

Using Online Resources to Improve Literacy

The definition of literacy varies from individual to individual: my 14-year-old son said it was “the ability to write”; my engineer husband said “the ability to read”; and the American government offers at least two different definitions:

In the Reading First section of the No Child Left Behind Act of 2001, reading is considered to mean “a complex system of deriving meaning from print that requires all of the following: (a) The skills and knowledge to understand how phonemes, or speech sounds, are connected to print; (b) The ability to decode unfamiliar words; (c) The ability to read fluently; (d) Sufficient background information and vocabulary to foster reading comprehension; (e) The development of appropriate active strategies to construct meaning from print; and (f) The development and maintenance of a motivation to read.”

The Workforce Investment Act of 1998 and the National Literacy Act of 1991 define literacy as “an individual’s ability to read, write, speak in English, compute and solve problems at levels of proficiency necessary to function on the job, in the family of the individual and in society.” This is a broader view of literacy than just an individual’s ability to read, which seems to be the more traditional concept of literacy. (From The National Institute For Literacy http://www.nifl.gov/nifl/facts/reading_facts.html)

The definition may be specific to the area in which you work, your local governing board, or your current legislation. For the organizing principles of this article, I used the five components of literacy as described by the 2000 National Reading Panel.

- Phonemic Awareness
- Phonics
- Fluency
- Vocabulary Development
- Comprehension

You will find multiple resources, activities, or tools for each component. As with most tools, *how* Web resources are used makes the difference between powerful learning experiences and busy work. As you examine resources, pause and think about your students, your classroom, and your areas of need. Determine if the resources are best used as a teaching prop that could demonstrate, illustrate, or motivate a lesson or concept. Other resources may lend themselves to the student learning center use and are sufficiently well-designed to encourage independent use, focused enough not to distract from the “work to be done,” and appropriate in their reinforcement of responses.

You’ll find that some resources work well as suggestions for “homework,” while other resources may be great for fostering group thinking and problem solving. Some of these group work settings may include a “knowledgeable leader” (such as a teacher, buddy reader, or peer coach), while others may be motivations for reading that prompt action away from the computer.

Phonemic Awareness

According to the **Partnership for Reading** http://www.nifl.gov/partnership_forreading/index.html, phonemic awareness is the ability to notice, think about, and work with the individual sounds in spoken words. Teaching students phonemic awareness includes working with students

to hear, identify, and manipulate the sounds and their letters. These are extremely auditory and participatory learning experiences. Because the sounds are key to phonemic awareness, it is important to find Web sites with clear sound; such Web sites are becoming more common, but this area is still developing.

Even with today’s limitations, there are a couple of really focused sites where students can practice phonemic awareness. The BBC’s **Crankophone** <http://www.bbc.co.uk/schools/wordsandpictures/cvc/crank/index.shtml> is an example of an online activity where students practice listening and distinguishing the sounds of vowels in the medial position in three letter words. This “game” provides students with a listening experience that can be repeated over and over, even while the teacher is busy. The sound is clear, although there is some British accent to it. There are many other games and activities on the BBC Words and Pictures site, so be sure to explore further.

From Cognitive Concepts, **GameGoo** <http://www.cogcon.com/gamegoo/goeyhome.html> has many excellent online activities for several literacy components. For phonemic awareness, try Paw Park (the Sassy Seals episode) and Alien Scavenger Hunt (especially the Space Trash episode). PBS’s **Between the Lions** <http://pbskids.org/lions/> is a literacy gold mine that has great resources and games including Fuzzy Ears and Pounce. If you aren’t yet using this terrific video series, check it out!

More Phonemic Awareness Resources

Phonological Awareness Literacy Screening (PALS)

<http://pals.edschool.virginia.edu/activities/index.cfm>

TeachersPlanet

<http://www.teachersplanet.com/subjects/pa.shtml>

AlphaBites

<http://www.alphabet-soup.net/alphabite.html>

ProTeacher

<http://www.proteacher.com/070000.shtml>

Phonics

According to the National Institute For Literacy, phonics includes the relationships between the letters (graphemes) of written language and the individual sounds (phonemes) of spoken language. There is an abundance of online printable worksheets for phonics. These are easy to find and almost too numerous to list. But keep in mind that the best online activities allow teachers to select the sounds or letters for students to practice. And watch for activities that do not distract from the task with extreme graphics.

One recommended Web site that is focused on printable tools and resources is **Reading A-Z** <http://www.readinga-z.com>. It offers a wide variety of leveled readers, decodable books, alphabet resources, and other resources. Some of these resources are available through a paid subscription only; however, many are available for free, and all are worthy of your attention. There are in-depth lesson plans with letter cards, picture cards, decodable printable books (as many as you need of each), and more. Some books even have running record forms ready to use. As students progress into reading, there are hundreds of books here to

print for students, and they are correlated to Reading Recovery, Fountas & Pinnell, and DRA levels. You'll also find great teacher support beginning with the phonemic awareness level.

Another terrific phonics resource that offers interactive, well designed books is **Starfall** www.starfall.com. This Web site offers lots of support for beginner readers, and copies of the books, worksheets, and student certificates can be ordered free of charge. Students can read the words by themselves, or click on any word and the computer will "sound out" the word phoneme by phoneme, highlighting the graphemes as it goes along. This Web site is really a precious gift for emergent readers and their teachers!

Additional Phonics Resources

Clifford's Sound Match (beginning sound match)
<http://teacher.scholastic.com/clifford1/flash/phonics/index.htm>

BBC's Digby Mole (beginning sounds, end sounds, rhymes)
<http://www.bbc.co.uk/schools/iaac/words/dgi.shtml>

Marvin Morrison's Word Puzzles (for older readers)
<http://www.soundpuzzle.com/index.html>

Fluency

Fluency is the ability to read accurately and quickly, recognize words, and comprehend what is read, all simultaneously. We often teach fluency by providing models of fluent reading and through repeated reading with guidance. The Internet does not yet provide feedback on oral reading skills or give assistance with fluency through games, drills, or activities. But, the Internet does offer a wide variety of things to read, in a variety of formats and genres.

Reading Material Online

MysteryNet's Kids Mysteries
<http://kids.mysterynet.com/>

Poetry4Kids
<http://www.poetry4kids.com/>

C.J. Heck's Poetry for Children
<http://www.barkingspiderspoetry.com/>

iEARN: Folk Tales from Around the World
<http://www.nsc.ru/folk/folktale.htm>

Sports Illustrated for Kids
<http://www.sikids.com/>

A Girl's World
<http://www.agirlsworld.com/>

A great way to work on reading fluency is with Readers Theatre, where students read with expression, inflection, and feeling. The repeated reading of the written work to improve performance brings gains in fluency and comprehension.

The Electronic Classroom's Readers Theatre
http://www.readingonline.org/electronic/elec_index.asp?HREF=carrick/index.html

Aaron Shepard's Reader's Theatre
<http://www.aaronshp.com/rt/index.html>

Lyric Sites

Students can improve their reading fluency by using lyrics. When I first started teaching, I used closed captioning on the television (with the sound off) to encourage older students to read. The speed of the dialogue was sometimes fast and furious and, if they were interested in the program, they would work hard to follow along. This is still a good technique. You can also use song lyrics. You want to choose the songs and lyrics carefully, but it can be fun to do a sing-along with written lyrics.

KIDiddles Classic Children's Songs and Folk Songs
<http://www.kididdles.com/museum/index.html>

Flying Pigs Campfire Songbook, Volume 3
http://www.argonet.co.uk/users/flying_pigs/frames.html

National Institute of Environmental Health Sciences: Sing-Along Lyrics
<http://www.niehs.nih.gov/kids/music.htm>

Student News Sites

To practice fluency, students can use kid-friendly news sites to gather information and then take turns "delivering the news." They can practice for a "week in review" news program, which provides more opportunities for practice. **CAUTION!** These sites have appropriate resources for students but, as with all Web sites, they should be pre-screened by the teacher.

Student News Net
<http://www.studentnewsnet.com/>

CNN Student News
<http://fyi.cnn.com/fyi/>

The New York Times Learning Network
<http://www.nytimes.com/learning/>

Scholastic News for Kids (elementary ages)
<http://teacher.scholastic.com/scholasticnews/>

Time for Kids
<http://www.timeforkids.com/TFK/index.html>

Online Audio Books and Stories

Online books and stories can provide excellent models of fluent reading. Look for clear narration and interesting content or storyline. Everyone enjoys being read to, especially a book that is well-read and well-felt. The one advantage of an online audio book is that students can listen to them from any Internet-connected computer at any time...even from home!

Web-Pop (offers online books and audio stories)
<http://www.web-pop.com/bookpopchooser.html>

Light Up Your Brain
<http://www.lightupyourbrain.com/stories.html>

Classic Fairy Tales (and some new ones)
<http://www.classicfairytales.com/en/>

Alice in Wonderland Online Audio Book
<http://wiredforbooks.org/alice/>

Vocabulary Development

Both oral vocabulary (the words we use in speaking or understand when listening) and reading vocabulary (the words we understand in print) are important in reading. Without sufficient vocabulary advancement, reading is tedious. Research shows that reading aloud to students, no matter what grade level, is a good way to encourage vocabulary development. In addition, students who read extensively on their own are more likely to develop rich vocabularies.

It is important to teach both individual words as well as word-learning strategies. Vocabulary development is more than lists of words to memorize. Playing with words (such as puzzles and word games) will encourage vocabulary growth. Reading aloud books that have vocabulary and reading levels that challenge your students can give them words in context and provide intrinsic motivation.

Vocabulary Development Resources

Education Place: Fake Out
<http://www.eduplace.com/fakeout/>

Education Place: Wacky Web Tales
<http://www.eduplace.com/tales/index.html>

Kid Crosswords and Other Puzzles
<http://www.kidcrosswords.com>

Scholastic: Annie's Rhyme Time

<http://teacher.scholastic.com/annie/index.asp>

Merriam Webster's Word Central (grades 4-8 and up)

<http://www.wordcentral.com/>

Vocabulary University

<http://www.vocabulary.com>

Word Play: Fun with Words

<http://www.wolinskyweb.com/word.htm>

Comprehension

Comprehension is the real reason for reading; without it, we have decoded a message that is meaningless. Unfortunately, few Web sites offer us access to content with a range of reading levels. One site that provides information with a range of reading and content levels is **Windows to the Universe: Mythology** <http://www.windows.ucar.edu/tour/link=/mythology/mythology.html&edu=elem>, which offers beginner, intermediate, and advanced levels. This is a spectacular feature, as all students can start at the beginner level and get familiar with the content and vocabulary. Then they can use the other levels (this can be a reading or content adjustment) by simply clicking the button on the top of the first screen. Hopefully, we will see more online resources with such a range of adaptation to a wide variety of levels.

Specific strategies for encouraging and teaching comprehension include using graphic organizers, questions (both asking/writing questions and answering questions), and summarizing. Graphic organizers can help students focus on details, isolate events and sequences, compare and contrast, and more. There is a wide variety of electronic or printable graphic organizers available online.

Graphic Organizers

Learning Resources

<http://www.eduscapes.com/tap/topic73.htm>

GO Index

<http://www.graphic.org/goindex.html>

SCORE

<http://www.sdcoe.k12.ca.us/score/actbank/torganiz.htm>

NCREL

<http://www.ncrel.org/sdrs/areas/issues/students/learning/lr1grorg.htm>

Write Design Online

<http://www.writedesignonline.com/organizers/>

Printable PDF Graphic Organizers

Education Place (English and Spanish)

<http://www.eduplace.com/graphicorganizer/>

Curry School of Education at the University of Virginia

<http://curry.edschool.virginia.edu/go/edis771/notes/graphicorganizers/graphic/>

TeacherVision

<http://www.teachervision.com/lesson-plans/lesson-6293.html?s2&detoured=1>

Region 15 Curriculum Resources (English and Spanish)

<http://www.region15.org/curriculum/graphicorg.html>

4 Blocks Literacy Framework

http://www.k111.k12.il.us/lafayette/fourblocks/graphic_organizers.htm

Illinois District 97

<http://www.op97.k12.il.us/instruct/IArts/Civil%20War/forms.html>

Electronic Graphic Organizer Makers

Teachology

http://teachers.teach-nology.com/web_tools/graphic_org/

Software

Inspiration: Free Trial Download

www.Inspiration.com

WebQuests

These are special inquiry-oriented activities where students draw from the Internet for most of the needed information. **WebQuests** <http://webquest.sdsu.edu/> are designed to help move students to the analysis, synthesis, and evaluation levels of thinking about what they read. At the site, explore the matrix of examples, as well as the training materials section that provides everything from templates to complete workshops about WebQuests.

A Closing Note to All Teachers

Environment, student motivation, engagement, discussion, and a desire to read are significant factors in encouraging literacy. Creating lifelong readers is essential. This is not just about passing a test, it is about being capable and eager to keep reading to learn and grow. Someone said recently, "An 'at-risk' student is any student who leaves school before or after graduation with little possibility of continuing learning." Being literate and striving to learn are keys to the future. And literacy and the love of learning seem to be closely linked.

All teachers are teachers of reading or literacy coaches. We are role models and examples; we may be the only literate adults some students know. When we share with our students our love of reading, our decision to spend "free time" reading, our discovery of new vocabulary, and our zest for continuing to learn, we encourage our students to do the same.

My students once saw me start to cry when reading *Charlotte's Web* aloud in class. For many students this was the first time they had ever even considered that a book could move them emotionally. Sharing the engagement I had with books and reading has made a difference with my students, and it can positively affect your students, too.

Teaching today is a journey with the latest information, new research, and new tools and resources. The Internet provides access to so much without enrolling in courses or going to after-school professional development. Access to research, online tools, and ideas (lesson plans and more) are not far from any teacher with online access. I hope you will continue to explore more about literacy by visiting these Web sites.

Put Reading First: Research and Practice

http://www.nifl.gov/partnershipforreading/publications/reading_first1.html

International Reading Association:

National Reading Panel Report

<http://www.reading.org/advocacy/nrp/background.html>

International Reading Association: ReadingOnline

<http://www.readingonline.org/>

Learning to Read

<http://toread.com/>

Reading Rockets

<http://www.readingrockets.org/>

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Patterns to Parabolas

Online Tools for Algebraic Thinking 

Art is the imposing of a pattern on experience, and our aesthetic enjoyment is recognition of the pattern.

--Alfred North Whitehead, 1943

The British philosopher Alfred Whitehead might have continued this quote by adding that algebraic thinking is the understanding of the pattern. For many people, algebra is synonymous with variables, equations, and abstract calculations. And yet, the type of thinking that is truly at the heart of algebra is the familiar process of recognizing and describing patterns.

The *Principles and Standards for School Mathematics* from the National Council of Teachers of Mathematics (NCTM) amplifies this point. The Standards urge educators at all grade levels to use patterns as an environment for exploring algebraic ideas. According to the Standards, “By viewing algebra as a strand in the curriculum from pre-kindergarten on, teachers can help students build a solid foundation of understanding and experience...”

Fortunately, the World Wide Web offers dozens of resources that can help build algebraic thinking. In fact, the Web is full of simulations and interactive sites that can turn any computer into a “patterns laboratory.” Here is a tour of some of the best online tools for developing algebraic thinking in even the youngest learners. The materials are generally presented according to grade level, starting with those that are most appropriate for preschoolers and ending with those that are best suited to high school students.

What Comes Next?

Children love patterns. Whether it is the rhyming pattern of a Dr. Seuss story or the colorful pattern formed by a string of beads, children have an innate ability to recognize things that repeat. Part of the pleasure in exploring patterns is predicting what comes next. Show a child a row of alternating red and blue blocks and she will be eager to find a block that extends the pattern.

The idea of continuing a pattern is one of the fundamental ideas in algebra, and many sites provide interactive tools that give students a chance to experiment with this skill.

Reasoning: Green Eggs and Ham

Preschoolers will enjoy completing the rows of Dr. Seuss characters. Challenge them to draw their own patterns after exploring the site.

<http://www.seussville.com/seussville/university/reasoning/games/>

Crack Hacker's Safe

Designed for older kids, this game combines shape patterns, color patterns, and number patterns. Completing the sequences is an exercise in logic as well as pattern recognition.

http://pbskids.org/cyberchase/webisode_1/web_1game.html

Virtual Manipulative: Color Patterns

This interactive tool generates patterns of colored beads. Have students complete the patterns and then describe them in their own words.

http://matti.usu.edu/nlvm/nav/frames_asid_184_g_1_t_1.html

Patterns in Math: People Patterns

Choose a level of play—beginner, intermediate, or advanced—and then see if you can extend the row of smartly dressed people.

Have students work in small groups to tackle some of the trickier patterns. Then ask them to share their reasoning process with the entire class.

<http://www.learner.org/teacherslab/math/patterns/people/>

A Pattern-Making Tool

NCTM has designed a number of *applets* (interactive online tools) to help teachers implement the national math standards. One of the best tools is the Making Patterns applet. Designed for elementary school students, the applet is easy to use yet extremely powerful. Students begin by choosing a “pattern unit,” such as a blue square followed by a red square. Clicking the Play button repeats the pattern unit throughout a 10-by-10 grid.

Students in the primary grades can simply experiment with the tool to see what types of patterns they can create. The results are often surprising! Challenge older students to create specific types of patterns and explain their work. For example, you might ask them to predict which pattern units result in vertical stripes and which pattern units result in diagonal stripes. The discussion questions at the site offer additional ideas for in-depth investigations. Along the way, students will use number sense, develop fundamental algebra skills, and get a terrific visualization workout!

Making Patterns

<http://standards.nctm.org/document/eexamples/chap4/4.1/index.htm>

Patterns You Can Hear

Humans interpret patterns not just by sight but also by sound. The Cyber-Pattern Player makes it easy for students to cook up their own rhythmic patterns. Have primary-age students make a pattern and then reproduce it by clapping. With older students, have them listen to a pattern that you create and then invite them to reconstruct it. In either case, the Cyber-Pattern Player is an excellent way to inspire auditory learners.

Cyber-Pattern Player

<http://pbskids.org/cyberchase/games/patterns/patterns.html>

Pattern Blocks

Pattern blocks have long been a part of the mathematics classroom. Recent online versions offer several advantages, including unlimited supplies of each block and nothing spilled on the floor!

You can use pattern blocks to move students toward some of the more formal ideas of algebra. Start by asking students to cover the yellow hexagon with green triangles. How many green triangles are needed? Next ask students how many green triangles are needed to cover two yellow hexagons. Then have them cover three yellow hexagons.

As students work, they can organize their findings in a table that shows the number of hexagons in one column and the number of triangles needed to cover them in another column. Have students describe any patterns that they see in the table. Then ask them to predict the number of triangles that would be needed to cover 5 hexagons, 10 hexagons, or 100 hexagons. Finally, ask them to state a general rule for n hexagons. This is an effective way to move from pattern recognition to the use of variables.

For further practice, students can experiment with different combinations of pattern blocks. For example, ask them to predict

how many red trapezoids would be needed to cover 85 hexagons. Then ask them to write a general rule that tells how many trapezoids would be required to cover n hexagons.

Arcytech: Pattern Blocks

http://www.arcytech.org/java/patterns/patterns_j.shtml

Virtual Manipulative: Pattern Blocks

http://matti.usu.edu/nlvm/nav/frames_asid_171_g_3_t_2.html

Number Crunchers and Function Machines

As students develop skills in analyzing and describing patterns, introduce them to the idea of a function machine. A function machine takes a number, called the *input*, does something to it (such as multiplying it by 2 or adding 7), and returns a new number, called the *output*. You can introduce the idea as a classroom game. First think of a secret rule, such as “subtract 3,” and then ask students to give you input numbers. If a student says “7,” you respond “4.” If another student says “12,” you respond “9.” Continue in this way until students recognize the pattern and can state the rule for the function machine. Not surprisingly, there are several interactive, online tools that automate this process.

Number Cruncher

This is an excellent function machine for beginners. As students provide input values, the function machine not only shows the output but also creates a two-column table. This helps students learn how to construct their own tables of values, and it makes it a bit easier to identify underlying patterns. When students think they know the machine’s rule, they can type it in and check their answer.

<http://www.shodor.org/interactivate/activities/numbercruncher/index.html>

Function Machine

This tool is similar to the Number Cruncher, but students need to create their own tables to keep track of inputs and outputs.

<http://www.shodor.org/interactivate/activities/fm/>

Ambweb Function Machine

Here is a deluxe function machine! You can choose the type of operation that you want the function to be based on, or you can click the Random button for a true challenge. Students will enjoy the machine’s slick graphics and sound effects, but the deepest learning comes in follow-up discussions. Ask students to share their strategies for recognizing the number patterns and identifying the machine’s rule. Then have them state the rules using algebraic expressions.

<http://ambleweb.digitalbrain.com/ambleweb/ambleweb/ambleweb/mentalmaths/functionmachines.html>

Balance Tools

The idea of equivalence is central to algebra. Equations, which state that two quantities are equal, are based on the notion of equivalence. Balance scales are a familiar model for introducing equivalence, and many common-sense properties of balance scales translate into key algebraic properties. For example, if you add a quantity to one side of a scale, you must also add the same quantity to the other side if you wish to preserve the balance. The same rule applies when adding a quantity to one side of an equation.

Balance-scale applets give students hands-on experience with equivalence. The two sites listed let students use a balance scale to compare the weights of a variety of shapes. Ask students to write down as many equivalences as they can find, then have them read these observations aloud. For example, “three squares are equivalent to one circle.” Experimenting with these tools will provide a strong foundation for later work with purely algebraic equations.

Shape Pan Balance

<http://illuminations.nctm.org/mathlets/shapebalance/index.html>

Balance Applet

<http://www.mste.uiuc.edu/wofford/balance/>

Coordinate Graphing

Coordinate graphing was revolutionized when graphing calculators first hit the market in the early 1990s. Allowing students to move among equations, tables, and graphs, the calculators made it possible to carry out investigations that would have been cumbersome or impossible just a few years before. However, for all their benefits, graphing calculators can be overly complicated and their price is still beyond the reach of many. The Web has answers to both of these drawbacks. Online graphing tools are generally easy to use and many of them are available for free!

Gizmo: Slope-Intercept Form

Simply drag the sliders and watch the equation change as the graph of the line changes. This dynamic tool makes it easy to explore the underlying patterns that connect a line, its slope, its y -intercept, and its equation.

http://www.exploremath.com/activities/Activity_page.cfm?ActivityID=16

Line Graphing Applet

Here is an applet that lets students drag or rotate a line while they watch the effect on the line’s equation. Before students begin experimenting, give them a list of questions to guide their investigations.

- What do you notice about the equation for any horizontal line?
- What can you say about the equation of a line if it slopes downward from left to right?
- When you rotate a line, which part of its equation stays the same? Which part changes?
- What other patterns do you notice?

http://www.edteach.com/algebra/graph_applet.html

Gizmo: Parabola

High school algebra may be an excursion into the abstract, but that doesn’t mean hands-on tools are no longer needed. Even the most advanced math students will be fascinated by the ease with which they can manipulate this parabola. The applet is a great way to explore the intricate connections between a graph and its equation.

http://www.exploremath.com/activities/Activity_page.cfm?ActivityID=8

Teacher Resources

Check out the following sites for additional online tools and lesson plans.

Rectangle Pattern Challenges

Cynthia Lanus of Rice University developed this lesson plan based on a growing pattern of colored squares. Can you figure out how many squares of each color will appear at the n th stage? The lesson’s Thought Questions are guaranteed to generate interesting class discussions.

<http://math.rice.edu/~lanus/Lessons/Patterns/rect.html>

Traffic Jam

This problem is a classic pattern-seeking activity and a perfect investigation for students who are working in small groups. The Web site includes a student page, teacher notes, and an interactive applet.

<http://mathforum.org/alejandre/frisbie/student.jam.html>

Shodor: Project Interactivate

Project Interactivate has interactive applets for every area of mathematics—including data and statistics, geometry, and number concepts—as well as more than 20 applets related to all levels of algebra. Click the Activities button to see the full list. Then visit the Lessons area for lesson plans that incorporate these interactive tools.

<http://www.shodor.org/master/interactivate/>

ExploreMath

This site is home to dozens of “gizmos.” Geared mainly toward middle school and high school algebra, these interactive tools are well designed and easy to use.

<http://www.exploremath.com/>

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