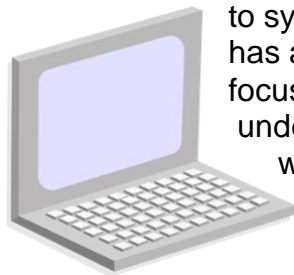# Module: Getting Started with ABRACADABRA

Teaching Early Literacy with the Learning Toolkit+

Welcome to the CSLP's Teaching Early Literacy with the Learning Toolkit+. As you move through these modules, you will familiarize yourself with each broad literacy skill and its corresponding sub-skills, gain a deeper understanding of various teaching approaches and practical tips, and explore how the CSLP's Learning Toolkit+ also known as LTK+ supports the development of these literacy skills.

These modules can be used in a variety of settings; from asynchronous and fully online to synchronous, blended and in-person workshops. Each of the modules has a similar structure, outlined in a table of contents. All of the modules focus on explanations, practice, and interactive content to insure understanding and engagement. We hope these modules provide you with new knowledge, useful suggestions on how to integrate the various literacy tools into your teaching, and helps you develop your expertise in early literacy instruction.

UNIVERSITÉ Concordia UNIVERSITY

CENTRE FOR THE STUDY OF LEARNING AND PERFORMANCE

Table of Contents

Introduction

Introduction

ABRACADABRA, often referred to as ABRA, stands for *A Balanced Reading Approach for Children Always Designed to Achieve Best Results for All*. It is an early literacy tool that provides engaging, interactive activities, and numerous stories in order to support beginning readers as they develop their skills. Teachers are also supported through ABRA's assessment capabilities and resources meant to provide professional development training.

The LTK+ is available to the educational community free of charge. To install the LTK+, please ask your LTK+ contact.

Module Objectives

This module will help you understand the contents of ABRA so that you can determine how to best use it to enhance your teaching. At the end of this module, you will be able to:

- Navigate to the ABRA tool within the LTK+
- Identify the key features of the ABRA tool
- Locate resources specifically designed to aid teachers in their use of ABRA.

Pause and Think

Activity: Individual Reflection

Use your course notebook (see *Appendix A*), or sign into ePEARL, to reflect on and answer these questions:

- What do you think the role technology has in the classroom?
- What do you hope to get out of the ABRA software?

ABRACADABRA

A Balanced Literacy Approach

ABRA activities support four key literacy skills: alphabetics, fluency, comprehension, and writing. These skills have been identified by researchers, including the National Reading Panel, as being foundational for success in literacy.

What is a Balanced Literacy Approach? (Video Script)

In the online version of this module, there is a video that describes a balanced approach to literacy education. The transcript is provided in the PDF version of the module.

In this video, you will learn about using a balanced approach to literacy education. This educational approach recognizes the importance of teaching both basic word reading skills through phonics methods and teaching reading comprehension through the use of authentic texts. Both components are critical to the final aim of reading comprehension and need to be balanced in different ways and at different times in the learning process.

The National Reading Panel was formed in the United States in order to evaluate the effectiveness of various literacy instruction approaches. They undertook a two-year rigorous and comprehensive review of one hundred years of literacy research. They identified several key skills linked to children's reading achievement. The report highlighted the need for five essential areas of instruction: phonemic awareness, phonics, fluency, vocabulary, and comprehension. The report emphasized the importance of providing explicit instruction to improve a child's reading and writing abilities. In addition, they noted that teachers would need to tailor instruction as children have different abilities and develop these skills at different speeds.

Since this report, the educational community has recognized the importance and necessity of a balanced literacy approach as it incorporates all of the essential areas. There are differing definitions for what exactly is meant by a balanced approach, but the key factor is balance. It is important to note that balance means more than dividing classroom time devoted to building reading or writing skills. It also means finding a good balance between different instructional strategies and focusing on the learners' skill levels. For example, determining how much time should be spent on teacher modeling or independent learning, or when is the best time to use whole group or small group instruction.

A balanced approach also incorporates a variety of tools and materials, and evaluating the quality of such materials. Children should have a wide range of texts available to them that meet their reading abilities. The texts should also provide topics that are interesting while still challenging learners to broaden their skills and interests. A balanced literacy approach also helps children develop strategic thinking, as they're asked to think about what they are reading and writing. Similarly, a balanced approach acknowledges that children can express their understanding in multiple ways.

Teachers play a key role. They determine how to structure classroom time to create this balance, and identify when they need to intervene or adjust their instructional strategies. Teachers use formative assessment to determine learners' individual needs and understanding, and then scaffold instruction to meet those needs. What works for one child may not work as well for another, but a balanced approach exposes learners to various strategies to help them succeed.

A balanced literacy approach was the framework in which ABRACADABRA was developed. It provides engaging activities across multiple levels of preliteracy and literacy skills. READS has been created to provide exposure to authentic texts and to

allow children the opportunity to practice and engage with these texts. The activities were designed to support the essential areas identified in the National Reading Panel report. Teachers can use the ABRA activities and stories to better provide differentiated instruction based on their learners' needs.

Using the range of activities in ABRA and complementing these with stories from READS will ensure a balanced literacy approach is used.

Pause and Think

Activity: Individual Reflection

Use your course notebook (see *Appendix A*), or sign into ePEARL, to answer the following questions:

- What did I learn from this video?
- What questions do I have after watching this video?

What is ABRA?

ABRA is one of the LTK+ tools. It is designed to support children's acquisition of early literacy. It's targeted towards young children at the beginning stage of their literacy education. Studies show that ABRA is highly effective at supporting the development of foundational skills. It is just as vital to support teachers, so additional features and resources are accessible from teacher accounts.

Promotional Video

In the online version of this module, there is a brief video that presents the philosophy behind the tool, and features testimonials from teachers, parents, and children.

Evidence-Based Practice

ABRA is both evidence-based and evidence-proven. This means that the activities were designed in consultation with subject matter experts, and using the evidence generated by research in instructional design and early literacy instruction. For example, the recommendations given by the *National Reading Panel* were used to ensure

The recommendations provided by the *National Reading Panel* heavily influenced the design of ABRA. Click on the links below to access key documents:

- Report of the National Reading Panel: Teaching Children to Read
- The National Reading Panel Report: Practical Advice for Teachers

ABRA was structured with a balanced approach to teaching the key literacy components.

- [Put Reading First](#)

Various pilot teachers are consulted while the LTK+ tools are being designed. Their feedback is used to highlight gaps and build a stronger tool relevant for the realities of different classroom arrangements.

ABRA has been studied in various classrooms around the world to evaluate its success in helping learners build their foundational skills. These research initiatives have shown that ABRA is highly effective when used regularly in the classroom and these effects last over time. Furthermore, these improvements transfer to other subject areas.

The table below summarizes the findings from quasi-experimental and randomized control trials published between 2009 and 2018 that explore effectiveness of ABRA use in comparison with traditional reading instruction on six major outcome types. The effect sizes are based on the data from 7,388 elementary learners.

Population Estimates by Outcome Category	k (# of comparisons)	$\overline{g}$ Average Effect Size		Percentile Advantage (adjusted ES)
		Non-adjusted	Adjusted[c]	
Phonics	23	**0.187****	**0.263*****	10
Phonemic Awareness	23	**0.378*****	**0.299*****	12
Reading Fluency	7	**0.088**	**0.181****	7
Reading Comprehension	11	**0.180****	**0244****	9
Listening Comprehension	9[b]	**0.274***	**0.313****	12
Vocabulary Knowledge	18	**0.080**	**0.183****	7
Overall	91	**0.200*****	**0.256*****	10

*** $p < .001$, ** $p < .01$, * $p < .05$
[a] *Weighted Average Effect size (random effects model) for Major Reading Outcome Categories and Heterogeneity Analysis (fixed effect model)*
[b] One outlier removed
[c] HLM-based effects were used to predict the effect sizes from the non-HLM studies

We used average effect sizes as a simple way to quantify the difference between ABRA and control groups on the six reading-related skills. The results of the comparisons show that the positive effects of ABRA hold for all types of reading skills and measures. This finding implies that an average learner exposed to ABRA performed at a higher level than an average learner from the control group consistently on all reading-related skills.

To learn more, read the research summary (see *Appendix B*).

ABRA's 4 Key Literacy Skills
ABRA is a set of engaging, interactive activities designed to build early literacy skills in:
- **Alphabetics**: This skill refers to the ability to associate sounds with letters and then to use those sounds to create words.
- **Fluency**: This skill refers to the ability to read a text out loud accurately, at the proper speed, and with expression.
- **Comprehension**: This skill targets reading for meaning, which is the goal of learning how to read. In ABRA, this category also covers vocabulary, which refers to the words used to communicate successfully.
- **Writing**: This skill addresses the use of letters and words to create sentences and texts for others to read.

Each of these skills is explored in more detail in subsequent modules.

Activities
ABRA has 33 activities spread across the four literacy domains: alphabetics, fluency, comprehension, and writing. The characters in ABRA introduce learners to a specific sub-skill. The activities' structure varies in order to support the skill(s) being taught. Some activities require learners' input in the software, while others work as a springboard to engage with peers or their teacher outside of the tool. Each activity has a demo to show learners what to do.

There is no set path for accessing the activities, which allows the flexibility to target the needs of various classrooms. Many activities have multiple levels of difficulty, which are designed to scaffold learners as they develop their skills. Levels can be accessed in any order so that learners can skip to a difficulty level suited to them. This flexibility allows ABRA to support any differentiation needs that are discovered.

ABRA Characters
There are several characters to be found in ABRA; each of them focuses on a specific skillset. The main character, Julie and her cat, Leo encounter them in the activities. Click on the characters to learn more about them:
- **Antoine Kountiv** (yeti): syllable and word counting
- **Colette Roby** (whale): sound recognition (decoding, blending, segmenting)
- **Dolcie and Alphonse** (mice): letter knowledge
- **Geoffrey Blazington** (dragon): vocabulary
- **Li Bai** (spirit): word recognition (matching, rhyming, changing, families)
- **Nanuq Aglakti** (polar bear): comprehension

- **Professor Oktav Phon Trapp** (monkey): sound differentiation
- **Roz Alphasaurus** (pterodactyl): sight words
- **The Speeders** (teddybears): fluency (speed)
- **Victor Logo** (human): spelling

What is Differentiation?

Every classroom has diversity. Learners come to you with different levels of readiness, interest, and ability to learn new content. Consider how the following traits impact your learners' learning experience:

- Attention span
- Cultural backgrounds
- Interests
- Language abilities
- Learning needs
- Prior experiences

Because of these differences, learners do not have the same starting point nor do they smoothly progress at the same pace as their peers.

Differentiation is modifying instruction so that it targets a learner's individual needs. Teachers can customize instruction to address learner's strengths and difficulties. Accounting for differentiation means considering what is to be learned, how learners will acquire this knowledge, the environment in which they will learn, and how they demonstrate their newfound knowledge.

Teachers can take advantage of the levels in ABRA to adapt their lessons to suit these individual needs.

See the assessment module to learn how this feature in ABRA can help you evaluate how your learners are progressing through ABRA.

Activity: Identifying Activities in the 4 Key Literacy Skills

Recall that ABRA's activities are divided into 4 key literacy skills. This exercise challenges you to sort those activities based on these key skills. Don't worry, if you find this activity difficult at first. You will have the opportunity to explore each literacy skill in-depth in the following modules.

Sort the following activities into the proper category in the table below:
Letter Bingo; Expression; Auditory Segmenting; Vocabulary (ESL); Prediction; The Alphabet Song; Rhyme Matching; Vocabulary; Animated Alphabet, Blending Train; Letter Sound Search; Story Elements; Basic Decoding; Story Response; Same Word; Comprehension Monitoring; Speed; Spelling Sentences; Same Phoneme; Reading Practice; Summarizing; Matching Sounds; Accuracy; Word Families; High Frequency Words; Tracking; Word Counting; Student Stories; Word Matching; Word Changing; Spelling Words; Syllable Counting; Sequencing; Auditory Blending.

The Four Categories in ABRA			
Sounds, Letters, and Words (Alphabetics)	Reading (Fluency)	Understanding the Story (Comprehension)	Writing (Typing)

Answer Key

The Four Categories in ABRA			
Sounds, Letters, Words (Alphabetics)	**Reading (Fluency)**	**Understanding the Story (Comprehension)**	**Writing (Typing)**
• Animated Alphabet • Auditory Blending • Auditory Segmenting • Basic Decoding • Blending Train • Letter Bingo • Letter Sound Search • Matching Sounds • Rhyme Matching • Same Phoneme • Same Word • Syllable Counting • The Alphabet Song • Word Changing • Word Counting • Word Families • Word Matching	• Accuracy • Expression • High Frequency Words • Reading Practice • Speed • Student Stories • Tracking	• Comprehension Monitoring • Prediction • Sequencing • Story Elements • Story Response • Summarizing • Vocabulary • Vocabulary (ESL)	• Spelling Sentences • Spelling Words

Stories

ABRA contains 20 stories in 4 story genres:
- **Folk tales**: Folk tales are oral stories that have passed from generation to generation. They explain issues relating to life, nature, values, culture, etc. Fairy tales are make-believe stories that take place in a distant land and often feature magical or imaginary creatures.
- **Poetry**: Writing that uses verse and rhymes to awaken the imagination and emotion as the reader interacts with the text.
- **Fiction**: Made up or "not true" stories created by an author.
- **Non-fiction**: True stories about real people, places, and events.

Many of these stories are connected to the ABRA activities. For example, some of the vocabulary words from the stories are used in the activities.

In addition to these 20 main stories, ABRA also contains several student stories. These stories were created by young children and submitted for a contest held several years ago. They are accessible in ABRA, though they are not connected to the activities in the same way as the ABRA stories. Audio recordings for the student stories are available with a Canadian, Kenyan, or Australian accent.

The stories within the tool all have varying levels of difficulty. Before selecting one to read with your class, you can locate the book in READS to determine its difficulty level. See the READS module to learn more about how the READS repository can support learners' acquisition of literacy skills.

Pause and Think
Activity: Individual Reflection. If Possible, Followed by a Group Discussion

Use your course notebook (see *Appendix A*), or sign into ePEARL, to reflect on and answer the questions below. If you are doing this module with peers, form small groups of 3-5 participants.
- How do you see ABRA being used in your classroom context?
- What barriers do you anticipate? How can you overcome them?
- How can ABRA help you provide differentiated instruction to your learners?
- Which of the key literacy skills are you most interested in learning more about? Why?

Getting Learners Set up on ABRA
Teacher Accounts
The teacher accounts can access all of the learner content but have some additional features. As a teacher, you will be able to view and edit your learner's account information.

The lobby page has two additional buttons next to the ABRA logo. These provide access to additional teacher resources or the assessment feature.

To learn more about the assessment feature, see the ABRA-Assessment module.

To learn more about the teacher resource site, go to the 'Your Teaching' section.

Assigned Level

It is important to ensure that learners' accounts are on an appropriate level. ABRA is only accessible on levels 1 and 2. For young children, it is recommended they use level 1 as it is geared towards primary (early elementary) while level 2 is geared towards late elementary/early middle school. The ABRA tool itself is the same in both levels. However, only level 1 has the ABRA-ePEARL link. To learn more about this, see the ePEARL module.

How to Access the Tool

Access the LTK+ by entering its URL in your browser.
Tip: It is a good idea to bookmark this URL for future reference.

Sign in using your personal credentials.
Once signed in, you will be taken to the LTK+ lobby page. If you are not sure what your username or password is, ask your LTK+ contact to help you find this information.

Look for the ABRACADABRA logo. If you do not see ABRA on your lobby page, your account might not be set to level 1 or 2. To change your level, go to Manage > My Account > My ePEARL Account (follow the troubleshooting instructions below to see how this looks*). If ABRA is still not shown on the lobby page, please contact the system administrator as ABRA may be turned off at the administrator level.
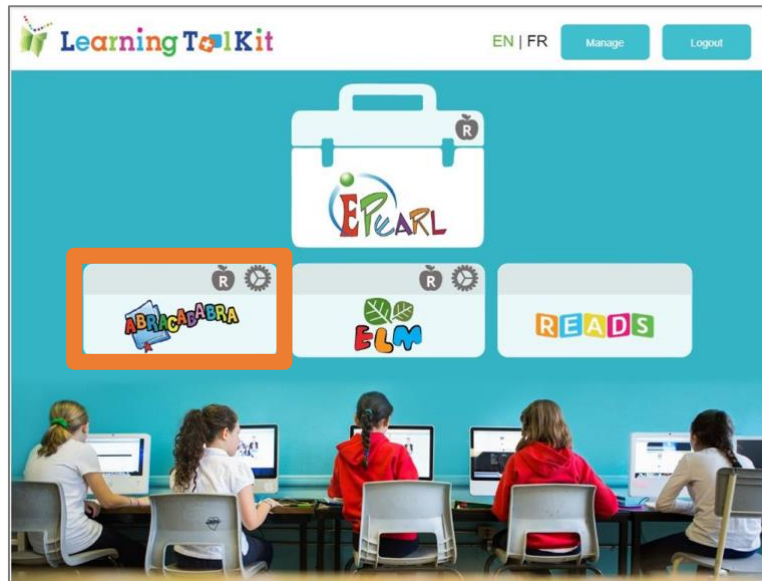
Click on the ABRA logo itself to go to the student module.

The resources icon will take you to the teacher resources site. To learn more about the teacher resource site, go to the 'Your Teaching' section.

The cog icon will take you to ABRA's assessment feature. To learn more about the assessment feature, see the ABRA Assessment module.

See *Appendix C* for a document that outlines these steps and key features.

Troubleshooting for ABRA
To change your level:
1. Click on **Manage** in the LTK+ Lobby.

2. You should see the following screen. Click on **My Account**.

3. Click on the **My ePEARL Account** tab.

4. Select the desired level from the **Choose your level** dropdown.

ABRA Lite

The student module portion of ABRA, is available on the web as a lightweight version of the tool. It contains all of the ABRA activities and stories. This can be a useful resource if you want to let an interested colleague explore the tool.

Be cautious if you provide your learners with this version. Without an account, none of their progress can be tracked. This means that you won't be able to use the assessment feature to monitor their progress and detect their errors.

Your Teaching
What is the Resource Website?

ABRA's *Teacher Resources* site offers teachers a multitude of paper-based and multimedia resources intended to help them implement ABRA effectively in their classroom. The site provides an overview of the ABRACADABRA software. Teachers can choose to drill down and explore activities or stories. The site contains explanations, demos, and, if relevant, additional resources for each activity and story in ABRA.

The site also hosts a number of videos containing teacher testimonials and explanation on how they use ABRA in their classrooms.

Lastly, the site provides an organized list of printable resources, such as suggested classroom activities and worksheets. These were created with the help of teachers and pedagogical consultants to ensure the activities properly target the literacy skills. They can be printed so learners can continue practicing and building their literacy skills outside of the software. The CSLP continues to work with partners around the world to create region-specific content, such as lesson plans that target their curriculum.

> Tip: There is a similar **Parents' Resources** website. You can share the link with your learners' parents so they may discover how to better support their children at home. You can access this website by clicking on the link on the top-right corner of the **Teacher Resources** website.

Teacher Videos

In the online version of this module, there are several videos that show how teachers have used ABRA in various ways. Alternately, you can view these videos on YouTube by clicking on the links below.

Classrooms have different practices based on the equipment available, classroom size and setup, and teacher's interest in incorporating technology. The learners also have a major influence as their numbers, learning needs, and comfort level with technology influence how smoothly technology can be incorporated in the classroom. All of these considerations impact how teachers use ABRA to complement their teaching.

- Implementing ABRACADABRA in Kenyan Classrooms
- Whole Class Instruction in Canadian Classrooms (see *Appendix D* for transcript)
- Lab Instruction in Canadian Classrooms (see *Appendix E* for transcript)
- Learning Centers in Canadian Classrooms (see *Appendix F* for transcript)

Teacher Aids

The following resources suggest ways to get started with ABRA.

Getting Started in ABRA (see *Appendix C*)
A short guide that reviews the main components of the software.

ABRA Icons (see *Appendix G*)
A one-sheet reference list of the icons used in ABRA.

ABRACADABRA Images (*go to the Teacher Resources site to download these images*)
This is a collection of images of the ABRA characters. You're free to use them in your classroom. For example, they could be used to decorate your classroom, or used at a classroom station.

Kenya Education: Health Education and Personal Hygiene (CBC) (see *Appendix H*)
This lesson plan is an example of a region-specific resource that the CSLP created with our partners in Kenya. Here, ABRA is linked to the Kenyan Competency Based Curriculum (CBC).

To get more resources, please visit the ABRA Teacher Resource website:
https://literacy.concordia.ca/resources/abra/teacher/en/

Summary

Summary
In this module, you learned…

- ABRACADABRA (or simply ABRA) is an early literacy tool that aims to support beginning readers.
- ABRA was designed using research evidence and best practices. Also, several studies have been conducted to ensure ABRA's effectiveness.
- ABRA is designed to provide a balanced approach that targets 4 key literacy skills: alphabetics, fluency, comprehension, and writing.
- ABRA has 33 activities and 20 stories (plus additional stories written by young children).
- Various multimedia and printable resources are available on the *Teacher Resources* website.

Appendices

A: Getting Started Course Notebook
B: Research Summary
C: Getting Started in ABRA
D: Whole Class Instruction in Canadian Classroom Video Transcript
E: Lab Instruction in Canadian Classroom Video Transcript
F: Learning Centers in Canadian Classroom Video Transcript
G: ABRA Icons
H: Kenya Education: Health Education and Personal Hygiene (CBC)

Reflect on Your Expectations

What do you think the role technology has in the classroom?

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What do you hope to get out of the ABRA software?

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ABRACADABRA: Watch the Video

What did I learn from this video?

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What questions do I have after watching this video?

How do you see ABRA being used in your classroom context?

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What barriers do you anticipate? How can you overcome them?

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How can ABRA help you provide differentiated instruction to your learners?

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Which of the key literacy skills are you most interested in learning more about? Why?

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Additional Notes

Write any questions or thoughts you have as you go through the module.

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RESEARCH SUMMARY (AUGUST 17, 2022)

Table of Contents

This document provides a list of all of the conference presentations, reports, published works and media reports on the LTK+ generally, followed by items that are specific to a tool. Items that are in blue represent non-Canadian studies.

Learning Toolkit+

Abrami, P. C. (2011). A toolkit for learning: Using technology to close the gap. *Education Canada*, 51(2), 54-57. http://www.cea-ace.ca/education-canada/article/toolkit-learning-using-technology-close-gap

Abrami, P.C., Savage, R.S., Deleveaux, G., Wade, A., Meyer, E. & Lebel, C. (2010). The Learning Toolkit: The design, development, testing and dissemination of evidence-based educational software. In P. Zemliansky & D.M. Wilcox (Eds.), *Design and implementation of educational games: Theoretical and practical perspectives* (pp. 168-187). Hershey, PA: IGI Global. http://dx.doi.org/10.4018/978-1-61520-781-7.ch012

Abrami, P.C., Wade, A., Lysenko, L., WaGioko, M., Kiforo, E., Iminza, R. & Marsh, J. (2020). The Learning Toolkit Plus: An overview. [Manuscript under review]. *Canadian Journal of Learning and Technology.*

Lysenko, L., Abrami, P.C. & Wade, A. (In press). *Sustainability and scalability of digital tools for learning: the Learning Toolkit Plus in Kenya*. *Canadian Journal of Learning and Technology.*

Conferences

Abrami, P.C. (2019, May). Organizer and chair of the panel "The Learning Toolkit + in Kenya" at the Annual Conference of the Canadian Association of African Studies, Penser l'Afrique-Monde : Originalité et pratiques innovantes, Montreal, QC

Amaro, D., Buchbinder, N., Castillo-Canales, D., Comba, R., Janigan, T., **Lysenko, L.,** …… (2022, April 18). Adaptation of education innovations in the Global South: Reflections from Knowledge and Innovation Exchange projects. Preconference workshop at the the annual conference of Comparative and International Education Society. Minneapolis, MN

Del Col, N., Wade, A., & Changamire, V. (2022, April 21). Academic -NGO Research Partnerships in International Development: Two case studies in Africa, Asia and America. Paper presented at the annual conference of Comparative and International Education Society. Minneapolis, MN.

Reports

Abrami, P. C., Lysenko, L., Wade, A., Marsh, J., Del Col, N., WaGioko, M., & Head, J. (2020, Dec. 31). Teaching and learning with technology in Sub-Saharan Africa. International Development Research Centre (IDRC) Final Report. Montreal, QC: CSLP.

Abrami, P. C., Wade, A., Marsh, J., WaGioko, M., Lysenko, L., Wachinga, A., Del Col, N. & Head, J. (2019, October). Teaching and learning with technology in Sub-Saharan Africa. (IDRC, Interim Report). Montreal, QC: CSLP.

LTK+ Promotional Site: https://www.concordia.ca/ltk

ABRACADABRA

SUMMARY OF RESEARCH

ABRACADABRA is based on the best available research on how children learn to read and the best available research on using technology for learning. Research is the bedrock on which ABRA, and our other tools, were designed and developed. ABRA has also been the subject of extensive efforts at validation over the years. Consequently, it is fair to claim that ABRA is both evidence-based *and* evidence-proven.

The most recent systematic review by Abrami, Lysenko and Borokhovsky (2020) summarizes substantial validation research on ABRA from 17 rigorous studies conducted between 2006 and 2019 in North America, the UK, Australia, Asia, and Africa. Including also true experimental randomized control trials and third-party assessments conducted, this research demonstrates uniformly positive effects of ABRA and, more recently, READS. Overall, the average adjusted effect size based on 91 comparisons and 7,388 students is +0.256 with the range of positive effects in all reading-related skills. The effects are generalizable across country contexts and measurement approaches. Importantly, ABRA research is ongoing and the results of a few more studies have been published since 2019 (for instance, Arciuli & Bailey, 2021; Gu et al., 2021) and are waiting to be incorporated into effect size estimates.

Population Estimates by Outcome Category	k (# of comparisons)	$\overline{g}$ Average Effect Size		Percentile Advantage (adjusted ES)
		Non-adjusted	Adjusted[c]	
Phonics	23	0.187**	0.263***	10
Phonemic Awareness	23	0.378***	0.299***	12
Reading Fluency	7	0.088	0.181**	7
Reading Comprehension	11	0.180**	0244**	9
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Vocabulary Knowledge	18	0.080	0.183**	7
Overall	91	0.200***	0.256***	10

*** $p < .001$, ** $p < .01$, * $p < .05$
[a] *Weighted Average Effect size (random effects model) for Major Reading Outcome Categories and Heterogeneity Analysis (fixed effect model)*
[b] One outlier removed
[c] HLM-based effects were used to predict the effect sizes from the non-HLM studies

Since 2012 other research projects on the impact of ABRA have been unfolding in Hong Kong, China, Kenya, the United Kingdom and Australia. Most recently, the feasibility of ABRA and READS implementation is being piloted in primary schools in Rwanda and Bangladesh. See for example: http://www.concordia.ca/research/learning-performance/tools/learning-toolkit.html#international

In Kenya, eight ABRA-READS studies were completed between 2012 and 2019. The results of five quasi-experiments conducted with the total sample of 2,548 primary school students in grades 1 to 3 yielded the overall adjusted effect size of +0.288. The specific effects sizes were +0.317 for listening comprehension, +0.200 for vocabulary knowledge and +0.338 for reading comprehension (Abrami et al., 2019). The primary research (Abrami et al., 2016; Lysenko et al., 2019) shows that ABRA-READS benefitted students across grade levels and genders about equally. While all students learned, low-performing students and struggling readers were often able to learn the most. The improvements also often transferred to other subject areas.

SCHOLARLY WORKS

External (Third Party) Evaluations of ABRA

Arciuli, J., & Bailey, B. (2019). Efficacy of ABRACADABRA literacy instruction in a school setting for children with autism spectrum disorder. *Research in Developmental Disabilities, 85*, 104-115. https://doi.org/10.1016/j.ridd.2018.11.003

Arciuli, J., & Bailey, B. (2021). The promise of comprehensive early reading instruction for children with autism and recommendations for future directions. *Language, Speech and Hearing Services in Schools, 52,* 225-238. https://doi.org/10.1044/2020_LSHSS-20-00019

Bailey, B., Arciuli, J., & Stancliffe, R. J. (2016, June). Effects of ABRACADABRA literacy instruction on children with autism spectrum disorder. *Journal of Educational Psychology*. Advance online publication. 109(2), 257-268.http://dx.doi.org/10.1037/edu0000138

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ePEARL

SUMMARY OF RESEARCH

The CSLP researchers have examined the effects of ePEARL digital portfolio on learning of students and teachers in Canada and Kenya.

In Canada, the impact of ePEARL digital portfolio on students' learning has been in focus of the two major quasi-experimental studies involving 618 older elementary students (Meyer et al., 2010; Abrami et al., 2013). This research consistently found important gains in writing and metacognitive skills for the students who completed their English Language Arts class assignment with ePEARL compared to those who did not use ePEARL. Namely, the effects of ePEARL were demonstrable on students' writing skills such as writing content (+0.13) and content management (+0.33) measured on a standardized test of achievement (CAT-4, 2008). The improved students' self-regulation skills were setting process goals (+0.42), selecting task strategies (+0.43), and using their teachers' and peers' feedback (+0.47) and self-observations (+0.23) to improve their work.

Another Canadian study examined the combined use of ePEARL and ABRACADABRA on early elementary students' reading comprehension skills (Lysenko & Abrami, 2014). Twenty-six grade 1 and 2 teachers and their 517 students from six English school boards participated in this quasi-experiment. The findings showed that the students who learnt with ePEARL and

ABRA significantly outperformed students from the control classes in terms of reading and written expression as measured by the standardized tests. In particular, the gains of ePEARL and ABRA students were most important in vocabulary skills, reading comprehension and writing skills including conventions, linguistics, and content.

In Kenya, the initial validation of ePEARL in secondary schools also yielded promising results (Lysenko et al., 2020). Unfolded in two phases and involving 201 students, the study demonstrated the practicality of implementing the digital process portfolio in the Kenyan context and captured positive impact of the tool on student learning outcomes. The findings of this pilot consistently show that students who used ePEARL to complete their project work in Biology, Physics, Business Studies or English outperformed their peers who had hardly used the portfolio for their class assignments or did not use it all on their school exams and their self-reported self-regulation skills. Further, more frequent and comprehensive use of portfolio features translated into higher student achievement in the relevant subject area. On average, one unit increase in using ePEARL improved a student's exam results by +0.39 and +0.30 standard deviations in phases 1 and 2 respectively.

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Davidson, A.-L., Lysenko, L., Bures, E., Abrami, P. C., Wade, A., & Idan, E. (2013). Le design, le développement et l'implantation d'un portfolio électronique pour appuyer la formation initiale des enseignants et favoriser leur professionnalisation. In T. Karsenti, S. Collin & G. Dumouchel (Eds.), *Actes du Colloque scientifique international sur les TIC en éducation : bilan, enjeux actuels et perspectives futures* (pp. 555-560). Montreal, QC: Centre de recherche interuniversitaire sur la formation et la profession enseignante.

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Abrami, P. C., Upitis, R., & Elster, A. (2014, February). *Transforming music education with digital tools: iSCORE and DREAM*. Paper presented at the Learning Through the Arts (LTTA) Congress, University of Würzburg, Neubaukirche.

Abrami, P. C., Wade, A., & Meyer, E. J. (2009, June). *Improving teaching and learning with electronic portfolios: The effectiveness and implementation of ePEARL*. Paper presented at the European Institute for E-Learning's (EIfEL) seventh international ePortfolio conference, Innovation, Creativity and Accountability, Learning Forum, London, England.

Abrami, P. C., Wade, A., Lebel, C., & Meyer, E. (2009, November). *PERLE: un portfolio électronique supportant l'autorégulation*. Paper presented at the sixth colloquium of le Centre interuniversitaire de recherche en technologies d'apprentissage (CIRTA), Quebec, QC.

Abrami, P.C., Wade, A.C., Savage, R.S., Deleveaux, G. & Meyer, E. (2009, May). *The learning toolkit (LTK): Evidence-based educational software*. Paper presented at the Canadian Association of Educational Psychology (CAEP) conference during the Canadian Society for the Study of Education (CSSE) Conference, Ottawa, ON.

Abrami, P. C., Wade, A., White, B., Pillay, V., Aslan, O., & Meyer, E. (2008, May*). Supporting learning through student-centred electronic portfolios.* Paper presented at ePortfolio & Digital Identity, Concordia University, Montreal, QC.

Abrami, P. C., Wade, A., Pillay, V., Aslan, O., Bures, E., & Bentley, C. (2007, October). *Encouraging self-regulated learning through electronic portfolios*. Paper presented at E-Learn 2007, Quebec City, QC.

Aslan, O., Schmid, R. F., & Abrami, P. C. (2009, May). *Using ePortfolio and modeling to develop self regulated learning and French writing skills in at-risk students*. Poster presented at the thirty seventh annual Canadian Society for the Study of Education (CSSE) conference, Ottawa, ON.

Aslan, O., Schmid, R. F., & Abrami, P. C. (2009, April). *Using an electronic portfolio to develop SRL and writing skills in at-risk students.* Poster presented at the International conference on Multimedia, Information and Communication Technologies in Education (M-ICTE), Lisbon, Portugal.

Aslan, O., Schmid, R., & Abrami, P. C. (2008, May). *Using an electronic portfolio to develop self-regulation and writing skills in children with learning disabilities*. Paper presented at ePortfolio & Digital Identity, Concordia University, Montreal, QC.

Aslan, O., Schmid, R., & Abrami, P. C. (2008, March). *Using an electronic portfolio to develop SRL and second language writing skills in at-risk students.* Paper presented at the annual meeting of the American Educational Research Association, New York, NY.

Bures, E. & Abrami, P.C. (2013, August). *Electronic portfolios to mindfully scaffold student teachers' development of expertise*. Paper presented at the Bienniel meeting of the European Association for Research on Learning and Instruction (EARLI), Munich, Germany.

Bures, E., & Abrami, P. C. (2013, June). *The Second generation of online discussion forums: Going beyond marginalia to ice-cream*. Paper presented at the annual meeting of the World Conference on Educational Multimedia, Hypermedia and Telecommunications (EdMedia), Victoria, BC.

Bures, E., Abrami, P. C., & Bentley, C. (2007, October). *Electronic portfolios -- Now that we have them, what can we do with them?* Paper presented at E-Learn 2007, Quebec City, QC.

Bures, E., Barclay, A., Abrami, P.C. & Meyer, E. (2009, August). *Contextualizing student assessment: How can teachers effectively assess electronic portfolios?* Paper presented at the European Association of Research and Learning in Instruction (EARLI), Amsterdam.

Bures, E., Barclay, A., Abrami, P. C., Meyer, E., & Venkatesh, V. (2011, September). *The 'mixed bag' of electronic portfolio assessment: Can electronic portfolios be a form of standardized assessment?* Paper presented at the European Association for Research on Learning and Instruction (EARLI) biennial conference, Exeter, United Kingdom.

Bures, E., Barclay, A., Abrami, P. C., Meyer, E., & Venkatesh, V. (2012, April). *The reality of assessing "authentic" portfolios: Can electronic portfolios serve as a form of standardized assessment of literacy and self-regulated learning at the elementary level?* Paper presented at the American Educational Research Association (AERA) annual meeting, Vancouver, BC.

Bures, E. M., Lysenko, L. V., Barclay, A., & Abrami, P. C. (2013, April). *Supporting student teachers' reflective practice through electronic professional portfolios*. Paper presented at the American Educational Research Association (AERA) annual meeting, San Francisco, CA.

Bures, E. M., Venkatesh, V., & Abrami, P. C. (2013, April). *How do electronic portfolios support the development of literacy and self-regulted learning in elementary students?* Paper presented at the American Educational Research Association (AERA) annual meeting, San Francisco, CA.

Cooperberg, A., Meyer, E., Wade, A., White, B., & Idan, E. (2008, May). *Professional training for ePortfolios: Designing a virtual tutorial for ePEARL*. Workshop presented at the ePortfolio & Digital Identity Conference, Concordia University, Montreal, QC.

Davidson, A.-L., Lysenko, L., Bures, E., Abrami, P. C., Wade, A., & Idan, E. (2012, May). *The design, development and implementation of an electronic portfolio-ePEARL Level 4, to help the professionalization of teachers/Le design, le développement et l'implantation d'un portfolio éléctronique pour appuyer la formation des enseignants et favoriser leur professionnalisation*. Paper presented at the International Scientific Conference on ICT and Education: past, current and future trends, Montreal, QC.

Egland, T., Zazula, D., & Wade, A. (2008, April). ePEARL – *Starting the electronic portfolio in your elementary classroom*. Workshop presented at the Digital Denizens: Keying into the 21st Century conference, Calgary, AB.

Idan, E., Abrami, P. C., Wade, A., & Meyer, E. (2011, March). *Designing for the development of self-regulation: A web-based electronic portfolio for adult learners*. Paper presented at the International Technology, Education and Development conference, Valencia, Spain.

Lebel, C., & Bernath, L. (2009, December). *ePEARL*. Workshop presented at the MATI meeting on portfolio standards, Montreal, QC

Lebel, C., & Pillay, V. (2010, January). *ePEARL*. Workshop presented at the Département d'éducation, Université de Québec à Montréal (UQAM), Montreal, QC.

Lysenko, L., Bures, E., Idan, E., Wade, A., Abrami, P. C., & Meyer, E. (2012, October). *An electronic portfolio for teachers: Design and preliminary assessment*. Paper presented at the 17th Annual E-Learn World Conference on E-Learning in Corporate, Government, Healthcare, & Higher Education, Montreal, QC.

Lysenko, L., Venkatesh, V., Kiforo, E., & Gatende, A. (2019, May). *Electronic portfolios in Kenyan secondary classrooms: results of the ePEARL pilot study.* Paper presented at the Annual Conference of the Canadian Association of African Studies, Penser l'Afrique-Monde : Originalité et pratiques innovantes, Montreal, QC.

Meyer, E., Abrami, P. C., & Wade, A. (2010, May). *Improving teaching strategies and learning outcomes with Electronic Portfolios.* Paper presented at the American Educational Research Association (AERA), Denver, Colorado.

Meyer, E., Abrami, P.C. & Wade, A. (2009, April). *Electronic portfolios in the classroom: Factors impacting teacher's integration of new technologies and new pedagogies.* Paper presented at the annual meeting of the American Educational Research Association (AERA), San Diego, CA.

Meyer, E.J., Abrami, P.C. & Wade, A. (2009, May). *Improving teaching and learning with electronic portfolios.* Paper presented at the Canadian Society for the Study of Education (CSSE), Ottawa, ON.

Morris, K. L. (2006, March). *Digital portfolio workbook for pre-service teachers.* Paper presented at the Society for Information Technology and Teacher Education (SITE) International Conference (pp. 2295-2298), Orlando, FL.

Stenzel, T., Diner, L., & White, B. J. (2010, June). *ePearl: Portfolios in the classroom.* Paper presented at the International Society for Technology in Education (ISTE), Denver, CO.

Stenzel, T., Diner, L., & White, B. (2011, June). *ePEARL: E-Portfolio encouraging active reflective learning K-12.* Poster presented at the 32nd annual conference of the International Society for Technology in Education (ISTE), Philadelphia, PA.

Upitis, R., & Abrami, P. C. (2013, October). Towards developing independent musicians. Paper presented at the Ireland International Conference on Education (IICE), Dublin, Ireland.

Upitis, R., & Abrami, P. C. (2010, May). *Developing ecological habits of mind through the support of electronic portfolios.* Paper presented at the American Educational Research Association (AERA), Denver, CO.

Upitis, R., Abrami, P. C., Brook, J., Troop, M., & Varela, W. (2010, November). *Using ePEARL for music teaching: A case study.* Paper presented at the International Association for the Scientific Knowledge conference, Oviedo, Spain.

Upitis, R., Abrami, P. C., Elster, A., Varela, W., & Brook, J. (2012, April). *On the importance of self-regulation in learning to play a musical instrument: A theoretical basis for designing iSCORE, a digital tool for music learning.* Paper presented at the International Organization of Social Sciences and Behavioral Research (IOSSBR) conference, Atlantic City, NJ.

Upitis, R., Abrami, P. C., Varela, W., & Elster, A. (2013, January). *iSCORE: A web-based tool for enhancing music learning.* Paper to be presented at the 11th Annual Hawaii International Conference on Arts & Humanities, Honolulu, Hawaii.

Upitis, R., Brook, J., & Abrami, P. C. (2014, January). Enhancing music learning with digital tools: A case study of a student using iSCORE. Paper presented at the Hawaii International Conference on Education (HICE), Honolulu, Hawaii.

Upitis, R., Brook, J., & Abrami, P. C. (2014, January). Enhancing music learning with digital tools. Paper presented at the Hawaii International Conference on Arts and Humanities (HICAH), Honolulu, Hawaii.

Upitis, R., Brook, J., & Abrami, P. C. (2013, April). *iSCORE: A web-based tool for music learning.* Paper presented at the American Educational Research Association (AERA) annual meeting, San Francisco, CA.

Upitis, R., Brook, J. & Abrami, P.C. (2012, November). iSCORE: *Providing effective professional development for users of an online music education tool.* Paper presented at the fifth international conference of Education, Research and Innovation, Madrid, Spain.

Upitis, R., Brook, J., Abrami, P. C., Varela, W., & Elster, A. (2012, July). *Revitalizing studio*

music learning through digital portfolios. Paper presented at the ISME Commission for Research in Music Education, 24th International Seminar, University of Macedonia, Thessaloniki, Greece.

Upitis, R., Patteson, A., & Abrami, P. C. (2010, May). *Developing ecological habits of mind*. Paper presented at the Canadian Society for the Study of Education (CSSE) and the Canadian Association for Curriculum Studies annual conference, Montreal, QC.

Upitis, R., Patteson, A., & Abrami, P. C. (2010, May). *E-learning, ecology and an arts education institutional partnership*. Paper presented at the Canada International Conference on Education (CICE), Toronto, ON.

Wade, A. (2009, June). *Using ePEARL in the classroom*. Workshop presented at the Lester B. Pearson School Board K4 teachers, Dorval, QC.

Wade, A. & Abrami, P. C. (2008, May). *Encouraging self-regulated learning through electronic portfolios* [Keynote speakers]. Digital Portfolio as a strategy for teachers' professional development: International seminar, Helsinki, Finland.

Wade, A., Abrami, P. C., White, B., Nicolaidou, I. & Morris, K. (2006, October). *ePEARL: Electronic portfolio encouraging active reflection learning*. Paper presented at the European Institute for E-Learning (EIFEL) – Oxford ePortfolio Conference, London, England.

Wade, A., & Deleveaux, G. (2009, October - November). *Using ePEARL in the classroom*. Three workshops presented at the English Montreal School Board (EMSB) Pedagogical Services ICT Day, Montreal, QC.

Wade, A., Idan, E., Abrami, P. C., & Lebel, C. (2007, October). *Electronic Portfolio Encouraging Active Reflective Learning Software (ePEARL)*. Paper presented at E-Learn 2007, Quebec City, QC.

Wade, A., & Upitis, R. (2010, February). *Using electronic portfolios in the arts: An introduction to ePEARL.* Workshop presented at the Royal Conservatory of Music, Toronto, ON.

ePEARL IN THE NEWS

Colloque Scientifique TICE. (2012, April). "PERLE" au Programme du colloque scientifique international sur les TIC en éducation : bilan, enjeux actuels et perspectives futures. http://www.youtube.com/watch?v=mGUnt8Ofj9c&context=C4370409ADvjVQa1PpcFPr6 W8imprspLLKozaPjTDLtRjCJfpR6wY .

ePEARL to shine at Congress: Montreal high school students and CSLP investigating human rights (2010, Jan.14). *Concordia Journal*. http://cjournal.concordia.ca/archives/20100114/epearl_to_shine_at_congress_2010.php

Venkatesh, V., & Abrami, P. C. (2012). Academic self-regulation in online learning environments: Research on electronic portfolios and Topic Map indexing tools. *Newsletter of the Studying and Self-Regulated Learning Special Interest Group.*, 4-5. http://uhaweb.hartford.edu/ssrl/Newsletters/2012_Spring_SSRL_Newsletter_3_19_12.pd f

Warwick, L. (2009, April). Student portfolios can measure progress. *Montreal Families*. http://www.montrealfamilies.ca.sslpowered.com/articles/09_apr/ed_portfolios.htm

IS-21

SUMMARY OF RESEARCH

All CSLP tools are built on a foundation of solid research evidence and IS-21 is no exception: research on information literacy and the use of technology in learning provided the foundation for the tool's development.

A field trial of the IS-21 software was conducted in Canadian schools to test the feasibility of using this tool to promote the development of students' information literacy skills (Wade et al., 2020). This was a two-phase study where 189 elementary and early secondary students used IS-21 to complete an inquiry project. The project topics included Recycling, Natural Disasters and Advertising. The results from both phases consistently show that learning with IS-21 had a number of benefits for students. Primarily, the students' gains were significant for overall and specific information literacy skills such as planning inquiry, searching and using information to generate knowledge. Further, after using IS-21, students improved their self-regulation skills of reflection and self-efficacy. Teachers' accounts of their experience of IS-21 research projects were positive. They reported that their students learnt how to do research with IS-21 and would be willing to use IS-21 in future. Notably, the most valuable aspect of completing IS-21 project was exposing students to the diversity of sources and making them apply meaningfully the criteria for selecting pertinent and high-quality sources to create their own knowledge on the topic of interest to them. The comprehensiveness of the tool was also praised by the teachers; on the other hand, the teachers agreed that it was overwhelmingly long to complete all twelve steps of IS-21. The issue of time was raised when teachers referred to pre-teaching the concepts and steps of research and providing necessary guidance to students to complete these steps in IS-21.

SCHOLARLY WORKS

Journal Articles & Other Publications

Wade, A., Lysenko, L., & Abrami, P.C. (2020). Developing information literacy skills through the inquiry process. *Journal of Information Literacy*. *14*(2). 96-127. http://dx.doi.org/10.11645/14.2.2754

Wade, A., Abrami, P. C., White, B., Baron, M., Farmer, L., & Van Gelder, S. (2009). Information literacy: An essential competency in the twenty-first century. *L'Association des bibliothécaires du Québec Library Association (ABQLA) Bulletin*, 50(2), 20-23.

Wade, A., Abrami, P. C., White, B., Baron, M., Farmer, L., & Van Gelder, S. (2008, December). Information literacy: An essential competency in the twenty-first century [Electronic Version]. *Newsletter for IFLA: School Libraries and Resource Centers*, 47, 15-18. Retrieved May 4, 2009, from http://www.ifla.org/en/publications/newsletters-13

Conferences

Abrami, P. C., Wade, A., Savage, R. S., Deleveaux, G., & Meyer, E. (2009, May). *The learning toolkit (LTK): Evidence-based educational software.* Paper presented at the thirty seventh annual Canadian Society for the Study of Education (CSSE) conference, Ottawa, ON.

Abrami, P. C., Wade, A., Farmer, L., Philips, J., Huebner, C., Baron, M., White, B., Peters, S., & Van Gelder, S. (2008, April). *IS-21: Information skills for the information society in the twenty-first century.* Poster presented at the Annual Meeting of the Quebec Library Association, Montreal, QC.

Wade, A. (2010, March). *Information literacy for 10-14 year olds: The IS-21 project.* Paper presented at the Quebec Librarians' Roundtable, Portes Ouvertes, Montreal, QC.

Wade, A. (2009, October). *Developing inquiry strategies using IS-21 in the classroom.* Workshop presented at the English Montreal School Board (EMSB) Pedagogical Services ICT Day, Montreal, QC.

Wade, A., & Abrami, P. C. (2010, March). *Information literacy for 10-14 year olds: The IS-21 project.* Online presentation presented at the Advanced Broadband Enable Learning (ABEL).

Wade, A., & Abrami, P. C. (2010, February). *Information literacy for 10-14 year olds: The IS-21 project.* Online presentation presented at the Canadian Network for Innovation in Education (CNIE) Wise & Witty Wednesday online seminar, Montreal, QC.

Wade, A., Abrami, P. C., Farmer, L., Henry, L., & Venkatesh, V. (2010, May). *Inquiry strategies for the information society in the twenty-first century (IS-21).* Paper presented at the Fifth International Conference of Learning International Networks Consortium (LINC), The Massachusetts Institute of Technology, Cambridge, MA.

Wade, A., Abrami, P. C., & White, B. (2010, November). *Inquiry strategies for the information society in the twenty-first century (IS-21).* Paper presented at the second conference of the library and information community of Québec, Montreal, QC.

Wade, A., Abrami, P. C., & White, B. (2009, May). *Inquiry strategies for the information society in the twenty-first century (IS-21): A resource for schools.* Paper presented at the annual conference of The Workshop for Instruction in Library Use (WILU), Montreal, QC.

Wade, A., & Baron, M. (2009, April). *Developing inquiry skills through the use of IS-21.* Workshop presented at the professional development day for library staff, English Montreal School Board, Montreal, QC.

Wade, A., Baron, M., & Van Gelder, S. (2008, December & October). *Developing inquiry skills through the use of IS-21.* Workshop conducted at the professional development day for library staff. Workshop presented at the English Montreal School Board with the pilot teachers, Montreal, QC.

Wade, A., Locke, J., & Devey, P. (2012, Aug.). *An online information literacy course for undergraduates: Early experiences.* Paper presented at the 2012 WLIC Conference Session "Information literacy meets E-learning", Helsinki, Finland.

Wade, A., Locke, J., & Devey, P. (2013, April). A*n online information literacy course for undergraduates: Some lessons learned.* Presentation at the eScape: Technology in teaching conference, Concordia University, Montreal, QC.

Reports

Wade, A. Abrami, P. & MacDonald, M. (2008, February) *Inquiry strategies for the information society in the twenty-first century (IS-21).* Final report prepared for Inukshuk Wireless. Montreal: Centre for the Study of Learning and Performance.

IS-21 IN THE NEWS

Warwick, L. (2011, Nov.). Program teaches kids valuable research skills. *Montreal Families*, p.23. http://www.montrealfamilies.ca/Montreal-Families/November-2011/Program-teaches-kids-valuable-research-skills/

Zarzour, K. (2011, Feb. 16). *Tackling tech temptations* [Wade quoted]. York Region.com. http://www.yorkregion.com/news/article/955780--tackling-tech-temptations

Zarzour, K. (2011, Jan. 12). *It's wireless world in today's classrooms* [Wade quoted]. York Region.com. http://www.yorkregion.com/news/article/928416--it-s-wireless-world-in-today-s-classrooms

Amend, E. (October 3, 2007). Internet help for parents. *The Chronicle*. Article on Information Literacy parent workshops given by Wade and Baron at Pierrefonds Public Library.

ELM

SUMMARY OF RESEARCH

Since 2014, we have studied the impact of ELM on student achievement and attitudes towards mathematics and have obtained positive results. It is in grade-one elementary classroom in Canada and Kenya that ELM passed through initial validation.

Canadian tests of ELM with 450 students demonstrated ELM impacts on students' learning and affective outcomes. After having learnt with ELM for about one term, the experimental students considerably outperformed their peers exposed to traditional instruction with the effect sizes of +0.22 (Lysenko et al., 2016) and +0.29 (Abrami et al., 2018) on the overall skills respectively measured by the standardized tests of mathematics CAT-4 (2008) and GMADE (Williams, 2004). In addition, the effects of ELM were observable on a set of affective outcomes. Students in classes where ELM was part of math instruction reported more enjoyment from learning math and less anxiety and boredom than their peers in the control group.

Consistent with the Canadian findings are the results from Kenya validation research (Lysenko et al., 2020) where 775 students and their 14 teachers from 7 primary public schools participated. The results of this test suggest that the use of ELM to teach math significantly improved young students' mathematical abilities over their peers from control classes. After the students worked in dyads or triads on ELM activities in the school computer lab during one weekly math lesson for a few months, the total effect size was +0.35 on the GMADE-tested math skills of mathematics. The impact of ELM affected students' ability to take language and concepts of mathematics and apply appropriate operations and computations to solve word problems. On this set of skills, the magnitude of difference between the experimental and control groups was +0.71.

SCHOLARLY WORKS

Journal Articles

Lysenko, L., Abrami, P., Wade, A., Kiforo, E. & Iminza, R. (2021). Emergent Literacy in Mathematics (ELM): Learning numeracy with interactive technology in Kenya grade-one classes. [Manuscript under revision]. *International Journal of Innovation in Science and Mathematics Education*.

Lysenko, L., Rosenfield, S., Dedic, H., Savard, A., Idan, E., Abrami, P. C., . . . Naffi, N. (2016). Using interactive software to teach foundational mathematical skills. *Journal of*

Information Technology Education: Innovations in Practice, 15, 19-34.
http://www.jite.org/documents/Vol15/JITEv15IIPp019-034Lysenko2154.pdf

Reports

The effects of ELM software on the learning mathematics in Kenyan elementary: A brief report on the 2019 study (Brief Report). Montreal, QC: CSLP.

Abrami, P. C., Wade, A., Marsh, J., WaGioko, M., Lysenko, L., Wachinga, A., Del Col, N. & Head, J. (2019, October). *Teaching and learning with technology in Sub-Saharan Africa.* (IDRC, Interim Report). Montreal, QC: CSLP.

The Centre for the Study of Learning and Performance. (January, 2015). Developing Foundational Skills in Quebec Students: *Orienter la réussite des mathématiques émergentes* (ORME) software. Final Report submitted to the Ministère de l'Économie, de l'Innovation et des Exportations.
https://www.concordia.ca/content/dam/artsci/research/cslp/docs/tools-software/learning-toolkit/elm_mdeie_final-report.docx

Conferences

Savard, A., Dedic, H., Rosenfield, S., & Naffi, N. (2013, September). *Developing number sense with a digital tool.* Symposium at the Advancing Learning in Differentiation and Inclusion (ALDI) Symposium, Dorval, QC.

Savard, A., Dedic, H., Rosenfield, S., Idan, E, & Head, J. (2014, November). *Developing number sense with a digital tool.* Workshop conducted at the annual QPAT convention, Montreal, QC.

ELM IN THE NEWS

Vidija, P. (2015, September 30). English and Mathematics classes for Mombasa public teachers [ELM]. *The Star Newspaper, Kenya*. http://www.the-star.co.ke/news/english-and-mathematics-classes-mombasa-public-teachers#sthash.zMGydH6s.HXWeFWVe.dpuf

GETTING STARTED IN ABRA

Navigate to the Tool

1. Log in to the LTK+.
   The first time you sign in, you will have to confirm the level. Select "Level 1" or "Level 2" as ABRA is only accessible in these levels.

2. Click on ABRACADABRA.

3. Click on the *Play! Student Zone* button.
   This will bring you to the *Adventure Room* page. From here you can choose activities, stories, or learn more about the characters.

4. Select an activity.
   First, select a main category.

First, select a main category.

Then, choose one of the activities.

Use the arrows to view more activities.

Once selected, it will appear on the desk below.

> ABRA's activities are divided into four main categories:
> • Sounds, Letters, and Words (Alphabetics)
> • Reading (Fluency)
> • Understanding the Story (Comprehension)
> • Writing (Typing)
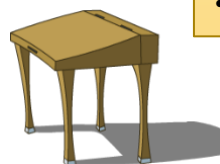
5. Select a book (if required).
   First, select a genre.

Then, choose a story.

Once selected, it will appear on the desk below.

> ABRA's stories are divided into four main categories (genres):
> • Folk and Fairy Tales
> • Poetry
> • Fiction
> • Non-Fiction

6. Click on the Go button.
   This will bring you to the activity or story page. A demo should load automatically.

7. Choose a level (if relevant).

8. Press the *Play* or *Read* button.

At any time, you can use the *Chooser* menu at the top of the screen to navigate to a different screen.

The *Back* button will bring you back to the previous screen.

The *Chooser* button will bring you to the *Adventure Room* page, where you select the activity and/or story you wish to engage with.

The *Home* button will bring you back to the splash page.

If you're not sure what page you're currently on, click on the arrow ▷ in the *Chooser* menu. This will open up the info box and it will list the story and activity you're currently playing.

WITHIN AN ACTIVITY

The following buttons are the ones you'll see within an activity.

	The *A-OK* button will check the answer.
	The *Help Me* button will guide learners to the answer.
	The *Yes* button is to indicate that you agree.
	The *No* button is to indicate that you disagree.
	The *Next* button is to move on to the next question.
	The *Repeat* button will replay the audio.

Teacher Tip: If learners are working in groups at one computer and need to switch back and forth between accounts, you can use the *Add User* button to make this process smoother. A maximum of three accounts can be signed in this way. Please note, that the learner answers are only tracked for the active account.

WHOLE CLASS INSTRUCTION

Video Transcript

Cycle 1 teacher, Eva Ceruli, shows how she uses the ABARACADBRA tool in conjunction with other teaching techniques to help her teach English Language Arts.

USING ABRACADABRA WITH THE WHOLE CLASS

Scene description: The whole class sits in a small group for story time. The teacher holds up a large book—making sure all the students can see the pictures and text.

Eva: *The Very Hungry Caterpillar*, and it's been written by ...

Scene description: cut to Eva being interviewed in front of the camera.

Eva: Some of the methods that we use before ABRACADABRA was introduced into our classroom was that I would read them a story.

Scene description: cut back to classroom where Eva reads the story and points to the text while the learner follows along repeating emphasized words.

Eva (with children reading with her): One cupcake and one slice of watermelon.

Scene description: cut back to Eva being interviewed in front of the camera.

Eva: And it would be the consonants sounds ... and then we'd build on vocabulary and we'd find words that begin with that consonant sound. And then we would do a poem and then children would have to find the consonant sound and circle it. We would do all that work before we would have to go back to our places and then work in a workbook that had consonant sounds, beginning or ending ... depending on what the activity was.

Scene description: cut to screen captures of the ABRA software, followed by scenes of children working in the classroom near computers with the ABRA software, and Eva addressing her learners from the front of the class.

Eva (voice overlaid): ABRABACADABRA has taken over for me. I don't need to do that anymore. I still will incorporate some of that in my classroom. I think it's important to have a balance of both, I said but at the same token some children are not always paying attention to you on the carpet when you're doing a consonant sound.

Scene description: Eva elicits correct responses from students.

Eva: Listen very carefully though.

Scene description: cut to children working with laptops interspersed with showing the ABRA software.

Eva: So, if they're at their computer and if they're listening to the consonant sounds, chances are they're hearing it for the first time!

Scene description: Eva sits with a learner who is using ABRACADABRA on a laptop.

Eva: Did you hear it already? Did you hear it once?

Student: No, it's my first time.

Eva: The first time, OK.

Scene description: shows a mix of children working with laptops, shots of Eva being interviewed in front of the camera, and older learners helping to set up the laptops in Eva's classroom.

Eva: Because we have the laptops in our school, each child can have one. So I thought it would be great for them to experience it. I think once you have the computers up in your classroom, you need to find a way to make them work.

The grade six boys are very, very helpful. They love to help the teachers, so I would kind of get some of the boys to help me. They would go and get the laptops for me, they would set up them all up on the desks and actually open them all up for the children. So, they knew exactly what they were doing.

What I found difficult was that when the children needed to listen to something this is when I felt I was hitting a bit of a wall, because we had no headsets. For the children to have that individual instructions, that's when I think I needed to re-look at the computers in my classroom. I got a whole set of them [headsets] and to actually see them [learners] having their headsets on – that attention all to themselves, I think was the most empowering part of my education. You could have heard a pin drop in the classroom. The kids were so in to it

Scene description: *The Alphabet Song* activity is displayed.
Computer: Sings the alphabet A, B, C, D, E, F, G.

Scene description: shows a mix of Eva helping her learners while they work on laptops, and screen captures of the ABRA software.

Eva: Children that are displaying some difficulties, I can see that they were going to the sites that they felt were challenging for them. Whereas the children who were already at a reading level, they were already going to the books, and they were listening to the books or they were reading the books with the computer. That's the beneficial value of the program in my classroom is that there are different levels for the children to work on. I feel ABRACADBRA will support you. It reinforces the work that you are doing.

Scene description: Eva give individual attention to a learner having difficulty.
Eva: Where can you find that word?
Child: I don't know.
Eva: Where do you think you might find that? ... Ah, smart.

Scene description: Eva being interviewed in front of the camera.
Eva: I would most definitely use ABRACADABRA is my classroom next year.

Scene description: Screen capture of the ABRA software.
Computer: Let's go!

Recap
Using ABRACADABRA with the Whole Class
- Balance with other teaching techniques
- Find ways to overcome challenges
- Facilitate independent use of ABRACADABRA

LAB INSTRUCTION

Video Transcript

Teacher, Pamela Tomecz, shows how she uses the ABRACADABRA tool in her school's computer lab setting.

USING ABRACADABRA IN THE COMPUTER LAB

Scene description: Learners use individual headsets in the computer lab during an ABRACADABRA writing lesson. Pamela's voice is heard overlaid this scene at first, then it cuts to show her being interviewed in front of a camera. This interview is interspersed with scene cuts showing Pamela setting up her computer lab, and learners in the computer lab.

Pamela: I decided to use the computer lab setting for ABRACADABRA because it was a stable environment to do this program. I teach two classes; which continuously change throughout the day. So it's very hard for me to have to setup my projector screen when I have student coming in and out of the classroom. And I also found it quite messy in the sense that I had one section of my classroom with wires and things and students were tripping over them and the classroom wasn't as ideal for me as the computer lab. And the computer lab was set up perfectly, the kids just had to come in, they all had their computers, so that was like prime, that was excellent, in my case.

Scene description: Pamela helps a child in the computer lab, while other learners work individually.

Pamela: No, it's an orange, so that means it's not right... ROA**D**.

Student: D.

Pamela: Aha.

Scene description: Pamela is being interview in front of the camera. This cuts to show her learners gathered in front of a big screen to illustrate what's she's saying.

Pamela: As soon as the students come into the lab, they're asked to sit down in front of the big screen. Once they are all seated quietly in front of that screen, I then click onto the ABRACADABRA program. Often, I tend to ask them, well where do I go now?

Pamela [speaks to the class]: Is everyone ready?

Learners: Yes.

Pamela: All eyes are on my screen?

Learners: Yes!

Pamela: All right. Remember how we read ... two and three.

Learners: Darryl Don't Dawdle! You'll miss recess!

Computer: Darryl, Don't Dawdle! You'll miss recess.

Scene description: Pamela continues her lesson with learners sitting in front of the big screen. As she asks her questions, the scene cut from showing her, the children, and the ABRA software.

Pamela [speaks to the class]: Now that we've finished reading our story I want us to play a game. So, I want us to do a writing game. So what icon would I have to click?

Child: The pencil.

Pamela: The pencil icon. What I would like you guys to do is, when you go back to your computer, I want you to click onto this game. So, this is the sentence game. Is that understood?

Learners: Yes!

Scene description: Pamela is interviewed in front of the camera.

Pamela: So basically, my advice for teachers who'd like to implement the ABRACADABRA program into to their ELA curriculum would be: be prepared. Make sure that you check out the software, that you go through it... that you understand what is wanted from your children. Check out the skills. You know already, what level they're at, so see which one fits what student. And normally I tend to do a full group reading with my kids before I send them off to do their individual work. So, based on that whole group assessment I can then say okay certain students are ready for this type of program or game and another type of game or program and the level based on that student.

I would definitely use ABRACADABRA next year in my classroom. It's a wonderful program, the kids love it and they're learning; which is number one.

Recap

Using ABRACADABRA in the Computer Lab
- Choose the right setting for students
- Introduce story and skills to whole class
- Place students at appropriate level

LEARNING CENTRE

Video Transcript

Teacher, Rosemary Di Giambattista, shows how she incorporates the ABRACADABRA tool into a language arts learning centre.

USING ABRACADABRA AS A LEARNING CENTRE

Scene description: The teacher rings a bell to get students' attention before instructing them on the day's lesson. This cuts to showing Rosemary being interviewed in front of the camera. When she discusses her classroom set up, the scene cuts to show different aspects of her class and activities.

Rosemary: In my classroom I decided to use ABRA as a centre because, first of all, we don't have enough computers for every student in the class, and I also like to set up my classroom for the children to work in centres. So, I have different centres going on at different times. In this way I decided to use the ABRA, so I would set up about four to six computers and I would usually set it up before the class. And then the children would know specifically what they had to work on.

Scene description: Rosemary stands beside chart that lists the ABRA activities she's assigned.

Rosemary: Boys and girls at the ABRACADABRA centre, these are the activities that I want you to do.

Scene description: Children work according to their assigned centre task(s).

Rosemary: The children know that when we have centres they're supposed to stay at their centre. I usually run the centres for about twenty minutes, depending on what the activities are. And they know that if they have any questions that they should try to work it out with the other students at the centre without always asking the teacher or the volunteer.

Scene description: Rosemary being interviewed in front of the camera.

Rosemary: When I have the transition from centre to centre, I usually advise the children that in about two minutes we will be changing centres.

Scene description: Rosemary addressing her students.

Rosemary: Boys and girls, in two minutes we will be switching stations.

Scene description: Rosemary being interviewed in front of the camera. This cuts to a scene showing Rosemary in her classroom giving her learners instructions.

Rosemary: So, this way they know that it's coming up and they can finish off their activity. Then I will signal that it's time to change centers.

Rosemary [speaks to the class]: At the ABC centre, over there—to put the words in order— will be Christopher and Thomas.

Scene description: Various shots of learners fully engaged while using ABRACADABRA.

Rosemary: I found the biggest benefit to be that the children are very engaged when they're using the computers. It appeals to a variety of learners, also there're children who are visual. Also, the auditory, there is a lot of sounds that they can compare and really pick up.

Computer [*Reading Speed* activity bell]: Ding! Ding! Ding!
Child: I did it!

Rosemary: I think one of the best successes is just to see the children, first of all, enjoying it and actually succeeding when they see the light and they say they can read the story or they can spot what's not right in the story or make the predictions. Just to see the excitement that they show.

Scene description: A child reads an ABRACADABRA story at the correct speed.
Student: When I open my eyes what do I see? I see a fish looking back at me.
Rosemary: Wow, just right!

Recap
Using ABRACADABRA as a Learning Centre
- Prepare centres before class
- Teach a routine and use it
- Work with students to increase benefits

ABRACADABRA ICONS

A Quick Reference of ABRA's Commonly Encountered Icons

As learners go through ABRA, they will encounter these navigational and functional icons. It may be advantageous for teachers to familiarize themselves and their learners with these icons to make their experience with the software enjoyable.

Characters	A-OK	Demo
Back	Help me	Repeat
Chooser *Back to the Adventure Room*	Yes	Warning *There is a problem with the installation*
Home	No	Log out
Settings	Next	

HEALTH AND PERSONAL HYGIENE

SCHOOL	P.P	DATE	TIME	ROLL

STRAND	Literacy Activities
SUB STRAND	Spelling (Writing)
SPECIFIC LEARNING OUTCOMES	By the end of the lesson, learners should know how to take care of their bodies, and why it is important to maintain personal hygiene. Learners learn how to work together by helping one another through the writing task.
ESSENCE STATEMENT	To help learners take responsibility in group work, as well as for their personal hygiene and health.
KEY INQUIRY QUESTIONS	1) What are the main elements of a sentence? 2) How do I take care of my body/hygiene/health?
CORE COMPETENCIES	Through the use of Digital Literacy, learners work to Communicate and Collaborate while helping each construct proper, meaningful sentence, while learning how to take care of their health and personal hygiene.
VALUE(S)	Responsibility for one's health and hygiene and care and compassion for others.
PERTINENT AND CONTEMPORARY ISSUE (PCI)	Learners will learn about why personal hygiene is important to one's health and wellbeing.
COMMUNITY SERVICE LEARNING	Have a nurse or Doctor come and speak to learners about how personal hygiene can impact one's health and wellbeing
NON-FORMAL LEARNING	
LINKAGE TO OTHER LEARNING AREAS	
LEARNING RESOURCES	ELM, plastic food (toys)
ORGANIZATION OF LEARNING	Small groups and discussion
INTRODUCTION (ASSESSMENT FOR LEARNING)	Learners listen and watch the facilitator's demonstration
LESSON DEVELOPMENT	Group learners according to their eating habits, for example (vegetarians, don't eat pork, allergies) and then have them compare which group of

<table>
<tr><td></td><td>learners has more or less people in it. Alternate criteria (tall, medium, short) and redo activity. Then proceed to Step 1.</td></tr>
</table>

STEPS	1) INTRODUCTION: What did you do this morning when you woke up?
	2) Facilitator reads the ABRA story When I Open My Eyes, and asks learners to think about their own morning routine while she reads. Option B - Read story with learners
	3) Facilitator asks learners the following questions:

- What time do you get up?
- What do you wear to school?
- When do you brush your teeth?
- Who takes you to school?

FORMS OF ASSESSMENT

QUESTIONING AND DIALOGUE
Interactive questioning style, dialogue, thinking together.

GROUP WORK
Collaborative learning: peer-support, peer tutoring, pair work, mastery learning.

FORMATIVE ASSESSMENT
Help learners develop and learn new competencies, and let them grow in a multitude of areas.

FACILITATOR REFLECTIONS

INQUIRY QUESTION	RESPONSE
What worked well and did not work so well in this lesson?	
What would/could I do differently next time?	
How can I encourage learners to be more engaged?	
Are learners using their learning potential fully in this situation? Why/why not?	
Refine my prompts	

PROMPTS THE FACILITATOR CAN ENCOURAGE LEARNERS TO USE
When a learner is stuck, another group member will prompt them; i.e.:

- What is the first thing you do when you get in the morning?
- Let's look up the meaning of 'dawdle' in the dictionary together.
- What do you think Darryl is doing?
- Let's put the story in order, first he…, then he…, finally he goes…
- Complete this sentence: "Before school, I…"

Getting Started with ABRA Module Glossary

ABRACADABRA (ABRA): a tool in the LTK+ suite that is designed to support children's acquisition of early literacy.

Accuracy: the ability to read a text with little or no errors.

Alphabetics: the ability to recognize the different sounds in a spoken language and then match those sounds to written letters and words. Alphabetic skills include letter knowledge, phonological and phonemic awareness, and phonics.

Balanced Approach: an educational approach that recognizes the importance of teaching both basic word reading skills through phonics methods and teaching reading comprehension through the use of authentic texts.

Blending: combining individual sounds to make a word.

Comprehension: the ability to understand information within a text.

Decoding: using knowledge of letter-sound relationships and letter patterns to sound out an unfamiliar word.

Differentiation: modifying instruction so that it targets a learner's individual needs.

ePEARL: a web-based portfolio software, offered within the LTK+ suite. It is designed to support children's acquisition of self-regulated learning (SRL) skills.

Expression: when a reader changes their voice (meaningful pauses, emphasizing words, and appropriate tone and pitch) to help convey feelings and meaning.

Fluency: the ability to quickly recognize words and their meaning. Fluent readers are able to read with accuracy, speed, and expression.

Formative Assessment: measures the current knowledge of the learner while the learner is engaged with the learning process. It is a means to highlight knowledge gaps and achievements, and adjust instruction rather than grading the learner's performance.

High Frequency Words (sight words): These are the most common words used in written texts.

Learning Toolkit+ (LTK+): a suite of tools designed to support the development of literacy (ABRACADABRA and READS), numeracy (ELM), inquiry (IS-21) and self-regulated learning and portfolio development (ePEARL).

Listening Comprehension: the ability to understand spoken language.

Phonemes: individual sounds of language.

Phonemic Awareness: identifying and manipulating the smallest units of spoken language (sounds).

Phonics: building connections between spoken words and written language.

Phonological Awareness: noticing and working with the sounds in spoken language.

Prediction: the ability to anticipate what will happen in the story based on what already occurred.

READS: a multilingual catalogue of digital books offered as part of the LTK+ suite of tools.

Rhyming: two or more words whose ending sounds the same. For example: bat and cat.

Segmenting: break a word down into individual sounds.

Sequencing: identifying the components of a story and placing the events in order.

Speed: refers to how fast a child can read. Reading speed is calculated by the number of words per minute (WPM) someone can correctly read.

Story Elements: the common components of a story: the setting, characters, plot, problem & solution.

Subject Matter Expert: a specialist with a deep understanding of a particular field or topic.

Summarizing: selecting the most important points in a text and then restating those points in your own words.

Syllables: an unbroken unit of spoken language that contains a vowel sound and usually a consonant.

Vocabulary: the words we use to communicate successfully. An individual's vocabulary can help their ability to comprehend what they hear or read.

Word Families: a group of words that share a pattern, such as ending with the same letters and sound. For example: best, rest, west.

Writing: a skill that uses letters and words to create sentences and texts to express thoughts, feelings, and experiences in a clear way.