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## 21st CENTURY TEACHING AND LEARNING

**Fall 2011** • **www.bigdealbook.com**

**Respond and Win!**

See page 41 for details.

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From the 3Rs to the 4Cs

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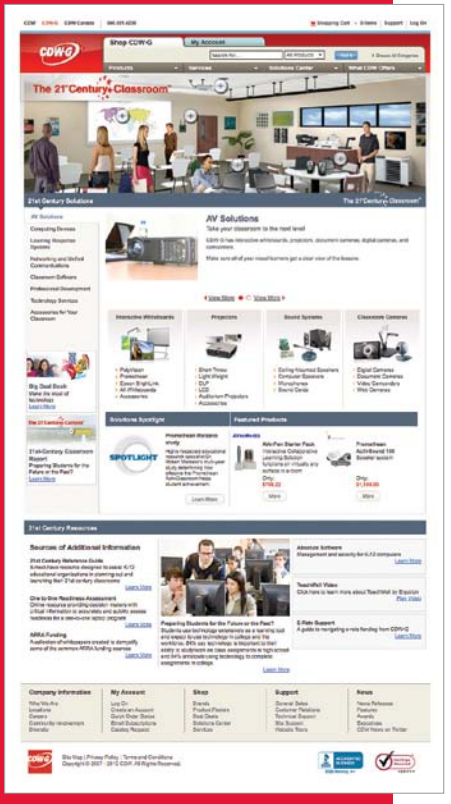


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Welcome to The BIG Deal eBook®

# RESOURCES for 21st CENTURY TEACHING AND LEARNING

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Respond and Win!
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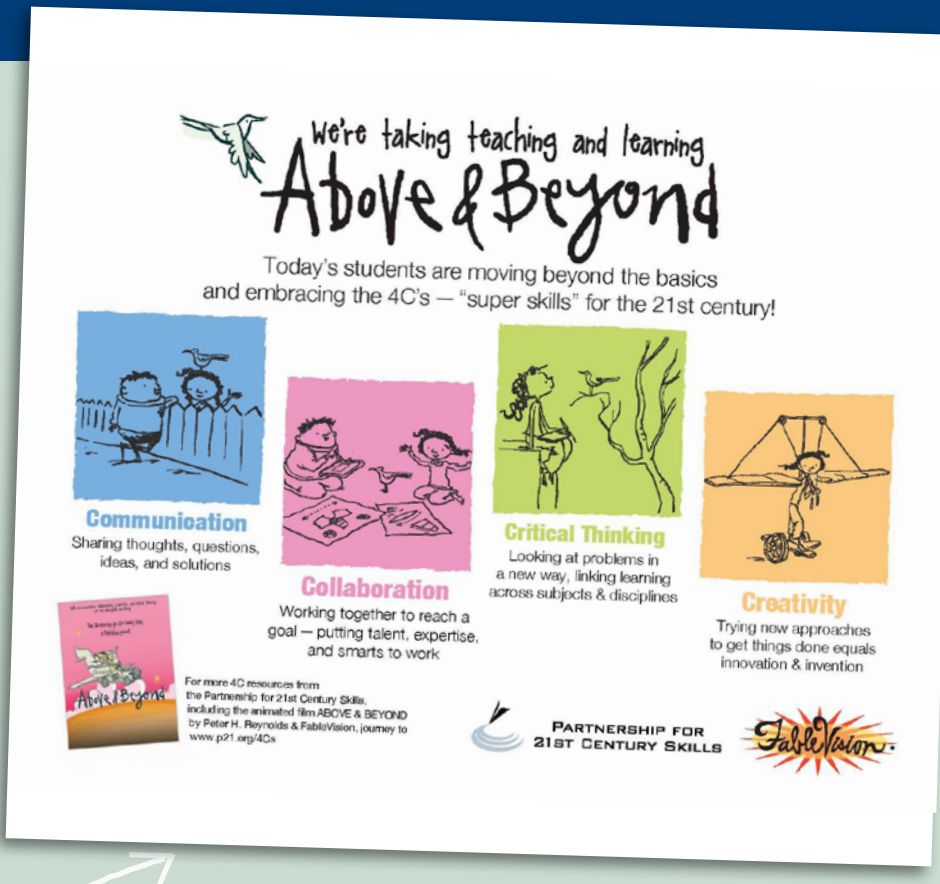
# From the 3Rs to the 4Cs

The **Partnership for 21st Century Skills** (P21) and **FableVision** have produced an original animated film, entitled ***Above & Beyond***, which is designed to spark conversations about the essential innovation skills needed for students to be successful—and the United States to remain economically viable—in an increasingly challenging global economy.

The five-minute animated film tells an allegorical story of how the **4Cs**—**communication**, **collaboration**, **critical thinking** and **creativity**—help students move beyond the foundational 3Rs to acquire the 21st century skills cited by industry as the keys to innovation and invention.


In the film, two schoolchildren compete in the school's engineering contest; one student can't move beyond the boxed kit, while the other is an "out-of-the-box" dreamer and visionary. The students join forces—and use communication, collaboration, critical thinking and creativity to win the contest.




Accompanying the film is an online digital toolkit that includes a *free*, downloadable poster and support resources.

View the animated film and download the *free* 4Cs poster from the P21 website.

**Web: *http://www.p21.org/4Cs***

# Communicating and Sharing Ideas

### Communicate Clearly

- Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts
- Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions
- Use communication for a range of purposes (e.g., to inform, instruct, motivate and persuade)
- Utilize multiple media and technologies and know how to judge their effectiveness *a priori* as well as assess their impact
- Communicate effectively in diverse environments (including multilingual)

*—from Partnership for 21st Century Skills*

## Multiple Means of Communication

### GET A FIX ON IT

• **Collaborize Classroom** is a *free* **online learning platform** that allows teachers to extend **classroom discussions** to a structured and online community. Collaborize Classroom provides four discussion-format choices: students can either agree or disagree with a statement, answer a multiple-choice question, post responses or choose between adding a new response or voting for someone else's response. Detailed **student participation reports** can be used for grading. Download *free* **lesson plans** to jump-start your classroom discussions.

**Web:** ***http://collaborizeclassroom.com/***

• Communication is essential to every area of life. It doesn't matter whether students are in school or out socially. At some point, they'll be using some form of communication. It could be anything from using the telephone or writing emails to giving presentations and writing reports. This **interactive** from the **BBC** helps students to learn **skills for different types of communications** so that they'll be able to communicate easily and confidently. Activities involve talking face-to-face with people at home; talking on the telephone, buying bus or train tickets, going to stores and talking to staff, sending text messages from a mobile device, writing letters or emails, arranging to meet friends and taking part in interviews. Two **modules** help students plan, prepare and deliver **effective presentations**, including tips on getting content, adding pictures and holding attention.

**Web:** ***http://www.bbc.co.uk/keyskills/comms/1.shtml***

**Web:** ***http://www.bbc.co.uk/keyskills/comms/level2/module2/1.shtml*** [**Effective Presentations** (**Level 2**)]

**Web:** ***http://www.bbc.co.uk/keyskills/comms/level3/module3/1.shtml*** [**Effective Presentations** (**Level 3**)]

## SAY IT ANYWAY

• The **act of communicating** involves verbal, nonverbal and paraverbal components. The **verbal** component refers to the content of the message, the choice and arrangement of words. The **nonverbal** component refers to the message sent through body language. The **paraverbal** component refers to how something is said—the tone, pacing and volume of voices. This web page offers ideas to help students understand how these three components are used to send clear, concise messages and to receive and correctly interpret messages sent to them.

**Web:** ***http://www.directionservice.org/cadre/section4.cfm***

• **Nonverbal communication** involves sending and receiving messages in a variety of ways without the use of verbal codes (words). Broadly speaking, there are two basic categories of nonverbal language: **nonverbal messages produced by the body**; **nonverbal messages produced by the broad setting** (time, space, silence). This web page defines nonverbal communication, explains why nonverbal communication is important and describes **cultural differences** in the various modes of nonverbal communication: general appearance and dress, body movement, posture, gestures, facial expressions, eye contact and gaze, touch, smell and sounds (paralanguage).

**Web:** ***http://www.andrews.edu/~tidwell/lead689/NonVerbal.html***

• **Nonverbal communication** causes us to make many judgments and assumptions. **About.com** provides four **activities—Wordless Acting, We Have to Move Now, Stack the Deck** and **Silent Movie**—designed to help students understand how much information is transmitted through nonverbal communication.

**Web:** ***http://homeworktips.about.com/od/mindandbody/a/nonverbal.htm***

• Developed by the **Rio Vista 21st Century Communication Rubric Committee**, this *free*, downloadable **21st Century Communication Rubric** helps teachers evaluate students' **oral** and **written communication skills** as well as their ability to use **digital presentation tools**.

**Web:** ***http://21clearninginua.wikispaces.com/file/view/21st+Century+Communication+Rubric.doc***

# Communicate Clearly

## WRITING: IT'S A PROCESS

• At this site, your students can go **inside the writing process** with the editors and writers of *TIME* magazine—and get **writing tips** at each stage along the way.

**Web:** ***http://www.glencoe.com/sec/literature/time/TIME.html***

• **The Literate Learner** website presents **The InterActive Six Trait Writing Process,** an interdisciplinary approach to teaching and improving student writing based on the **6+1 Traits writing model.** The site provides an **overview of the model** along with **scoring rubrics** for each trait. **Exercises** give both you and your students a chance to read sample writings, rate them and compare their ratings with ratings made by English teachers.

**Web:** ***http://www.literatelearner.com/6traits/page_template6t.php?f=main***

• The resource links on the **University of Missouri**'s **eThemes** website provide information on the **6+1 Writing Traits** as well as **definitions, descriptions, rubrics** and **exercises** to help students become familiar with the **characteristics of good writing.** The site has many **interactive features** that allow students to practice writing and learn how to evaluate the effectiveness of what they've written. The site also has **video clips, prompts, activities** and **examples of writing** at different levels of accomplishment, as well as resources on grammar and text structure.

**Web:** ***http://ethemes.missouri.edu/themes/1283***

• **ReadingLady.com** provides *free*, downloadable **classroom posters** to help you introduce the **six traits of good writing** to your students. The posters are available as both Word and PDF files.

**Web:** ***http://www.readinglady.com/index.php?module=documents&JAS_DocumentManager_op=viewDocument&JAS_Document_id=8***

• **Education Northwest** offers a variety of **generic narrative, expository** and **persuasive writing prompts** to get your students started. You'll also find tips on how your students can write their own prompts. These **self-written prompts** will offer better starting blocks for your students than the generic prompts because they spring from the immediacy of their lives.

**Web:** ***http://educationnorthwest.org/resource/514***

**Attention Web Browsers:** Website addresses do change periodically. If you have difficulty connecting, use a search engine to get an updated address. These sites are recommended by teachers and editors for educational value, but all content and associated links are the domain of the site sponsor.

• **Education Northwest** has also compiled a vast array of *free* **lesson plans** organized around the **six traits of good writing.** Once you've assessed the writing needs of your students, you should be able to narrow the writing areas (traits) that they need to improve. To find a lesson that addresses the needs of your students, search by grade range (1–3, 4–5, 6–8, 9–12) or by trait (Ideas, Organization, Voice, Word Choice, Sentence Fluency, Conventions).

**Web:** ***http://apps.educationnorthwest.org/traits/lessonplans.php***

• **Education Northwest** offers two *free*, downloadable sets of **6+1 Traits Scoring Rubrics**—a 5-Point set for K–2 and 3–12, and a 6-Point set for K–2 and 3–12—as well as **student writing-sample papers**, organized by trait, score and grade level, to help you assess and evaluate your students' writing based on the six traits. The **Beginning Writers' Rubrics**, whether 5- or 6-point, were created to support teachers as their students are starting to write in order to help them learn and build a common vocabulary and establish a vision for good writing, while still developing the skills necessary to write. The 3–12 upper-level rubrics, whether 5- or 6-point, are generally used with late second or third graders on up through higher level education.

**Web:** ***http://educationnorthwest.org/resource/464*** **[rubrics]**

**Web:** ***http://apps.educationnorthwest.org/traits/scoring_examples.php*** **[sample papers]**

## A RECURSIVE JOURNEY

• The **Paradigm Online Writing Assistant** offers tips to take your students through the **writing process**, from choosing a subject to documenting sources. The site also contains information on **types of essays.**

**Web:** ***http://www.powa.org/***

• At the **CanTeach** website, you'll find a list of hundreds of **writing prompts** and **journal topics** that include ***What is* … questions** (What is the meaning of "He laughs best who laughs last"?), ***What if* … questions** (What would happen if you grew taller than trees? How would this change your life?), ***What do you think* … questions** (What do you think *courage* means?), ***I wish* … questions** (I wish there were a law that said … This would be a good law because …)—and many more.

**Web:** ***http://www.canteach.ca/elementary/prompts.html***

• **Role Audience Format Topic** (R.A.F.T.) is a **writing strategy** that helps students understand a topic from **different perspectives**. The R.A.F.T. strategy provides a focused writing assignment and encourages students to analyze the content while assuming different roles and addressing different audiences. The strategy motivates students by allowing for choice and involving them in the topic in a personal way.

**Web:** ***http://olc.spsd.sk.ca/de/pd/instr/strats/raft/*** **[strategy explanation]**

**Web:** ***http://www.learningthroughlistening.org/Classroom-Teaching-Tools/Strategies-and-Activities/Strategies/R-A-F-T-Strategy/349/*** **[strategy instruction]**

• The *free* **text organizers** from **Writing Fun** will help your students navigate the **stages of the writing process**. The texts students create may be factual (true) or literary (imaginary). All the organizers are *freely* downloadable and printable. Students will also find printable **online tips** related to text structures, style and language suited to their audience, grammar and usage—and more—for each type of writing—information report, procedure, recount, explanation, persuasion, discussion; narrative, response, description, poetry; and everyday writing (letter, email, invitation, news).

**Web:** ***http://www.writingfun.com/writingfun2010.html***

• **Expository writing** is an increasingly important skill for elementary, middle and high school students to master. This **interactive Essay Map**, from **ReadWriteThink**, helps students organize their writing online. Using the tool, students can write outlines for **informational**, **definitional** or **descriptive essays**. The map includes space for all elements of the **traditional five-paragraph format**: an introductory statement, three main ideas that students want to discuss or describe, supporting details for each idea and a conclusion that summarizes the main ideas. The tool offers multiple ways to navigate information, including a graphic in the upper-right corner that allows students to move around the map without having to work in a linear fashion. Students can also click the **Review My Map** link and preview what they have written, return to the map for revisions or print the completed map for reference.

**Web:** ***http://readwritethink.org/materials/essaymap/***

• **Step Up to Writing** makes the process of writing an **expository paragraph/composition** simple and easy for your students to remember. In this activity, students become familiar with the three main steps—(1a–green) topic sentence; (2–yellow) reason/detail/fact; (3–red) explanation/example; (1b–green) topic sentence restated. Relating the steps to colors—green, yellow and red—helps students master skills of increasing complexity.

**Web:** ***http://www2.pylusd.k12.ca.us/glk/jlaurich/StepUpToWriting.htm***

• An **I-Search paper** is a personal research paper about a topic that is important to the student. An I-Search paper is usually less formal than a traditional research report. In an I-Search paper, the student relates his or her personal search for information as well as what the student learned about the topic. Many I-Search papers use the structure illustrated in the **framework** described on **Gallaudet University**'s website. Simple, clear **directions** and **explanations** help students create a Search Story that will hook their readers. At the end of the process, students **reflect** on their search, describing the significance of their research experience.

**Web:** ***http://www.gallaudet.edu/clast/tutorial_and_instructional_programs/english_works/writing/research_papers_citations_and_reference/i-search_paper_format_guide.html***

• The **interactive Persuasion Map** on the **ReadWriteThink** site helps students map out their arguments for a **persuasive essay** or **debate**. Students begin by determining their goal or thesis. They then identify three reasons to support their argument and three facts or examples to validate each reason.

**Web:** ***http://www.readwritethink.org/materials/persuasion_map/***

• Letters take many forms and serve a variety of purposes. The **TeacherVision** website gives K–12 students practice with the fine art of **letter writing**. You'll find formatting tips and strategies for teaching your students the basics of different types of letter writing (such as **persuasive, business** and **friendly**) and also plenty of **lesson plans** to put their newfound knowledge into practice. You'll also find letter-writing **rubrics** for **Résumé and Cover Letter** and **Business Letter/Memo**. (**National Letter Writing Week** is celebrated during the second week in **January**.)

**Web:** ***http://www.teachervision.fen.com/letters-and-journals/resource/26369.html#ixzz1T4A4TrpI***

• In this **interactive** from **PBS Kids Go!**, the storybook character ARTHUR helps primary-aged children learn the **parts of a friendly letter, envelope, email, greeting card** and **postcard**. By rolling the cursor over the sample text, children get easy-to-understand explanations of each part of the communication. Once they've learned the different ways to send a note—letter, email, greeting card, postcard—children can practice writing to ARTHUR or their ARTHUR friends in **Letters To ...** , and to their other friends in **Arthur's E-Cards**. (For hints on how to write a letter, students can check out the **Letter Writer Helper**.)

**Web:** ***http://pbskids.org/arthur/games/letterwriter/letter.html***

• This **BrainPOP movie** teaches students how to write a **business letter**. The movie's two characters, Tim and Moby, help students discover what a business letter is and why they need to know how to write one. Students will learn the differences between formal and causal letters. They'll also learn the proper format for a business letter, including what goes at the top and which two addresses they need to include. And they'll learn what goes into the body of a business letter and why it pays to be polite.

**Web:** ***http://www.brainpop.com/english/writing/businessletter/preview.weml***

• In this **interactive online quiz**, your students can practice finding **errors in parts of a friendly letter** written to the storybook character Mr. Henshaw. Students will need to look carefully! The quiz was created by a teacher for the **Quia** website.

**Web:** ***http://www.quia.com/pop/7318.html?AP_rand=653554388***

**Attention Web Browsers:** Website addresses do change periodically. If you have difficulty connecting, use a search engine to get an updated address. These sites are recommended by teachers and editors for educational value, but all content and associated links are the domain of the site sponsor.

• The **software program Writing Reviser** from **SAS Curriculum Pathways** uses artificial intelligence to walk students through the revision process, allowing children who need more practice to get more immediate feedback. One of the boons of Writing Reviser is that it doesn't automatically correct students' work for them; rather it encourages them to rewrite and edit themselves based on suggestions from well-known writers and political figures. For example, Frederick Douglass shows how to avoid fragments and run-ons; Mark Twain demonstrates how to select a variety of verbs; Jack London shows how to vary sentence length; and Abraham Lincoln demonstrates how to choose strong verbs.

**Web:** ***http://www.sascurriculumpathways.com/portal/#/search?searchString=%2522writing%2Breviser%2522&searchSubject=0&searchCategory=***

## A TELLING STORY

• With Native culture bearers as guides, your students can explore the art, heritage and legacy of the **Native American oral tradition**. **Circle of Stories** brings together the oldest and newest forms of communication.

**Web:** ***http://www.pbs.org/circleofstories/***

• **Digital Storytelling** is the practice of using computer-based tools to tell stories. As with traditional storytelling, most digital stories focus on a specific topic and contain a particular **point of view**. However, digital stories usually contain some mixture of computer-based images, text, recorded audio narration, video clips and/or music. The topics that are used in Digital Storytelling range from personal tales to the recounting of historical events, from exploring life in one's community to the search for life in other corners of the universe and, literally, everything in between. A great way to begin learning about Digital Storytelling is by watching the **video introduction to Digital Storytelling** on this site.

**Web:** ***http://digitalstorytelling.coe.uh.edu/***

• ***KIdsWWwrite*** is a nonprofit **Web anthology** developed to publish young authors' work. Its aims are to encourage children to read and write for enjoyment, and to enable children to share and celebrate children's writing. A new issue is published by the **Kalamalka Institute for Working Writers** in British Columbia during the first week of each month. Students can read the latest issue online, where they'll find **stories** and **poems** organized by age range (5–8, 9–12 and 13–16). The site also links to **Sarah's Stars: Kids' Books, Kids' Reviews**, a website with students' reviews of books submitted by publishers and authors.

**Web:** ***http://www.kalwriters.com/KIdsWWWrite/index.html***
[**Web anthology**]

**Web:** ***http://www.kalwriters.com/KIdsWWWrite/reviews.html***
[**Kids' Reviews**]

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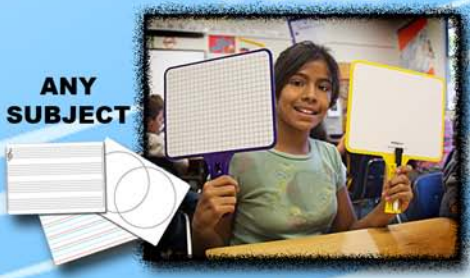

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• Storyteller and collector of folktales Heather Forest shares her wealth of stories on the simple, enchanting **Story Arts** site. Learn how to hone the craft of **storytelling** and then work with your students to improve their **listening** and **speaking skills**, create new stories from their own experiences and retell stories from their cultural roots.

**Web:** ***http://www.storyarts.org***

• **Storybird** is a **collaborative storytelling tool** that helps students create original, art-inspired stories that can be shared in print or online. Storybird reverses the process of visual storytelling by starting with the image and "unlocking" the story inside. Students choose an artist or a theme, get inspired and start writing.

**Web:** ***http://storybird.com/***

• **PicLits** is a *free* drag-and-drop **literacy tool** that enables students to create sentences inspired by pictures or to add inspirational or humorous captions to the pictures. **Learn It** provides learning opportunities and examples for creating captions, compound sentences or paragraphs. Advanced **lesson plans** for teachers appear under the Learn It tab as well. Under **Explore the Gallery**, students can see already created PicLits as well as comments and ratings. After selecting a picture (or using the one provided) and dragging a word onto the screen, they can choose different forms of the word by using the drop-down menu next to the word. They can move their words anywhere on the screen for creative writing. Or they can click "freestyle" to type in their own words instead of choosing from their list. The word lists change, depending on the image students select.

**Web:** ***http://www.piclits.com/compose_dragdrop.aspx***

## SPEAKING: AM I CLEAR?

• This **Speaking Resource Guide**, sponsored by the **Oregon Department of Education**, provides **teaching strategies for public speaking** as well as a collection of **classroom speaking activities**. Inside the Resource Guide, you'll find **student speaking scoring guides** and **suggestions** and **score sheets** for **evaluating student presentations**. Other features include suggestions on finding an appropriate topic through "brain mapping," creating and delivering a successful speech, using visual aids, crediting sources and minimizing speech anxiety. The latter part of this Resource Guide contains both general ideas for speeches and actual speaking activities that have been used successfully in the classroom.

**Web:** ***http://w3.mesd.k12.or.us/si/overview1.pdf***

**Plus:** A collection of **Speaking Activities** were submitted by classroom teachers in the **Oregon Public Schools**. You can download and adapt them *freely* to fit the needs of your classroom and students.

**Web:** ***http://w3.mesd.k12.or.us/si/benchmrkact4.pdf***

• **Save the Last Word for Me** is a **discussion strategy** from **Facing History and Ourselves** that requires all students to participate as active speakers and listeners. Its clearly defined structure helps shy students share their ideas and ensures that frequent speakers practice being quiet. It is often used as a way to help students debrief a reading or film.

**Web:** ***http://www.facinghistory.org/resources/strategies/save-last-word-me***

• The **literature circle** is a student-centered **cooperative learning reading activity** for a group of four to six students at any grade level or in subject area. This **technology-enhanced literature circle activity** describes uses for literature circles in which students participate in an online environment, such as a course space, which allows them to interact with other students in different grades or classes.

**Web:** ***http://drscavanaugh.org/lit_cir/***

• Students of all ages can create **multimedia presentations** using **Microsoft PowerPoint**. Jim Jingle and Sue Special, the two stars of the **PowerPoint in the Classroom** show, serve as students' guides in this fun-filled, **online tutorial** from **ACT360 Media**. As they work through the tutorial, students will learn how to create slides, make changes, add images and charts, add motion and sound, and practice using speaker cards in timed rehearsals.

**Web:** ***http://actden.com/pp/***

• **ESLgo.com**'s **evaluation rubric** measures proficiency in **expressing oneself in English**. The rubric includes the following categories, which are scored on a scale from 4 to 1: Grammar, Vocabulary, Fluency, Listening, Voice and Nonverbal Communication. While the rubric is designed for use with English learners, it's useful for evaluating native English speakers' language expression as well.

**Web:** ***http://www.eslgo.com/resources/sa/oral_evaluation.html***

## LISTENING: WHAT ARE THEY TALKING ABOUT?

• **Learn to Listen/Listen to Learn: Developing Deeper Conversations** is a **discussion format** from **Facing History and Ourselves** that helps students develop their discussion skills, particularly their **ability to listen** to one another. It is especially useful when trying to discuss controversial topics.

**Web:** ***http://www.facinghistory.org/resources/strategies/learn-listenlisten-learn-deve***

• In 2008, **StoryCorps** launched the first annual **National Day of Listening**. The tradition continues again this year on **November 25, 2011**, the day after Thanksgiving. StoryCorps' *free* **Education Toolkit** provides resources to bring the National Day of Listening to your classroom or library. Encourage your students to set aside one hour to record a conversation with someone important to them. They can interview anyone they choose: an older relative, a friend, a teacher or someone from the neighborhood. They can preserve their interview using recording equipment, such as cell phones, tape recorders, computers or even pen and paper. StoryCorps' *free* ***Do-It-Yourself Instruction Guide*** is easy to use and will prepare students and their interview partner to record a memorable conversation, no matter which recording method they choose. Students can make a yearly tradition of listening to and preserving a loved one's story. The stories they collect will become treasured keepsakes that grow more valuable with each passing generation.

**Web:** ***http://www.nationaldayoflistening.org/***

• **Interviewing** family members or friends can be a valuable way for teens and preteens to learn about themselves and their families. In this **video**, a father helps a teen prepare for an interview with his mother.

**Web:** ***http://media.readwritethink.org/video/lbcvid5.wmv***

• These **video-based listening comprehension exercises** help students (especially those learning English) practice understanding spoken English. The exercises are based on movie trailers. Students just click on one of the trailers on the website, watch the video and then answer some listening comprehension questions.

**Web:** ***http://www.infosquares.com/eslvideo/index.html***

• Your students can develop their **listening skills** through **ELLLO**'s **Mixer**. The activities feature six different speakers answering the same question on a particular subject. Topics include Shyness, Favorite Music, Big Regret, Favorite Season, School Subjects, Sports, Transportation, Saving Money, The World—Better or Worse and other high-interest areas. Students can easily follow the topic and compare the various responses. Most of the activities include **images**, an **interactive quiz**, a **transcript** of the audio and a *free*, **downloadable MP3**. The site offers more than 1,000 such activities!

**Web:** ***http://www.elllo.org/english/Mixer.htm***

# Collaborating and Reaching Goals

### Collaborate with Others

- Demonstrate ability to work effectively and respectfully with diverse teams
- Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
- Assume shared responsibility for collaborative work and value the individual contributions made by each team member

*—from Partnership for 21st Century Skills*

## Collaborate with Others

### WORK TOGETHER, LEARN TOGETHER

• In 2011, students in kindergarten through grade 8, from 289 classes in 29 states and ten countries, participated in the **global Progressive Story Project**. Each class wrote one paragraph at a time of a five-paragraph story, with the final stories posted online. Check out last year's stories and voice threads. Then join this **shared writing experience** in the **spring of 2012**. Find instructions and timelines online. Registration opens on February 22 and runs through March 11; classes will be grouped by March 27; stories will be written from March 28 through March 30.

**Web:** ***http://writeyourstory.wikispaces.com/***

• In the **English Club**, English learners can make their own English page with **blogs**, **photos**, **videos**, **music**, **groups** and **friends**. They can test their level in English and get help with English grammar. They can also study English **grammar**, **vocabulary** and **pronunciation**, play English **games** and do English **quizzes** online. And they can chat in English with other students and teachers and find **pen pals** for English practice.

**Web:** ***http://my.englishclub.com/***

• The **University of Missouri**'s **eThemes** website offers suggestions for **games**, **activities** and **lesson plans** to encourage **team building** among elementary school students. There are **indoor** and **outdoor activities**, and **cross-curricular lesson ideas**. Many of the activities can be adapted for different age groups.

**Web:** ***http://ethemes.missouri.edu/themes/1045***

**Attention Web Browsers:** Website addresses do change periodically. If you have difficulty connecting, use a search engine to get an updated address. These sites are recommended by teachers and editors for educational value, but all content and associated links are the domain of the site sponsor.

• Active participation in **cooperative learning activities** helps students improve their social skills and provides greater use of **higher-level thinking skills** and increased appreciation for **different points of view**. Cooperative learning is not just "group work"; students learn together in producing group projects. Cooperative learning can be used as an integral part of your classroom management plan and at every stage of your lessons. Check out the ideas in the **lessons** and **video** on these sites.

**Web:** ***http://www.atozteacherstuff.com/Lesson_Plans/Cooperative_Learning/index.shtml*** [lessons]

**Web:** ***http://www.youtube.com/watch?v=5LWE2HF1v1Y&feature=related*** [video]

## TOGETHER WE CAN

• Researchers at **Brandeis University** have put a new spin on the traditional spelling bee format in an effort to prove their theory that neither head-to-head competition nor pure cooperation is the best way to motivate students. The environment that best engenders education and innovation, they say, is somewhere in the middle. To test their hypothesis, they developed **SpellBEE**, a *free* **online, interactive, multiplayer spelling game**. The game is distinctive in that it sets up an entirely new relationship among players. Instead of trying to defeat one another, players, in addition to spelling their own words correctly, are motivated to help one another learn.

**Web:** ***http://edutech.cs.brandeis.edu/***

**Plus:** Also check out **PatternBEE**, **GeograBEE**, **MoneyBEE**, **CalcuBEE** and **MeloBEE**.

• The **United States Academic Decathlon** (USAD) is a **team competition** wherein students match their intellects with students from other schools. Students are tested in **ten categories**: Art, Economics, Essay, Interview, Language and Literature, Mathematics, Music, Science, Social Science, Speech. The curricular theme for the 2011–2012 school year is **The Age of Empire**.

**Web:** ***http://usad.org/***

**Plus:** Running concurrently with the Academic Decathlon, the **Online Middle School Pentathlon Program** is comprised of **five academic events**: Language/Literature, Mathematics, Music, Social Studies, Science. The Pentathlon competition is held online only. The Pentathlon consists of a contained curriculum for the subjects listed above. Like the Academic Decathlon, the Pentathlon theme for 2011–2012 is **The Age of Empire**. The materials are now available for downloading, in PDF documents only.

**Web:** ***http://usad.org/competition/pentathlon.asp***

*Continued on page 18* ➡

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Amazing Resources for Educators www.edweb.net/bdbt

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## REACH OUT GLOBALLY

• The **Teddy Bear Project** is an accessible place to begin **global collaboration**. The aim of the project is to help students foster tolerance and understanding of cultures other than their own. After you register, a facilitator matches your class with a partner class. The classes send each other a Teddy Bear or other soft toy by airmail through the normal postal system. The bear sends home diary messages by email at least once a week. Students write the diary messages as if they are the visiting bear describing its experiences in the new culture. The project offers opportunities for authentic writing by providing students with a real audience. View the full list of **projects currently active.**

**Web:** ***http://media.iearn.org/node/98***

• **Exchange 2.0 – Technology-enabled International Interaction** was developed by **Connect All Schools** to help teachers use the Internet to "reach out" globally. The materials were initially prepared as part of the **U.S. Department of Education**'s inaugural International Education Week in November 2000. This **third version** of the **online guide** has been prepared as part of the Department of Education's effort to expand **global awareness through collaboration** between students and teachers in the United States with their peers around the world. Each section of the guide provides links to elementary, middle school and high school **projects** and to **organizations** that are involved in international education via the Internet and Web 2.0 tools.

**Web:** ***http://www.connectallschools.org/exchange-guide-international-collaboration***

• **The Center for Innovation in Engineering and Science Education** (CIESE) at the **Stevens Institute of Technology** sponsors and designs **interdisciplinary, collaborative projects** that utilize the Internet's potential to reach peers and experts around the world. The site describes the projects that are currently being sponsored by CIESE. For example, in spring 2012, students in grades 5–8 can join schools from around the world in **The Global Sun project**, as they try to figure out how proximity to the equator affects average daily temperature and hours of sunlight. The project will start on March 5, 2012 and end on April 28, 2012. In the Internet-based collaborative **Square of Life project**, which will begin on March 14, 2012 and end on June 10, 2012, students in grades 1–4 can share information about the plants, animals and nonliving objects found in their schoolyard environment with other students from around the country and the world. Each project has a brief description and links to the National Science Standards and NCTM math standards it supports.

**Web:** ***http://www.ciese.org/collabprojs.html***

• **Creative Connections** is a nonprofit international cultural exchange organization that creates and facilitates **arts-based exchanges** between classrooms in the United States and their peers around the world. These exchanges teach cultural literacy and promote appreciation for other cultures, customs and traditions. Currently, the organization's programs include five versions of **ArtLink**, a classroom-to-classroom international art exchange program; the **International Young Performers' Tour**, which brings talented student performers from around the world to perform in local U.S. schools; **live class-to-class videoconferencing**; and **in-classroom "Discovering World Cultures Through Art" workshops**.
**Web:** ***http://www.creativeconnections.org/***

• The **Janusz Korczak International School**'s website serves as the online home for the **International Book-Sharing Project**, a program of the Ghetto Fighters' House Museum and the Yad LaYeled Children's Museum in Israel in which schools from around the world are paired together. Students in the partner schools read the same book in their respective classrooms and then discuss subjects related to the Holocaust via forums hosted on the Korczak International School's website. The Book-Sharing Project has been tailored for two age groups: The project entitled **Children of the World Learn about Children** is intended for middle school, while the project entitled **Confronting Prejudice and Indifference** is aimed at high school.
**Web:** ***http://www.korczakschool.org/***

• **Global SchoolNet**'s **International Schools CyberFair** involves youth in conducting research and publishing their findings on the Web. The program encourages youth to become community ambassadors by **working collaboratively** and **using technology** to share what they've learned. Students evaluate each other's projects by using a unique **online evaluation tool**. Register now. Projects are due **March 16, 2012**; peer review will take place between **March 25 and April 15, 2012**.
**Web:** ***http://www.globalschoolnet.org/gsncf/***

• **iEARN**—the **International Education and Resource Network**—is currently the largest nonprofit organization pairing students and teachers across continents. It is built around a **Collaboration Center** that includes dozens of ongoing projects and offers professional development for teachers new to **digital collaboration**.
**Web:** ***http://iearn.org***

• **The Flat Stanley Literacy Project** has been a perennial favorite for inspiring students to **communicate** and **connect**, often across great distances. In 1994, Dale Hubert, a grade 3 teacher in London, Ontario, Canada, began the **Flat Stanley Project**. He invited other teachers to take part by hosting "flat visitors" and to encourage their students to write their own Flat Stanley journals. One of the many advantages of sending flat visitors is that they can visit friends by traveling in an envelope. Students' written work goes to other places by conventional mail and email. While it's similar to a pen pal activity, it's actually much more. In a standard pen pal exchange, students rarely know how to begin or what to write about, but with a Flat Stanley or one of the other flat characters from the **Template Gallery**, it's as if the sender and the recipient have a mutual friend, and writing becomes easier and more creative. Now Flat Stanley has his own **apps** for **iPhone** and **iPad**, along with new **online curriculum resources**. You can check out the Flat Stanley List of Participants (after you've registered and logged in).

**Web:** ***http://www.flatstanley.com/***

**Web:** ***http://www.flatstanley.com/stanley*** [**template gallery**]

**Web:** ***http://www.flatstanley.com/resources?subpage=teaching_materials*** [**curriculum resources**]

• **ePals** is a **global community** of **collaborative learners, teachers** and **academic experts** in 200 countries and territories. It provides students, particularly those in elementary and middle school classrooms, safe connections to classes around the world. Put your school on the map!

**Web:** ***http://www.epals.com***

# Thinking Critically and Solving Problems

### Reason Effectively

- Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

### Use Systems Thinking

- Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems

### Make Judgments and Decisions

- Effectively analyze and evaluate evidence, arguments, claims and beliefs
- Analyze and evaluate major alternative points of view
- Synthesize and make connections between information and arguments
- Interpret information and draw conclusions based on the best analysis
- Reflect critically on learning experiences and processes

### Solve Problems

- Solve different kinds of non-familiar problems in both conventional and innovative ways
- Identify and ask significant questions that clarify various points of view and lead to better solutions

*—from Partnership for 21st Century Skills*

## New Blooms

• **Beyond Bloom** is a **new version of the cognitive taxonomy** devised by **Benjamin Bloom** in 1956. Displayed in a table on this site are the two primary existing taxonomies of cognition. The one on the left side of the table, entitled "Bloom's," is based on the original work of Benjamin Bloom and others as they attempted in 1956 to define the functions of thought, coming to know, or cognition. The taxonomy on the right is the more recent adaptation and is the redefined work of one of Bloom's former students, Lorin Anderson, working with one of Bloom's partners in the original work on cognition, David Krathwohl. The primary differences are not just in the listings or rewordings from nouns to verbs, or in the renaming of some of the components, or even in the repositioning of the last two categories. The major differences in the updated version are in the more useful and comprehensive additions of how the taxonomy intersects and acts upon different **types** and **levels of knowledge—factual**, **conceptual**, **procedural** and **metacognitive**.

**Web:** ***http://www.uwsp.edu/education/lwilson/curric/newtaxonomy.htm***

• A **rubric** is a scoring guide that describes the requirements for various levels of proficiency when students respond to a learning task, open-ended question or stated criteria. The purpose is to answer the question, "What are the conditions of success, and to what degree are those conditions met by the student involved in the task?" This *free*, downloadable **metacognition rubric** will help you in evaluating your students' thought reflections; awareness of their own thoughts and ability to communicate them; recognition of their own learning styles and preferences; understanding of the nature of the task and the skills required to complete it; ability to formulate strategies to complete a task and to overcome challenges; and ability to plan, monitor and regulate their own work.

**Web:** ***http://21clearninginua.wikispaces.com/file/view/Metacogntion+Criteria.pdf***

## CLIMBING THE LADDER OF LEARNING

• **Bloom's Revised Taxonomy** of **cognitive objectives** is one of the best ways to differentiate the curriculum to meet the needs of your students. Because of its **six levels of thinking**—Remembering, Understanding, Applying, Analyzing, Evaluating and Creating—Bloom's Revised Taxonomy can provide a framework for planning units that incorporate low- to high-level thinking activities. This site provides an introduction to Bloom's Revised Taxonomy that includes a thorough breakdown of each of the six levels of the revised taxonomy as well as a list of useful **print** and **Internet resources**. A *free*, downloadable **set of colorful posters** explains each of the six levels of the taxonomy: each poster presents a **brief definition of the term** as well as **sample thinking skills** (verbs) that relate to that particular level of the taxonomy.

**Web:** ***http://www.kurwongbss.eq.edu.au/thinking/Bloom/blooms.htm***

• The **resources** on **Northern Illinois University**'s website will help you employ the revised Bloom's taxonomy in planning effective instruction and challenge your students to move from the most basic skills (remembering) to more complex learning that leads to higher-order thinking (creating) The resources are from a workshop entitled "**Teaching with the Revised Bloom's Taxonomy**" offered by the Faculty Development and Instructional Design Center at Northern Illinois University. From the website, you can *freely* download the Workshop Presentation [PPTX] and these handouts: Original Vs. Revised [Word]; Bloom's Revised Taxonomy Planning Sheet [Word]; Half Sheet Handout [Word]; Question Stems [Word]; Bloom's Digital Taxonomy Map [Word]; and The Helpful Hundred – Planning for Instruction [Word].

**Web:** ***http://www.niu.edu/facdev/programs/handouts/blooms.shtml***

**Attention Web Browsers:** Website addresses do change periodically. If you have difficulty connecting, use a search engine to get an updated address. These sites are recommended by teachers and editors for educational value, but all content and associated links are the domain of the site sponsor.

• **A Model of Learning Objectives** is a website created at **Iowa State University**'s **Center for Excellence in Learning and Teaching**. "Mouse" [roll] over the colored blocks in this **3-D representation of the 4 X 6 taxonomy** and you will see simple **examples of learning objectives** that generally match each of the various combinations of the cognitive process and knowledge dimensions. For example, roll over "Evaluate" and you will see "Make judgments based on criteria or standards." Roll over the blocks next to "Evaluate" and you will see "Check for consistency among sources"; "determine relevance of results"; "reflect on one's projects"; and more. The taxonomy is also explained, and links are provided for even more useful resources.

**Web:** ***http://www.celt.iastate.edu/teaching/RevisedBlooms1.html***

• **Bloomin' Google** is a clickable **image map**, assembled by **Kathy Schrock**, which shows Google tools and apps that support Bloom's Revised Taxonomy.

**Web:** ***http://kathyschrock.net/googleblooms/***

## Reason Effectively

*Critical thinking involves **logical thinking** and **reasoning**, including skills such as comparison, classification, sequencing, cause/effect, patterning, webbing, analogies, deductive and inductive reasoning, forecasting, planning, hypothesizing and critiquing.*

• **Mission: Critical** is a project of the **Institute of Teaching and Learning** at **San Jose State University** in California. The goal of the project is to create a "virtual lab" that familiarizes users with the **basic concepts of critical thinking** in a self-paced, interactive environment. This website offers your students the opportunity to test their ability to distinguish between **inductive** and **deductive reasoning**. After assessing their knowledge of these two kinds of reasoning, students can move to the section on **Inductive Arguments** and **Deductive Arguments**, which includes a discussion of each type of argument followed by a set of questions to assess students' ability to distinguish between the two types.

**Web:** ***http://www.sjsu.edu/depts/itl/graphics/induc/ind-ded.html***
[**overview**]

**Web:** ***http://www.sjsu.edu/depts/itl/graphics/induc/induc.html***
[**inductive argument**]

**Web:** ***http://www.sjsu.edu/depts/itl/graphics/deduc/deduc.html***
[**deductive argument**]

**Plus:** Another section of Mission: Critical deals with **Fallacies and Non-Rational Persuasion**—misdirected appeals and emotional appeals, and other common fallacies, such as circular reasoning, loaded questions and "straw man." The section includes 40 **fallacy review exercises** and an **exit quiz**.

**Web:** ***http://www.sjsu.edu/depts/itl/graphics/main.html***

• **FactCheckEd.org**, a project of **Annenberg Classroom**, helps students learn to be smart consumers of information, not to accept it at face value; and to **weigh evidence logically**, not to draw conclusions based on their own biases. Many of the **lesson plans** present students with a message, such as an actual political or product advertisement, and guide them through a process of discovery leading to the facts. Other lessons teach some of the core **concepts of reasoning**, giving students the building blocks to help them parse others' arguments and strengthen their own. Using **video clips** from popular films and television programs, the lessons explain **deductive versus inductive reasoning**, **logical fallacies**, the power of **visual rhetoric** and similar tools of critical thinking.

**Web:** ***http://factchecked.org/***

• The **21st Century Skill Rubric for Critical & Creative Thinking** was designed by the **Catalina Foothills School District** in Tucson, Arizona. This *free*, downloadable rubric addresses a set of cognitive skills or strategies that increases the probability of a desired outcome—gathering, analyzing, interpreting and evaluating evidence, and expanding knowledge through investigation, problem solving, invention and experimentation.

**Web:** ***http://www.cfsd16.org/public/_century/pdf/Rubrics/CFSDCritical&CreativeThinkingRubrics.pdf***

• With the online **Rubric for Deductive Thinking**, from the "**Effective Practices for Gifted Education in Kansas**" **manual**, you can evaluate your students' ability to identify a generalization that relates to a situation, a condition that relates to the generalization and data that support the generalization as well as determine the value of data presented and draw conclusions using data.

**Web:** ***http://www.adifferentplace.org/deductivereasoning.htm***

## LEARNING TO THINK

• ***Analogy*** is a term that means a "word relationship." Analogies are like word puzzles; solving analogies helps students develop **critical thinking skills**. In this **analogies game** from **Quia**, students must complete a set of analogies by selecting the best word from a drop-down menu of choices. After completing each analogy, students can check their answers online.

**Web:** ***http://www.quia.com/pop/14975.html***

**Plus:** In the **AWESOME ANALOGIES game**, students must figure out why the first pair of words go together so that they can finish the second word pair—for example, Cat is to MEOW as dog is to ____ .[bark]

**Web:** ***http://www.quia.com/cb/7146.html***

• Your students can try their skill at completing **nonverbal reasoning analogies** with the *free*, **online interactive** from **Curriculumbits.com**. After students have made their selection, they can click on the Check Answer button or press Reset to change their answer. The screens are interactive and can be easily projected on an interactive whiteboard for whole-class instruction.

**Web:** ***http://www.curriculumbits.com/prodimages/details/misc/nv1.swf***

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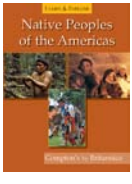


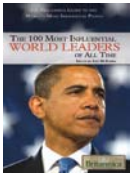




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—*School Library Journal* review of *The 100 Most Influential People* series (April 2010)

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• **Just Read Now!** offers an "up-close" look at a range of innovative and effective **reading/thinking strategies**, along with actual **classroom examples** and associated **lesson plans**. The strategies, which can be applied across academic disciplines and learner levels, are subdivided into the following four areas: **Discussion Strategies** (strategies that promote discussion in whole-group or small-group settings), **Active Reading Strategies** (strategies that promote active involvement and thinking with the text), **Vocabulary Strategies** (strategies that promote vocabulary development and understanding) and **Organization Strategies** (strategies that provide an organizational structure to assist in text comprehension). For each strategy, you'll find an explanation of the strategy's **instructional purpose**, **step-by-step directions** for carrying out the strategy with students, a **graphic organizer/thinking map** to help students internalize the strategy, a **standards-based lesson** that demonstrates the practical application of the strategy in the classroom and a **list of resources** for further exploration of the strategy.

**Web:** ***http://www.justreadnow.com/strategies/index.htm***

• In this *free* **lesson** from **National Geographic**, students visit the **Mental Mapper** exhibit in **Xpedition Hall** and explore the **different types of mental maps**. The **Mental Mapper interactive** demonstrates the use of mental maps to organize information in a spatial context. It also illustrates how children and adults differ in the ways they map the same environments. Students will work with teachers to create a mental map of their classroom based on their individual perspectives of what the classroom contains.

**Web:** ***http://www.nationalgeographic.com/xpeditions/hall/index.html?node=21*** [lesson]

**Web:** ***http://www.nationalgeographic.com/xpeditions/hall/1/x2/xpedition2.html*** [interactive]

• The *free* **graphic organizers** from **Real Classroom Ideas** will help your students map their thoughts and ideas. You'll find organizers for **working with text** (pyramid notes, Venn diagrams, KWL charts, T-charts and more), a **science observation chart** and **research/presentation help** (Internet source card, research planning chart, oral presentation note card, text connections organizer and more). You'll also find organizers for **vocabulary/spelling**, **cause and effect**, **compare and contrast** and **writing/prewriting**.

**Web:** ***http://www.realclassroomideas.com/65.html***

• Knowing how a piece of text is organized will help your students make better sense of the information. Each **organizational structure** suggests questions that readers should consider as they're reading and be able to answer once they've finished reading the passage. This website lists **questions** students can ask about the following text structures: **chronological sequence**, **comparison/contrast**, **description**, **point of view**, **problem/solution**, and **process/cause and effect**. The site also provides **examples** of **completed graphic organizers** and **blank graphic organizers**.

**Web:** ***http://www.somers.k12.ny.us/intranet/reading/questions.html***

• Looking for **signal words** can help students determine a text's organizational structure. The signal words on this site are categorized according to the following types of structures: **chronological sequence, generalization/principle, comparison/contrast, process/cause and effect** and **description.**

**Web:** ***http://www.somers.k12.ny.us/intranet/reading/signalwords.html***

• The **interactive Comparison and Contrast Guide,** from **ReadWriteThink,** includes an **overview, definitions** and **examples.** The **Organizing a Paper** section includes details on **whole-to-whole** (block), **point-by-point** and **similarities-to-differences** structures. In addition, the guide explains how graphic organizers are used for comparison and contrast, provides tips for using **transitions** between ideas in comparison and contrast essays and includes a **checklist,** which matches an accompanying **rubric.**

**Web:** ***http://www.readwritethink.org/materials/compcontrast/***

**Plus:** An **interactive graphic organizer** helps students develop an outline for one of three types of **comparison essays:** whole-to-whole, similarities-to-differences or point-to-point.

**Web:** ***http://www.readwritethink.org/materials/compcontrast/map/***

## THINKING TO LEARN

• Six works of art from the **North Carolina Museum of Art** illustrate some of the ways artists communicate **stories** through a **visual language** of color, line, shape and pattern. **Reading Art** provides suggestions for teaching K–8 students to use proficient **reading strategies—visualizing, determining importance, making connections, inferring, questioning** and **synthesizing—**to analyze a work of art in much the same way they read strategically.

**Web:** ***http://www.ncartmuseum.org/artnc/theme.php?themeid=2***

• ***La Escuela Electrónica*/The Electronic Schoolhouse** is a bilingual website focusing on the Latino experience in New York State. Using photographs, letters, flyers, broadsides and more, dating from 1861 to the present, the website combines historical records and technology to promote the development of **critical thinking skills, reading** and **writing skills,** and **understanding historical content** and **context.**

**Web:** ***http://www.archives.nysed.gov/projects/escuela/***

• Students are bombarded with images every day—in print, on TV and online. Their first reaction might be to assume that a photograph represents reality, but **photo manipulation** is as old as photography itself. Digital cameras and computers have made altering photos even easier to do and harder to detect. Such changes result in false "realities" that range from surprising and eye-catching to truly deceptive and misleading. This **online interactive,** from the **Peabody Essex Museum** in Salem, Massachusetts, encourages students to **analyze images** by **looking at details, searching for clues** and **thinking critically.**

**Web:** ***http://eye-spy-pem.tumblr.com/***

• These *free*, downloadable **Academic Language Paragraph Frames** will help you scaffold your students' instruction in **history**. You'll find frames for **comparing, cause and effect, applying, problem solving, persuasion, synthesizing, interpreting, evaluating evidence, academic communication, classifying** and **categorizing.**

**Web:** ***http://www.jeffzwiers.com/graphics/acalang_paragraph_frames-history.doc***

• **Learning Through Art,** from the **Guggenheim Museum,** provides two sets of tools for the classroom. The first explores how to facilitate **class discussions around works of art,** an approach called "**Inquiry with Art.**" The second is a **database** of selected **Learning Through Art projects,** or "**Art Investigations,**" with links to additional, related resources. Used individually or together, these resources can support you in creating an environment in which your students are challenged to **think, learn** and **communicate.**

**Web:** ***http://www.learningthroughart.org/***

• **America's Foundation for Chess** uses chess as a learning tool to teach **critical thinking skills** and advance math and reading skills. **First Move** is a two-year curriculum for second- and third-grade students that requires no previous chess knowledge to be successful. "The Chess Lady" teaches lessons on DVD, and the classroom teacher facilitates the student activities. A **sample online video** features the second lesson in the curriculum. Accompanying the video are two *free*, downloadable **lessons.** The professionally designed First Move program maps to state standards. The program is offered during the school day as a supplemental curriculum to the existing core curriculum. The focus is not on competition or tournament play, but rather on the **thinking skills** that are an inherent part of chess.

**Web:** ***http://www.af4c.org/pages/first-move***

• **Hooda Math**'s *free* **online video games** are intended for students ranging in age from 8 to 16. Each of the three game categories involves students in using **complex mathematical thinking**—with increasing levels of difficulty appropriate for all students' learning needs. The **Geometry Games** engage students in **making and testing conjectures** about geometric properties and relationships and develop deeper understanding of the **relationships** among angles, side lengths, perimeters, areas and volume of two- and three-dimensional objects. The **Arithmetic Games** help students gain knowledge of numbers and operations and **apply** that knowledge to simulated real-world situations. And the **Logic Games** help students of all ability levels improve their skills of **problem solving** and **inductive** and **deductive reasoning,** providing the foundations of **algebraic thinking.**

**Web:** ***http://hoodamath.com/***

**Plus:** Invite students to try the featured **shopping mall game** in which they create their own mall by making money to unlock more stores. If they build their shopping mall, the shoppers will come!

**Web:** ***http://hoodamath.com/games/shoppingmall.php***

• In **Stories from the Aftermath of Infamy, Face to Face** explores what it means to be an American with the face of the enemy. These are **real stories** of fear, anger, hatred, loyalty and trust. An accompanying **Teacher's Guide** includes **lesson plans** and **fact sheets** that compare the treatment and internment of Japanese Americans after the bombing of Pearl Harbor during World War II with the treatment of Arab and Muslim Americans after the tragedies of September 11. Students can explore these civil liberties issues through discussion, through becoming "the enemy" and through artistic expression. These lessons are directed toward grades 6–12 for use in the following subject areas: Civics, Historical Understanding, U.S. History, Language Arts, **Thinking and Reasoning**, Visual Arts and Working with Others.

**Web:** ***http://archive.itvs.org/facetoface/intro.html***

**Web:** ***http://archive.itvs.org/facetoface/activities/*** [activities]

## Use Systems Thinking

***Systems thinking*** *is a vantage point from which one sees a whole, a web of relationships, rather than focusing only on the details of any particular piece. Events are seen in the larger context of a* ***pattern*** *that is* ***unfolding over time****. Systems thinking provides students with a more effective way of interpreting the complexities of the world in which they live—a world that is increasingly dynamic, global and complex.*

### SEEING THE "BIG PICTURE"

• **The Center for Innovation in Engineering and Science Education** (CIESE) at the **Stevens Institute of Technology** offers students in grades 9–12 the opportunity to apply **systems thinking** and learn the core concepts of **systems engineering** as they reverse-engineer a common product. Before they begin the project, students will be provided with an **overview of systems thinking**, including the systems model. Through **guided activities**, students will reverse-engineer a common device that contains both electrical and mechanical components and then create a systems diagram for the deconstructed device. Students will create reassembly instructions and diagrams that partner schools worldwide will use in their attempt to reconstruct the device. A **lesson plan**, with *free*, downloadable **materials** and **activity sheets**, is available online. This project will take approximately three weeks to complete. Registration will open in the spring; check the website for specific dates.

**Web:** ***http://www.ciese.org/curriculum/seproject/index.html***

• In this **media-rich interactive lesson** from **Teachers' Domain**, students in grades 6–8 are introduced to the concept of an ecosystem and explore how to **analyze ecosystems** using a **systems thinking approach**. A class discussion brings out students' ideas about ecosystems and introduces basic information about the components and processes of ecosystems. Next, students encounter a hypothetical ecosystem and gain experience analyzing it the way scientists do. Students then select a local ecosystem and apply what they have learned to analyze it. Finally, students extend their understanding by characterizing three different types of ecosystems and describing their components and processes.

**Web:** ***http://www.teachersdomain.org/resource/lsps07.sci.life.eco.lpexpecosystems/***

• With the **science games** from **Thinkfinity**, you can take students online and watch them engage in **critical, scientific thinking** through **interactive play**. They can test their knowledge of the parts of the body's systems with **All Systems Are Go!** Or build a spacecraft that can withstand the trip to Mercury with **Make a Mission**. Finally, add **A Touch of Class** to students' day to reinforce plant and animal classification.

**Web:** ***http://www.thinkfinity.org/science-interactives***

• This website provides a **continuum of systems thinking rubrics** corresponding to performance levels within 21st century skills. The **Systems Thinking—Beginner Rubrics** were designed for teachers to use with primary students and/or students who are just beginning to learn systems thinking concepts and strategies. The **Systems Thinking—Beginner rubrics** (for student use) were reworded based on the teacher's rubrics to simplify the language and systems thinking terminology. They were designed for use by primary students and/or students who are just beginning to learn systems thinking concepts and strategies. The **Systems Thinking—Concept Rubrics** (for teacher and/or student use) were designed for intermediate elementary to high school students and/or students who have reached a more advanced understanding of systems thinking concepts and strategies. These rubrics address the Big Picture, Change over Time, Interdependencies, Consequences, System-as-Cause and Leverage Actions.

**Web:** ***http://www.cfsd16.org/public/_century/pdf/Rubrics/CFSDSystemsThinking_Rubric.pdf***

## Make Judgments and Decisions

• **Democratic societies thrive on dissent, discussion and debate. Teaching Tolerance**'s *Civil Discourse in the Classroom* provides **lessons** that offer a way for **basic argument literacy** to be integrated into any classroom. Students of all ages, backgrounds and skill levels are able to learn the basic tools for argumentation. Once they learn these tools, it becomes easier to build discussion and deliberation into daily classroom activities. Many students also find that practice in structured argument dramatically improves their ability to read and produce persuasive writing.

**Web:** ***http://www.tolerance.org/handbook/civil-discourse-classroom/chapter-2-building-blocks-civil-discourse***

• The **Historical Treasure Chests activities** from the **Stevens Institute of Technology** engage students in investigating authentic materials from the past. Students are provided with four **primary sources** and **questions** to guide their investigation. A wealth of other primary resources can be accessed on the websites listed in the reference section. By looking closely for details, students **draw conclusions** about the items and **formulate hypotheses** about the time period(s) during which they were created. Further research, using **secondary sources**, will either confirm or challenge their ideas.

**Web:** ***http://www.k12science.org/curriculum/treasure/student_activities.html***

• **Looking for Bias, Perspective, Interpretation, and Process** is a set of **questions** from the **Oakland Museum of California** for **analyzing primary sources**—for example: Who created the source and why? (**process**), Did the author have firsthand knowledge of the event, or did the author report what others saw and heard? (**bias, perspective, interpretation**), How does this document support and/or conflict with what you've read in other sources? (**cross-checking**). Accompanying the online questions are two **sample excerpts for analysis.**

**Web:** ***http://www.museumca.org/picturethis/looking-bias-perspective-interpretation-process***

## MINDING THE MEDIA

• The ***PBS NewsHour***'s **Student Reporting Labs** connects students with professional mentors at their local public broadcasting station to produce original news reports with youth perspectives on important national issues. The website includes a collaborative space where students interact with professional journalists as well as peers from around the country who are working on the same topic. The curriculum features nine **lesson plans** that emphasize finding, **analyzing** and **evaluating** the quality of information provided by any source.

**Web:** ***http://www.studentreportinglabs.com***

• The **New Mexico Media Literacy Project** provides a *free* download entitled ***Introduction to Media Literacy***, which supports **critical analysis of media** in these areas: **Media Literacy Concepts** (first principles for the study and practice of media literacy), **Text & Subtext** (difference between what is seen and/or heard, and what it means to the viewer/listener), **The Language of Persuasion** (how media messages work), **Deconstructing Media Messages** (how to decode media messages), **Creating Counter Ads** (how to "talk back" to deceptive or harmful media messages). The information in this resource will help you engage students in this kind of careful analysis.

**Web:** ***http://medialiteracyproject.org/sites/default/files/resources/Intro_to_Media_Literacy.pdf***

**Attention Web Browsers:** Website addresses do change periodically. If you have difficulty connecting, use a search engine to get an updated address. These sites are recommended by teachers and editors for educational value, but all content and associated links are the domain of the site sponsor.

• Visual content and design in advertising have a great impact on the consumer, but it is language that helps people to identify a product and remember it. A study of vocabulary used in advertising listed the most common adjectives and verbs in order of frequency. Invite your students to try this **exercise** to test their knowledge of **commonly used words in advertising.**

**Web:** ***http://www.linguarama.com/ps/293-6.htm***

• Most youngsters don't think to look for bias or false information online, and subtle forms of racism may be difficult to recognize. In ***Allies and Aliens***, students assume the role of agents from planet Earth who must assess varying degrees of prejudice and misinformation as they visit websites from other planets. This **interactive learning module**, from the **Media Awareness Network** (MNet), teaches students the basics about **bias, stereotyping, misinformation** and **propaganda techniques** on the Internet and in other media. It also helps students understand the difference between fact and opinion and the importance of authenticating online information. The challenges of this module are intended to sharpen students' research skills as well as their **critical thinking skills.** The experiences involve them in recognizing **viewpoint, bias** and **manipulation**—online and offline. An extensive **Teacher's Guide** contains **background information** about the module, the **issues** that it addresses as well as supporting **discussion points** and **student activities.**

**Web:** ***http://www.media-awareness.ca/english/games/allies_aliens/kids.cfm*** [game]

**Web:** ***http://www.media-awareness.ca/english/games/allies_aliens/teachers.cfm*** [Teacher's Guide]

## Solve Problems

• **Art of Problem Solving** (AoPS) is a website for motivated students of mathematics. The site includes the largest **online math problem-solving forum** in the world as well as **online courses** for students in grades 6–12 who seek a greater challenge in mathematics, and those students preparing for MATHCOUNTS, the American Math Competition (AMC) or other prominent mathematics contests. The site also offers the **Art of Problem Solving books,** used for more than 10 years by the top math schools and students in the country; and *free* **resources** and **online problem-solving sessions.**

**Web:** ***http://www.artofproblemsolving.com/***

## NEW REALITIES, MULTIPLE SOLUTIONS

• **Visual Thinking Strategies** (VTS), is a school curriculum and teaching method that uses **art** to develop **critical thinking, communication** and **visual literacy skills.** The aim of the curriculum is to engage learners in a rigorous process of examination and meaning-making through visual art; increase **observation skills, evidential reasoning** and **speculative abilities;** and engender the willingness and ability to find **multiple solutions** to **complex problems.** The curriculum uses facilitated discussion to enable students to practice respectful, democratic, **collaborative problem-solving skills** that over time transfer to other classroom interactions and beyond. The program includes **lesson plans, video** and **image resources** and **student activities**. Watch a **video of VTS in action**. Also download the *free* "Introduction to Visual Thinking Strategies," "Guide to Museum Visits," "Guidelines for Image Selection for Beginning Viewers"—and other useful resources that will help you develop your students' visual thinking abilities.

**Web:** ***http://www.vtshome.org/***

• By talking, writing and **reasoning** in math journals, students shift the emphasis of their work from finding the "right" answer to a **metacognitive exploration of how their problem solving works**. In this **lesson** on the **ReadWriteThink** website, students begin by exploring their own attitudes and feelings about math by responding to open-ended prompts in their **math journals**. They are then introduced to the **magic triangle puzzle** and invited to talk and write about their predictions for how to solve the puzzle, drawing comparisons with prediction in reading and journal writing for language arts. Students then work in small groups to find **multiple solutions** to the puzzle and write their solutions, strategies and other observations in their math journals. Next, they examine their notes from the group work and look for evidence of positive attitudes and successful problem solving. Finally, they revisit their initial journal entry and assess how and why their attitude has changed.

**Web:** ***http://www.readwritethink.org/classroom-resources/lesson-plans/talking-writing-reasoning-making-820.html***

• **Exploring the Environment** features 18 **online modules** that put students in **problem-based learning scenarios**. For example, in one module (under Global Climate Change), students predict the impact of increased carbon dioxide on the wheat yield in Kansas. In another module (under Weather or Not?), they predict weather 48 hours in advance. Topics include coral reefs, climate change, the Everglades, mountain gorillas, rainforests, volcanoes, water quality, ozone depletion—and more.

**Web:** ***http://www.cotf.edu/ete/***

• **EcoMUVE** is a curriculum research project at the **Harvard Graduate School of Education** that uses **3-D virtual environments** to teach middle school students about **ecosystems** and **causal patterns**. Students work individually at their computers and **collaborate in teams** within the virtual world. The immersive interface allows students to learn science by **exploring** and **solving problems** in realistic environments. EcoMUVE includes two inquiry-based modules. In **Module 1**, which represents a **pond ecosystem**, students explore the pond and the surrounding area, even under water, see realistic organisms in their natural habitats and collect water, weather and population data. Students visit the pond over a number of virtual "days" and eventually make the surprising discovery that, on a day in late summer, many fish in the pond have died. Students are challenged to figure out what happened: they work in teams to collect and analyze data, and gather information to solve the mystery and understand the complex causality of the pond ecosystem. In **Module 2**, which represents a **northern hardwood forest ecosystem**, students visit two forested islands on 10 different dates over about 50 virtual "years." While exploring the plants and animals that live in the forest ecosystem, students learn about individual, population and community levels in ecosystems. Students work in teams to see how the populations and forest structure change on each island over time. The interface and tools are based on those of the first module; students use a camera tool and field guide, collect environmental and population measurements, shrink to view organisms at microscopic levels, talk to nonplayer characters (NPCs) and travel in time.

**Web:** ***http://ecomuve.org/***

• **Rice University**, in partnership with the **Fort Worth Museum of Science and History**, the **American Academy of Forensic Sciences** and **CBS**, has created ***CSI: Web Adventures***, a **game** designed to introduce middle school students to forensic science through cases based on the popular TV-show franchise about crime-scene investigations. During the game, students identify shoe prints, test DNA and interview suspects in order to **crack the case**. The game outlines which academic standards it covers and was crafted with learning objectives in mind.

**Web:** ***http://forensics.rice.edu/***

• ***Water Wonders / Las Maravillas del Agua*** is an original **chapter book** featuring young scientists, Sydney and Symon Starr, a sister and brother team who love **creative problem solving** and sharing what they discover through writing, art and song. The book introduces the arts to STEM education through various activities that encourage readers to **experiment** and **solve problems** on their own as well as through suggestions for further reading. The science, technology, engineering, arts and mathematics (STEAM) approach to learning delivers and encourages the "Four Cs"—**C**ritical thinking, **C**ollaboration, **C**ommunication and **C**reativity. The book is a collaborative publication from **FableVision**, **Reading Is Fundamental** and the **National Writing Project** (NWP). Visit the NWP website to begin your students' science adventure—in **English** or **Spanish**—with Sydney and Symon.

**Web:** ***http://www.nwp.org/cs/public/print/resource/3585***

• **Air Defenders: The Quest for Clean Air** is an interdisciplinary, multimedia educational website for students 10 years of age and up. Students earn their Air Defender badge while pursuing their quest to clean the air and protect community health. Air Defenders learn through activities in science, health education and music lessons that meet national academic standards. The **lessons** develop **critical thinking** with a focus on **finding solutions** for home and farm waste disposal, exploring the physics and chemistry of waste incineration and open burning, and on the related issues of air quality and human respiratory health.

**Web:** ***http://www.airdefenders.org/***

• **PBS Kids'** ***Design Squad Nation*** is an **engineering-based reality show** for youth. Each episode pits two teams against each other to **design solutions to problems** ranging from creating usable furniture from cardboard to tricycle-based drag racers. The *Design Squad* website provides full **video of episodes**, **teacher** and **event guides** (including many **design challenges**), **user-submitted challenges** and **solutions** (such as, "I wish I could measure the pollution in my neighborhood"), **games** and a **blog**.

**Web:** ***http://pbskids.org/designsquad/***

• **LEGO Education** and **Learning.com** offer teachers a way to ignite their students' interest in science, technology, engineering and mathematics (STEM) by collaborating to deliver a **LEGO Education Simple and Motorized Mechanisms curriculum module** through Learning.com's digital learning environment. Teachers can find the LEGO Education curriculum module that focuses on key physical science principles, assign it to students and then grade and track student progress—all online. Students work as young scientists, engineers and designers to explore scientific principles and apply them to **hands-on problem-solving activities.**

**Web:** ***http://www.learning.com/LEGOeducation/***

## INQUIRING MINDS

• Questions are powerful tools that are central to **scientific inquiry**. Given the importance of **investigable questions** to scientific inquiry, what can teachers do to help students learn how to generate them? Possibilities the author explores in ***A Quest to Improve*** are (a) demonstrating to students that we value their questions, (b) providing students with opportunities to explore natural phenomena, (c) modeling asking investigable questions and providing examples of question stems, and (d) providing explicit practice identifying and refining questions. Members of the **National Science Teachers Association** (NSTA) can get the article, which appeared in the December 2010 issue of *Science and Children*, *free of charge* on the NSTA website; nonmembers can purchase the article for $0.99. The NSTA website provides **ideas for using investigable questions in the classroom.**

**Web:** ***http://learningcenter.nsta.org/product_detail.aspx?id=10.2505/4/sc10_048_04_32***

• Dan Rothstein and Luz Santana of the **Right Question Institute** have found that teaching students to ask their own questions can stimulate students' curiosity and engage them more effectively while teaching a critical lifelong skill. The authors describe a step-by-step process called **Question Formulation Technique** (QFT) that helps students to produce their own questions, improve them and strategize how to use them. Teachers can use the QFT at different points: to introduce students to a new unit, to assess students' knowledge to see what they need to understand better and even to conclude a unit to see how students can, with new knowledge, set a fresh learning agenda for themselves. The QFT has six key steps: teachers design a question focus; students produce questions; students improve their questions; students prioritize their questions; students and teachers decide on next steps; and students **reflect** on what they have learned.

**Web:** ***http://www.hepg.org/hel/article/507#home***

• The **Questioning the Author** (QtA) **strategy**, developed by Isabel Beck et al at the **University of Pittsburgh**, is intended to get students to think beyond the words on the page. This **Questioning the Author interactive** will help your students consider the author's intent, craft, clarity and organization. Students can then decide if the author has communicated successfully and explain why they think so. Likewise, if students are struggling over a selection of text, it may be because that text hasn't been written clearly. Students can then be invited to improve the text.

**Web:** ***http://www.vrml.k12.la.us/cc/18str/ques_auth/ques_auth.asp***

• What's under foot? What are things made of? Science projects that emphasize inquiry help students make sense of their world and build a solid foundation for future understanding. **The Inquiry Project**, a partnership among teachers, **TERC** and **Tufts University**, supports teachers in third to fifth grades as they guide students in **hands-on investigations** about matter. Students develop the habits of scientists as they **make observations**, **offer predictions** and **gather evidence**. Companion **videos** show how scientists use the same methods to explore the world. Inquiry activities can be connected to longer-term projects, such as creating a classroom museum that showcases students' investigations.

**Web:** ***http://inquiryproject.terc.edu/***

# Creating and Innovating

### Think Creatively

- Use a wide range of idea creation techniques (such as brainstorming)
- Create new and worthwhile ideas (both incremental and radical concepts)
- Elaborate, refine, analyze and evaluate ideas in order to improve and maximize creative efforts

### Work Creatively with Others

- Develop, implement and communicate new ideas to others effectively
- Be open and responsive to new and diverse perspectives; incorporate group input and feedback into the work
- Demonstrate originality and inventiveness in work and understand the real-world limits to adopting new ideas
- View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

### Implement Innovations

- Act on creative ideas to make a tangible and useful contribution to the field in which the innovation will occur

*—from Partnership for 21st Century Skills*

## Think Creatively

### SETTING THE PROCESS IN MOTION

• To foster creativity and innovation, **Dimensions of 21st Century Learning** recommends a culture in which changes to methods and practices (through innovation) are positively viewed; where mistakes that arise from innovation are not punished, but rather seen as an opportunity to learn; and where time is allocated to reflect on and learn from past mistakes. Find additional recommendations, as well as a list of **key strategies for scaffolding creativity and innovation** and **factors that stifle intrinsic motivation and creativity**.

**Web:** ***http://creativity-innovation.metiri.wikispaces.net/Teaching+Strategies***

• This **Continuum of Progress**, provided by **Dimensions of 21st Century Learning**, will help you evaluate the extent to which your students generate **unique ideas**; demonstrate **expertise** in an area; engage in **risk taking** despite mistakes; display **inquisitiveness**, openness and excitement; demonstrate **flexibility** and **adaptability**; are intensely **motivated** for **intrinsic reasons**; and tolerate and respond to **ambiguity**.

**Web:** ***http://creativity-innovation.metiri.wikispaces.net/Rubric***

**Attention Web Browsers:** Website addresses do change periodically. If you have difficulty connecting, use a search engine to get an updated address. These sites are recommended by teachers and editors for educational value, but all content and associated links are the domain of the site sponsor.

## FOOD FOR THOUGHT

*To think logically is a great approach to problem solving, but sometimes creative thinking is necessary to delve deeper into a problem. Creative thinking involves the skills of flexibility, originality, fluency, elaboration, brainstorming, modification, imagery, associative thinking, attribute listing, metaphorical thinking, forced relationships. The aim of creative thinking is to* ***stimulate curiosity*** *and* ***promote divergence****.*

• **Divergent thinking**, a thinking approach to deal with any problem creatively, is discussed in this article on **Buzzle.com**. The article explains divergent thinking and describes the basic skills involved on any topic: authenticity, imagination, inherent curiosity, calculative risk taking, simplification, flexibility, fluency and elaboration. In addition, the article offers **examples of divergent thinking** (**brainstorming**, **mind mapping**, **free writing**, **journal writing**) and provides links to **creative thinking exercises** and **activities**, such as **questions** that make one think creatively—for example, How does one write with invisible ink?

**Web:** ***http://www.buzzle.com/articles/divergent-thinking.html*** [**article**]

**Web:** ***http://www.buzzle.com/articles/creative-thinking-exercises.html*** [**creative thinking exercises**]

**Web:** ***http://www.buzzle.com/articles/creative-thinking-activities-and-exercises.html*** [**creative thinking activities**]

• **Divergent thinking** typically occurs in a spontaneous, free-flowing manner. Following divergent thinking, the ideas and information are organized using convergent thinking—that is, put back together in some organized, structured way. On this web page, you'll find **strategies of divergent thinking**, which include **questions to help brainstorm** a list of personal topics (for example: What do I know about? What are my areas of expertise? What are my interests?) as well as **questions to help narrow and refine a broad topic** into a specific, focused one (for example: How would you describe *something*? How has *something* changed? Why are those changes important?) The web page also provides **techniques to stimulate divergent thinking**—brainstorming, keeping a journal, free writing and mind or subject mapping

**Web:** ***http://faculty.washington.edu/ezent/imdt.htm***

• With the online **Rubric for Divergent Thinking Evaluation**, from the "**Effective Practices for Gifted Education in Kansas" manual**, you can evaluate your students' ability to substitute, combine, adapt, modify, magnify, minify, eliminate, reverse and rearrange—all traits of divergent thinking.

**Web:** ***http://www.adifferentplace.org/divergentthinking.htm***

• The **AIMS Education Foundation's Puzzle Corner** includes 23 *free* **Divergent Thinking Puzzles** that have been rated according to their level of difficulty—from easiest to most difficult. For example, ***Alphabetical Puzzlers*** (rated "easy") is a set of puzzles that use letters of the alphabet in a "puzzling" manner. The first two puzzles are similar; solving one should help students solve the other. Both of these puzzles have two lists, with each of the letters from *a* to *w* placed into one or the other of these lists according to a certain rule. Students are challenged to discover that rule. They are then challenged to determine into which lists *x*, *y* and *z* should be placed. ***Apple Pie Slicing*** (rated "difficult") shows a pie sliced into six pieces with three straight cuts going through the center. It challenges students to see how many different numbers of pieces (two through eight are all possible) they can "slice" a pie into using three straight cuts. Students are then asked to determine the minimum and maximum number of pieces possible and to justify their answers.

**Web:** ***http://www.aimsedu.org/Puzzle/categories/divergent.html***

## Open New Doors of Learning

• The seven *free* **brainstorming activities** on this site are rooted in the practicalities of real life. They can be used to help students see how original and creative thinking can be applied to their daily lives and any business enterprises they may pursue. Try different activities, under the pull-down menu, with different groups of students.

**Web:** ***http://www.glencoe.com/sec/busadmin/entre/teacher/creative/brain/index.htm***

• On the **CreatingMinds** website, you'll find a treasure trove of tools for helping your students generate ideas. Each **idea creation tool** includes an explanation of when to use it, how to use it (with an example) and how it works. There's also a link to a suggested related tool. Among the tools are **Attribute Listing**—listing the attributes of objects and then challenging them; **Brainmapping**—combining brainwriting and mind mapping; and **Reversal**—looking at the problem backwards.

**Web:** ***http://creatingminds.org/tools/tools_ideation.htm***

• This website presents a collection of **creative thinking prompts** originally published in ***The Journal Newsletter***, including **journaling prompts** and **free writing prompts**. One journaling prompt asks students to create a list of images that symbolize (1) toughness, cruelty; (2) toughness, strength. Another prompt suggests using the following phrase as a starting point for a 20-minute free writing activity without self editing: "Collapsing under a canopy of green ..."

**Web:** ***http://www.davidrm.com/thejournal/tjresources-exercises.php#free***

## Work Creatively with Others

• **Brown University's Choices Program** for high school social studies uses a problem-based approach to make complex international issues accessible and meaningful for students of diverse abilities and learning styles. The program, which is available in print and digital versions, fosters the 21st century skills of **collaboration**, **creativity** and **innovation**. Students examine contrasting policy options and explore the underlying values and interests that drive **different perspectives**. Students create political cartoons, memorialize historical events artistically and develop original policy options. They critique editorials, audio and video sources, maps and other visuals for **perspective** and **bias**. They watch video clips to gather and assess information from leading scholars. The Choices Program provides a number of teaching tools for use with Choices resources in the classroom. They include **teaching activities**, **graphic organizers** and **assessment tools**. Additional resources include **interviews**, **speeches**, **photographs** and **paintings**, **online ballots** and **surveys**, annotated links to **additional electronic resources** on other sites and **lesson plans** drawing on the online resources available.

**Web:** ***http://www.choices.edu/index.php***

• "**Inanimate Alice**" connects technologies, languages, cultures, generations and curricula within a sweeping narrative accessible by all. Set in the early years of the 21st century, "Inanimate Alice" tells the story of Alice and her imaginary digital friend, Brad. In episode 1, Alice is living with her parents in a remote region of Northern China. Over the course of the remaining episodes, each a self-contained adventure, students see her develop into a talented animator and designer with the biggest games company in the world. Through text, sound, images, music and games, the story of Alice becomes increasingly interactive and gamelike, reflecting Alice's own developing skills as a game designer and animator. As Alice's journey progresses, new storylines appear elsewhere, providing more details and insights and enriching the tale through surprising developments. Students are encouraged to **co-create developing episodes** of their own, either filling in the gaps or developing new strands. Students apply knowledge through **high-order thinking skills** and emphasize the value of **collaboration** in a **real-world context**.

**Web:** ***http://www.inanimatealice.com/***

• **Thinking Machine 4** explores the invisible, elusive nature of thought. In this **interactive**, students can play **chess** against a transparent intelligence, its evolving thought process visible on the board before them. The artwork is an **artificial intelligence program**, ready to play chess with the student. If the student confronts the program, the computer's thought process is sketched on screen as it plays. A map is created from the traces of literally thousands of possible futures as the program tries to decide its best move. Those traces become a key to the invisible lines of force in the game as well as a window into the spirit of a thinking machine.

**Web:** ***http://turbulence.org/spotlight/thinking/chess.html***

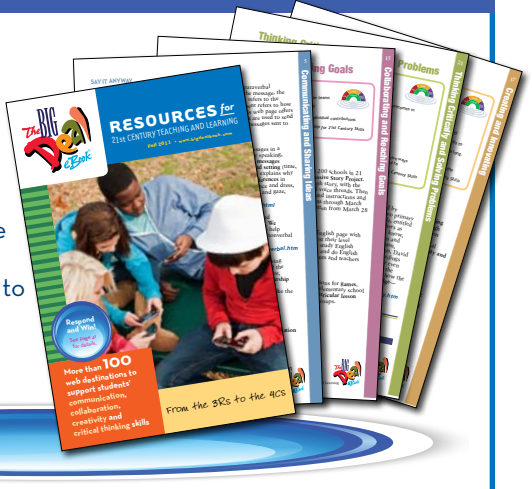
*Continued on page 42* ➡

# RESPOND AND WIN!

Log on to ***www.bigdealbook.com/21CF11survey***

We're eager to hear your comments about this edition of ***The Big Deal eBook of Resources for 21st Century Teaching and Learning***.

Respond to a brief questionnaire by December 31, 2011 and you'll be entered in a random drawing to **win a $100 gift card!***




**Plus**, when you enter, you'll automatically be added to The Big Deal Network. This entitles you to a ***free*** e-newsletter identifying grants, ***free*** resources and websites of substance.


*One American Express gift card will be awarded for every 100 completed questionnaires.

• On the **Invention at Play** website, students collaborate with others to **compose a unique story.** First they play with the random words in the **Word Play interactive** and submit their own sentences. Then they watch as others add to the tale. The site was developed by the **Lemelson Center** at the **Smithsonian**'s **National Museum of American History** in partnership with the **Science Museum of Minnesota.**

**Web:** ***http://www.inventionatplay.org/playhouse_wordplay.html***

• **Creationary** is a **LEGO build-and-guess game** that challenges students' imagination, creativity, building and predicting skills with more than 300 bricks and accessories. The *free* touch-screen drawing program also enhances collaboration as students work with one another to complete a final project. With the **LEGO Creationary app,** students can guess what's being built on an iPad, iPhone or iPod Touch. And they can share their scores with friends via email or on Facebook.

**Web:** ***http://itunes.apple.com/us/app/lego-creationary/id401267497?mt=8***

• The **Rube Goldberg Machine Contest** brings the ideas of Pulitzer Prize–winning artist Rube Goldberg's "invention" cartoons to life. This **Olympics of Complexity** is designed to pull students, aged 11–14, away from conventional problem solving and push them into the endless chaos of **imagination** and **intuitive thought.** Groups are given an elementary challenge: something as simple as peeling an apple, sharpening a pencil or putting toothpaste on a toothbrush. But instead of just "solving" the problem, students have to make the solution as complicated and as convoluted as possible. In fact, the more steps—there's a minimum of 20—the better the Rube Goldberg Machine. In 2012, the challenge is to **inflate a balloon and pop it!** Team registration will be available online in early November. Visit the website for details and download a PDF version of the 2012 Rube Goldberg Machine Contest Rule Book.

**Web:** ***http://www.rubegoldberg.com/***

**Plus:** Invite your students to play the **Goldburger To Go game.** The cast and crew on the **PBS Kids ZOOM** set are hungry. Can your students perfect the ZOOMers' **Rube Goldberg invention** for serving lunch? The ZOOMers say it just needs a few minor adjustments before it can deliver lunch to everybody.

**Web:** ***http://pbskids.org/zoom/games/goldburgertogo/index.html***

• Drawing from what innovative Fortune 500 companies do to promote creativity and innovation in the workplace, **ASCD**'s **DVD, *21st Century Skills: Promoting Creativity and Innovation in the Classroom***, takes you on a fieldtrip to dynamic classrooms to show real-world strategies for your classroom curriculum and instruction. The video demonstrates how teachers promote creativity by encouraging students to express themselves via multiple media and by engaging them in tasks that require open-ended problem solving and creative thinking. Teachers explain how they make **collaboration** a classroom norm and allow students to engage in authentic, real-world tasks and experiences.

**Web:** ***http://shop.ascd.org/productdisplay.cfm?productid=609096***

## INSPIRE INNOVATION

• **The Henry Ford** museum has been collecting America's most pivotal and influential stories of innovation since 1929. **Inspiring Innovation** is an online exhibit in which students discover what thinking and learning like an innovator really means. Through an online series of **interview video clips**, students connect with the ultimate source, today's hottest innovators.

**Web:** ***http://oninnovation.com/about/about-oninnovation.aspx***

• **Innovation 101** is an **online education module** that uses the oral history interviews and assets of **The Henry Ford**'s **OnInnovation** resource for active teaching and learning. This five-day unit allows students to explore the various traits and processes used by innovators, past and present. **Lesson One: What Is Innovation?** helps students critically think about the needs that precede any innovation. Why is innovation necessary in our lives and the world around us? **Lesson Two: Process of Innovation** delves into the questions, Is there one set process that all innovators use to innovate? What is the relation between the process of innovation and design thinking? How are Invention, Innovation and Discovery similar, yet different? In **Lesson Three: Traits of an Innovator**, students explore the questions, Are there commonalities or congruencies between innovators? Do legendary and current-day innovators share common traits? Are these traits important for success in life? **Lesson Four: Keys to Innovation** gets students thinking about the questions, Can an innovative mindset be cultivated and practiced? What can we learn from some of the role-model innovators? And **Lesson Five: Innovation, Intellectual Property Rights and More** helps students answer the questions, Is it important to protect innovation? How can we be protective of our innovative ideas yet ignite others to learn and expand from the same? At the conclusion of the five-day unit, the **Post-Unit Student Activities** continue to engage students to apply the core principles of innovation to their own lives.

**Web:** ***http://oninnovation.com/education/innovation-101.aspx***

## COOL INVENTORS, HOT INVENTIONS

• Unlocking the genius inside us requires curiosity and a commitment to test knowledge through experience. What better role model for such behaviors than **Leonardo da Vinci!** At the **Boston Museum of Science**'s **Exploring Leonardo** website, you'll find four main content sections: **Inventor's Workshop** highlights some of Leonardo's futuristic inventions, introduces the elements of machines, lets students explore how these elements can work together to perform new functions and gives students a chance to try analyzing Leonardo's inventions and designing their own. **Leonardo's Perspective** introduces Leonardo's way of looking at the world and explores Renaissance techniques for representing the 3-D world on 2-D surfaces. **What, Where, When?** is a brief biography of Leonardo da Vinci with images. **Leonardo: Right to Left** explores Leonardo's curious habit of writing in reverse. The site also has four pages with cool **interactives: Playing Around With Size and Distance**, **Exploring Linear Perspective**, **Investigating Aerial Perspective** and **Gadget Anatomy**. And it offers five **lesson plans** for **hands-on classroom activities** to extend learning: **Leonardo Right to Left**, **Leonardo's Window**, **How Far? How Small?**, **Sketching Gadget Anatomy** and **Be Inventive!** Plus, the website supports opportunities for students to **communicate** their ideas electronically.

**Web:** ***http://www.mos.org/sln/Leonardo/***

• Writer, inventor, diplomat, businessman, musician, scientist, humorist, civic leader, international celebrity … genius—**Benjamin Franklin** was one of the most extraordinary human beings the world has ever known. On this **PBS** website, your students will learn how Franklin's experiments helped scientists unravel some of the mysteries of electricity. In the **How Shocking interactive**, students will have their own electrical experience as they make a spark, fly a kite and build a lightning rod. In addition, students will learn that Franklin was also a civic-minded person who continually looked for ways to make life better. They can walk down the street in **Ben's Town** and learn how Franklin helped improve the life of his fellow citizens, and they can travel with Franklin around the globe and discover the influence of his **Worldly Ways** at home and abroad.

**Web:** ***http://www.pbs.org/benfranklin/explore.html***

• **Thomas Alva Edison** changed our world! His genius gave us electric lights in our home and an entire system that produced and delivered electrical power. He was the first to record sound—and he also started the recording industry. Edison developed the first movie camera and produced the first movies. In this **Smithsonian online exhibition**, your students can read about Edison's incredible accomplishments, discover how to make a light bulb and learn about his most famous creations through **Edison Invents**, an **interactive** experience featuring **audio**, **video** and **images** of Edison and his inventions.

**Web:** ***http://invention.smithsonian.org/centerpieces/edison/***

• Is there a "woman Edison"? A female "Columbus"? A feminine counterpart to fast flyers Charles Lindbergh and John Glenn? If so, who are they? In the **American Women Quiz**, an **interactive** on the website of the **National Institute of Environmental Health Sciences**, students will learn about some of the most famous **American women adventurers, explorers** and **inventors.**

**Web:** ***http://kids.niehs.nih.gov/science/quizzes/american_women_quiz.htm***

• On the **Invention at Play** website, students will see how sketching helps inventors think visually and spatially and both capture and express ideas. In the **Inventors' Sketchbook interactive**, students can see **Alexander Graham Bell's sketches** for the **first telephone** and **Newman Derby's sketch** for the **first sailboard.** Then students can use their imagination to sketch their own invention. When they're done, they can give their invention a title and description and send it to their friends.

**Web:** ***http://www.inventionatplay.org/inventor.html***

• Unlike technologies such as the light bulb or the telephone, the **Internet** has no single "inventor." Instead, it has evolved over time. The Internet got its start in the United States more than 50 years ago as a government weapon in the Cold War. For years, scientists and researchers used it to communicate and share data with one another. Today, we use the Internet for almost everything, and for many people it would be impossible to imagine life without it. On **A&E Networks' Digital History** website, your students can view a **photo gallery** of the **invention of computers** and the **Internet**. They can also watch **videos** on the origin of the Internet and the first digital computer, microchips and computing, transistors that transformed electronics, 1980s technology and Buzz Aldrin describing computers on *Apollo*.

**Web:** ***http://www.history.com/topics/invention-of-the-internet***

## VISIONARY ARTISTS

• **Off the Map** takes a look at **backyard paradises** created by visionary artists. These people did not consider themselves to be artists, but what they've built is amazing and very difficult to categorize. Five **classroom learning activities—Visionary Inventions** (for grades 4–6), **Exquisite Trash** and **Strangers from Other Worlds** (for grades 7–9), **Brave New World** and **Preserving the Wonder** (for grades 10–12)—are designed to bring students closer to understanding what visionary art is and to encourage the further discussion of creative endeavor. After students tour the work of the untrained visionary artists, they can visit the **Backyard Gallery** and then create their own backyard paradise.

**Web:** ***http://www.pbs.org/independentlens/offthemap/#***

**Web:** ***http://www.pbs.org/independentlens/offthemap/html/level2_byp.html?0*** **[interactive tour]**

**Web:** ***http://www.pbs.org/independentlens/offthemap/html/classroom.htm*** **[classroom activities]**

Classroom Resources for

# Don't Copy That 2

## School Version

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- The much-anticipated sequel to the 1992 video classic *Don't Copy That Floppy*
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- Educates 6th – 12th grade students about the ethical and legal use of copyrighted materials, such as software, books, articles, music, and movies.

**Use the Classroom Resources that support the video**

- Designed for leaders at classroom through district levels, especially technology educators, librarians and media specialists.
- Includes support materials for the video, lesson plans for middle schools and high schools, a glossary, and other resources.
- Aligned to digital citizenship teaching objectives in ISTE NETS Standards, 21st Century Skills, and AASL Standards for 21st Century Learners

Software & Information Industry Association
www.siia.net

SIIA

Download your FREE access to the Don't Copy That 2 video and your free copy of the Classroom Resources today.

**dontcopythat2.com**

• If there's a future architect among your students, you can find out at **Architect Studio 3D**, where students can design a house, walk through it in three dimensions and then share it with the world. They can also learn more about architecture, past and present, and explore **Frank Lloyd Wright**'s life and work.

**Web:** ***http://www.architectstudio3d.org/AS3d/index.html***

• **How Van Gogh Made His Mark** is an **interactive exploration** of four landscape drawings in the **Metropolitan Museum of Art** in New York City. The interactive introduces students to the creative genius of **Vincent Van Gogh**, the draftsman. Students can read a short **biography** of Van Gogh, view Van Gogh's **drawings** and learn **techniques** for using line to create illusions and light and dark areas (hatching). They'll also learn about the different **drawing tools** Van Gogh used to create "marks," and they'll try their skill at "**mark making.**"

**Web:** ***http://www.metmuseum.org/metmedia/interactives/art-trek/how-van-gogh-made-his-mark***

• Your students can explore **Piet Mondrian**'s painting ***Composition with Red, Yellow, and Blue*** (1935–1942) in this segment from **Making Sense of Modern Art**, an extensive and engaging guide to modern and contemporary works in the permanent collection of the **San Francisco Museum of Modern Art**. Students can "zoom in" on full-screen details of Mondrian's painting, explore excerpts from archival videos and films and listen to commentary by artists, art historians, critics and collectors.

**Web:** ***http://www.sfmoma.org/explore/multimedia/interactive_features/54#ixzz1YRXe0tG5***

**Plus: Composition with Javascript** is an interactive work made using HTML, CSS, Javascript and jQuery, based on **Piet Mondrian**'s ***Composition with Yellow, Red, Black, Blue and Grey*** (1920). It allows anyone to **deconstruct** the original painting and form it again in whatever he or she wants. Lines are shiftable (just drag a line with the mouse) and colors changeable (with a click). The texture of the painting was preserved to appear authentic.

**Web:** ***http://www.compositionwithjavascript.com/***

• In **The Dancers and Degas**, your students will join a student from the American Ballet Theatre and a dancer from the New York City Ballet in exploring the world of the dancer through the works of **Edgar Degas** at the **Metropolitan Museum of Art** in New York City. After they've explored Degas' life and work, students can create their own sketches in a fun activity.

**Web:** ***http://www.metmuseum.org/metmedia/interactives/art-trek/the-dancers-and-degas***

• The **Metropolitan Museum of Art** provides an opportunity for your students to see Harlem street life through the eyes and imagination of **Romare Bearden**. **Let's Walk the Block** explores this artist's famous collage, *The Block*, with a guided tour, music by the Branford Marsalis Quartet and **activities** designed by the museum.

**Web:** ***http://www.metmuseum.org/metmedia/interactives/art-trek/romare-bearden-lets-walk-the-block***

## Bring Ideas to Life

• The **School of Imagination** is an **online art academy** teaching children around the world **how-to-draw in 3-D!** Enrolling in the School of Imagination is easy. First students draw the *free* **sample lessons**. After they've completed the first few *free* lessons, students click on the "Lesson Review" light bulb icon inside the lesson area. These first drawing adventures have several **follow-up activities** to strengthen the skills, vocabulary and ideas presented. For example, after they complete the first "**Pencil Rocket**" **lesson**, they will click on the light bulb icon to print the "**Pencil Rocket**" **lesson worksheet, vocabulary chart, super story starter page, achievement certificate**, other "**Pencil Power Practice Pages**" and several helpful **learning charts**. After this first lesson, students can go on to the "**Phunny Phred D. Fish**," "**Jolly Jiggling Jellyfish**" and "**Totally Terrific Treasure Chest**" **lessons**. And finally they can take a fun, inspiring journey through the **School of Imagination Student Art Gallery**, displaying student art pieces that demonstrate successful application of important drawing principles and imagination.

**Web:** ***http://www.draw3d.com/schoolofimagination/school.html***

• On the **Utah Education Network**'s website, students in grades 3–6 can compose music, create art, play music games and participate in online art activities. For example, in the **String Thing interactive** (**Compose Music** section), students make their own string instrument and then write a song, add a beat and play it back. With the **Mobile Maker** (**Create Art** section), students design their own mobile and spin it. In the **Orchestration Station** (**Music Games** section), students explore the ways a piece of music can sound different. Or students can take on the role of **The Art of Crime Detective** (**Art Activities** section) and help solve crimes by drawing sketches of the criminals. The site includes a trove of interactives that will help develop students' **creative thinking**.

**Web:** ***http://www.uen.org/3-6interactives/fine_arts.shtml***

• In the **New York Philharmonic**'s **KidZone**, your students can visit the **Composer's Gallery** and meet Wolfgang Amadeus Mozart, Johann Sebastian Bach and others. They can learn about instruments in the **Instrument Storage Room**, make their own instruments in the **Instrument Lab**, create original music in the **Composition Workshop**—and more. And if they stop by the **Newsstand**, they'll find copies of the *Baroque Banner*, the *Classical Connection*, the *Romantic Reporter* and the *20th Century Sentinel* with reports on what was going on in music and other areas during Bach's and Mozart's times as well as in the nineteenth and twentieth centuries.

**Web:** ***http://www.nyphilkids.org/gallery/main.phtml?***

• Linear perspective—the technique used to create the illusion of space in a painting or drawing—has served as the golden rule for artists since the Italians developed it during the Renaissance. Then along came artist Hans Hofmann. Developing a technique he called "push and pull," Hofmann proved that the illusion of space, depth and even movement on a canvas could be created abstractly using color and shape, rather than representational forms. On this **PBS** web page, your students can learn about push and pull, and discover how color relationships and placement affect their perception of space. Then they can create their own painting with the **Push and Pull Puzzle**.

**Web:** ***http://www.pbs.org/hanshofmann/push_and_pull.html***

**Plus:** Under the **For Teachers** link, find classroom resources designed to explore the influential theories of the artist and teacher Hans Hofmann, as well as to give students insight into the artistic process itself.

**Web:** ***http://www.pbs.org/hanshofmann/for_teachers_001.html***

• **NGAkids Photo Op** is a two-part **interactive** introduction to **digital photography** and **image editing**. Students use the **virtual camera** to snap pictures. Then they experiment with the easy-to-use **photo-editing tools** to give their art a whole new look. The special-effects palette, colorizing options, collage tools, warps and mirrors will transform their photographs.

**Web:** ***http://www.nga.gov/kids/zone/index.htm#photoop***

• **Word Type** is an **activity** in **nonverbal meaning** in which students design a word or headline to look like its real or opposite meaning. This technique is often used in advertising, as a graphic designer reinforces a message through the choice of typeface, arrangement of letters and coloring effect. In the two examples shown in the **Try It!** section, your students will see how much more impact the words *Jumble* and *Elegant* have with their unique design style and coloring than if the words were displayed in a plain, unimaginative way.

**Web:** ***http://www.creativity-portal.com/becreative/activities/wordtype.html***

• Artists use their imaginations to create scenes and places that are not real and that might never exist. If your students could invent their own imaginary city, what would it be like? Invite them to try their skill with **My Imaginary City**, an online **interactive** created by the **Tate Museum** in London.

**Web:** ***http://kids.tate.org.uk/games/my-imaginary-city/***

**Plus:** Why not try **dancing** to create a masterpiece? In the **Airbrush interactive** created by the **Tate Museum**, students use a **webcam** to paint with their whole body.

**Web:** ***http://kids.tate.org.uk/games/airbrush/***

• The **Design Your Own Robot online exhibit**, developed by the **Museum of Science** in Boston, provides an introduction to robotics. Students will learn how robots work and what they do. They will also find out how robots are being used to go where humans cannot, to do repetitious and boring tasks, for quick and accurate assembly tasks, and in recreational settings. The **Design Your Own Robot interactive** allows your students to design and construct robots to accomplish six tasks. As they engage with this interactive, they'll learn something about the elements of robot design. When they're finished building each robot, they can link to a website showing a robot similar to the one they've built but operating in a real-world setting. The **Robots Gallery** contains the **online interactive**, **explanatory materials** and a number of **accompanying activities**.

**Web:** ***http://www.mos.org/robot/index.html*** [**online exhibit**]

**Web:** ***http://www.mos.org/robot/robot.html*** [**interactive**]

**Web:** ***http://www.mos.org/robot/visitors.html*** [**Robots Gallery**]

• This **Robotics** website, created by the **Galileo Educational Network** (GENA), takes students through all the **stages** of the **robotics design process**: Defining the Problem; Researching and Design; Creating a Prototype; Building Your Robot; Programming and Testing Your Robot; and Evaluating Your Robot.

**Web:** ***http://www.galileo.org/robotics/design.html***

• Do your students have a great idea or invention to share? Encourage them to visit **Invent Now**. In the **Invent Now Showroom**, they can try out cool inventions and meet the youth who created them. When they're ready to get started on their own inventions, they can download the *free* **Inventor's Toolkit**, which is full of ways to spark their creativity. Whether it's a re-invention or an idea all their own, students can show off their invention in the inventors' **Gallery**—but first they need to learn what it takes to be a "smart inventor." The **step-by-step lesson** in **Patent It Now!** is an engaging way to learn how real patents are granted.

**Web:** ***http://inventnow.org/***

**Web:** ***http://inventnow.org/dyn/showroom/pdf/InventorsToolKit.pdf*** [**toolkit**]

**Plus:** If your students need a spark to get their brainwaves flowing, **Invent Now** has six **Zones**, each with an **Invention Challenge**. Students can choose among these challenges: **The Sketch Pad**, **Game Changers**, **Investigation Station**, **The Hollywood Insighter**, **Mission Control** and **Going Green**.

**Web:** ***http://inventnow.org/challenges/***

• Your students have created the perfect invention, and now they need to build it. Where will they find the materials or the perfect work space? Check out **Invent Now Camp Invention**, a week-long **summer enrichment program** hosted in local schools for children in grades 1–6. It's a place they can bring their ideas to life and come up with plenty of new inventions.

**Web:** ***http://www.invent.org/camp/default.aspx***

**Web:** ***http://www.invent.org/camp/video.aspx*** [**video**]

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