INAC to provide a pilot to interested indigenous and northern communities with similar goals of measuring the acceleration of skill mastery, impact of support for educators and staff, as well as discovering any specific enhancements that can be addressed to meet the needs of these communities.

It is proposed that Squiggle Park: Dreamscape would be added to this pilot with a focus on collaborating with indigenous educators to develop content packs that can be integrated into the games and in-turn provide a culturally relevant program for English Language Learning mastery.
## APPENDIX 1 - Characteristics of ELLs

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>ELL Context</th>
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</thead>
<tbody>
<tr>
<td><strong>Instructional Setting</strong></td>
<td>ELLs are typically taught in English-only settings, increasingly in mainstream classrooms. It is common to have ELLs with many diverse language and skill levels in one class.</td>
</tr>
<tr>
<td><strong>Objectives of ELL Instruction</strong></td>
<td>Academic and career success; academic language/content. A sense of belonging and integration into Canadian society.</td>
</tr>
<tr>
<td><strong>Funding</strong></td>
<td>There is funding through the IRCC to provide language learning programs through settlement organizations and through the Settlement Workers in Schools Programs. The Department of Canadian Heritage has official languages-funded programs focused on second-language learning. Provincially, dedicated ELL funding is provided by the Ministries of Education.</td>
</tr>
<tr>
<td><strong>Families</strong></td>
<td>Parents are highly motivated to help their children become literate in English. Families may not speak English; may not be literate in native language.</td>
</tr>
<tr>
<td><strong>Teachers</strong></td>
<td>75% of classroom teachers have ELLs; 30% have no ELL training.</td>
</tr>
<tr>
<td><strong>Technology</strong></td>
<td>Growing need. In 2014, eight out of ten top technology products used with ELLs in schools were not designed especially for this student population.</td>
</tr>
</tbody>
</table>
APPENDIX 2 - Understanding the ELL Market

In 2012, The Global Silicon Valley Education Sector (GSV EDU) Factbook\(^3^4\) cited the Global English Language Learning (ELL) market as one of the largest and fastest-growing education sectors, as this chart shows.

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<tbody>
<tr>
<td>Global English Language Learning</td>
<td>$63.30</td>
<td>25%</td>
<td>$193.20</td>
</tr>
<tr>
<td>Higher Ed eLearning</td>
<td>$48.80</td>
<td>25%</td>
<td>$149.00</td>
</tr>
<tr>
<td>K-12 eLearning</td>
<td>$16.60</td>
<td>33%</td>
<td>$69.00</td>
</tr>
<tr>
<td>EduGaming</td>
<td>$2.00</td>
<td>30%</td>
<td>$7.40</td>
</tr>
<tr>
<td>Social Learning/Communities</td>
<td>$1.00</td>
<td>40%</td>
<td>$5.60</td>
</tr>
</tbody>
</table>

Key Insights

- The British Council estimates that one in four people in the world speak English with some level of competence.
- China may already be the largest English-speaking country in the world.\(^3^5\) The number of learners of English in China is at least as large as the entire native-speaking population of the U.S., which is more than 300 million.
- Due to the fast-growing Hispanic population and immigration, the U.S. ELL school population is growing at more than seven times the rate of the total student population. In 10 years (1997-1998 to 2008-2009), the number of ELLs enrolled in public schools increased from 3.5 million to 5.3 million (51%).\(^3^6\)

\(^3^4\) https://commoncorediva.files.wordpress.com/2014/09/2012-gsv-education-sector-factbook.pdf
\(^3^5\) http://www.ednetinsight.com/news-alerts/voice-from-the-industry/the-global-English-Language-learning--ell--market.html#footnote3
\(^3^6\) https://declara.com/content/D5ODr20a
Growth Trends

• A working knowledge of English improves job prospects globally.
• Global middle-class growth along with wealthier, more ambitious parents are leading the expansion of private providers of English—particularly in Brazil, China, Turkey, and India.
• Online opportunities for learning English internationally have not yet achieved significant traction.
• ELLs in the U.S. represent 11% of total Pre-K-12 enrollment.
• English language learning products (digital and non-digital combined) generated $35.5 billion (or 63% of the total language learning market) in 2013, making it the largest concentrated revenue opportunity in the international language learning market. As of 2013, only 5% ($1.8 billion) of that $35.5 billion English language learning revenue was generated by the sales of digital products.37 The market for online tools has a potential value of more than $30 billion!

In 2018, a report published by Latest Industry News forecasted the digital English language learning market to grow at a CAGR of +22% during the period 2017-2021.38 The staggering number of people are learning English around the globe and the Global ELL market—services, fees, tests, and products/content—is and will continue to remain a large and growing market.

Market Requirements

For new products to succeed in the global ELL market, it is important that they meet the following requirements:

1. A digital solution that is accessible on tablets and phones for ease of accessibility.
2. A pedagogy that requires no initial starting knowledge of English or learning to use the program.
3. A product that engages users to drive their own learning.
4. A product that is appealing and targeted at older youth and the adult market.
5. Products with proven efficacy in their pedagogy for targeted learners.
6. Programs that allow for independent and personalized instruction meeting each user at their need.

APPENDIX 3 - Supporting videos

Watch reading recovery expert Christy MacNeil explain why Squiggle Park works for struggling readers.39

Listen to Literacy Expert Kristalyn Preziosi explain the pedagogy behind the program and why it works.40

39 https://www.youtube.com/watch?v=_eOZEcpwrOY
40 https://www.youtube.com/watch?v=_eOZEcpwrO
APPENDIX 4 - Collaborators

Julia Rivard Dexter, Co-Founder, Squiggle Park
• Bachelor of Communication Design (B.Comm.), Nova Scotia College of Art and Design, 2003
• Canada’s Inspiring 50 Women in STEM presented by the Embassy of the Kingdom of the Netherlands in Canada with the support of the Senate of Canada, 2018.

Leah Skerry, Co-Founder, Squiggle Park
• Bachelor of Commerce (B.Com.), Saint Mary’s University, 2009
• International ELL teacher in Uganda, 2012

Neesha Desai, Data and Research Lead
• Doctor of Philosophy (Ph.D.), Computer Science, University of Alberta, 2015
• Master of Science, Computer Science, University of Alberta, 2009
• Bachelor of Science, Computer Science, University of Victoria, 2006

Samantha Sproule, Customer Success Manager, Squiggle Park
• Honours Bachelor of Business Administration, Acadia University, 2017
• Venture for Canada Fellow, 2017

Lauren Lutz-Coleman, Technology Education Teacher in North Brunswick Township School District
• Master of Arts, Digital Media Design and Learning, New York University, 2016
• Bachelor of Science, Elementary Education and Teaching, Boston University, 2012

Erin Schryer, Literacy Researcher, Executive Director at Elementary Literacy Inc.
• Doctor of Philosophy (Ph.D.), Early Literacy Education, University of New Brunswick, 2014
• Master of Education (MEd), Curriculum and Instruction, 2010

Laura Minnigerode, Education and Parenting Consultant
• Master of Education, Harvard Graduate School of Education, 1989
• Bachelor of Arts in Communications, Indiana University Bloomington, 1987

Samantha Shannon, Data Analyst
• BBA, Major in Marketing from St.FX University and an Advanced Diploma in PR
• Data Analytics, General Assembly

Christie Lillard, English as a Second Language Teacher in New York City Public Schools
• Master of Education, Human Development, University of Maryland College Park, 2015
• Master of Science, Teaching English to Speakers of Other Languages, City College of New York, 2018
• Bachelor of Arts, Spanish and International Affairs, University of Georgia, 2011
• Bachelor of Arts, Linguistics, University of Georgia, 2012
APPENDIX 5 - Additional Resources

In addition to the Squiggle Park game license, each organization received additional resources to support game play, learning, and fun. Each organization received the following resources:

Training: Online training seminars for training on how to use Squiggle Park, the PALS reading assessment tool, strategies for highly effective readers, how to manage Squiggle Park data, and an introduction to blended learning.

Documents for parents: Documents to support communication with parents about the pilot and the games were provided to all of the participating organizations in six languages; Farsi, Arabic, Hindi, French, Spanish and Mandarin.

Badge program: A badge program with sticker sets, which educators use as a motivator for players to reach goals.

Book set: A book set for each of their locations, which accompanies the first five worlds of Squiggle Park.

The above image shows the Squiggle Park books, digital game and badge program stickers that were supplied to each pilot organization.
Through the training, the educators earned Basic Certification in Squiggle Park and have been sent the badge to use in their personal profiles.
APPENDIX 6 - Educator dashboards

Squiggle Park
How to check progress & download mini-lessons