

Evidence-based Educational Software: ABRACADABRA



The State of Learning in Canada

- 20% of primary-school students have to repeat a grade; 70% of those drop out of high school.
- The Canadian average secondary school dropout rate is 12%.
- The main reason given by students for dropping out of school is overwhelmingly school-related (41.7%)

The State of Learning in Canada

- The OECD Program for International Student Assessment (PISA)
- Reading, mathematics, & scientific literacies among 15 year old students in 32 countries.
- 25% of Canadian students performed at **low levels of proficiency in reading, mathematics, and/or science.**

The State of Learning in Canada

- In reading, 27.6% of the Canadian students tested performed at or below Level 2 of five proficiency levels.
- These students encountered basic difficulties in: “Locating straightforward information, making low-level inferences of various types, working out what a well-defined part of a text means, and using some outside knowledge to understand it.”

The State of Learning in Canada

- Such basic difficulties have a significant impact on the economic well being of our society.
- For example, a **one percent** increase in the literacy rate of Canadians will drive a sustainable **\$18.4 billion** growth in Gross Domestic Product *annually* (Statistics Canada, 2004).

The State of Learning in Canada

- In 2001, 57% of Aboriginal people between the ages of 20 and 24 had at least completed high school, a steady increase from 38% in 1981.
- Still, the proportion of young Aboriginal adults who had not completed high school was more than 2.5 times higher than among the non-Aboriginal population.

The State of e-Learning (in Canada): Problems

- Great promise; e-learning policies exist in every Canadian province & territory
- Limited evidence of the effectiveness of educational technology in schools (Ungerleider & Burns; Dynarski et al.)
- Limited evidence of wide-scale technology integration in the curriculum

The State of e-Learning (in Canada): Solutions

Educational Goals:

- Address an essential educational competency in an impactful way.

Design Goals:

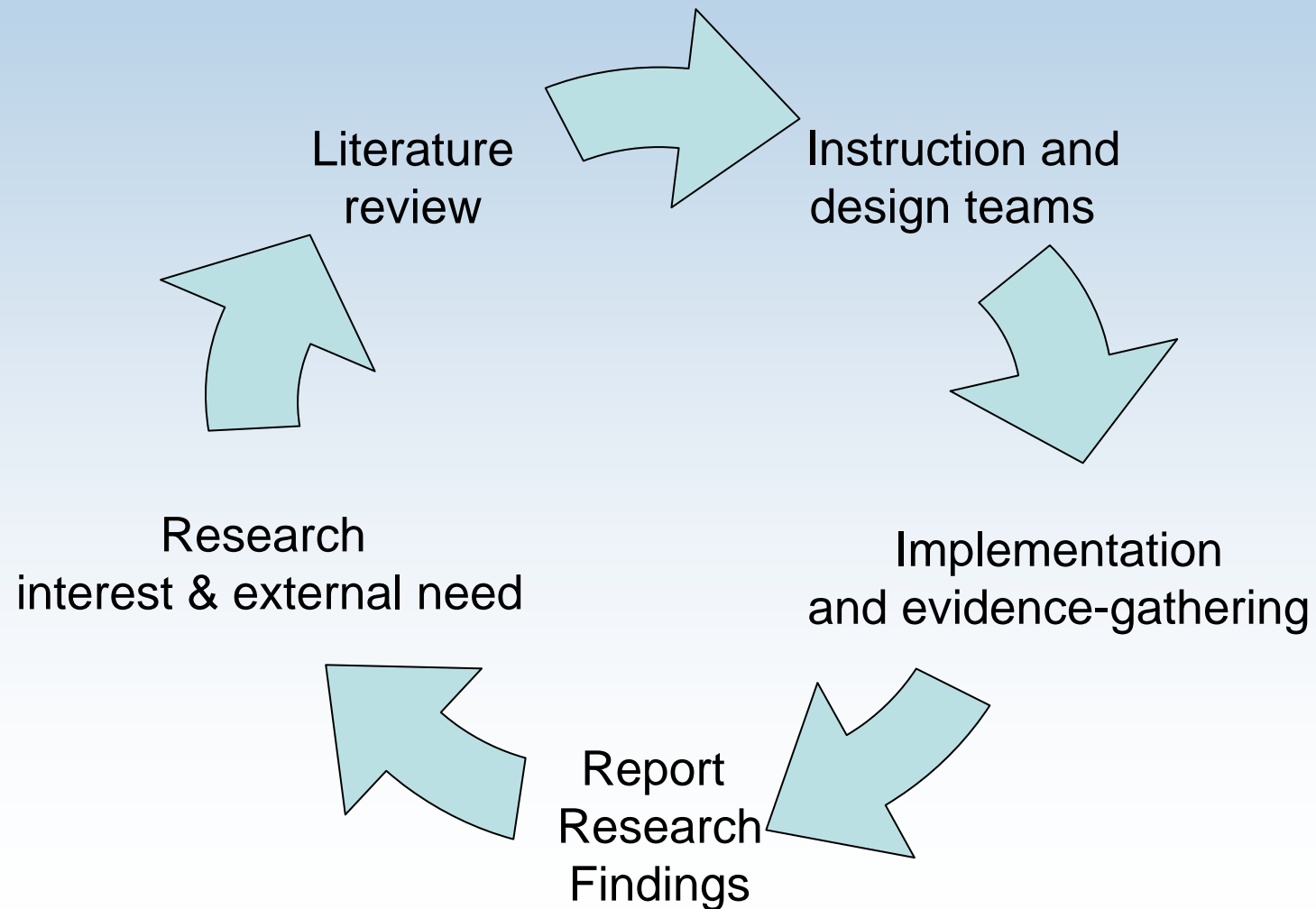
- Insure the tool meets multiple criteria-- ethical, equitable & inclusive; theoretically sound; effective; cost efficient; flexible, modular and adaptable; scalable & sustainable; improvable (serves as a tool for research)



ABRACADABRA:
A web-based reading program
<http://grover.concordia.ca/abra/>

Available **without charge**

How can technology and research affect learning and performance?



Research findings and reviews are the basis of software design

National Reading Panel (2000) & Other Reviews

Four Key Skills and 32 Related Sub-skills:

- Alphabetics/phonemic awareness
- Fluency/automaticity
- Comprehension/understanding
- Written & spoken expression

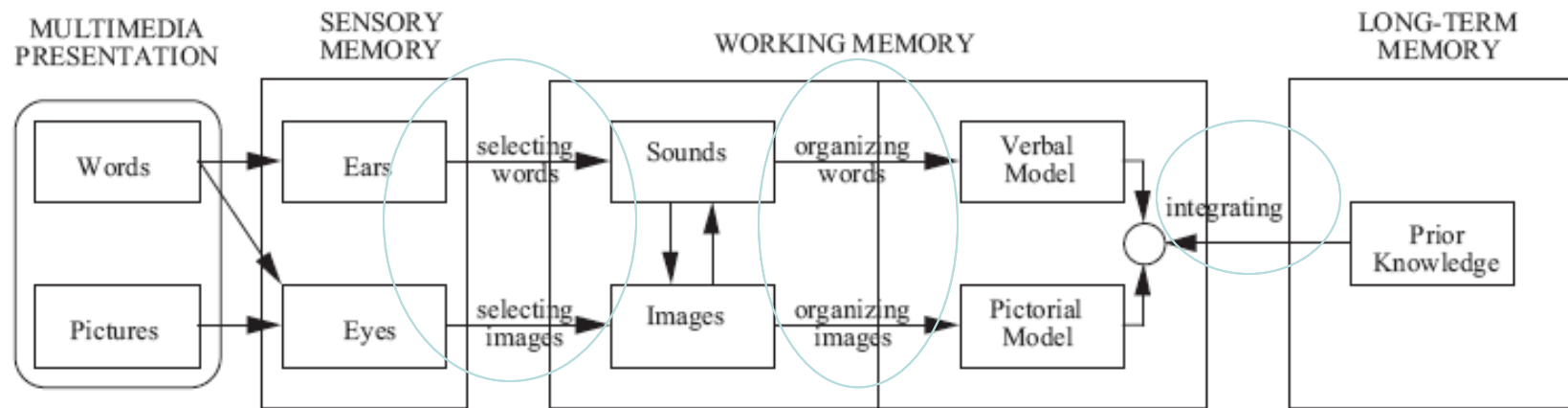
Pan-Canadian Advisory Board

- Researchers & Educators

Research findings and reviews are the basis of software design

Skill Area	Comprehension							
Sub-Skill	Story Elements	Comprehension Monitor	Sequencing	Prediction	Story Response	Summarizing	Vocabulary	Vocabulary ESL
ACTIVITY TITLE	Who, Where and What Happened?	Find the Word that Doesn't Belong	Place These Events in Order	What Happened Next	What do You Think?	Summarizing		
Story Titles								
Bean Sprouts		X	X				X	X
Billy Goats	X	X	X	X	X	X	X	X
Darryl	X	X			X		X	X
Dove and Ant		X	X	X	X	X	X	X
Feelings					X		X	X
Frogs and Well	X	X	X	X	X	X	X	X
Henny-Penny	X	X	X	X	X	X	X	X
I Can Move							X	X
Open My Eyes					X		X	X
Red Hen	X	X	X	X	X	X	X	X
Waterfall	X		X	X	X	X	X	X
Canadian Wild Animals	Independent Picture Books							
Counting to Ten								
My Town								
Where Am I								
The Fruit Family								
The Four Seasons								

Figure 2
Cognitive Theory of Multimedia Learning



Note. Reprinted from "Cognitive Constraints on Multimedia Learning: When Presenting More Material Results in Less Understanding," R. E. Mayer, H. Heiser, & S. Lonn, 2001, *Journal of Educational Psychology*, 93, Figure 2, p. 190. Copyright 2001 by the American Psychological Association.

Sensory memory—brief storage of sounds and images.

Working memory—the learner **selects** relevant sounds and images for further processing. Also in working memory, The learner **organizes** some of the sounds and some of the images into coherent verbal and visual models.

Long-term memory—activate prior knowledge to be **integrated** with the models in working memory and stores the resulting knowledge in long-term memory.

Motivational Sciences

- Key concepts for learners:
engagement, perceived control, self-efficacy, success expectations, & self-regulation
- Key concepts for teachers-expectancy theory as one basis of teacher professional development:
 - Success expectations
 - Value of outcomes
 - Cost of implementation
- Key concept for scaffolding--Just-in-time multimedia support

ABRACADABRA is:

- A web-based application (now uses school portals)
- Modular - instruction (stories and activities), Professional Development, Assessment, Communication and Parent
- Flexible - no required path, customizable for different provinces, particular individual needs, single or multiple student use, classroom/lab, at-home, etc.
- Pedagogically sound and visually engaging
- Linked with others tools in the Learning Toolkit—
ePEARL & ISIS-21

Instructional heart

Activities



Stories

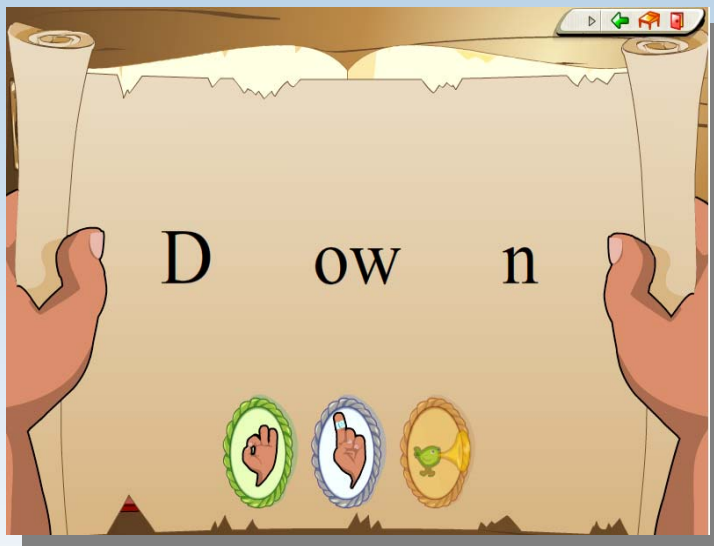


Choice of skill type OR story

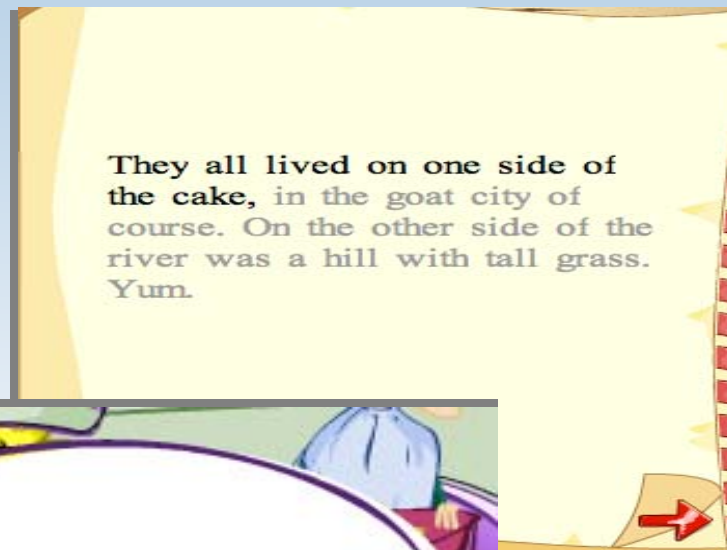
- 32 Activities
- 17 Linked Stories
- 13 students' stories

Auto-instruction for students in how to complete activities.

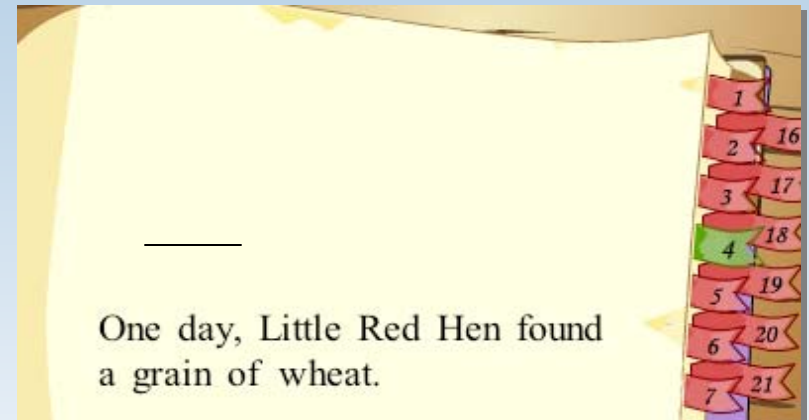
Built-in scaffolding and support



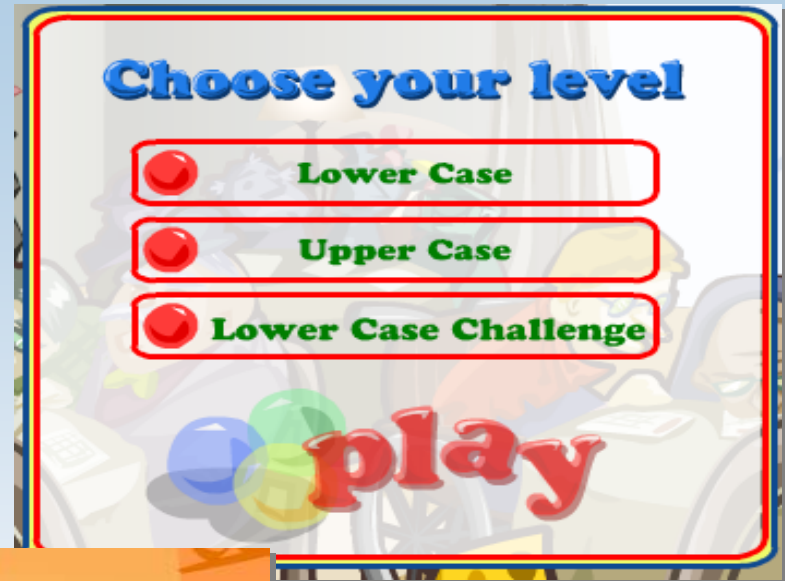
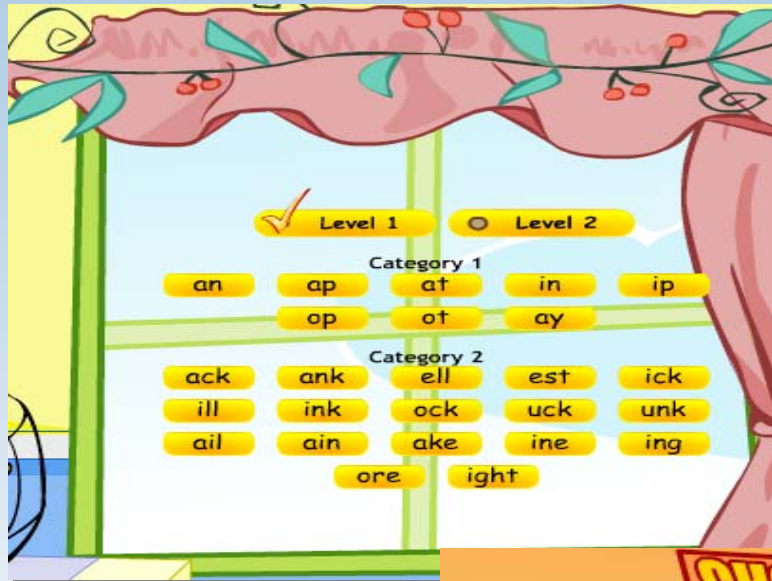
Visual and
audio support



Children can read books, get help with pronunciation, or be read to by the computer.



Multiple points of entry









An area for teachers



A Balanced Reading Approach for CANadians Designed to Achieve Best Results for All

Welcome to the teacher zone

<p>Stories</p>  <p>For your convenience, find ABRACADABRA'S stories accessible by levels of difficulty, genre, and themes.</p>	<p>Skills</p>  <p>As a balanced reading programme we use authentic texts to learn and practice skills necessary for reading development.</p>	<p>Printable Resources</p>  <p>Based on ABRACADABRA's stories and skills, find printable, ready-to-use items that can supplement or extend your lessons.</p>
<p>ELA Best Practices</p>  <p>Find activities related to the facets of English Language Arts; ie, reading, writing, listening, and speaking. Also, videos and tips that can help teachers hone their craft are found here.</p>	<p>Assessment ⓘ</p>  <p>Tools that can help teachers evaluate students' activity when they use the computers are available. This information is important to devise instruction that is relevant for each student.</p>	<p>Communication ⓘ</p>  <p>Share ideas with colleagues or ask questions of ABRACADABRA's Instruction and Design team.</p>

Videos show how teachers use ABRACADABRA with their classes

ABRA Introduction



An introduction to ABRACADABRA

1. Why does ABRACADABRA advocate a "balanced" reading approach?
2. How do alphabetics, fluency, comprehension, and writing assist in literacy development?
3. How does research affect the development of ABRACADABRA?

Whole Class Instruction



This video clip addresses these questions:

1. How can I use ABRACADABRA with other teaching techniques?
2. What should I do when faced with a problem using technology?
3. What can I do when each student is actively engaged with the software?

Lab Instruction



This video clip addresses these questions:

1. How can I determine which setting is best to use computers?
2. How can I teach ELA and use ABRACADABRA effectively?
3. How does ABRACADABRA help to meet the individual needs of students?

Learning Centre















This video clip addresses these questions:

1. What should I do before using centres in my classroom?
2. How can teaching a classroom protocol assist classroom management?
3. What are some of the benefits of using ABRACADABRA?

Ready-to-use printable resources

Name: _____

Write the number of syllables you hear in each word.











 Example Cherries: 2	 Strawberry: _____	 Lemons: _____
 Bananas: _____	 Pineapple: _____	 Grapes: _____
 Coconut: _____	 Pear: _____	 Avocado: _____
 Apple: _____	 Tomato: _____	 Watermelon: _____

Name: _____ Word Spelling - Level 3

Short Vowel Sounds

Look at each picture. Spell each word. Find and circle them in the puzzle.
Hint: The words are across and down.




G	Z	P	N	E	T	R	T
A	Q	R	A	T	E	Z	U
S	U	D	S	H	N	D	B
K	A	C	U	P	Z	O	W
I	B	E	D	I	K	G	X
S	D	W	I	G	I	Q	C
H	O	I	D	K	B	O	X
Z	I	P	G	M	A	U	L




	— — —		— — —
	— — —		— — —
	— — —		— — —
	— — —		— — —
	— — —		— — —




Name: _____ Story Sequencing - Level 1

Darryll Don't Dawdle

Look at the pictures in each row. Based on the story, decide what happened first, next and last. Put the numbers 1, 2, and 3 on the lines below them to show in what order they took place.

A.   

B.   

C.   

Name: _____

What did the dog, the pig and the cow do when the Little Red Hen did not share her bread? Draw your answer.



Write your sentence here.

ABRA captures and reports student learning activity

(Individual remediation, re-teaching, & professional development)

Basic Decoding

49 min.
time spent

3
num. sessions

Partners

Lindsay Bernath, Vanitha Pillay, Benoit Danis, Erin Comaskey, Gia Deleveaux

Stories

The Little Red Hen, How a Bean Sprouts, Darryl! Don't Dawdle

Sound Identification

	level 1	level 2	level 3	level 4	level 5	level 6	level 7
Correct	1			5	1		
Help					1		

error report

Image Identification

	level 1	level 2	level 3	level 4	level 5	level 6	level 7
Correct	1			3			
Incorrect				2	2		

error report

Answer	Student Answer
black	braid
crop	spot
test	river
gold	shelf

ABRACADABRA's Body of Research

- Prototype (BLTK) built in 1998
- ABRACADABRA in 2002 (usability testing)
- Pilot Study 2004
- Larger study 2005-2006 1st Grade
- Small Kindergarten Study 2005-2006
- Classroom Integration 2006-2007
- Longitudinal pan-Canadian study 2007- 2009
- Australia trials 2007-2010
- Scalability & sustainability research 2009--??

Research Design Standards

- Scientific valid and comprehensive measures
- Observations and implementation fidelity checks
- Longitudinal investigations with delayed post-testing
- Experimental and quasi-experimental designs

Mean Effect Sizes at Post-Test and Delayed Post-Test
In Comparison With Torgesen's (2005) Findings.

Measures	Torgesen's Mean ES (Pre-test to Post-test)	ABRA Mean ES (Pre-test to Post-test)	ABRA Mean ES (Delayed post-test)
Blending Words	.30	.65	.27
Elision	NA	.34	.16
Reading Fluency	.19	-.11	.17
Word Attack	NA	.23	.10
Reading Comprehension	.19	.30	-.03

Future Research & Development

- Special needs students
- Parental support and home study
- Pre-service teacher education
- French adaptation and second language learners
- Remedial instruction & adult education
- Current uses of LTK: Quebec, Manitoba, Alberta, BC, Australia, & Portugal

ABRA Demo





Thank you!