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Learning, Attitudes and Perceptions: Evaluating Teachers Acquiring Competence with Online Literacy Programs for Children

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by

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I dedicate this thesis to my mom, all of your love and support has made this dream a reality.

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Abstract

Given the prevalence of computer software in educational settings, it is important to establish the efficacy of software for teachers in the classroom. One free software program, ABRACADABRA (ABRA), has been demonstrated to be effective in the development of literacy skills in young children (e.g. Wolgemuth, et al., 2014). The present study evaluated the impact of teachers' literacy knowledge and comfort with technology with respect to professional development workshops providing training in the implementation of ABRA. Two cohorts of teachers were drawn from Canada and one from Kenya. A total of 64 female teachers (Mage= 38.26, SDage =11.22) completed two surveys one prior to training and one after. Outcomes indicated that participants' knowledge of literacy did not significantly vary across locations; however, their confidence in teaching four areas (reading fluency, writing, comprehension, and alphabetics) of literacy did vary as a function of location, with Kenyan teachers yielding the highest teaching confidence. Across all locations, participant's confidence in teaching early literacy increased following the workshop. Perceived comfort using technology and comfort teaching with technology were highly correlated, but no differences were observed for perceived comfort across cohorts. Overall, there were no differences among the teachers in these perceptions, however, teachers with previous professional development related to literacy expressed more confidence teaching literacy than those who had no previous professional development. Qualitative analyses confirmed some well-established barriers and successes for these teaching workshops.

Keywords: Educational technologies, literacy, professional development, teachers

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Evaluating Professional Development for a Web-Based Literacy Tool for Teachers and Student Teachers

Student success is highly dependent on the quality of teacher instruction provided. There is a substantial body of research that demonstrates the positive correlation between student achievement and the quality of teacher instruction (Basma & Savage, 2017; Chen, Brown, Hattie, & Millward, 2012; Koh, Wallhead & Ward, 2006;Wolff, McClelland & Stewart, 2010). In order to provide the highest quality of teacher instruction, teachers must continually be aware of changes in knowledge and content in their teaching domain as well as changes relevant to existing teaching techniques. Teachers in several countries (e.g., Canada, United States and Australia) are provided with various opportunities to continuously learn throughout their careers by means of professional development (PD). The goal for teachers to have ongoing education is to enhance professional practice by ensuring teachers are familiar with theoretical or philosophical changes in instructional design, subject content, advancements in technology and integration of technology and student learning needs (Basma & Savage 2017; Koehler & Mishra, 2009). Awareness of developmental changes within learners is a generally a part of pre-service teacher's development. For example, early literacy skills are one area that involves both learner characteristics that differ as a function of development, and instructional foundations that have changed dramatically over the last few decades that impact instructional design.

Early literacy skill development is critical. There are two complementary skills in early reading. First children must develop the skills that will allow them to read and then children must learn how to use their reading skills to learn new content. In previous literature these two skills are often referred to as: learning to read and reading to learn (Indrisano & Chall, 1995). Children need to learn to read if they are to succeed in society. Teachers can play a pivotal role in

teaching the foundational skills that will allow children in the earliest grades to learn to read. Even when teachers do not have the specialized training in early reading instruction, they can draw upon external resources to enhance their in-class instruction. Concomitant with advances in technology are advances in educational software to support early language and literacy skill development.

"ABRACADABRA", for example, is a theoretically sound, empirically tested, freely available web-based literacy tool that has demonstrated success in improving and developing early literacy skills among children in kindergarten to grade two (Piquette, Savage & Abrami, 2014; Savage et al., 2009; Savage et al., 2013;Wolgemuth et al., 2013) The purpose of the present study is to examine teacher's introduction to ABRACADABRA through professional development training sessions.

Roadmap

The following document introduces the structure and empirical strengths of the ABRACADABRA software program as an auxiliary teaching support for early grade-school learners. Using educational software to support learning is then discussed with respect to the impact on teachers and their implementation of this tool. This discussion introduces the importance of understanding how pedagogy impacts the use and integration of technology. In addition, the importance of professional development as a means to introduce new technologies and instructional tools is discussed. These set the foundations for the current study involving professional development for an early reading software program.

A Web-Based Literacy Tool: ABRACADABRA

ABRACADABRA (A Balanced Reading Approach for Canadians Designed to Achieve Best Results for All) was developed by researchers from the Centre for the Study of Learning

and Performance (CSLP) at Concordia University (Savage, Abrami, Hipps & Deault 2009). ABRACADBRA (hereafter referred to as ABRA) is a free of charge, user friendly, online literacy tool designed to augment and standardize literacy instruction as well as promote the development of early literacy skills. This tool was created for students, teachers and parents to use free of charge. There are two online versions of ABRA available to users. One version, ABRAlite, provides all of the online activities but does not maintain any permanent record of the user. The second version includes all of the online activities but also retains a record of user performance and is provided to school boards for use. The former version is typically used by parents and the latter version by teachers. The ABRA software was developed following best-practice, developmental theory and effective reading interventions. This web-based program has 32 interactive literacy activities which are separated into four modules; alphabetics, fluency, comprehension and writing. Through these four modules a total of 21 stories that can be accessed to create several different activities for children of varying literacy levels (CSLP, 2015).

A considerable body of research supports the efficacy of ABRA as an instructional tool. Four Randomized Control Trials (RCT) found substantial evidence to support ABRA's efficacy as a tool for supporting early literacy skill development for typically developing children in Kindergarten, Grade 1 and Grade 2. For example, Savage et al., (2009) used a within-classroom randomized control trials (RCT) design with 144 Canadian Grade 1 students who each received 13 hours of ABRA intervention in small groups. Savage et al., (2009) reported significant improvement in letter sound knowledge, listening comprehension, reading comprehension and phonological blending for these typically developing Grade 1 children compared to a control group which did not receive the ABRA intervention.

Wolgemuth and colleagues (2013) also used a within-class RCT design with 300

Australian students (including several Aboriginal students who were taught English as a second language). Trained teachers delivered ABRA as part of a pull-out program in schools for approximately 40 minutes four times a week for a total of 16 weeks. Students who received the ABRA intervention demonstrated significant improvements in phonological awareness and grapheme-to-phoneme knowledge. Interestingly, the second language Aboriginal students improved just as well as the non-Aboriginal students and in some cases they showed greater improvement than the non-Aboriginal students (Wolgemuth et al., 2013).

A large pan-Canadian study by Savage et al., (2013) used a cluster RCT intervention study to determine the efficacy of ABRA. This study had a classroom-level RCT intervention with 1,067 children in 74 kindergarten and Grade 1 or Grade 1/2 classes across several Canadian cities. Well-trained teachers in ABRA implemented the ABRA intervention to their classrooms for 20 hours per child over one semester. Savage et al., adhered to the Consolidated Standards of Reporting Trials (CONSORT) which is one of the most rigorous standards for reporting RCT. The results at post-test determined that the classrooms with the ABRA intervention were significantly advantaged over the control classrooms in several measures including: phonological blending ability, letter-sound knowledge and there were marginally significant results for phoneme segmentation fluency.

The final cluster RCT study by Piquette, Savage and Abrami (2014) had a total of 203 students, (107 kindergarten and 96 Grade 1 children) from 24 classes from one school district in Canada. Children received approximately 10-12 hours of whole class instruction using ABRA during the pre and post-test. The intervention group demonstrated significant gains in letter-sound knowledge over the control group. Medium effect sizes were also apparent for the intervention which included letter-sound knowledge, phonological blending, and word reading as

compared to effect sizes for standard teaching.

Additionally, there is evidence that ABRA is effective for other diverse learners. Specifically, this literacy tool can aid literacy instruction among children with Autism Spectrum Disorder (ASD). Bailey, Arciuli, and Stancliffe (2017) employed a pretest-post-test control group design where participants were assigned to the experimental group or the wait-list control group. Twenty children diagnosed with ASD, aged 5-11, years received one-on-one literacy instruction using ABRA over 13 weeks for a total of 26 sessions. Post-test results revealed significant improvements in reading accuracy and comprehension compared to the wait-list condition. This research suggests that ABRA is an effective resource for early literacy instruction and literacy development across typically developing children, second language speakers and recently children with ASD.

Use of Technology as an Educational Tool

Technology is constantly evolving and Information and Communication Technologies (ICT) have become an increasingly prevalent aspect in society today. A diverse array of technologies has also expanded into the educational sector. Evidence suggests that using educational technologies such as modelling tools, internet-based software, and computer simulations promote student learning (Bailey, Arciuli, & Stancliffe, 2017; Bell & Trundell, 2010; Janssen & Lazonder 2015; Savage et al., 2013). However, the effectiveness of technologies and relevant software is dependent on the educators' level of adoption and integration of technology (Wolgemuth, et al. 2013;). Educators who are more comfortable with technologies as instructional tools, are more likely to utilize technology and utilize it well (Wolgemuth, et al., 2013). Therefore, the benefits of educational technology lie not only with the efficacy of the tool but also on teacher's ability to successfully implement the tool.

Theory of Pedagogy in Technology

Pedagogy refers to the instructional techniques or practices that allow learning to take place (Siraj-Blatchford, Sylva, Muttock, Gilden & Bell, 2002). It relates specifically to the interactive learning process that takes place between teacher and student while also taking the learning environment into consideration (Siraj-Blatchford et al., 2002). Different pedagogical orientations or beliefs predict which approaches educators will use. Pedagogy informs teacher actions and beliefs (and vice versa) due to different educational philosophies and values and by the different assumptions that are held about child development, learning, and appropriate styles of instruction (Janssen & Lazonder, 2015; Siraj-Blatchford et al., 2002).

Various assumptions shape teachers pedagogical knowledge and they include: their personal preferences, domain knowledge of education, and skills with instructional tools. Teachers develop personal preferences through years of education and professional development accompanied by years of teaching experience (Janssen & Lazonder, 2015). For example, teachers have varying educational philosophies that are formed by their own schooling and additionally by their years of teaching experience to determine what pedagogical tools have been most effective in their classrooms. It is therefore to the teacher's discretion whether they choose to employ instructional technological tools in their teaching. In addition to personal preferences, all teachers have domain knowledge within the realm of academia (i.e., the numerous subjects that teachers are responsible for instructing). This domain knowledge is a second component that can guide teachers pedagogical knowledge, that is dependent on the subject or grade level that they might be teaching (Janssen & Lazonder, 2015). Teachers are introduced to new instructional tools frequently through PD and new curricula expectations. Teachers skills with instructional tools determine how quickly and thoroughly they are able adopt these tools and most importantly

how successfully they are able to implement the tools in their classrooms (Wolgemuth et al., 2013). Therefore, in order to use technology as an effective teaching tool, teachers must first be willing to integrate technology in their teaching, have sufficient content knowledge and teachers must be able to gain the necessary skills to use technology in teaching (Mishra & Koheler, 2006).

These three core components (pedagogy knowledge, content knowledge and technology knowledge) combined comprise Mishra and Koheler's (2006) Technological Pedagogical and Content Knowledge (TPACK) framework (see Figure 1). Integration of these three core components results in four intersections; the first intersection involves the overlap of pedagogical and content knowledge (PCK). For example, if teachers were to combine these two components it would provide learning that is based on subject knowledge (domain knowledge) and teaching and learning strategies (personal preferences). The intersection of technology and content knowledge (TCK) would be based primarily on teaching subject knowledge with technology aids. This intersection addresses how technology and content influence one another which requires teachers to understand which specific technologies are best suited for addressing subject-matter learning and how the content can change technology or vice-versa (Koheler & Mishra, 2009) The third intersection involves pedagogy and technology (PTK) which would reflect how teaching methods can be altered when using technological aids (i.e., using a smartboard to teach the class). Finally, the intersection of all three components (pedagogy, content knowledge and technology) form the TPACK model, which should theoretically provide the best method of teaching with technology (Mishra & Koehler, 2006). TPACK is the basis of effective teaching with technology, which requires all three components be combined instead of being viewed as separate parts. This framework requires teachers to understand the ability to instruct using technologies, pedagogical practices that utilize technology in efficient ways to

teach content and prior knowledge of what makes concepts easy or difficult to learn and how technology can be best suited to address these issues (Koehler & Mishra, 2009). The TPACK framework has been used and studied over the years to evaluate teacher's technology integration efforts in lesson design practices—however, research has not been able to fully support this model. Studies have determined that although teachers are confident of the three basic components of the TPACK framework they still struggle applying this knowledge when designing lessons (Maeng, et al., 2013; Pamuk, 2009).

Some studies suggest that the issues faced by teachers implementing technology into their classrooms could be due in part to the lack of integrated support teachers receive when they are being trained (Janssen & Lazonder 2016; So & Kim, 2009; Wood, Anderson, Piquette-Tomei, Savage & Mueller, 2011). One intervention that has proven successful in aiding teachers to integrate technology into their teaching is Just-In-Time-Support. Just-In-Time support provides users with real-time support when faced with technical issues or queries (Janssen & Lazonder, 2016; Wood, et al., 2011). The most common issues faced when working with technology are hardware issues (i.e. computer freezing, wi-fi not working) or software related issues (unaware of how to access content, logging in/out) (Wood, et al., 2011). By providing instantaneous support, less time is spent troubleshooting and users are able to quickly progress through training tasks. Just-In-Time instruction facilitates acquisition of key skills as well as promoting longer term use. Ideally, Just-In-Time instructions should be an immediate support that tapers over time. One study demonstrated that users require a substantial amount of Just-In-Time-support during the initial implementation and requests begin to decline as time and experience with the program progresses (Wood et al., 2011).

The benefits of Just-In-Time support are evident for teachers developing lessons by

influencing the quality of lessons as teachers reported providing high quality lessons when they were provided with integrated support during their initial training (Janssen & Lazonder, 2016). Therefore, teachers can benefit from integrated Just-In-Time support when they are being trained to use new technology software which would later translate to a higher degree of technology classroom integration.

Teacher Professional Development

Professional Development (PD) is an ongoing expectation of active, involved teachers. Teaching philosophies, methods, and tools are subject to change over time and for different learners. Professional development offers opportunities for teachers to engage in ongoing learning, to connect with peers and to enhance their professional skills. Most school boards offer professional development opportunities to promote personal development and professional standards throughout a teacher's career (e.g., Ontario Ministry of Education, 2004).

Introducing technology as an instructional tool requires training to ensure acquisition of technology skills, familiarity with software design and navigation and, most importantly, knowledge about effective integration of technology within the classroom. For certain educational technologies such as ABRA, interested teachers are offered to attend a PD workshop to gain both the necessary technological skills to implement the software in their classrooms, and to further develop their own early literacy teaching knowledge. (Helmer, Bartlett, Wolgemuth, & Lea, 2011). Professional development for teachers has been linked to influencing teacher knowledge, beliefs, attitudes, and pedagogic methods (Callaghan, Long, Es, Reich & Rutherford, 2018). This positive influence on teacher knowledge has also led to a positive effect on student learning (Koh, Wallhead & Ward, 2006). Although there is research doubting the efficacy of one-day or even two-day workshops, an extensive systematic review and meta-analysis by

Basma and Savage (2017) supports positive outcomes. This review examined 17 studies on the relationship between teacher PD and student literacy outcomes. Basma and Savage (2017) concluded that the quality of the PD was a more significant influence on student reading outcomes than the length (in hours) of the PD itself. PD less than 30 hours provided significant reading outcomes for students, however there was no significant improvement above and beyond for PD over 30 hours— suggesting that higher quality PD is a better indicator of positive student reading outcomes than the length of teacher PD.

Foundations of Literacy Development

Software programs that target developing and improving early literacy skills should be grounded in theory. Early literacy acquisition begins with the development of preliteracy skills, which in many studies is cited as phonological awareness which then leads to development of word reading skills and finally text comprehension (National Reading Panel (NRP) 2000, Vibulpatanavong & Evans, 2018). Additionally, concepts of print, grapheme-phoneme relationships and text comprehension have been also cited as the essential components to the development of early literacy development (Grant, Wood, Gottardo, Evans, Philips & Savage, 2012).

Phonological awareness is a building block to the development of literacy and is also the strongest predictor of reading acquisition (Vibulpatanavong & Evans, 2018). Phonological awareness deals with the recognition, identification, and manipulation of smaller sound units (phonemes) within words (Anthony & Lonigan, 2004). Phonemes combine to create syllables and words—for example, the word cat has three phonemes ‘k’/’æ’/’t’, There is a general consensus within the field of early literacy that phonological awareness develops primarily based on the size of units being manipulated which range from syllable awareness, to onset-rime

awareness and manipulation of sounds at the beginning or end of the word (Grant et al., 2012; Anthony & Longian, 2004). Once children have progressed to the final stage of phonological awareness they are able to manipulate individual sounds in words and this is measured through segmentation, deletion or substitution of individual sounds (Grant et al., 2012). Additionally, another strong predictor for reading success which involves visual processing as opposed to phonological processing is knowledge of alphabetics (Vibulpatanavong & Evans, 2018). For example, in ABRA children can develop their phonemic awareness by the Alphabetics section of the software, which allows children to distinguish first between different sounds (i.e. cow, pig, and cat noises) and as children progress they can then start to distinguish between different phonemes.

Children must first understand the basics of how a book is read, concepts of print introduces children to distinguish between pictures and text and to understand book-level concepts such as *cover* and *title* and knowing how a book opens (Grant et al., 2012). Additionally, other language development skills such as syntactic and vocabulary form in the preschool years which can later predict reading comprehension (Grant et al., 2012). ABRA addresses this portion of reading development by providing stories in a book format, allowing children to view and select different books that were specifically created for ABRA.

While children are first developing their phonemic awareness skills they also begin to understand grapheme-phoneme relationships by understanding and identifying letter sounds. Once children learn the relationship between letters and sounds they are then able to blend these sounds to form words. In order for children to begin developing their reading skills they must learn so by reading accurately and fluently which later allows readers to quickly access words and focus on meaning and comprehension (Grant et al., 2012; Indrisano & Chall, 1995). For

example, ABRA has a Fluency section that addresses this very same concept and allows children to read-along various narratives.

Assessing the Efficacy of Interventions

There is an increasing number of activities, apps, games and software programs that are marketed towards children under the guise of an educational context (Grant et al., 2012; Wood, Grant, Gottardo, Savage & Evans, 2017). Since there is no regulatory board that screens the educational quality or content of such technologies (Willoughby & Wood, 2008), many parents and teachers may find themselves questioning the efficacy of interventions based on the use of such software and how they may benefit their children. Which technologies can be deemed as both developmentally and pedagogically appropriate is a question that researchers are interested in when evaluating such interventions (Grant et al., 2012; Wood et al., 2017; Wood, Gottardo, Grant, Evans, Philips & Savage, 2012).

Many researchers have analyzed best teaching methods and pedagogically sound learning experiences in some well-known technologies (Grant, et al., 2012; Wood et al., 2017) and have developed certain measures to evaluate the claims of such tools. Such studies are empirical, evidence-based research that are developed and evaluated by experts in the respective fields of the subject matter and pedagogy. For example, ABRA was developed by a multidisciplinary team of educational researchers, policy makers, school administrators, language arts consultants and teachers from countries around the world (CSLP, 2015). A multitude of studies have been conducted to evaluate ABRAs effectiveness in improving and developing early literacy skills in children from varying ages, second languages, and recently special learners (Bailey, Arciuli, & Stancliffe, 2017; Piquette, Savage & Abrami, 2014; Savage et al., 2009; Savage et al., 2013; Wolgemuth et al., 2013)

However, in order to first deem whether the intervention is methodically sound and targets the intended educational content (which for the purpose of this study is literacy acquisition), the software program should be developed using theoretical models and empirical findings from the field of literacy development (Grant et al., 2012). One study evaluated 30 commercially available literacy software programs to determine whether the skills taught in programs are definitive precursor reading skills. Grant and colleagues (2012) evaluated common and readily available literacy programs by developing a taxonomy of reading skills to assess the activities relevant to early reading skills specific to Preschool, Kindergarten and Grade 1 level. Grant and colleagues (2012) then systematically assessed the content and quality of the software programs based on this taxonomy.

The reading skills taxonomy was developed by three of four reading experts in the field of reading development which chronologically identified the development of pre-reading skills and included an example of the activity (Grant et al., 2012). Nine other taxonomies were developed by public research on the topic and a 10th taxonomy was created from the National Reading Panel's assessment of the scientific literature on reading (Grant et al., 2012). The final reading taxonomy included nine skills in chronological learning order: "Concepts of Print, Alphabetic Knowledge, Phonological Awareness, Grapheme-Phoneme Relationship, Phonics, Syntactic Awareness, Decoding, Fluency, and Text Comprehension" (Grant et al., 2012, p.325).

Following the creation of the reading taxonomy the 30 software programs were coded for the presence or absence of each skill in the taxonomy and the quality of learning for each skill (Grant et al., 2012). Grant and colleagues (2012) determined that although some of the necessary literacy skills were being taught, (albeit less than expected), and introduced at the appropriate developmental age, it was not systematic or consistent across the software levels or in

accordance with the reading taxonomy expectations. The quality of instruction for different skills varied and in general only a few software packages were deemed as excellent or good compared to the vast majority of low ratings, ABRA was one of these few programs that was strong in almost all domains.

In conclusion, literacy learning software that is marketed as educational but does not have the empirical evidence to support such claims is unlikely to provide students with the required developmental literacy skills (Grant et al., 2012; Wood et al., 2017). In order to assess interventions such as these it is necessary to develop and use reading skills taxonomies.

In addition to assessing the quality of the software to be used in the intervention it is also important to assess the generalizability of the intervention across contexts. Education involving literacy occurs in primary classrooms throughout the world. Previous research has demonstrated the efficacy of ABRA as an instructional tool in Canada, Australia, and Britain. However, in each of these countries English is the predominant language (Piquette, Savage & Abrami, 2014; Savage et al., 2009; Savage et al., 2013; Wolgemuth, et al., 2013) The present study examines the efficacy of workshops designed to train teachers to use ABRA in both a predominantly English-speaking environment and for teachers who are unlikely to have English as their first language and who will be using the software to teach children who also are not likely to have English as their first language. Ensuring transfer and generalization of interventions is an important consideration for success.

Present Study

Findings in the literature that are particularly relevant to the main study are: (1) Teacher professional development that uses educative technology can lead to a positive effect on student literacy development (Basma & Savage, 2017; Callaghan et al., 2017; Koh, Wallhead & Ward,

2006; Savage, et al., 2013; Wolgemuth, et al., 2013). (2) The TPACK framework can serve as an effective reference to determine effective teaching with technology, which requires all three knowledge components (pedagogy, content and technology) to be combined instead of being viewed as separate parts (Koehler & Mishra, 2009; Pamuk, 2012; Mishra & Koehler, 2006; Maeng et al., 2013).

Hypotheses and research question. The main purpose of this study is to examine how teachers' previous literacy knowledge, literacy teaching confidence, and technology background could impact their perceptions of both the ABRA program and the PD workshop. In addition, this study will look across three different locations to determine the cross-cultural relevance this PD program may have.

Consistent with previous research it is expected that teachers may find the technological aspects of ABRA challenging (Wolgemuth et al., 2013; Janssen & Lazonder 2015; Janssen & Lazonder 2016; Pamuk 2012; Ko, Wallhead & Ward 2006; So & Kim, 2009). Qualitative data will assess experiences navigating the software and perceptions towards implementing this software as a teaching tool.

Hypothesis 1: It is expected that teachers who have high comfort in working with technology will be more likely to have high comfort in teaching with technology.

Hypothesis 2: Consistent with the TPACK model, it is expected that teachers who have high domain knowledge in literacy will also be more confident when teaching literacy.

Hypothesis 3: It is expected that teachers who have previously attended PD workshops regarding literacy will be more likely to express higher confidence in teaching literacy.

Given regional and international differences in teacher education programming, one question explored in the present study was whether domain knowledge or literacy confidence differed as a function of location?

Research question. In addition, to the hypotheses, the present study provided a descriptive summary of general perceptions toward the workshop, challenges faced during the workshop and anticipated after the workshop.

Overall, these research questions and hypotheses help to provide an understanding of how teachers and student teachers experience the PD aspect of the ABRACADABRA training workshop as well as indicate areas for improvement and ongoing needs of teachers.

Method

Design

The present study focuses on the instructional workshops provided to teachers prior to implementing ABRA as a learning tool in their classrooms. A pre-test/post-test design was used to examine knowledge gains regarding early literacy skill development as well as attitudes toward the ABRA software and implementation of technology in the classroom (see Figure 2). The study compares practicing teachers in Canada and Kenya. All participants completed one survey prior to a workshop and one survey after the workshop (see Figure 2).

Participants [1]

Overall three groups were examined which reflects three different regions. Two groups were from Canada: Western Canada and central Canada; and the final group was from Eastern Africa.

[1] When the word teacher is used in this study it refers to the participants who completed the necessary teacher training, otherwise when the word participant is used it is for all of the individuals who partook in this study.

Canadian sample. In total, 32 female participants were recruited for the North American sample. With 21 self-identifying as teachers, 7 as student teachers, 2 as special education assistants and 2 as administrators. Participants were recruited from two large Canadian cities, Vancouver and Toronto.

Western Canada sample. In Vancouver, 17 participants were recruited of whom 15 self-identified as teachers and 2 as special education assistants (M_{age} = 42.53 SD_{age} = 9.35) (range is 31 to 62 years of age) with one reporting to have had three years of experience and the second reporting 30 years of teaching experience. Participants were invited to a professional development workshop through their local school board. All participants volunteered for the workshop and further volunteered to participate in the study.

Central Canada sample. A second group of 15 participants were recruited from Ontario of whom 6 self-identified as teachers, 7 as student teachers and 2 as administrators (M_{age} =33.07 SD_{age} =11.40) (range is 22 to 61 years of age). These participants had an average of $M_{=}$ 7.81 years of teaching experience (SD= 7.35 years) (range is 0-20 years) and were recruited through a course offered at the University of Toronto's Ontario Institute for Studies in Education (OISE). The course was titled "Reading and Writing Difficulties". Participants were offered the professional development training as part of their ongoing course. Participation in the study was voluntary. All members of the class chose to participate.

Kenyan sample. In total, 63 participants were recruited for the Kenyan sample. Due to missing data, full descriptive information was only available for 18 participants. All participants identified as teachers. Participants were recruited from several Kenyan cities, (M_{age} = 40.28 SD_{age} = 10.99) (range is 25 to 59 years of age). Participants had approximately M=17.22, SD=10.82 years of teaching experience (range is two to 34 years of teaching experience).

Participants were invited to a professional development workshop through their local school board. All participants volunteered for the workshop and further volunteered to participate in the study.

Participants were asked whether they had attended a PD workshop on literacy in the last three years. Among the Canadian sample all but one teacher in each location had attended workshops and all Kenyan teachers indicated that they had attended a workshop. They were asked to estimate the number of hours they had dedicated to professional development about literacy learning in the last year. Teachers reported having M=40.16 hours, (SD=100.01 hours of PD). This mean was greatly influenced by one participant who was a reading recovery teacher and who identified as having a total of 450 hours of PD. When this teacher was removed as an outlier the mean number of hours was 17.39 (SD= 12.67), range was 0-50 hours. Among the student teachers the number of PD hours ranged from 0-10 hours with an average M=4.33, SD=5.32. Among the two special education assistants, one reported 6 hours of PD and the second reported 10 hours of PD exposure. Among the two administrators, one reported 36 hours of PD and the second reported 40 hours of PD exposure.

The Kenyan sample reflected an educated group, 100% of the participants had completed high school and 57% had completed university or college or higher education (i.e., graduate studies). All of the participants reported having completed teachers college. The Canadian sample also reflected a highly educated group. All participants had completed a university or college program, with 15 participants having completed postgraduate studies or having obtained a graduate degree. The one exception was a student teacher who was enrolled in an ongoing university degree. All of the teachers and administrators (N=23) had completed teachers college.

Among the student teachers, 6 had not completed teachers college and one was currently in progress.

Current teaching assignments for five participants in the African sample included only Grade 1 classes, four participant reported teaching Grade 2. Three participants reported teaching grades 3 and 4. Seven participants taught Grade 3. One participant reported teaching multiple grades (Grades 1-3). Current teaching assignments for five participants in the Canadian sample included only Grade 1 classes, one participant reported teaching grades 1 and 2, 3 participants taught reported grades 3 and 4. One participant taught grades 6 and 7. Six participants reported that they were not currently teaching. All other teachers reported teaching multiple grades.

This study was reviewed and approved by a University Ethics Review Board and all participants were treated in accordance with APA/CPA ethical guidelines.

Materials

Materials were comprised of three surveys, and one workshop session. All components were completed during the one professional development workshop session.

Pre-test survey. The pre-test survey was comprised of three components: demographic information, literacy knowledge, and technology knowledge and skills. There was a total of 34 items on the surveys that were a combination of open-ended, rating scale, and multiple-choice questions. Prior to completing the pre-test survey, participants were asked to generate a unique code based on a series of three questions. This code included letters and numbers and was used to link the pre-test survey, post-test survey and the follow-up survey. Demographic information included gender, age, level of education, and previous training in literacy instruction (i.e. “How many years have you been teaching? What grades have you previously taught?”).

To measure the participants' knowledge of literacy, a 16-item scale was adapted from a 54-item scale developed by Binks, Washburn, Malatesha, and Hougen (2012). The scale was developed from former surveys and questionnaires created by other researchers in the field of literacy knowledge and acquisition. The scale was created to assess the understanding of basic language constructs related to reading instruction (see Appendix A). Reliability for the adapted scale was (Cronbach's alpha .804). The literacy component included questions on phonology items (i.e. "How many speech sounds are in the following words? For example, the word "cat" has 3 speech sounds 'k'/'æ'/'t', and the word "box" has 4 speech sounds 'b'/'o'/'k'/'s, . Speech sounds do not necessarily equal the number of letters. Please write "DK" to indicate that you don't know").

Questions that pertained to technology information assessed the availability of computer technologies in the teacher's school context and if they had any previous experience with literacy software (i.e.. "Have you ever used any online/packaged software such as "Reader Rabbit" or "Star Fall", etc. as an instructional tool in your classroom?"). In total teachers responded to 51 questions. Teachers were also asked what kind of computer equipment is available, whether computers were available in each classroom and/or labs, and how reliable the internet was at their schools (see Appendix B). In addition, both teachers and student teachers were asked to rate their own familiarity with computers and how comfortable they felt teaching with technological aids. See Appendix B for complete pre-test survey for both student teachers and teacher participants.

ABRA workshop. The ABRA workshop that was used in the present study was part of the Learning Toolkit that was developed by the Centre for the Study of Learning and Performance (CSLP). The workshop was approximately three hours long and was presented by a

certified ABRA trainer from CSLP. The format of the workshop was hands on and included a PowerPoint presentation explaining the four foundational ABRA activities (Fluency, Writing, Comprehension and Alphabetics). Participants were also provided with handouts on Reading, Fluency and Comprehension (See Appendix C). The handouts for the three activities were created as a guide and training activity to engage the participants and allow them to self-assess their ABRA knowledge. The trainer provided both detailed descriptions of each activity component and demonstrated how users could first access these activities on the ABRA website. The trainer then provided a guided navigation of the ABRA website and provided a few in-class demonstrations of the various activities and games in ABRA. The participants were then allotted approximately five to ten minutes of active exploration time with ABRA. This sequence was followed for each of the four foundational components of the software. Students were encouraged to familiarize themselves with multiple levels and activities of the software. The trainer then showed the participants the teacher landing page and how they could view individual student profiles and their grades. Throughout the training workshop participants were encouraged to ask any questions or concerns regarding ABRA which either the trainer or the facilitators were able to answer. Following the ABRA workshop, participants were then asked for their feedback on the upcoming storyboard/analytics summary which is currently being designed as the teacher progress reports for their classrooms. See Appendix C for a summary of the workshop handouts.

Post-test survey. The second survey (post-test survey) was given to the participants immediately following the workshop. The code generated by the participants prior to the pre-test survey was used again in order to link the pre-test and post-test surveys. The post-test survey was composed of a combination of 23 open ended, rating scale and closed ended questions that

assessed the participants' impression of the workshop. (i.e., What did you like or dislike, what was easy or challenging regarding the ABRA component? Can you give us some examples?). There were also questions regarding what changes participants would make to the training workshop component (i.e. "With respect to the training what could you suggest as an addition or change that might improve the training sessions?"). They were also asked questions on how they were able to introduce their students to ABRA (i.e. "How confident do you feel helping to navigate students through ABRA?"). Lastly, they were also asked what they believed could be improved to make ABRA more easily implementable. (i.e. "What additional information, practice or support would be helpful for you going forward that would make implementing ABRA more likely or more easily?").

Procedure

Three professional development workshops were offered; one in British Columbia, one in Ontario and one in Kenya. All three sessions followed the same procedural format, however the two Canadian sessions occurred in one day while the Kenyan session occurred over three afternoons. The two Canadian sessions had the same trainer provide the instruction. The Kenyan instructor was supported by the same instructor involved in presenting the Canadian context. The Canadian sessions focused entirely on the software while the Kenyan sessions paralleled the software instruction but also included integrative information for how the software would relate to a new set of instructional guidelines instituted by the Kenyan government. All three ABRA training workshops were interactive, therefore participants were asked to bring either a laptop or tablet to the training session or were provided with one (all Kenyan participants were provided with a laptop). All Canadian participants completed surveys individually. Although instructed to complete surveys individually, some Kenyan participants discussed some answers with peers

while completing the surveys. This collaborative effort is consistent with collaborative approaches generally endorsed among the Kenyan participants.

The British Columbia session took place in a classroom context during a Professional Development Day (PD Day) at a school selected by the District School Board. Two facilitators were present throughout the BC session to help participants with troubleshooting and to provide support when required and/or requested. The Ontario session took place in an active classroom setting at the university, and the ABRA trainer provided the training through a live video conference through five large television monitors placed strategically around the room. Additionally, three facilitators were present throughout the Ontario session to provide support. Facilitators at both sites provided troubleshooting support (i.e. setting up the ABRA website on participants' devices if needed, helping participants log in, or accessing content on the teacher resource page). The Kenyan sessions took place at a modern, well-equipped school and were supported by four facilitators, two of which were present at either the session in British Columbia or the Ontario session.

The workshop in British Columbia took four and half hours to complete and included a planned refreshment break. The Ontario site took three hours with only one 10-minute break. The Kenyan sites took 3 afternoons each lasting approximately 3- 4 hours and included a lunch and refreshment break.

Prior to the start of the workshop(s) the facilitators provided a brief description of the study, hard copies of the surveys (for the BC and Kenyan session) and links to the website to reach the Qualtrics link to complete the surveys (for the ON session). Due to technical difficulties, the ON participants were also given hardcopies of the post-test survey to complete.

Facilitators collected completed survey measures. At the end of the discussion, participants were given the ABRA trainers emails if they required any additional support after the workshop.

Results

Initially the design of this study called for comparisons across teaching experience with expected groups representing teachers (Canadian and Kenyan) and student teachers (Canadian). However, participants attending workshops varied in experience and roles in unanticipated ways. Specifically, among the Canadian groups, there were four unexpected participants: administrators (n=2, in the sample from Ontario) and special education assistants (n=2 in the sample from British Columbia). In addition, among the student teacher group only six participants self-identified as student teachers with all other members of the group self-identifying as teachers (i.e., full-time teachers returning for the course as an upgrade). Given the low number of student teachers and the presence of educators in other roles, analyses for the present study provide a descriptive summary of data reflecting administrators, special education assistants and student teachers. No inferential analyses are conducted with these groups. However, analyses across locations could be conducted. Specifically, the present sample permitted comparison across three sites (two Canadian sites and one site in Kenya). Comparative analyses across locations included only participants self-identifying as teachers across the three locations: British Columbia, Ontario and Kenya. A parallel set of analyses were conducted which included all participants from each sample at each location is presented in Appendix A. Given similarities in the pattern of outcomes for these two parallel sets of analyses only the analyses reflecting teachers independent of other participants are presented in the following results section.

Two main aspects were examined. First, experiences relevant to literacy and training were explored and compared across samples in the different locations. This is followed by an examination of perceptions and experiences following the ABRA training workshops.

Literacy and Training

Knowledge of literacy. To assess background knowledge in literacy, participants were asked to complete a 16-item questionnaire with items scored dichotomously (correct or incorrect). Items were aggregated and yielded a maximum score of 16.

Location differences. As summarized in Table 1, teachers' mean scores on the background literacy measure reflected scores just above the midpoint of the measure. Specifically, the British Columbia sample averaged $M = 8.60$, the Ontario sample averaged $M = 10.0$ and the Kenyan sample averaged $M = 8.96$. A ONEWAY analysis of variance comparing teachers' literacy knowledge across the three sites, British Columbia, Ontario and Kenya yielded no significant differences, $F(2,46) = .520$, $p = .598$.

Interestingly, there was considerable variation in scores within each group with some teachers achieving very low scores (e.g., 1 out of 16) and others quite high scores (e.g., 14 out of 16). Specifically, participants scores in British Columbia ranged from 1 to13 ($SD = 4.05$), the Ontario sample ranged between 6 and 14 ($SD = 2.76$), and the Kenyan sample ranged from 4 to 12 ($SD = 1.97$).

Two Pearson correlations were conducted to examine potential relationships between teachers total literacy knowledge score and both their pre-test and post-test confidence in teaching literacy. Neither of the correlations were significant ($r = .009$, $p = .966$ and $r = .377$, $p = .058$ for the pre- and post-test correlations).

Three t-tests were conducted to compare total literacy knowledge between those teachers who had previously attended PD and those who did not, and whether those who had attended PD differed in their pre-test literacy teaching confidence and post-test literacy teaching confidence. There was no significant difference for literacy knowledge as a function of attending PD. There was a significant difference between teachers who attended PD and those who did not with respect to their pre-literacy teaching confidence, $t(17) = 2.215$, $p = .041$. However, there were no significant differences for post-test literacy teaching confidence or total literacy knowledge score.

Experience/ role differences. Visual inspection of mean scores across the teaching experience/roles (see Table 1 for a summary), revealed the lowest mean score regarding basic literacy concepts for student teachers ($M = 7.2$) followed by special education assistants ($M = 7.5$), then teachers ($M = 8.98$, SD = 2.82). Administrators' mean score was highest ($M = 12.5$) which was expected.

Confidence Teaching Literacy

Across all three sites teachers were asked to indicate how confident they felt about their ability to teach early reading before they participated in the workshop and after participating in the workshop. Prior to the workshop, participants rated four areas of early reading, which differed somewhat by location. The Canadian sample assessed: reading comprehension, writing, reading fluency and alphabetics, while the Kenyan sample assessed: word reading, writing, comprehension, and English language. An aggregated confidence was created for the pre-test measures by combining reading comprehension and writing scores. Following the workshop, all of the participants rated four areas of early reading (i.e., reading fluency, alphabetics, comprehension, and writing). A five-point scale was used with lower scores reflecting higher

confidence. The pre-workshop measures were analyzed individually and were also aggregated to create an overall confidence score with a minimum of 4 and maximum of 20. Post-workshop measures were analyzed individually and as an overall confidence score. The overall total confidence score was calculated by adding the four items to create a score with a minimum 4 and maximum of 20 (see Table 2 for a complete summary of mean scores). Only two items assessing confidence for reading comprehension and writing were phrased in the same way across all locations pre and post-test, therefore differences over time are examined only for these two measures.

Pre-workshop Confidence.

Location differences: For all seven topics assessed for confidence at pre-test, scores reflected the lower levels of the 5-point scale indicating higher levels of confidence. Specifically, mean scores for reading comprehension across all three groups were highest for the Kenyan group M = 1.65 (SD = 1.12), followed by the British Columbian participants (M = 1.86, SD = .535) and the Ontario group (M = 2.33, SD = .816). A ONEWAY analysis of variance comparing across the three groups of teachers did not yield significantly different results for reading comprehension, $F(2,34) = 1.32$, p =.279. For writing the lowest mean was observed in the Ontario group (M = 2.67, SD = 1.37) followed by the sample from British Columbia (M = 2.29, SD = .726) and the Kenyan group *(*M = *1.*61, SD = 1.20). A ONEWAY ANOVA was conducted, which approached statistical significance F (2,35) = 2.81, p =.074. For reading fluency, the Ontario participants scored lower in their confidence to teach reading fluency (M= 2.67, SD = 1.37) than the British Columbian sample (M = 2.07, SD = .26). The ONEWAY ANOVA assessing reading fluency yielded no significant differences between the two sites responding to this measure (i.e., across Ontario and British Columbia), $F($1,19) = 2.86, p=.107.

For alphabetics, participants from Ontario had a lower mean score (M = 2.86, SD = 1.03) compared to those from British Columbian (M = 2.06, SD = .250). A ONEWAY ANOVA was conducted which yielded no significant differences, $F(1,19) = .241$, p= .63.

Two additional confidence measures were asked of the Kenyan sample in place of alphabetics and reading fluency. With respect to their perceived confidence teaching the English language, participants indicated relatively high confidence with a M = 1.72 SD = 1.18. Similarly with respect to word reading, the Kenyan sample rated their confidence as $M = 1.68$, $SD = 1.06$.

A second ONEWAY analysis of variance was conducted across the three locations for the overall aggregated measure of confidence in literacy training. There was a statistically significant difference among the three groups $(F(2,34) = 4.39$, p = .020). Tukey b post hoc comparisons revealed that confidence prior to the workshop was highest for the Kenyan group (M = 3.23, SD = 2.28) compared to the British Columbia sample (M = 4.14, SD = 1.10) and the Ontario sample (M = 5.0, SD = 2.10), The Ontario sample and the British Columbian sample also differed significantly from one another.

In addition, all four confidence variables were compared across the two Canadian sites, there were no differences in confidence as a function of location, largest $t(19) = 1.690$ p = .107 for reading fluency.

Experience/role. Visual examination of the mean scores for pre-workshop teaching literacy confidence across the teaching experience/roles (see Table 2 for a summary), indicated a lower mean score for student teachers ($M = 6.5$, SD = 1.76) and administrators ($M = 5.0$, SD = 1.41) in comparison to the special education assistant with a score of 4. . Overall, teacher mean scores (M = 3.76, SD = 1.76) was the highest in comparison to these other groups.

Post Workshop Confidence

Teacher's confidence for four aspects of reading were assessed at post-test (i.e., reading comprehension, writing, reading fluency and alphabetics). A series of four ONEWAY analyses of variance were conducted to examine the confidence that teachers reported in regards to teaching each of the four areas. For reading comprehension, writing, and alphabetics there was a significant difference among the teachers when three locations were combined, $F(2,44) = 1.443$, $p=.042$, $F(2,44)= 4.598$, $p=.015$ and $F(2,48) = 4.611$, p=.015, respectively. Tukey B post hoc comparisons revealed that in each case teaching confidence was highest for the Kenyan group (M =1.41, M=1.48 and M=1.31) followed by the British Columbia sample (M = 1.69, M=1.92, and M=4.14) and the Ontario sample (M = 2.20, M=2.40 and M=5.0) for reading comprehension, writing and alphabetics, respectively (see Table 4 for a full summary).

The ONEWAY analysis of variance comparing across the three locations for reading fluency, yielded no significant differences across the groups, $F(2,44)= 2.91$, $p= .065$.

Aggregated Confidence Scale

A ONEWAY analysis of variance was conducted to assess overall confidence of the post-test aggregated four early reading items across the three sites, British Columbia, Ontario and Kenya. There was a significant main effect across groups. $F(2,44) = 5.21$, $p = .009$. Tukey b post hoc comparisons revealed that overall confidence was the highest for the teachers in Kenya of M = 5.79 (SD = 4.45, range 4-12) compared to those from British Columbia (M = 7.00, SD = 2.20) and Ontario (M = 9.4, SD = 3.87). Teachers from Kenya were also significantly different than the Ontario teachers.[2]

Post Workshop Experience / Roles. Comparisons for teaching early literacy confidence was assessed between the four groups of participants (i.e. teachers, administrators, student

[2] Pre-post test comparisons for confidence could not be conducted due to small sample size.

teachers and special education assistants). Teachers mean scores (M = 7.67, SD = 3.05) were in between student teachers (*M* = 10.00, *SD* = 2.83) and special education assistants (*M* = 6, SD = 2.83) and administrators (*M* = 6.00, *SD* = 2.83).

Comfort Teaching Literacy

Comfort was assessed through one question asked for each topic: reading comprehension, writing, reading fluency, and alphabetics. Teacher's comfort in teaching these four aspects of reading were assessed only at post-test (see Table 4 for a complete summary). A series of four ONEWAY analyses of variance were conducted to examine comfort ratings for each of the four areas. An aggregated score was also developed by adding all four items for a total literacy comfort score (see Table 1 for summary). Only the one analysis involving alphabetics yielded significant differences among the teachers of the three locations (F (2,48) = 2.285, p = .015). Tukey B post hoc comparisons revealed that teaching literacy confidence was highest for the Kenyan group (*M* = 3, *SD* = 1.66) compared to the British Columbia sample (*M* = 4.14, *SD* =1.10) and the Ontario sample (*M* = 5, *SD* = 2.10).

The analyses for reading fluency approached but did not meet statistical significance, F (2,48) = 2.809 p = .070. Mean comfort ratings for reading comprehension and writing did not differ statistically for teachers across locations, F(2, 48) = 2.18, p = .124 and F(2,48)= .877, p = .423, respectively.

Experience/role. Visual examination of the total literacy comfort score determined that teachers had the highest score *(n* = 18) *M* = 5.72 (SD = 3.39) with administrators *(n* = 2) following closely behind *M*=6 (*SD*=2.82) the student teachers (*n*= 2) and special education assistants (*n* = 2) both scored the same and had the same standard deviation (*M* = 10,).

Comfort with Technology

Location. Participants were asked eight questions regarding their perceptions towards using technology. A total score was calculated by adding all eight items. Each item used a five-point scale scoring scheme. Any items that were asked in a negative view of technology (i.e., Technology makes me uneasy and confused) were reverse coded to ensure an accurate overall total, with a high score indicating higher technology comfort (Maximum score = 40; see Table 2 for summary). The Kenyan group had an average of M = 30.12 (SD = 4.35), followed by the Ontario group with a M =*29*.33 (SD = 2.66) and the British Columbia group *with* M = 28.53 (SD = 6.88) (see Table 2 for a summary of results). A ONEWAY ANOVA comparing across the three sites, British Columbia, Ontario and Kenya, yielded no significant differences as a result of group, F (2,52) = .523 , p = .596.

Experience/roles. Examination of mean scores for the teacher and other groups, indicated that the teachers had mean confidence with technology scores that were only slightly higher (M = 29.60, SD = 4.99) than the student-teachers (M = 29.00, SD = 3.44) and special education assistants (M = 29.00, SD = 2.83) but approximately equivalent to administrators (M = 29.50, SD = 4.95).

Teaching with Technology

Location. Participants were also asked to report their perceptions of teaching with technology through five questions regarding using technology in the classroom. All items used the same five-point scale (1 =. Strongly disagree to 5 = Strongly agree). Only one item was reverse-coded due to the negative wording of the question (i.e., When I am using technology as a teaching tool, I feel nervous). A high score in this measure indicates higher technology comfort (Maximum score = 25). The Kenyan sample had a M = *19.78* (SD = 3.54) followed by the

British Columbian sample M = 19.29 *(SD* = 2.13) and the Ontario sample M = 18.17 (*SD* = 1.33) (see Table 2 for a summary of results). A ONEWAY ANOVA was conducted to examine the differences in perceptions regarding technology for teachers as a function of location. No significant main effect was found F *(*2,49) = .738, p = .483

Experience/ Roles. Examination of scores for teaching with technology for the teacher group (*M = 19*.46*, SD*=3.04) was higher than student teachers (M = 19.20, *SD* = 2.68) and administrators (M = 19.00*, SD* = 1.41) but slightly lower than special education assistants (*M*=20) which is expected since they are more likely to use assistive technology with their students.

A Pearson correlation was conducted to determine if there was a relationship between working with technology score and teaching with technology, which determined there was a significant strong positive correlation, r = .731, p =. 001.

Attitudes toward Computers and ABRA: Qualitative Analysis.

Following the workshop, participants were asked to complete the post-test survey which included five open-ended questions regarding their experience using ABRA. All responses were examined by two raters who read the responses one at a time using an inductive coding strategy to identify and label emerging themes (Boyatzis, 1998; Strauss and Corbin, 1990; Thomas, 2006). The raters read all responses together and any disagreements were resolved through discussion. Questions differed for the Canadian and Kenyan sample. In general, comments were brief and often consisted of one or two words with few expanded comments comprising a sentence or more.

Canadian sample. The first question asked to participants was “If your attitude towards computers and software as an instructional tool changed following this training session, what

changes occurred?" A total of 18 responses were provided and of that total, four indicated no change in their perceptions of computers. One participant indicated that they were already open to using new technology innovations; in addition another participant added that they would consider offering stations in their classrooms for ABRA. Three teachers expressed excitement to use ABRA in their classes going forward. Two participants noted the software was user-friendly and five acknowledged ABRA as a beneficial tool or extra support in their teaching.

The Canadian sample were also asked to provide feedback about their impressions regarding the training for ABRA. A total of 38 comments were provided. Two broad thematic categories were identified, the first was related to positive reviews of the training and the second was related to suggestions for improvement. A total of 30 comments were made in regard to positive reviews of the program and eight comments were suggestions for improvement. Overall, five participants found it to be very thorough, five thought it was enjoyable, three found it to be clear, one participant found the training easy to follow and two indicated the training was very descriptive/informative. For example, one participant summarized their perceptions as "Teachers and parents can use software immediately after training". Additionally, two participants stated that the workshop was helpful, and four participants stated that the presenters were helpful.

Suggestions for improvement included: one participant who wanted more reference to the workshop schedule as the workshop progressed, two participants stated they needed headphones, and two found that the training was too long. One participant wanted additional opportunities to ask questions and one participant indicated that the hands-on interactive time with the software was unnecessary. Additionally, three participants indicated a need for the workshop to extend beyond the immediate issues surrounding instruction in using the software and expressed a desire

for more training in regards to: more time for lesson planning, more insight on the administrative side of ABRA, and managing classes on the site.

Kenyan sample. Teachers in Kenya were asked to identify key challenges in using ABRA. A total of 16 participants did not identify any challenges in using ABRA. A total of 22 participants identified challenges in navigating the specific activities in the program, two of which included going to the READS section. Six of the participants also identified specific activities as challenging (three for comprehension, one for alphabetics, one for matching, and one for summarizing the story). Five of the participants had challenges with basic software issues which included three participants who had problems accessing and starting the program and two participants that identified logging in and out as a challenge. Two participants identified navigational challenges; in particular, they noted that it took them a long time to operate the system. One person identified "tracking" but did not elaborate on this to more clearly identify where the tracking issues occurred. Lastly, and similar to comments raised by the Canadian teachers, one teacher indicated a need to go beyond the limits of the program because they found it difficult to "come up with core competence skills and values for comprehension" which was in reference to the curriculum in Kenya.

Participants were asked "what barriers or challenges do you see with respect to you being able to implement ABRA in your classrooms/schools?" There was a total of 22 participants who answered this item and 10 participants who did not. Some common issues that occurred were hardware/software issues. For hardware, three participants were concerned with headphones, two were concerned about internet connectivity issues, five were concerned with availability of devices (laptops, iPads) and one was concerned with compatibility (i.e., google chrome books). With respect to software, one participant identified logging in and out, one identified setting the

difficulty of the program, and two identified school board access as a challenge. Additionally, some instructional barriers were also identified. One participant identified this software could be a challenge for students with learning disabilities. One identified concern regarding engagement amongst older students and students with special needs, and one participant was concerned with the tracking feature for students and having students work independently. Also, one participant expressed integration with ongoing activities as a challenge rather than having it as a stand-alone activity. Broader concerns included: one participant identifying getting buy-in from other teachers on staff. Only one participant identified concerns from parents. In particular this participant identified parental concerns regarding screen time as a possible barrier. Finally, one participant identified economic challenges, specifically the "price".

Discussion

The overarching goal of the present study was to examine teachers' perceptions toward a professional development workshop regarding software designed to provide instructional support for the teaching of early literacy. Consistent with the TPACK model (Mishra & Koheler, 2005) domain/content knowledge and technological knowledge/confidence were important considerations when assessing the pedagogical training that occurred during the workshop. Outcomes of the study were mixed with a lack of changes in some areas and some evident gains. The cross-cultural comparison in the present study provided insights regarding the transfer of this professional workshop

The first hypothesis examined whether teachers who had high comfort with technology would be more likely to have high comfort in teaching with technology as would be expected by the TPACK model. This hypothesis was supported. In fact, there was a strong positive correlation supporting this relationship between comfort with technology and teaching with

technology. Teachers from all three sites rated themselves well above the midpoint for comfort with technology and for teaching with technology. The positive relationship between these variables aligns with previous research on teachers' beliefs and attitudes towards technology and teaching with technology. Teachers who have a negative attitude towards technology are less likely to use technology in their classrooms while those with more positive attitudes generally are more likely to use technology in their classrooms (Agyei & Voogt 2011; Kim, Kim, Lee, Spector & DeMeester 2013;). The majority of teachers in this sample were comfortable working with technology and indicated they would be comfortable using technology to teach.

The TPACK framework illustrates that in order to effectively teach with technology, one must have some proficiency using said technology (Mishra & Koheler, 2005). Although most teachers in our samples indicated familiarity and comfort using technologies, some participants had lower self-ratings. Some research suggests that teacher training programs should integrate technology use in their curriculum to provide pre-service teachers with the exposure and repeated experiences with technology needed to become more comfortable with implementing technology in their classrooms (Georgina & Olson, 2008; Leu, O'byrne, Zawilinski, McVerry & Everett-Cacopardo 2009). The present study permitted a single training session. in order to advance those teachers who had lower ratings. The type of workshops for ABRA may need to institute more longitudinal or repeated experience opportunities to better support subsequent implementation in the classroom (Callaghan, et al., 2018).

The second hypothesis examined whether teachers who have high domain knowledge in literacy would be more likely to rate themselves as more confident when teaching literacy. Contrary to this expectation, analyses of the literacy knowledge test scores indicated no relationship to confidence in teaching literacy. It is interesting to note that although the teachers

self-assessed as having relatively high confidence in teaching literacy, their literacy knowledge scores were quite low. The average scores for both British Columbia and Kenya were approximately only 50% correct, with participants in Ontario scoring slightly higher but still only at 60%. Previous research has identified over-estimation as a concern. Specifically, when teachers are asked to self-assess their knowledge of literacy, they tend to overestimate how much they truly know (Cunningham, Perry, Stanovich & Stanovich, 2004). Subsequent research supports this finding and emphasizes that many teachers do not have a sufficient knowledge of the underlying linguistic concepts needed to effectively teach early literacy (Binks-Cantrell, et al., 2012;Moats, 1994). This is important as it indicates that more professional development in the underlying constructs related to literacy development may need to be incorporated into workshops involving instruction regarding instructional software to support early reading.

Interestingly, following the workshop the teachers' post-test mean confidence in teaching all four areas did increase slightly although no analyses were conducted due to the small sample size of the Ontario teachers. This increase was seen across the Canadian groups in reading fluency, writing, reading comprehension and alphabetics. There was also an increase in the two areas of reading that was measured from the Kenyan group. The Kenyan teachers' literacy teaching confidence increased from pre-test to post-test regarding comprehension and writing. This however could be attributed to the additional training that was provided to Kenyan teachers to better link ABRA with the new curriculum that was being introduced. These outcomes may suggest that the design of the software may have provided some of the foundations needed to enhance teachers' confidence in their knowledge. A post-test assessment of knowledge would be needed to identify whether the structure of ABRA, a balanced approach to literacy, and the identification and explanation of key elements (i.e., fluency, reading comprehension alphabetics

and writing) provided teachers' with an increased understanding of some of the linguistic underpinnings needed to better understand development of early literacy. Future research might also include literacy measures that directly map on to the key areas of early literacy presented in the ABRA software rather than just the linguistic elements used in the present study. Assessing knowledge of literacy is challenging given the breadth of constructs involved. For example, research demonstrates that there are differences in teachers' knowledge of literacy and although they might perform better on tasks related to syllables, they do not do well on tasks related to phonemes and graphemes (Joshi et al., 2009).

The third hypothesis examined whether teachers who had previously attended PD workshops regarding literacy would be more likely to express higher confidence in teaching literacy. Partial support was found for the third hypothesis. Teachers who had previously attended PD differed in their pre-test literacy confidence scores, but this difference was not present at post-test. This outcome may indicate that the ABRA workshop provided sufficient information regarding fundamentals of literacy development that the advantages associated with earlier PD in literacy were no longer evident after training. However, this could also be attributed to a recency effect as the teachers were previously primed with literacy knowledge, so they might recall this information more easily (Murdock, 1962). As previous research suggests, teachers who undergo high quality PD regarding literacy are more likely to effectively understand literacy concepts and apply them in their teaching (Binks-Cantrell, et al., 2012; McMahan, Oslund & Odegard, 2019). Alternatively, the lack of other comparisons involving literacy teaching confidence found between the groups could reflect the need for additional literacy skill training.

The teachers may require additional time in their PD as research has demonstrated that teachers not only depend on the quality of PD workshop instruction, but they also desire additional support both during and following the workshop (Callaghan, et al., 2018). A study that included self-report measures for teacher PD revealed that teachers do desire PD support when integrating new technology in their classrooms (Callaghan, et al., 2018). Teachers who were willing to integrate a computer-based math game into their classrooms stated that they desired the opportunity to have PD where they play the game with experienced personnel guiding them through so that they could fully understand the contents of the game and be able to later explain it to their students (Callaghan, et al., 2018). Although the participants were able to gain hands-on experience with ABRA at intervals throughout the workshop, there may have been insufficient time for participants to fully explore all of the activities on their own.

Additionally, teachers report that they would prefer to have consistent dialogue between the PD support (i.e. presenters and facilitators), as they believe it allows them to strengthen their knowledge of the software. Although workshop presenters were positively reviewed in the qualitative outcomes in the present study, previous research identifies the importance of ongoing support. When communication between teachers and PD support was weak, that is, there was minimal contact between teachers and PD support (Callaghan, et al., 2018), learning gains were lower. This evidence suggests that a high-quality PD workshop can be effective, however there should be open dialogue between the teachers and the PD support to ensure teachers have the necessary support when needed. For future studies it would be important to keep a line of communication open to the ABRA experts whenever needed, so that teachers may feel confident in their newly developed skills. Just-in-time instruction could be one mechanism to support teachers. One study demonstrated that although users require substantial amount of immediate

support during the initial implementation of software, requests for support decline over time as experience with the program and how to integrate the program progresses over time (Wood et al., 2011). As teachers' acquire more skill with just-in-time support, the quality of their lessons increases (Janssen & Lazonder, 2016). Combining the present workshops with additional support may better enhance acquisition and integration of ABRA.

An important question in the present study was to determine potential differences as a function of regional difference across cultural differences. There were differences across all three groups in their literacy knowledge scores, but these did not indicate cross-cultural differences per se. For example, Ontario teachers scored the highest in the literacy knowledge tests. This could be due to the fact that they were currently enrolled in a course dedicated to reading and writing difficulties. Ontario participants also scored the lowest in teaching confidence. It is possible that this could be due to the fact that some of the teachers in the Ontario sample were not exclusively primary school teachers and might not have the necessary training to teach literacy to younger children. Teachers in British Columbia had the lowest scores for literacy knowledge which was surprising considering that they were predominately all primary school teachers and had years of teaching experience. However, when it came to confidence teaching literacy the British Columbian teachers' scores placed them between Kenya and Ontario. Kenyan teachers scored the highest across all literacy teaching confidence measures and were in between Ontario and British Columbia in their literacy knowledge scores. This pattern of outcomes indicates no pervasive cross-cultural patterns but rather more regional or experience-based elements that may explain differences across locations.

Additionally, research (Cummins, 1979) suggests that language transfers across individual's L1 and L2, which could explain why the Kenyan sample scored the highest in

teaching literacy confidence. Kenya has two official languages, the Bantu Swahili/Kiswahili language and English, but there are 68 languages spoken in Kenya (Eberhard, Simons & Fennig, 2019). Kenya has various ethnic groups that also have their own mother tongues within their communities so individuals, specifically teachers, must be fluent in the two official languages and most likely have fluency in at least one additional language— their mother tongue (Eberhard, Simons & Fennig, 2019). This would make teachers in Kenya multi-lingual and research has indicated that phonological awareness is a type of metalinguistic awareness that can be transferred from participants L1 to L2 (Kuo, Uchikoshi, Kim, & Yang 2016). This language fluency could positively influence the Kenyan teachers confidence in their ability to teach literacy.

Limitations and Future Directions

The three main limitations of this study involved sampling issues, consistency across measures, and inability to employ longitudinal measures. The sample size in this study was relatively small. Some analyses (e.g., repeated measures ANOVA across pre-post literacy teaching confidence) were unable to be conducted due to the small sample size. Future research that could recruit larger samples inclusive of teachers, student/pre-service teachers as well as administrators wold be important for examining the impact of workshop training across the spectrum of experience and roles.

The differences in measurements across the two countries differed slightly in terms of wording and items assessed. For example, in the Kenyan measurements for pre-literacy confidence two concepts English language and word reading were not assessed in the Canadian sample but instead alphabetics and reading fluency were assessed. The inconsistency of the measures allowed for only a limited number of comparisons to be made across the three

locations. The measures were phrased differently across the Canadian and Kenyan samples, due to cultural variations (i.e. English language lessons for the Kenyan sample). Consistency across all measures should be ensured in future studies to allow complete comparisons across all items of the surveys used.

For example, following ABRA workshop participants could be examined weekly over one or two terms. This would give teachers more opportunities to explore the program and evaluate their own experiences in regards to challenges experienced, how they tackle these issues, and, if they seek help somewhere else, who they seek help from. Answers to these questions would provide researchers with more insight regarding what issues teachers face and how these issues are best addressed.

Closing Comments

The present study reported the perceptions of teachers learning to use an online literacy program across three different locations and determined how their previous literacy knowledge, and perceived comfort of using technology would influence their perceptions towards the workshop and what challenges they would expect when implementing the program in their classrooms. Overall, participants rated the workshops positively. They expressed expected concerns related to hardware and software barriers following the workshop (Wood, et al., 2011). These barriers include access, costs, navigation, and integration concerns. These ongoing concerns are important considerations for implementation. Providing workshops and training requires subsequent support in the classroom to promote integration. Understanding how teachers use the educational technologies such as ABRA when they are on their own is a critical future direction to further understand how teachers use technology across diverse instructional contexts.

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Tables and Figures

Table 1

Means and Standard Deviations for Literacy Scores and Teaching Literacy Confidences Across Teacher Groups

	Total Literacy Knowledge		Total Comfort Teaching Literacy	
	N	M (SD)	N	M (SD)
Kenya	28	8.96 (1.97)	33	6.21 (2.26)
British Columbia	15	8.60 (4.05)	13	4.84 (1.34)
Ontario	6	10.00 (2.76)	5	8.00 (5.87)
Overall Teachers	49	8.97 (2.82)	51	6.04 (2.69)
Overall Non-teachers	9	8.44 (4.25)	6	8.00 (3.27)
Student Teachers	5	7.20 (4.60)	2	10.00 (2.83)
Special Ed. Assist.	2	7.50 (3.54)	2	10.00 (2.83)
Administrator	2	12.50 (2.12)	2	6.00 (2.83)

Table 2

Means and Standard Deviations for Total Technology Scores and Total Teaching with Technology Scores Across Groups

	Total Technology Score		Total Teaching with Technology Score	
	N	M (SD)	N	M (SD)
Kenya	34	30.12 (4.35)	32	19.78 (3.54)
British Columbia	15	28.53 (6.88)	14	19.29 (2.13)
Ontario	6	29.33 (2.66)	6	18.16 (1.33)
Teachers	55	29.60 (4.99)	52	19.46 (3.03)
Non-teachers	9	29.11 (3.44)	9	19.33 (2.00)
Student Teachers	5	29.00 (3.94)	5	19.20 (1.76)
Special Ed. Assist.	2	29.00 (2.82)	2	20.00 (--)
Administrator	2	29.50 (4.95)	2	19.00 (1.41)

Table 3

Means and Standard Deviations for Pre-Post Literacy Teaching Confidence

	Total Pre-Literacy Teaching Confidence		Total Post-Literacy Teaching Confidence	
	N	M (SD)	N	M (SD)
Kenya	17	3.23 (2.28)	29	5.76 (2.08)
British Columbia	14	4.14 (1.10)	13	7.00 (2.20)
Ontario	6	5.00 (4.91)	5	9.40 (4.45)
Teachers	37	3.86 (1.95)	47	6.49 (2.63)
Non-teachers	9	5.89 (1.76)	6	8.00 (3.27)
Student Teachers	6	6.50 (1.76)	2	10.00 (2.83)
Special Ed. Assist.	1	4.00 (--)	2	10.00 (2.82)
Administrator	2	5.00 (1.41)	2	6.00 (2.83)

Table 4

Means and Standard Deviations for Pre-Post Literacy Teaching Confidence Areas

Location	Kenya		Ontario		British Columbia	
	N	M (SD)	N	M (SD)	N	M (SD)
Pre-Comprehension	17	1.65 (1.12)	14	2.79 (0.98)	15	1.87 (0.52)
Pre-Writing	18	1.61 (1.20)	14	2.86 (1.03)	15	2.27 (0.70)
Pre-Alphabetics	--	-- (--)	14	2.86 (1.17)	17	2.24 (0.66)
Pre-Reading Fluency	--	-- (--)	14	2.86 (1.03)	16	1.73 (0.25)
Pre-English Language	18	1.72 (1.18)	--	-- (--)	--	-- (--)
Pre-Word Reading	19	1.68 (1.06)	--	-- (--)	--	-- (--)
Post-Comprehension	29	1.41 (0.57)	10	2.00 (0.94)	15	1.80 (0.68)
Post-Writing	29	1.48 (0.69)	10	2.10 (0.99)	15	2.00 (0.53)
Post-Alphabetics	29	1.31 (0.54)	10	2.10 (0.99)	15	2.00 (0.53)
Post-Reading Fluency	29	1.55 (0.69)	10	2.10 (0.99)	15	1.73 (0.70)

Table 5

Means and Standard Deviations for Post Literacy Teaching Comfort Areas

Location	Kenya		Ontario		British Columbia	
	N	M (SD)	N	M (SD)	N	M (SD)
Comprehension	33	1.55 (0.62)	5	1.60 (0.89)	13	1.15 (0.38)
Writing	33	1.64 (0.70)	5	2.00 (1.41)	13	1.46 (0.66)
Alphabetics	33	1.42 (0.56)	5	2.20 (1.79)	13	1.08 (0.28)
Reading	33	1.61 (0.83)	5	2.20 (1.79)	13	1.15 (0.38)
Fluency						

Figure 1. TPACK Framework

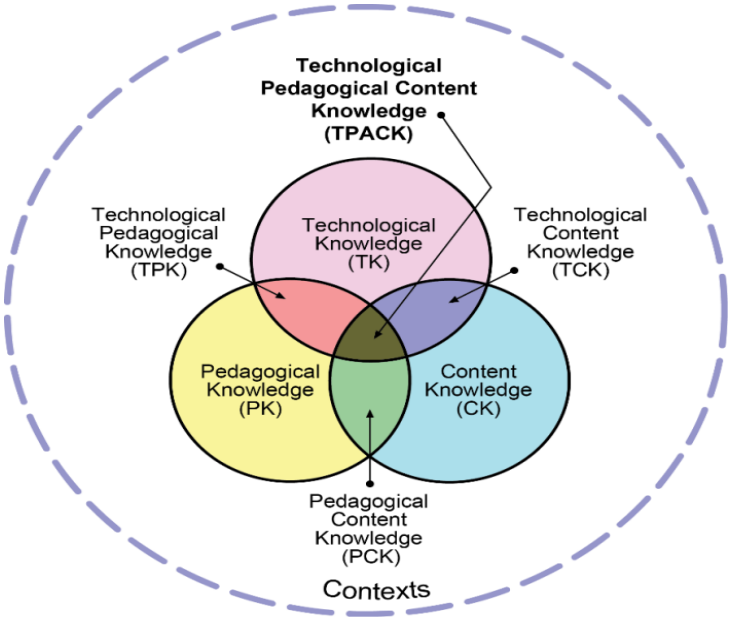
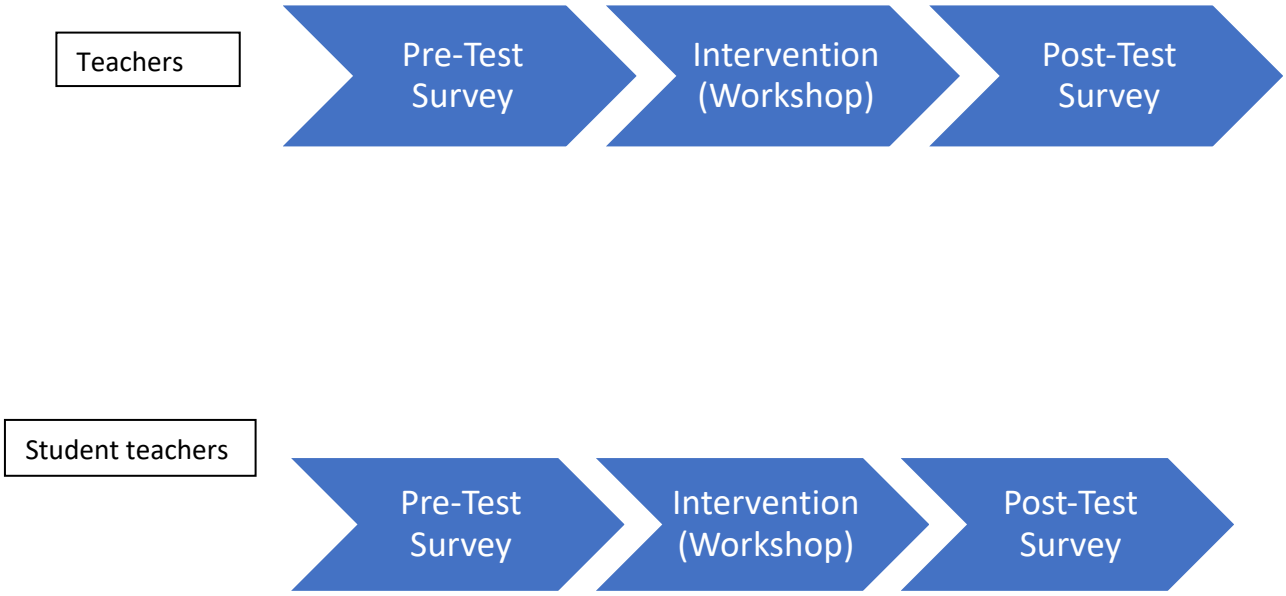


Figure 2. Design of Study



Appendix A

Literacy and Training

In addition to the analyses made comparing teachers, supplemental analyses were made across the three locations including all of the participants (i.e. teachers, student-teachers, special education assistants and administrators) to address potential differences from the larger groups understanding that these groups may vary in training and experience..

Knowledge of literacy. To assess background knowledge in literacy, participants were asked to complete a 16-item questionnaire with items scored dichotomously (correct or incorrect). Items were aggregated and yielded a maximum score of 16.

Location Differences. Visual inspection of mean scores across the three locations yielded similar means with all groups falling just above the midpoint of the measures. Specifically, the British Columbia sample averaged a total of M = 8.47 (SD = 3.91) correct answers (range=1-13), the Ontario sample averaged a total of M= 9.3 (SD = 3.79; range = 3-14) correct answers, and the Kenyan sample averaged a total of M=8.96 (SD = 1.97; range =1-14) correct answers.

A ONEWAY ANOVA comparing literacy knowledge across the three sites, British Columbia, Ontario and Kenya yielded no significant differences as a function of group $F=2,57 = .285$ $p=.753$

Confidence Teaching Literacy

Location differences: For all seven topics assessed for confidence at pre-test, scores reflected the lower levels of the 5-point scale indicating higher levels of confidence. Specifically, mean scores for reading comprehension across all three groups were highest for the Kenyan group M=1.65 (SD=1.12), followed by the British Columbian participants (M=1.87, SD=.516) and the Ontario group (M=2.79, SD=.975). A ONEWAY analysis of variance yielded

significantly different results for reading comprehension, F(2,43)= 6.47 p=.003. For writing the lowest mean was observed in the Ontario group (M=2.86, SD= 1.03) followed by the sample from British Columbia (M=2.27, SD=.704) and the Kenyan group (M=1.61, SD=1.20). A ONEWAY ANOVA was conducted, which yielded statistical significance F (2,44) = 6.05, p=.005. For reading fluency the Ontario participants scored lower in their confidence to teach reading fluency (M= 2.86, SD=1.03) than the British Columbian sample (M=2.06, SD=.25). A ONEWAY ANOVA was conducted, which determined there was a significant differences across Ontario and British Columbia, F (1,28) = 9.01, p=.006. For alphabetics, participants from Ontario had a lower mean score (M=2.86, SD=1.17) compared to those from British Columbia (M=2.24, SD=.664). A ONEWAY ANOVA was conducted which yielded no significant differences, F(1,29)= 3.48, p=.072.

A ONEWAY ANOVA assessed differences across the three locations for overall confidence in literacy. There was a statistically significant difference between the three groups (F(2,43) = 6.61 , p = .003). Tukey B post hoc comparisons revealed that teaching literacy confidence was highest for the Kenyan group (M=3.24 , SD=2.27) compared to the British Columbia sample (M=4.13, SD=1.06) and the Ontario sample (M=5.64, SD= 1.09).

Post-Workshop Confidence

Teacher's confidence for four aspects of reading were assessed at post-test (i.e., reading comprehension, writing, reading fluency and alphabetics). A series of four ONEWAY analyses of variance were conducted to examine the confidence that teachers reported in regards to teaching each of the four areas. For reading comprehension, writing and alphabetics there was a significant difference among the teachers for the three locations, F=(2,51) = 3.44, p=.040 F(2,51)= 4.13, p=.022 and F=(2,51) = 6.69, p=.003, respectively. Tukey B post hoc comparisons

revealed that in each case teaching confidence was highest for the Kenyan group (M =1.41, M=1.48 and M=1.31) followed by the British Columbia sample (M = 1.80, M=2.00, and M=1.86) and the Ontario sample (M = 2.00, M=2.10 and M=1.86) for reading comprehension, writing and alphabetics, respectively (see Table 4 for a full summary).

The ONEWAY analysis of variance comparing across the three locations for reading fluency, yielded no significant differences across the groups, $F(2,51)= 1.98$, $p= .148$.

Aggregated confidence scale. One ONEWAY analysis of variance was conducted to assess overall confidence of the post test aggregated four early reading items across the three sites, British Columbia, Ontario and Kenya. There was a significant main effect across groups. $F(2,51)= 4.41$, $p=.017$. Tukey b post hoc comparisons revealed that overall confidence was the highest for the teachers in Kenya of M=5.79 (SD= 4.45, range 4-12) compared to those from British Columbia (M=7.40, SD= 2.41) and Ontario (M=8.3, SD= 3.88). Teachers from Kenya were also significantly different than the Ontario teachers.

Technology Scores

Location. Participants were asked eight questions regarding their perceptions towards using technology (see Table 2 for summary). A total score was calculated by adding all eight items using a five-point scale scoring scheme. Any items that were asked in a negative view of technology (i.e. Technology makes me uneasy and confused) were reverse coded to ensure an accurate overall total, with a high score indicating higher technology comfort (Maximum score = 40). Visual inspection of mean scores indicates high similarly regarding comfort teaching with technology. The Kenyan group had a total average of M= 30.12 (SD=4.35), followed by the Ontario group with a M=29.23 (SD=3.19) and the British Columbia group with M=28.59 (SD=6.47).

A ONEWAY ANOVA comparing across the three sites, British Columbia, Ontario and Kenya yielded no significant differences as a result of group, F (2,61)= .602 , p=551.

Teaching with Technology

Location. Participants were also asked to self-assess their perceptions of teaching with technology and were asked a total of five questions regarding using technology in the classroom. A total was created by adding all five items by using the same five-point scale scoring scheme (1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree). Only one item was reverse-coded due to the negative wording of the question (i.e. When I am using technology as a teaching tool, I feel nervous). The Kenyan sample had a M=19.78 (SD=3.54) followed by the British Columbian sample M=19.38 (SD=1.99) and lastly, the Ontario sample had M= 18.69 (SD=1.89). A ONEWAY ANOVA comparing across the three sites, British Columbia, Ontario and Kenya yielded no significant differences as a result of group, F (2,58)= .652, p=525.

Summary

Overall, all patterns of results observed with this aggregated sample reflected similar outcomes to the results obtained when examining teachers only. Comparisons across all of the constructs which included technology comfort, literacy knowledge and teaching literacy confidence did not differ substantially from those found with teachers.

Table 1

Means and Standard Deviations for Literacy Scores and Teaching Literacy Confidences Across Groups

	Total Literacy Knowledge		Teaching Literacy Comfort	
	N	M (SD)	N	M (SD)
Kenya	28	8.96 (1.97)	33	6.21 (2.26)
British Columbia	17	8.47 (3.91)	15	5.53 (2.33)
Ontario	13	9.31 (3.79)	10	7.60 (4.52)
Overall Teachers	49	8.97 (2.82)	51	6.04 (2.69)
Overall Non-teachers	9	8.44 (4.25)	7	8.00 (3.27)
Student Teachers	5	7.20 (4.60)	2	10.00 (2.83)
Special Ed. Assist.	2	7.50 (3.54)	2	10.00 (2.83)
Administrator	2	12.50 (2.12)	2	6.00 (2.83)

Table 2

Means and Standard Deviations for Total Technology Score and Total Teaching with Technology Score

	Total Technology Score		Total Teaching with Technology Score	
	N	M (SD)	N	M (SD)
Kenya	34	30.12 (4.35)	32	19.78 (3.54)
British Columbia	17	28.59 (6.47)	16	19.38 (1.99)
Ontario	13	29.31 (3.19)	13	18.69 (1.89)
Teachers	55	29.60 (4.99)	52	19.46 (3.03)
Non-teachers	9	29.11 (3.44)	9	19.33 (2.00)
Student Teachers	5	29.00 (3.94)	5	19.20 (1.76)
Special Ed. Assist.	2	29.00 (2.82)	2	20.00 (--)
Administrator	2	29.50 (4.95)	2	19.00 (1.41)

Table 3

Means and Standard Deviations for Total Pre-Literacy Teaching Confidence and Total Post-Literacy Teaching Confidence

	Total Pre-Literacy Teaching Confidence		Total Post-Literacy Teaching Confidence	
	N	M (SD)	N	M (SD)
Kenya	17	3.23 (1.66)	29	5.76 (2.08)
British Columbia	15	4.13 (1.06)	15	7.40 (2.41)
Ontario	14	5.64 (1.90)	10	8.30 (3.89)
Teachers	37	3.86 (1.95)	47	6.49 (2.63)
Non-teachers	9	5.89 (1.76)	7	8.00 (3.27)
Student Teachers	6	6.50 (1.76)	2	10.00 (2.83)
Special Ed. Assist.	1	4.00 (--)	2	10.00 (2.82)
Administrator	2	5.00 (1.41)	2	6.00 (2.83)

Appendix B

Canadian Pre-Test Survey

Code:

1. What are the last three letters in your last name? ____ _____ _____

2. What is the first three letters of the month of your birth? _____ _____ _____

3. What are the first three numbers of your street address? (If you have only one or two number(s) ex. 8 enter 008) ____ _____ _____

4. What are the first three letters of the high school you attended? (If more than one pick the first one) ____ _____ _____

1. What is your gender?
   - ○ Male
   - ○ Female
   - ○ Other
2. What is your age? (in years only) _____
3. What is your highest level of education?
   - ○ Some university or college
   - ○ Completed university or college
   - ○ Undergraduate university degree
   - ○ Graduate university degree
   - ○ Post graduate studies

4. Have you completed teachers college?

   ○ Yes

   ○ No

   ○ Currently in progress

5. What was your undergraduate degree major? _____

6. What year did you graduate from your teacher education program? _____

7. How many reading education courses you have taken (both at the undergraduate and graduate levels)?

   ○ Undergraduate _____

   ○ Graduate _____

8. Please list any certifications you have (i.e., reading specialist, K-12; special education etc.):

   _____

9.Estimate the number of hours you have dedicated to professional development about literacy learning in the last year. _____

10. Have you attended any professional development workshops regarding literacy instruction in the last three years? (Please circle) Yes No

11. How many years have you been teaching? _____

12. What grades have you previously taught? (please check all that apply)

- ○ Grade 1
- ○ Grade 2
- ○ Grade 3
- ○ Grade 4
- ○ Grade 5
- ○ Grade 6
- ○ Grade 7
- ○ Grade 8
- ○ High school

13. If you are currently teaching in the classroom please identify the grades that you are teaching.

- ○ Grade 1
- ○ Grade 2
- ○ Grade 3
- ○ Grade 4
- ○ Grade 5
- ○ Grade 6
- ○ Grade 7
- ○ Grade 8
- ○ High school

○ N/A I am not currently teaching

14. Are you currently involved in an administrative position or consulting position within your school board?

○ No, I am not involved in either an administrative or consulting position

○ I am in involved in both administrative and consulting positions

○ I am involved in a consulting position

○ I am involved in an administrative position

15. Have you ever used any online/packaged software such as "Reader Rabbit" or "Star Fall" etc. as an instructional tool in your classroom?

○ Yes

○ No

16. What software have you used in the last three years?

_____

17. Have any of the teachers at your school attended one of the ABRACADABRA workshops?

○ Yes

○ No

18. Do you know of any other teachers in your district who have attended one of these ABRACADABRA workshops?

○ Yes

○ No

19. How confident are you in your ability to teach early reading?

- ○ Very confident
- ○ Confident
- ○ Neither confident or unconfident
- ○ Unconfident
- ○ Very unconfident

20. Imagine you were providing a workshop for new teachers to help them to learn about literacy instruction. How would you define the following literacy components;

Alphabetics: _____

Reading Fluency: _____

Writing: _____

Comprehension: _____

21. Which of the following literacy components do you typically apply in your classroom?

- ○ Reading Fluency
- ○ Writing
- ○ Comprehension
- ○ Vocabulary
- ○ Alphabetics

The following questions are about literacy:

22. A phoneme refers to…

- ○ A single letter
- ○ A single speech sound
- ○ A single unit of meaning
- ○ A grapheme
- ○ No idea

23. Phonological awareness is:

- ○ The ability to use letter-sound correspondences to decode
- ○ The understanding of how spoken language is broken down and manipulated
- ○ A teaching method for decoding skills
- ○ The same as phonics
- ○ No idea

24. How many speech sounds are in the following words? For example, the word “cat” has 3 speech sounds ‘k’-‘a’-‘t’. Speech sounds do not necessarily equal the number of letters. Please write “DK” to indicate that you don’t know.)

- ○ Box: _____

- Grass: _____
- Ship: _____
- Moon: _____
- Brush: _____
- Through: _____
- Eight: _____
- Knight: _____
- Shriek: _____
- Thing: _____
- Crutch: _____
- Bank: _____
- Knee: _____
- Enough: _____
-

25. If you are currently teaching or were planning to teach an English Language Lesson, how often would your students be engaged in the following activities?

	Never	1- 3 times a week	4-6 times a week	7-10 times a week	more than 10 times a week	I do not know how often I do this
Teacher Reading aloud to class	○	○	○	○	○	○
Children Reading aloud	○	○	○	○	○	○
Repeated oral reading (e.g. echo reading)	○	○	○	○	○	○
Silent (independent) reading	○	○	○	○	○	○
Children working in pairs	○	○	○	○	○	○
Children working in groups	○	○	○	○	○	○
Breaking words into sounds/parts	○	○	○	○	○	○
Sounding out words	○	○	○	○	○	○
Spelling	○	○	○	○	○	○
Vocabulary development (e.g. defining and explaining word meaning)	○	○	○	○	○	○
Filling in worksheets	○	○	○	○	○	○
Teacher summarizing stories/text for children	○	○	○	○	○	○
Children summarizing stories/text orally	○	○	○	○	○	○
Asking children questions about stories/text orally	○	○	○	○	○	○

Children writing summaries of stories/text	○	○	○	○	○	○
Asking children to write answers to questions about stories/text	○	○	○	○	○	○

26. How confident do you feel in your ability to teach in these areas?

	Very confident	Somewhat confident	Neutral	Somewhat unconfident	Very unconfident
Reading Fluency	○	○	○	○	○
Alphabetics	○	○	○	○	○
Comprehension	○	○	○	○	○
Writing	○	○	○	○	○

27. What sort of computer equipment are the students in your school/school district typically able to access?

○ Stationary Computers (Desktop computers)

○ Mobile Computers (Laptops/iPads)

○ Both

28. If you have stationary computers are they:

- ○ In every classroom
- ○ In a special computer lab
- ○ Both

29. Typically are there enough stationary computers for the entire class?

- ○ Yes
- ○ No

30. Typically are there enough mobile computers for:

- ○ The whole class
- ○ Subset of the class

31. Do you have any issues with the firewall at your school? (Not being able to access information, content, YouTube videos etc.)

- ○ Always
- ○ Most of the time
- ○ About half the time
- ○ Sometimes
- ○ Never

32. Compared to other teachers how comfortable are you in your abilities to use the following:

	Very Uncomfortable	Somewhat Uncomfortable	Neutral	Somewhat Comfortable	Very Comfortable
Computers	○	○	○	○	○
Internet	○	○	○	○	○
Cellphone/smartphone	○	○	○	○	○

33. For each of the following statements, indicate how much you agree with the statement by selecting one of the options on the scale. Consider the term “technology” to include the following: computers, Internet, smart phones, and tablet devices, as well as software

or websites you would use with these devices.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I like working with technology	○	○	○	○	○
Working with technology makes me very nervous	○	○	○	○	○
Generally I feel OK about trying a new problem on a technology device.	○	○	○	○	○
Figuring out technology problems does not appeal to me.	○	○	○	○	○
Once I start working with technology I find it hard to stop	○	○	○	○	○
I feel comfortable working with technology	○	○	○	○	○
Technology makes me uneasy and confused	○	○	○	○	○
I have a lot of self-confidence when it comes to working with technology	○	○	○	○	○

34. Teaching with technology

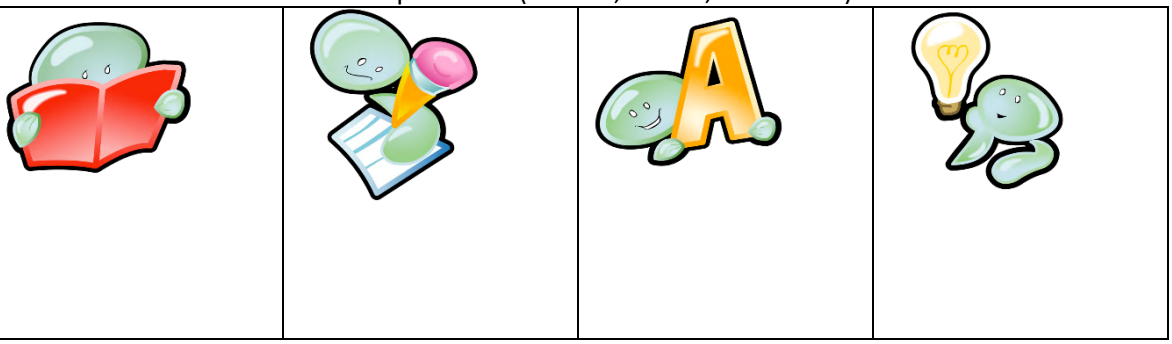
	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
I feel comfortable supervising my students while they are using technology as a learning tool	○	○	○	○	○
When I am using technology as a teaching tool, I feel nervous	○	○	○	○	○
Once my students start to work with technology, they will find it hard to stop	○	○	○	○	○
Integrating technology into my teaching practice will be easy	○	○	○	○	○
I will have enough support at my home school to be able to integrate the programs in my teaching	○	○	○	○	○

Appendix C

Workshop Handouts

ABRACADABRA Alphabetics Activity Guide

1. Tick the icon that stands for Alphabetics (Sounds, letters, and words) in ABRA.



2. Which activities permit students to practice rhyming words?

3. Which activity has children tell how many words are in a sentence?

4. Which activity has children listen to a word then break it down into phonemes?

5. List 3 simple activities you would use to ascertain how well your students hear.

6. List 3 activities you will use with students who are just beginning to learn about sounds and letters.

7. Which activities ask students to listen to sounds then put them together to make words?

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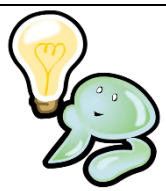
ABRACADABRA Fluency Activity Guide

8. Tick the icon that stands for Fluency (Reading) in ABRA.



9. Define reading fluency.

10. Why is this skill important?

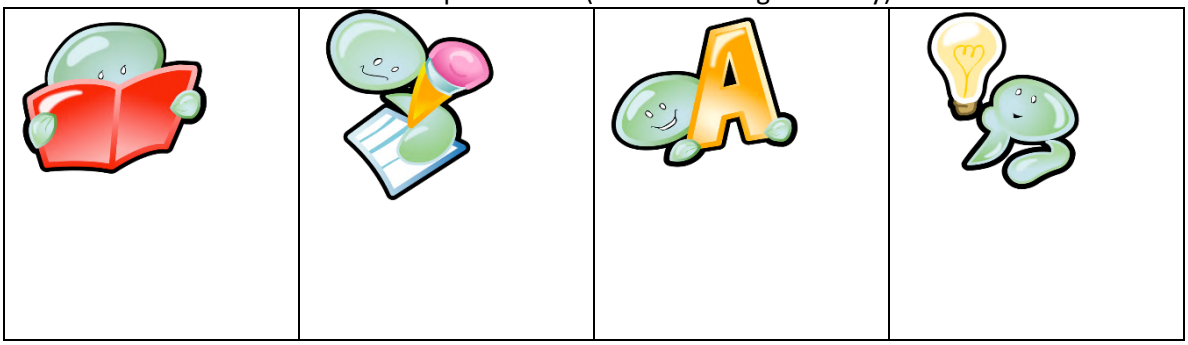
11. On average, how many words a minute do typical 1st, 2nd and 3 graders read?

12. How do you calculate reading fluency?

13. List 4 methods teachers can use for students to improve their reading fluency?

ABRACADABRA Comprehension Activity Guide

14. Tick the icon that stands for Comprehension (Understanding the story) in ABRA.



15. Where would you go to practice putting the story in order?

16. In which single activity would students answer story questions about characters, theme, plot, location, etc.?

17. List 3 activities in ABRA where it is better to have students work in pairs/groups or write their answers?

18. Explain the difference between the *Vocabulary* and *Vocabulary ESL* activities.

19. What are the 5 genres of books found in ABRACADABRA?

20. What are the four cuing systems you should practice with your students?

Appendix D

Post-test survey

ABRA Workshop after Training

Code:

1. What are the last three letters in your last name? ____ _____ _____

2. What is the first three letters of the month of your birth? _____ _____ _____

3. What are the first three numbers of your street address? (If you have only one or two number(s) ex. 8 enter 008) ____ _____ _____

4. What are the first three letters of the high school you attended? (If more than one pick the first one)

____ _____ _____

1. We would like some feedback about your impressions regarding the ABRACADABRA software. First, we would like to know positive impressions, what did you like about ABRACADABRA. Can you please provide us with some specific examples (two if possible) of things that you liked?

   _____

   _____

2. What did you dislike about the ABRACADABRA software? Can you please provide us with some specific examples (two if possible) of things that you disliked?

   _____

   _____

3. What was challenging to understand about the ABRACADBRA software and can you give us some examples?

   _____

   _____

4. We would like some feedback about your impressions regarding the training for ABRACADABRA. What were your overall impressions?

_____

_____

5. In general, how did you find the pace of instruction?

- ○ Too fast
- ○ Just right
- ○ Too slow

6. Do you feel there were sufficient examples of the ABRACADABRA program provided in the workshop to allow you to feel that you could use it as an effective teaching tool?

- ○ Strongly agree
- ○ Somewhat agree
- ○ Neither agree nor disagree
- ○ Somewhat disagree
- ○ Strongly disagree

7. While you were learning about ABRA in the training session, who provided support for your personal questions? Check all that apply.

- ○ Presenter
- ○ Fellow attendees
- ○ Facilitators

8. When you felt you needed clarification during the training how often did you seek out support or clarification?

- ○ Always
- ○ Most of the time
- ○ About half the time
- ○ Sometimes
- ○ Never

9. How often did you feel that you needed additional support or clarification during the ABRA training?

- ○ Always
- ○ Most of the time
- ○ About half the time
- ○ Sometimes
- ○ Never

10. In regards to ABRA do you recall seeing information about

	Yes	No
Reading Fluency	○	○
Alphabetics	○	○
Comprehension	○	○
Writing	○	○

11. How thoroughly were the following concepts defined and explained?

	Extremely clear	Slightly Clear	Neither clear or unclear	Slightly Unclear	Extremely unclear	N/A
Reading Fluency	○	○	○	○	○	○
Alphabetics	○	○	○	○	○	○
Comprehension	○	○	○	○	○	○
Writing	○	○	○	○	○	○

12. How comfortable do you feel in your ability to teach

	Moderately comfortable	Slightly comfortable	Neither comfortable nor uncomfortable	Slightly uncomfortable	Moderately uncomfortable
Reading Fluency	○	○	○	○	○
Alphabetics	○	○	○	○	○
Comprehension	○	○	○	○	○
Writing	○	○	○	○	○

13. How confident do you feel in your ability to help your students navigate using the ABRA software?

- ○ Very confident
- ○ Somewhat confident
- ○ Neutral
- ○ Somewhat unconfident
- ○ Very unconfident

14. How confident do you feel in your ability to teach

	Very confident	Somewhat confident	Neutral	Somewhat unconfident	Very unconfident
Reading Fluency	○	○	○	○	○
Alphabetics	○	○	○	○	○
Comprehension	○	○	○	○	○
Writing	○	○	○	○	○

15. With respect to the training what could you suggest as an addition or change that might improve the training sessions?

_____

_____

16. What additional information, practice or support would be helpful for you to ensure that you are comfortable using ABRA?

_____

_____

17. What barriers or challenges do you see with respect to you being able to implement ABRA in your classrooms/school?

_____

_____

18. Following this training session how likely are you to use ABRACADABRA as an instructional tool in your classrooms?

- ○ More likely to use ABRA than I would have been before the training
- ○ Somewhat more likely to use ABRA than I would have been before the training
- ○ Neither more nor less likely to use ABRA than I would have been before the training
- ○ Somewhat less likely to use ABRA than I would have been before the training
- ○ Not at all likely to use ABRA

19. If your attitude towards computers and software as an instructional tool changed following this training session, what changes occurred?

_____

_____

Appendix E

Kenyan Study Pre-Survey

Q1 What is your name?_____

Q2 What is your gender?

- ○ Male (1)
- ○ Female (2)

Q3 What is your age?_____

Q4 What is your highest level of education?

- ○ Grade 6 (1)
- ○ Grade 7 (2)
- ○ Grade 8 (3)
- ○ Some high school (4)
- ○ Completed high school (5)
- ○ Some university or college (6)
- ○ Completed university or college (7)
- ○ Undergraduate university degree (8)
- ○ Graduate university degree (9)
- ○ Post graduate studies (10)
- ○ Completed teachers college (11)

Q5 What was your undegraduate degree major? Did you also minor in another area?

_____

Q6 How many years were you in a teacher education program?

_____

Q7 What year were you registered in a teacher education program?

_____

Q8

List the reading education courses you have taken (both at the undergraduate and graduate levels; write the name, if you don't remember write at the junior level, ACP, etc)

_____

_____

_____

_____

_____

Q9 Please list any certifications you have (i.e., reading specialist, K-12; special education etc.): *

_____

_____

_____

_____

_____

Q10 Estimate the number of hours dedicated to literacy learning for children in your previous educational training_____

Q11 Estimate the amount of hours dedicated to literacy learning in your current educational training

_____

Q12 Do you have any volunteer work dedicated to literacy instruction?

- Yes (1)
- No (2)

Q13 What literacy instruction programs have you volunteered for?

_____

Q14 Do you have any tutoring experience dedicated to literacy instruction?

- Yes (1)
- No (2)

Q15 Describe your experience tutoring in regards to literacy instruction

_____

Q16 Do you have any other experiences in regards to literacy instruction?

_____

Q17 Have you attended any professional development workshops regarding literacy instruction?

- ○ Yes (1)
- ○ No (2)

Q18 Can you estimate the amount of hours spent at these workshops regarding literacy instruction?

_____

Q19 How many years have you been teaching?_____

Q20 Where is your home school?_____

Q21 What grades have you previously taught? _____

Q22 What grade are you currently teaching?

- ○ Grade 1 (1)
- ○ Grade 2 (2)
- ○ Grade 3 (3)
- ○ Grade 4 (4)
- ○ Grade 5 (5)
- ○ Grade 6 (6)
- ○ Grade 7 (7)
- ○ Grade 8 (8)
- ○ High school (9)

Q23 How many hours of English instruction do your students have per week?_____

Q24 Have you ever used any online/packaged software such as "Reader Rabbit" or "Stall Fall" etc. as an instructional tool in your classroom?

- ○ Yes (1)
- ○ No (2)

Q25What software have you used? _____

Q26 Was the software used personally by the students?

- ○ Yes (1)
- ○ No (2)

Q27 How many children are in the classroom that you will be using the Toolkit (ABRACADBRA) Software?_____

Q28 How many girls?_____

Q29 How many boys?_____

Q30 Have any of the teachers at your school attended one of the Toolkit (Abracadabra) workshops?

- ○ Yes (1)
- ○ No (2)

Q31 How many? _____

Q32 Do you know of other teachers in your district who have attended one of these ABRACADABRA training workshops?

- Yes (1)
- No (2)

Q33 On your own where do you seek other information on literacy and early reading

- Newsletters (1)
- Articles (2)
- Teacher forums (3)
- Teacher journals (4)
- Other (5) _____

Q34 How confident are you in early reading competency?

Q35 Imagine you were providing a workshop for new teachers to help them to learn about literacy instruction. How would you define the following literacy components;

- Alphabetics: (1) _____
- Reading Fluency: (2) _____
- Writing: (3) _____
- Comprehension: (4) _____
- Cooperative Learning: (5) _____

Q36 Which of the following literacy components do you typically apply in your classroom?

- [ ] Reading Fluency (1)
- [ ] Writing (2)
- [ ] Comprehension (3)
- [ ] Vocabulary (4)
- [ ] Alphabetics (5)
- [ ] Cooperative Learning (6)

Q37 In your English Language lessons, how often were your students engaged in activities targeting…?

	Never (1)	1-3 Times a week (2)	4-6 Times a week (3)	7-10 times a week (4)	More than 10 times a week (5)	I do not know how often I do this (6)
Alphabetics (1)	○	○	○	○	○	○
Reading Fluency (2)	○	○	○	○	○	○
Comprehension (3)	○	○	○	○	○	○
Writing (4)	○	○	○	○	○	○
Vocabulary (5)	○	○	○	○	○	○

Q38 In your English Language lessons you provide to your class. Thinking about the amount of instruction you typically provide (as noted in the previous question). How close is the amount of instruction you provide to your ideal?

	Would decrease a lot (1)	Would decrease a little bit (2)	Would not change how much I provide at all (3)	Would increase a little bit (4)	Would increase a lot (5)
Alphabetics (1)	○	○	○	○	○
Reading Fluency (2)	○	○	○	○	○
Comprehension (3)	○	○	○	○	○
Writing (4)	○	○	○	○	○
Vocabulary (5)	○	○	○	○	○

Q39 Please answer the following questions about your background knowledge of concepts related to literacy.

Q40 A phoneme refers to…

- ○ A single letter (1)
- ○ A single speech sound (2)
- ○ A single unit of meaning (3)
- ○ A grapheme (4)
- ○ No idea (5)

Q41 How many speech sounds are in the following words? For example, the word “cat” has 3 speech sounds ‘k’-‘a’-‘t’. Speech sounds do not necessarily equal the number of letters. Please write “DK” to indicate that you don’t know.)

- ○ Box: (1) _____
- ○ Grass: (2) _____
- ○ Ship: (3) _____
- ○ Moon: (4) _____
- ○ Brush: (5) _____
- ○ Through: (6) _____
- ○ Eight: (7) _____
- ○ Knight: (8) _____
- ○ Shriek: (9) _____
- ○ Thing: (10) _____
- ○ Crutch: (11) _____
- ○ Bank: (12) _____
- ○ Knee: (13) _____
- ○ Enough: (14) _____

Q42 Phonological awareness is:

- ○ The ability to use letter-sound correspondences to decode (1)
- ○ The understanding of how spoken language is broken down and manipulated (2)
- ○ A teaching method for decoding skills (3)
- ○ The same as phonics (4)
- ○ No idea (5)

Q43 In your English Language lessons, how often were your students engaged in the following activities?

	Never (1)	1- 3 times a week (2)	4-6 times a week (3)	7-10 times a week (4)	more than 10 times a week (5)	I do not know how often I do this (6)
Teacher Reading aloud to class	○	○	○	○	○	○
(1) Children Reading aloud	○	○	○	○	○	○
(2) Repeated oral reading (e.g. echo reading)	○	○	○	○	○	○
(3) Silent (independent) reading	○	○	○	○	○	○
(4) Children working in pairs	○	○	○	○	○	○
(5)						

Children working in groups	○	○	○	○	○	○
(6) Breaking words into sounds/parts	○	○	○	○	○	○
(7) Sounding out words	○	○	○	○	○	○
(8) Spelling	○	○	○	○	○	○
(9) Vocabulary development (e.g. defining and explaining word meaning)	○	○	○	○	○	○
(10) Filling in worksheets	○	○	○	○	○	○
(11)						

Teacher summarizing stories/text for children	○	○	○	○	○	○
(12) Children summarizing stories/text orally	○	○	○	○	○	○
(13) Asking children questions about stories/text orally	○	○	○	○	○	○
(14) Children writing summaries of stories/text	○	○	○	○	○	○
(15) Asking children to write answers to questions about stories/text (16)	○	○	○	○	○	○

Q44What sort of computer equipment are the students in your school able to access?

- ○ Stationary Computers (Desktop computers) (1)
- ○ Mobile Computers (Laptops) (2)
- ○ Both (3)

Q45 If you have stationary computers are they:

- ○ In every classroom (1)
- ○ In a special computer lab (2)
- ○ Both (3)

Q46 If your school has a designated computer lab—how often do you have access to it

- ○ At any time (1)
- ○ Shared with other teachers (have to coordinate among the teachers) (2)
- ○ Shared with others (but is bookable) (3)
- ○ Shared with others (I have no control over access) (4)
- ○ Multipurpose room, with unpredictable access (5)

Q47 Are there enough stationary computers for your entire class?

- ○ Yes (1)
- ○ No (2)

Q48 How many computers are typically in this lab?_____

Q49 Do you have to sign out the mobile computers?

- ○ Yes (1)
- ○ No (2)

Q50 Are the mobile computers available in your classroom or centralized?

- ○ Available in each classroom? (1)
- ○ Centralized (2)

Q51 Are there enough mobile computers for:

- ○ The whole class (1)
- ○ Subset of the class (2)

Q52 How many students are there to a computer? _____

Q53 How many computers are available? _____

Q54 How reliable is the internet in your school?

- ○ Very reliable (1)
- ○ Somewhat reliable (2)
- ○ Neutral (3)
- ○ Somewhat unreliable (4)
- ○ Very unreliable (5)

Q55 Do you have any issues with the firewall at your school? (Not being able to access information, content, YouTube videos etc.)

- ○ Yes (1)
- ○ Sometimes (2)
- ○ No (6)

Q56 How reliable is the electricity for the computers in your school?

- ○ Always available (1)
- ○ Available at certain hours a day (2)
- ○ Available under my control (3)
- ○ Unpredictable—over days (4)
- ○ Unpredictable—throughout any given day (5)

Q57 Does your school have a generator

- ○ Yes (1)
- ○ No (2)

Q58 Is the generator available to support computer use?

- ○ Yes (1)
- ○ No (2)

Q59 Do you have a say regarding when the generator could be used? _____

Q60 Have you ever seen anyone else use ABRACADABRA in the classroom before coming to this training session?

- ○ Yes (1)
- ○ No (2)

Q61 Who? _____

Q62 How comfortable are you in your abilities to use the following technologies?

	Very Uncomfortable (1)	Somewhat Uncomfortable (2)	Neutral (3)	Somewhat Comfortable (4)	Very Comfortable (5)
Computers (1)	○	○	○	○	○
Internet (2)	○	○	○	○	○
Cellphone/smartphone (3)	○	○	○	○	○
Whatsapp (4)	○	○	○	○	○

Q63

For each of the following statements, indicate how much you agree with it by selecting one of the options on the scale. Consider the term “technology” to include the

following: computers, Internet, smart phones, and tablet devices, as well as software or websites you would use with these devices.

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
I like working with technology (1)	○	○	○	○	○
Working with technology makes me very nervous (2)	○	○	○	○	○
Generally I feel OK about trying a new problem on a technology device. (3)	○	○	○	○	○
Figuring out technology problems does not appeal to me. (4)	○	○	○	○	○
Once I start working with technology I find it hard to stop (5)	○	○	○	○	○
I feel comfortable working with technology (6)	○	○	○	○	○
Technology makes me uneasy and confused (7)	○	○	○	○	○
I have a lot of self-confidence when it comes to working with technology (8)	○	○	○	○	○

Q64 Teaching with technology

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
I feel comfortable supervising my students while they are using technology as a learning tool (1)	○	○	○	○	○
When I am using technology as a teaching tool, I feel nervous (2)	○	○	○	○	○
Once my students start to work with technology, they will find it hard to stop (3)	○	○	○	○	○
Integrating technology into my teaching practice will be easy (4)	○	○	○	○	○
I will have enough support at my home school to be able to integrate the programs in my teaching (5)	○	○	○	○	○

Appendix F

Kenyan Study Post Survey

Q65 Did the presentation appear organized?

- ○ Yes (1)
- ○ No (2)

Q66 How organized was the presentation?

_____

_____

_____

_____

_____

Q67 Could you sum up your impression of the training for ABRA in a few words?

_____

_____

_____

_____

_____

Q68 What did you like or dislike, what was easy or challenging to understand about ABRA?

_____

_____

_____

_____

Q69 Can you give us some examples of what you think was easy/challenging, things you like more or less.

_____

_____

_____

_____

_____

Q70 In general, how did you find the pace of instruction?

_____

_____

_____

_____

_____

Q71 What did you like or dislike, what was easy or challenging regarding the ABRA component? Can you give us some examples?

_____

_____

_____

_____

_____

Q72 How comfortable did you feel with the concepts being presented?

- ○ Very comfortable
- ○ Comfortable
- ○ Neither comfortable or uncomfortable
- ○ Uncomfortable
- ○ Very uncomfortable

Q73 In regards to ABRA do you recall seeing information about

	Yes (1)	No (2)
Reading Fluency (1)	○	○
Alphabetics (2)	○	○
Comprehension (3)	○	○
Writing (4)	○	○

Q74 How confident do you feel in your ability to teach

	Very confident (1)	Somewhat confident (2)	Neutral (3)	Somewhat unconfident (4)	Very unconfident (5)
Reading Fluency (1)	○	○	○	○	○
Alphabetics (2)	○	○	○	○	○
Comprehension (3)	○	○	○	○	○
Writing (4)	○	○	○	○	○

Q75 How confident do you feel helping to navigate students through ABRA?

- ○ Very confident (1)
- ○ Somewhat confident (2)
- ○ Neutral (3)
- ○ Somewhat unconfident (4)
- ○ Very unconfident (5)

Q76 How throughly were the following concepts defined and explained?

- ○ Reading Fluency (1) _____
- ○ Alphabetics (2) _____
- ○ Comprehension (3) _____
- ○ Writing (4) _____

Q77 With respect to the training what could you suggest as an addition or change that might improve the training sessions?

_____

_____

_____

_____

_____

Q78 What additional information, practice or support would be helpful for you to ensure that you are comfortable using ABRA?

_____

_____

_____

_____

_____

Q79 What additional information, practice or support would be helpful for you going forward that would make implementing ABRA more likely or more easily?

_____

_____

_____

_____

_____

Q80 Do you feel there were sufficient examples in the workshop from ABRA to effectively teach how to use it?

- ○ Yes (1)
- ○ No (2)
- ○

Q81 What barriers or challenges do you see with respect to you being able to implement ABRA in your classrooms/school?

_____

_____

_____

_____

_____

Q82 Did your attitude towards using computers change as a result of your training to use ABRA? If so, in what way?

_____

_____

_____

_____

_____

Q83 While you were learning about ABRA in the training session, what kinds of support did you receive? (i.e., , colleagues, ambassadors, trainers, others)? How often did you seek out additional support or clarification from others?

_____

_____

_____

_____

_____

Q84 In your classrooms, do your students work in pairs or groups to complete specific activities (reading a book, completing an assignment etc.)? What kind of instructions do you give the children before they work together? Please describe.

_____

_____

_____

_____

_____