ABRACADABRA:

A STUDY IN THE DEVELOPMENT, IMPLEMENTATION, AND EFFECTIVENESS OF A WEB-BASED LITERACY RESOURCE

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Abstract

This report describes research to explore the effectiveness of the ABRACADABRA (ABRA) web-based literacy system. The purpose was to explore the effects in a classroom-level Randomized Control Trial (RCT) intervention with at least 10 intervention and 10 control classrooms across Canada. This report summaries this completed work with *N* = 433 participants in Quebec, Ontario, and Alberta. Formal analysis of findings indicates that the ABRA system as currently implemented by teachers had significant effects on children's sight word reading and phonological awareness, and discernible but currently non-significant effects on letter-knowledge. These results are discussed in relation to current implementation and plans for further scaled up intervention work across Canada in 2008-2009.

ABRACADABRA: A study in the development, implementation and effectiveness of a web-based literacy resource

Many influential researchers have documented their beliefs that computer-based technologies are capable of providing powerful and flexible tools for learning (Bereiter, 2003; Dede, 1996; Harasim, Hiltz, Teles, & Turoff, 1995; Rabiner & Malone, 2004; Scardamalia & Bereiter, 1996). Among others, Mayers, (2001) has documented the many advantages of using multimedia for learning from increased facility at acquisition, enhanced processing, and improved long-term retention and recall attesting to the potential of technology-based literacy programs. There is also much optimism about the potential of technology to impact positively on learning in political circles. The Council of Ministers of Education, Canada (CMEC) reported, “The enhanced accessibility, flexibility, and responsiveness made possible by on-line learning technology make it well-suited to support lifelong learning, whether used in conjunction with and as an enhancement to traditional models of education, or as a stand-alone option” (CMEC, July, 2001, p. 01). Up until very recently it could however be fairly remarked that expectation in this domain currently ran far in advance of the existing evidence base. Our approach to this applied research and effective practice rests upon the base of the need for the firmest quality research evidence (see also Jamieson, 2006). In much scientific research the gold standard for establishing intervention effectiveness is the randomized control trial (RCT) intervention (e.g. Reynolds, 2001). While some reviews of research have identified robust trends in quasi-experimental studies of technology effectiveness and express some cautious optimism regarding the role of technology in literacy (e.g. Blok, Oostdam, Otter, & Overmatt, 2002; Macarthur, Ferretti, Okolo, & Cavalier, 2001), other critical meta-analytic reviews of the effectiveness of technology focusing specifically on the use of RCT designs (e.g., Ehri, Nunes, Willows, Schuster, Yaghoub-Zadeh, & Shanahan, 2001; Torgerson & Zhu, 2003) have however suggested that the research base is weak in methodological terms and mixed in terms of findings. Indeed Torgerson & Zhu, (2003) conclude their

major review by arguing strongly that there is an urgent need for basic evidence from well-designed random-control studies of the use of technology to facilitate learning to read *before* technology is embraced by any practitioners. Accordingly, we are in the midst of carrying out a three-year, Pan- Canadian RCT study rather than a well-designed quasi-experimental study.

An analyses of the literature since 2003 confirms that while there has been some progress in advancing the research base on technology generally (see e.g. Chambers, Cheung, Madden, Slavin, & Gifford, 2006 for one small-scale randomized *school* study), the new century has not seen the emergence of a robust and extensive literature on the effects of technology using the optimal RCT designs. Most research continues to be small scale and quasi-experimental in nature at best or does not describe treatment and control allocation procedures clearly (e.g. Clarfield & Stoner; 2005; Macaruso, Hook, & McCabe, 2006; Wood, 2005). Such research has generally focused only on word reading and decoding skills and not on additional fluency and text comprehension skills. The CSLP team is also involved in a series of studies involving the evaluation of discrete technology-based supports for literacy learning in the highly influential *Success For All* program (Abrami et al., 2008; Chambers et al., 2006 a, b). These studies are larger in scale but still do not conform to the highest 'gold standard' design achieved in a randomized control study. Furthermore, most research described above, including our own work, has focused on single commercially-available CD/video packages as the medium of delivery for technology. Almost no research exists on more dynamic *web-based* technologies that are readily available, free to all users and thus potentially have so many powerful impacts on practice across Canada in terms of economy, scalability and sustainability.

Our intervention research work *has* used randomized control designs to evaluate the effectiveness of ABRACADABRA (Savage et al., in press: Savage, Abrami, Hipps & Deault, 2008) in grade 1 alongside carefully monitored implementations by trained facilitators to carefully study the impact of the tool on

student learning. We were able to show in a well-designed RCT study that even a pilot version of ABRACADABRA can produce significant effect sizes for change in literacy in grade 1 (Abrami et al., 2008; Hipps et al., 2005). In June 2006 we completed a randomized control trial study in grade 1, *n* = 150 participants (recently accepted for publication -Savage, Abrami, Hipps, & Deault, 2008), contrasting two different reading intervention strategies: a so-called 'synthetic phonics' program based upon a highly-structured approach to letter-sound teaching and focusing on explicit phoneme blending and an 'analytic phonics' program based upon the exposure of children to words embodying shared rhymes (e.g. Johnston & Watson, 2004). Both curriculae were contained in a substantially updated version of the ABRACADABRA application.

Results showed statistically significant advantages in standardised measures of key literacy skills of letter-sound knowledge, phonological blending, listening comprehension and reading comprehension in ABRACADABRA groups. Intervention effects for listening comprehension reflected one full stanine of improvement, for example, and effects for phonological blending ability were larger still than this. Effects were also quite specific, and were generally only significant in the intervention embodying the 'synthetic phonics' program (Savage et al., 2008), suggesting that specific aspects of the content of ABRACADABRA rather than simply being involved in an intervention explained the results obtained. Improvements were also evident in basic word reading and word attack (non-word decoding) ability, where effect sizes in terms of standard score change per hour of intervention (.23) were slightly greater than the mean of the interventions described and reviewed by Torgesen, (2000). Such word-level skills are generally seen as being crucial co-requisites to reading acquisition (e.g. Savage & Carless, 2006; Share, 1995).

We have reason to believe that future implementations of ABRA may produce even stronger effects than we have documented above. Implementation fidelity achieved by using the tool outside normal classroom routine without the

active involvement of teachers may under-estimate true effects and challenge the tools generalizabilty to the situations most important to research. Another limitation in our previous study was in the complexity of the computer implementation of phonic activities: Only vowel and consonant singletons were represented in the letter-sound tasks. We have already started adding more complex digraph units (e.g. ‘sh’, ‘ch’, ‘qu’, ‘ea’ ‘ee’ etc) to the system and this work will be complete by the time of the proposed studies, as well as some dozen new activities that we have developed and which have come online in 2006. A further factor to consider was that children were also taught to use ABRA in our study in January of year 1 which may have limited the impacts on literacy: A program starting early in the fall may show even stronger effects. The proposed RCT study below seeks to address these methodological issues.

Our other studies also show that we already have strong evidence concerning the effectiveness of ABRACADABRA in promoting word level decoding, reading and related letter-sound and phonological abilities. We have to date used both small-group based and whole class based *quasi-experimental* studies in Kindergarten (Comaskey, Savage, & Abrami, manuscript submitted for publication) and in whole class settings in year 1 (Savage & Tremblay, 2006, in preparation). The effects of ABRACADABRA have been statistically significant in all of these studies. In one kindergarten study, large effect sizes for changes on experimental measures of letter-knowledge, phonological awareness and word reading were evident compared to controls (ES = .08 and above in all cases, using Cohen’s 1988 standard criteria for assessing effect sizes).

We have also systematically explored response to this intervention by children with - and without attention problems (Deault, Savage, & Abrami, 2008). Unlike the regular classrooms, children at risk of attention difficulties were as likely to succeed in learning in the ABRA intervention as children not so-rated. There were significant unique associations between pre- to – post-test improvements in literacy in regular classrooms (where the overall rate of

improvement was lower than in the ABRA intervention). This finding suggests that the ABRACADABRA intervention can support 'at-risk' children effectively. More generally, this form of secondary analysis of our large pan-Canadian data set will allow us to further explore more generally the crucial topic of response to intervention by children on a range of dimensions, the focus on much scholarly work currently (see e.g. Torgesen, 2000; Issue 39(2) of The *Journal of Learning Disabilities* 2005 and issue 41(1) of The *Reading Research Quarterly* recently devoted to this topic). Future analysis of the large-scale classroom intervention study will it was argued give important information on these important issues concerning response to intervention.

Methodology for 2007-2008 ABRACADABRA study

Participants

As the 2007-2008 study called for more at least 10 experimental and 10 control classrooms, to generate interest in the web-based, free literacy tool ABRACADABRA (ABRA), investigators, researchers and the staff of the Centre for the Study of Learning and Performance (CSLP) demonstrated the software to principals, teachers, English Language Arts (ELA) consultants at school boards, and other educators at various meetings throughout the year. The schools that had kindergarten and first grade teachers who expressed interest were sent letters asking them participate and outlining what would be expected from all parties. For example, principals had to ensure that the experimental classes were prioritized and guaranteed to have their required two hours of computer time each week so that the implementation phase would not be compromised. On the other hand, the CSLP promised to provide teachers with technological and pedagogical training and support.

From these presentations, 28 teachers from the provinces of Quebec, Ontario and Alberta responded positively. Their teaching experience ranged from

two to over 30 years in the classroom. During the time of intervention, some of the teacher-participants were acting as “cooperating teachers” for new teachers-in-training from their local universities. Because these teachers-in-training had to teach English Language Arts as a part of their internship, their cooperating teachers thought it wise for them to be trained in ABRA as well so they brought the student-teachers with them to the training sessions. Before they were able to participate, the rationale, goals, and parameters of the study were explained to the student-teachers and their consent to participate received.

Once the adults had agreed to participate in the ABRA study, permission had to be sought for their students to participate. Parental consent letters that followed the guidelines and standards as put forth in Canada’s tri-council policy on the ethical treatment of human participants were prepared and given to the teachers for distribution to their students. The parents were given up to two weeks to ask questions and complete the form. Once the consent forms were returned, there were 433 students whose parents had agreed to participate in the study – 152 kindergartners, 229 1st graders, and 52 2nd graders. (The 2nd graders were permitted to participate because they were in a grade 1-2 split and their teachers felt they would benefit from exposure to ABRA). Of the 433 students, 215 were girls and 218 were boys and they came from non-denominational, inner city as well as suburban schools. The composition of the student-participant group represented the diverse nature of their provinces with their cultural, socioeconomic, racial, and linguistic characteristics.

Measures

As ABRACADABRA aids alphabetic, fluency, comprehension and writing growth, a battery of instruments designed to assess each of these elements was used to assess these aspects of students’ general cognitive, reading and listening development before and after exposure to ABRA intervention. The design of the instruments dictated how the pre- and post-tests were administered; i.e., to the class as a whole group or to individual students. Trained

research assistants (RAs) from local universities conducted the tests and knew that they had to be sensitive to the behaviours and emotions of the young students: If the students showed signs of frustration or wanted to stop the test, it had to be stopped immediately. What follows are the tests used in this study.

The Group Reading Assessment and Diagnostic Evaluation (GRADE) is a standardized, developmentally-appropriate instrument that is designed to be administered to the whole class at once. It can take up to 90 minutes to administer but does not have to be completed in one setting. This tool was used as a pre- and post-test to assess students' ability to differentiate between same, different and rhyming words as well as their listening comprehension. For example, in the *rhyming words* section, students were given a word and were asked to choose from four other words the one that rhymed with the one given. A stanine score was yielded from this test.

GRADE was also used to assess sentence and passage comprehension. In the former measure, students were asked to read a sentence that had a missing word. Then they read a selection of four words and chose the one that best fit that cloze sentence. For example, they may have to select between "wet", "cry" "yellow" and "around" to complete the sentence "The rain made the street _____." In the latter, students read short passages of about 32 words then selected the correct multiple choice response that best answered each question. The questions tended to focus on the main idea, key points and inferences that could be drawn from each text. The sentence and passage comprehension scores were combined to give a standard score; maximum standard score = 140. According to the manual that comes along with the GRADE test, this reading comprehension test measures meta-cognitive skills of previewing, predicting, clarifying, and summarizing.

A subtest in the *Comprehensive Test of Phonological Processing* (CTOPP) was used to examine students' ability to blend words. In this test, the

children were asked to listen to a CD that presented them with disjointed sounds that, when blended together, made a word. For example, if /sh/ /ow/ were played, the children had to put the sounds together and say the word “show”. As the test continued, it grew more linguistically complex in that it required students to blend longer words that had smaller phonemic units.

Another test administered was the *Fry’s Instant Word List.* Twenty (20) words were randomly selected from Fry’s first 200 words and used throughout all provinces. The same 20 words were used at pre- and post-test. The maximum score for this test was 20 in that students were given a point for each correctly read word.

To examine children’s *letter/sound knowledge*, the RAs showed them each of the 26 letters of the English alphabet and asked them to produce their corresponding sounds. As they did this, they were given one point for each correct response. The total correct for this test was 26.

In addition to the above-mentioned measures, at post-test, kindergartners were given the phonemic segmentation section of the *Dynamic Indicators of Basic Literacy Skills* (DIBELS). This measure is a standardized, individually administered test that assesses students’ pre- and early literacy skills. Here, students’ ability to fluently break three- or four-phoneme words into their individual phonemes in one minute is examined. For example, if the RA said “ship”, students had to say /sh/ /i/ /p/ to get the 3 possible points for this word. The RA would continue to present words until that minute was completed then calculate how many correct responses each student made. Kaminski and Good (1996) claim that this test is a good predictor of later reading achievement.

DIBELS also has a standardized, individually administered oral reading section that takes one minute to complete. This part measures reading accuracy and fluency. Here, students were asked to read a passage out loud for one minute. As they read, the RA kept account of how many words were read

correctly. If after three seconds words remain omitted, delayed, or substituted for another, they were scored as errors. If words were self-corrected within three seconds, they were scored as correct but the RA recorded the exact miscues that were given. The number of correct words per minute from the passage was tabulated as the oral reading fluency rate.

In order to have a control task that would isolate the intervention's specific effects on literacy, the Wide Range Achievement Test mathematics test (WRAT-3) was used. Oral questions were asked that assessed children's competency in dealing with basic number concepts. Children were asked to count items, tell which number was greater or smaller, and to add or subtract numbers. This task was chosen because it took little time to administer and it did not rely heavily on literacy skills. Only the raw scores of this test were used and a maximum score that could be attained was 15.

Procedure

Research design

After compiling a list of the total number of classes and grade levels that were available to be a part of this study, they were randomly divided into experimental and control classrooms to have an even number of classroom participation at each grade level in each school. Students in the control classrooms continued to receive their regular English Language Arts (ELA) lessons while those in the experimental used ABRA in their ELA lessons. Of the 28 classrooms used in this study, seven teachers operated as both experimental and control teachers; i.e., they taught one group using ABRA at one time during the day and a totally different group not using ABRA at another time during the day.

The students were placed in either an ABRA experimental or control condition based on their class teachers' selection; i.e., since this study focused on how classroom teachers used ABRA, the teachers were randomly selected to

be in an experimental or control condition so their students were placed with them. However, there were teachers from Quebec who had combined grades 1 and 2 split or who taught language arts to two groups of the same grade at different periods of the day therefore these students had an additional level of random selection to be placed in a research condition. This resulted in 228 (119 female and 109 male) in the experimental and 205 (96 female and 109 male) in the control group. At the time of writing this report, we have not received all of the data from our partners in Alberta and Ontario therefore these numbers may change.

As described, before any ABRA intervention took place all students were pre-tested to ascertain the students' reading levels at that time. Preliminary analysis revealed that there were no significant differences between the children in the classrooms therefore their similar cognitive capabilities at the beginning of the study did not favour one group over another. Post-testing took place after 10 – 12 weeks of ABRA intervention to see if there were effects. There was a group that received delayed pre- and post-testing due to the late request of a teacher to be a part of the study. At the time of the writing of this report, it is still uncertain whether or not this data will be used.

Session design

Before teachers were permitted to use ABRA with their classes, a full day of training took place. The Quebec personnel flew to Ontario to conduct the initial training while Alberta did their own. At this time teachers were exposed to the philosophical, developmental and pedagogical underpinnings of the software and were given hands-on time to explore the software. After the teachers had become familiar with the components of ABRA, they were given a suggested format to use for a one hour ABRA lesson:

10 minutes word level work
10 minutes text level work
20 minutes collaborative work
20 minutes extension work

Word level work included anything that dealt with phonemic awareness, phonological awareness or phonics so the Alphabetics area in ABRA addresses these. The children could have done activities such as sound matching, word matching, rhyming words, word changing, etc to fulfill this part of the format. Text level work invited use of the Fluency and Comprehension activities of ABRA along with the "Stories" section in ABRA. For fluency, students could have done activities such as high frequency words, reading with expression, reading accurately, choral reading, etc. For Comprehension, they could have done activities that focused on prediction, comprehension monitoring, story elements, summarizing, etc. Collaborative work encouraged students to work together in order to practice skills they would have learned in the earlier two sections. Collaborative work did not have to be done on a computer. This became an opportunity for students to work and learn from each another. Things that could be done to fulfill this portion of the ABRA format could be write alternative endings for stories, readers' theatre, puppet shows, change characters in stories, etc. Finally, the extension activities did not have to be done in the classroom; they could have been given as homework and shared with the others when students returned to school. Activities in this section were similar to those given in the Collaborative section.

Teachers were told that this four-part suggested format was flexible and should be manipulated to meet the individual needs of their students. They were given examples of how they could accomplish each of these parts; i.e., where and when they could do work that focused on alphabetics, fluency, comprehension, or writing activities. They also visited the newly designed "Teacher's Zone" which was to be a resource area for them. The teachers then

got into groups based on the grade levels they taught and planned ABRA introductory lessons for their classes based on this format.

Once in the classes, the RAs worked with the teachers for approximately four weeks. Due to turnover of staff at the CSLP, the support promised to Quebec teachers was not as extensive as was promised so by the time of official observation, some teachers were not as comfortable with ABRA as they would have liked to be but they continued with the programme. Then, as there was not set way to deliver ABRA as each teacher teaches differently and students' needs are different, the teachers used the software flexibly. Many of them introduced a skill from the Alphabetics section to the whole class first, practiced that skill in an ABRA story then had the students do some sort of seatwork afterwards. The experimental teachers were encouraged to use ABRA for two hours each week so that the goal of total time on ABRA would be reached; i.e., 20 – 24 hours over a 10 – 12 week period. As time went on and some teachers felt pressured to do other schoolwork, some wanted to stop computer time to do other school work. The CSLP personnel encouraged them to stick with the plan and find ways to integrate ABRA in other areas to fulfill all needs. One way an experimental classroom teacher did this was by using the ABRA story, *How a bean grows,* to integrate science and ELA lessons.

Treatment Integrity

As was previously stated, this study sought to promote treatment integrity (TI) by having trained RAs go into the classrooms twice a week to support the teachers pedagogically and technologically so that all would feel comfortable using the software when teaching but due to the staffing issues, this was not always possible. Subsequently, two means that were developed to ensure TI revealed the teachers' frustration with this lack of support; in log books used after each ABRA session and during a focus group interview with them at the end of the study, Quebec teachers reported that they were disappointed that this

support was not always there during the first four-weeks their students experienced ABRA. To combat this problem in the 2008-2009 study, a call for more reliable RAs was made and promises to see the project through to its completion were made by the current literacy and research coordinators.

Formalized TI instruments were used during the last 6 weeks of the study. These instruments focused on the implementation of ABRA (for example, timing and types of activities done), the general structure of the classroom, classroom management, and student engagement. In Quebec, RAs were given a newly designed standardized checklist to use when observing 20% of the literacy instruction time in the experimental classrooms. When this tool was used, no feedback was given to the teachers if teachers did not specifically ask for it. However, the Literacy Instruction Questionnaire was given to experimental and control teachers to complete near the ninth week of implementation. This questionnaire was similar to the one the RAs used but it permitted teachers to evaluate their own teaching immediately after conducting their lesson.

Finally, the RAs were also responsible for conducting observations using the *Early Literacy and Language Classroom Observation* (ELLCO), a standardized instrument that takes about 90 minutes to administer and measures the practices and materials witnessed in early literacy classrooms. This tool was used in all classrooms – experimental and control – near the end of the study. The RAs had to observe the same lesson, rate them separately in their personal booklets, then meet after the lesson to come to a rating consensus about it. In Quebec, the same two RAs observed each classroom but this was not the case in Ontario and Alberta.

Preliminary results

All pre- and post-tests for Alberta and Quebec were marked, checked and double checked in Quebec by RAs and the research coordinator before being put

into the SPSS (Statistical Package for the Social Sciences) database; Ontario had its own RAs do these similar activities before sending the results to the Quebec team. Lead investigator, Dr. Robert Savage, analyzed the data. From this, the desire is to learn how effectively classroom teachers use reading intervention and technology in classrooms across three provinces.

Formal data analyses

At the time of this writing, only the main pre- to post-test data set for the main ABRACADABRA versus ELA control teaching comparisons was available, so this was the exclusive focus of analyses reported here. The main focus here was thus on this data, and the main question of intervention effectiveness that we wished to explore. Preliminary data analyses using standard approaches suggested that there was no marked kurtosis or skew in the attainment data, so no data transformations were undertaken. There was no strong preliminary evidence of marked effects of outliers, though the data set will probably need to be explored more fully on this particular question at a later date. At this point no data was excluded form analysis. The means and standard deviations of all attainment variables at pre- and post-test are presented in Table 1. Inspection of Table 1 show signs of post-test advantage for the ABRA group on letter-knowledge, phonological awareness, and the Fry sight word reading measure, but no clear signs of advantage in the listening comprehension and reading comprehension measures.

Table 1:

Means and standard deviations for ABRA and ELA groups at pre-and post-test

Measure	ABRACADABRA		ELA Control	
	Pre-test	Post-test	Pre-test	Post-test
Letter knowledge	14.74 (8.91)	20.51 (7.35)	14.84 (8.84)	19.66 (7.64)
Fry sight words	6.20 (7.13)	12.20 (7.89)	5.94 (6.95)	10.61 (8.50)
Phonological awareness	9.34 (2.50)	12.05 (7.75)	9.76 (2.24)	10.79 (2.49)
Listening Comprehension	4.61 (2.01)	5.05 (2.10)	4.49 (1.88)	4.91 (2.16)
Reading Comprehension	-	-	4.20 (2.31)	3.89 (2.41)

The main approach to analysis was to use mixed design Analysis of Covariance (ANCOVA), where for each variable of interest, the post-test score operated as the dependent variable and pre-test score on the same variable operated as the covariate. The one variable for which this was not the case was Reading Comprehension where due to the inexperience of children it is not possible to measure reading comprehension at the start of the school year. For this variable Univariate ANOVA was used. In all analyses, intervention condition: ABRA versus regular classroom teaching (ELA) was the between subjects variable. Classroom level effects were also ignored at this stage of data analyses as there was not enough power to explore this issue with n = 10 - 13 classrooms in each condition. Randomisation of intervention across classrooms should however in a general sense control for extraneous effects of classrooms across

the study. As an additional index of the practical importance of findings η^2 ('effect size' was reported). As an aid to interpretation here, η^2 of .01 is considered small, η^2 of .06 is considered 'medium-sized' and η^2 of .10 or greater is considered 'large' in standard practice (see e.g. Savage et al., 2008 for more details).

Preliminary results of ANCOVA show that at post-test, ABRA had a significant beneficial effect on children's Fry list sight word reading, F (1, 387) = 5.68, p < .02, partial η^2 = .014, and phonological blending, F (1, 248) = 5.48, p = .02, partial η^2 = .022. There was also a near-significant effect for letter-sound knowledge, F (1, 386) = 3.48, p = .07, partial η^2 = .01. There was however no significant effects for GRADE reading comprehension, F (1, 189) = < 1, *ns*, partial η^2 = .00, or for GRADE listening comprehension F (1, 189) = < 1, *ns*, partial η^2 = .00. Finally, alternative analyses of effect size using Cohen' s (1988) criteria for each variable (post-test – pre-test / pre-test standard deviation) were also undertaken. These produced signs of *large* effect sizes for ABRA on phonological awareness in particular, ES > 1 for ABRA, ES = .41 for ELA, suggesting that ABRA is having a strong effect here.

Discussion: *Issues, Progress, and Development*

The present report confirms that a large-scale pan-Canadian reading intervention study with over 400 children and with 28 teachers in 3 provinces across Canada was completed as requested on budget, in the prescribed time scale, and reported here in as full a form as currently available given the short time between post-testing and the date of this report. Importantly, the research suggests strongly that children in the intervention condition receiving ABRA were advantaged over those not receiving ABRA in key measures of word reading and phonological awareness, and strong but currently non-significant trends were also evident in letter-knowledge growth.

These findings *replicate* existing findings (e.g. Abrami et al., 2008; Savage et al., 2008), that ABRA has measurable positive effects on reading attainment in a large-scale field study when delivered for 20 hours. These results *extend* knowledge on the effects of ABRA by showing that classroom teachers across Canada can be trained and supported to use ABRA in ways that are effective. The effects of ABRA are not limited to controlled experiments run by university staff and may suggest that ABRA has real potential as a scalable and sustainable resource to support literacy across the nation.

Following the analysis above the following issues remain to be explored:

1) Fuller analyses of this data set are needed: As the database has very recently been established and verified, it was only possible to report the main pre- to post-test treatment effect. It was not possible to report internal reliabilities for measures used here; explore the demographic features of the sample; or explore intervention in relation to specific measures of treatment integrity of the field trial. Secondary questions concerning response-to intervention also remain to be explored and can be explored more fully later.

2). Only preliminary findings from TI protocols were available at the time of writing. These available suggest that teachers used ABRA mainly to teach phonics (which is consistent with the effect patterns reported above) and hardly utilized the Fluency, Comprehension, or Writing sections of the software. The habit of teachers essentially using ABRA as a phonics tool was interesting especially since an equal and substantial amount of time was spent covering the four important elements of literacy acquisition during the teacher training and subsequent feedback sessions. As another study showed that ABRA can have a significant impact on fluency and listening comprehension development (Savage et al., 2008) this suggests that further or more effective training must be done with teachers to get them to use the software more fully.

To this end, the 2008-2009 training sessions will have teachers focusing on activities that address higher-order skills. For example, training will begin from the comprehension and fluency sections then span out to the alphabetic section so teachers will become familiar doing the “more difficult” activities first then move on to the “easier” skills. It is hoped that this shift will help teachers see the value of all facets of the tool and how they can help their students perform better in all aspects of literacy acquisition, not only in alphabetics.

3) Finally, from the focus group interviews and TI observations, we have gathered that the needs of kindergarten and grade one teachers are different therefore next year’s training will address these issues so that all teachers will feel even more at ease when using the software. Training will provide teachers with packages pertaining to their specific grade level that will cover more of their particular concerns and issues.

4) This report provides preliminary analysis of interim data and should be treated as such. From one view ANCOVA ignoring classroom effects is less than ideal, and a larger analysis with classroom as the unit of analysis (and using HLM modeling techniques) is required. This view is fully endorsed by this research team. The aim from the conception was to use this study to build a larger pan-Canadian study with n = 60 classrooms in 2008-2009. Plans are well underway to achieve this goal and to report this analysis in due course.

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