

CSLP Summary of the Learning Toolkit Research

 (January 24, 2022)

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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. (2020). *Sustainability and scalability of digital tools for learning: the Learning Toolkit Plus in Kenya*. [Manuscript under review]. *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

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.



ABRACADABRA Promotional site: <https://www.concordia.ca/research/learning-performance/tools/learning-toolkit/abracadabra.html>

Awards

UNESCO. (2017, Sept.). *UNESCO King Sejong Literacy Prize*. <https://en.unesco.org/news/technology-helps-develop-literacy-and-numeracy-sub-saharan-africa>

Canadian Network for Innovation in Education (2011). *Award of Merit for Excellence and Innovation in Overall Use of Technology for Learning*

Association for Educational Communications and Technology Design & Development (2010). *Outstanding Practice Award*.

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.

Substantial validation research on ABRA comes from 17 rigorous studies including true experimental randomized control trials and third-party assessments conducted in North America, the UK, Australia, Asia, and Africa. Summarized in two systematic reviews (Abrami et al., 2015; 2020), 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.

Population Estimates by Outcome Category	k (# of comparisons)	\bar{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**	0.244**	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

Since 2012 other research projects on the impact of ABRA have been unfolding in Hong Kong, China, Kenya, the United Kingdom and Australia. See for example:

<http://www.concordia.ca/research/learning-performance/tools/learning-toolkit.html#international>

In Kenya four quasi-experimental studies of ABRA-READS were conducted with the total sample of 2,548 primary school students in grades 1 to 3. These studies yielded the overall adjusted effect size of +0.288, and specific effects sizes of +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.

ABRACADABRA 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>
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- 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), 257-268.¹ <http://dx.doi.org/10.1037/edu0000138>¹
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- Helmer, J., Harper, H., Lea, T., Wolgemuth, J. R., & Chalkiti, K. (2014). Challenges of Conducting Systematic Research in Australia's Northern Territory. *Asia Pacific Journal of Education, 34*(1), 36-48. <http://dx.doi.org/10.1080/02188791.2013.809692>
- McNally, S., Ruiz-Valenzuela, J., & Rolfe, H. (2018, March). ABRA: Online reading support (Evaluation report and executive summary. Addendum added). London, UK: Education Endowment Foundation. <https://educationendowmentfoundation.org.uk/our-work/projects/online-reading-support/>¹
- Nair, A., & Dubé, A. K. (2021). *Overcoming barriers to remote learning: Computer assisted instruction to enhance mathematical word problem solving* Technology, Mind & Society, <https://assets.pubpub.org/qt55gcf/41634565320290.pdf>
- Sha, K., & Savage, R. (2020). Separating the Medium from the Message: Effects of Web- Versus Pencil and Paper- Delivery of the ABRACADABRA Intervention on Literacy, Motivation and Self-Esteem. *Journal of Interactive Learning Research, 31*(4), 283-317. <https://www.learntechlib-org.lib-ezproxy.concordia.ca/primary/p/210443/>
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- Arshad-Ayaz, A., Naseem, M. A., Inyega, J. (In press). Using technology for learning: Generalizable lessons from the qualitative research on technology integration in Kenyan educational system. *Frontiers in Educational Technology*.
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- Comaskey, E., Savage, R., & Abrami, P. C. (2009). A randomized efficacy study of web-based synthetic and analytic programmes among disadvantaged urban kindergarten children. *Journal of Research in Reading*, 32(1), 92-108. doi: 10.1111/j.1467-9817.2008.01383.x ¹
- CSLP, World Vision, Aga Khan Academy & Wilfrid Laurier University. (2020, Nov. 26). *Using ABRACADABRA @ Home in a remote region of Kenya: Response to the pandemic*. Report.
- Deault, L. Savage, R., & Abrami, P. C. (2009). Inattention and response to the ABRACADABRA web-based literacy intervention. *Journal of Research on Educational Effectiveness* 2(3), 250-286. doi.: 10.1080/19345740902979371 ¹
- Di Stasio, M., Savage, R., & Abrami, P. C. (2012). A follow-up study of the ABRACADABRA web-based literacy intervention in grade 1. *Journal of Research in Reading*, 35(1), 69-86. doi:10.1111/j.1467-9817.2010.01469.x ¹
- Gu, H., Yao, J., Zhou, L., Cheung, A.C.K., & C. Abrami, P. (2021). A quasi-experimental study of a web-based English literacy tool for Grade 3 students in China. *ECNU Review of Education*, 4(1), 84-107. <https://doi.org/10.1177/2096531120972709>
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¹ randomized control trial or true experiment

² quasi-experiment

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BOOK CHAPTERS

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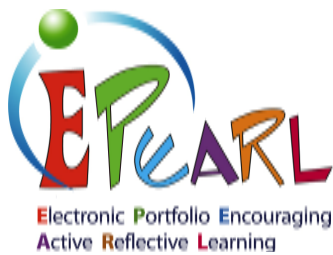
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SUMMARY OF RESEARCH

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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IS-21 Promotional site: <https://www.concordia.ca/research/learning-performance/tools/learning-toolkit/IS-21.html>

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.

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>
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- 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). *An online information literacy course for undergraduates: Some lessons learned*. Presentation at the eEscape: Technology in teaching conference, Concordia University, Montreal, QC.

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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

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