How to use abstract symbolic screens to

Get Real

A roundup of apps & sites to help children learn about the real world

By Warren Buckleitner

Consider a baby's brain. Something amazing and invisible goes on whenever he or she interacts with something new. This interaction has a lot to do with language and learning, and they start the instant any "sensorimotor" (a Piagetian stage) contact happens. It might be a spoonful of pudding, or the cold nose of a puppy. During the very first two years or so, these new items don't exist in a child's head unless they are currently sensing them. It's out of sight, out of mind.

Google bing

Search on "mental representation" or "representational thought" if you want to dig deeper into the theory behind this article.

THE DAWN OF SYMBOL AWARENESS. When the child reaches around 24 months of age, something incredible happens that is **exclusive to the human species.** You can show them a picture of that spoonful of pudding and they'll start to get hungry. Try showing a picture of a bone to a dog -- even a very smart one, and it just doesn't work. For the toddler, "out of sight" no longer means "out of mind," and symbols can, for the first time, start to fill in for real items. Now this isn't to say we should start using abstract products at age two. This is a very gradual process and older children (and even adults) depend on concrete objects to create understanding. This concrete/abstract relationship lies at the core of constructivist theory. This notion — that symbols that are in the form of language, pictures, words, sentences and so on —is one of the defining characterisitcs of the human species, and it lies at the core of Jean Piaget's definition of cognition.

ENTER THE IPAD...Over the past 48 months, but especially this year, the concept has gotton boost due primarily to a single device: the iPad. We can now hand a child a camera/web enabled iPad (and coming soon, a swarm of Android options) with a multi-touch screen, so they can take a snapshot of a real object, and control the process of turning it into a symbol. A better name of the iPad might be "the symbolizer." Because the child is actively involved in taking the photo, it has more meaning. These tablets can do a lot more than take photos. Increasingly it is possible to find apps where children can play with symbols, much like they do lumps of clay. Consider the apps from TouchPress, where you can spin a working V8 engine with your fingertip, or the clever ebook on the cover of this issue, called Rounds: Franklin Frog that playfully introduces one of the most abstract science concepts reproduction (gasp). Then there's the augmented reality titles like Solar Walk or Spacecraft 3D that bridge the concrete symbolic space by making it possible to show the evening stars through your ceiling, or to examine the Curiosity Explorer, as if it is sitting on your dinner table. It is also easy to find symbol-rich apps that link pictures with more abstract printed labels, as in the Peapod Labs and Oceanhouse Media titles. Here's a starter list, by topic.

EARLY EXPLORING

ABC Food by PeaPod labs is one in the series of the ABC apps. Others deal with transportation, animals and so on. The app turns your iPad into an alphabet-themed visual encyclopedia. Instead of using stock art, however, these apps pull photos from royalty free sources, such as Flickr and YouTube. The photos are beautiful and they create an authentic presentation of letter-themed food art. Each word is spelled on the bottom of the screen. Touching any of the letters within the word lets you quickly jump to a new set of words. eaches: language, reading, letter recognition. Peapod Labs. , $1.99. Best for ages 3-up. [Rating: 4.7]

X is for X-Ray What does the inside of a seashell look like? What about an insect, a motorcycle or an iPad? Here's an app that lets you find out. The app contrasts two images -- before x-ray and after x-ray, and every possible gradation between. To move between the views, you swipe with a single finger, from top to bottom. The app would be an excellent supplement to any science curriculum, for general exploration and discussion. It would be fun to use it along with a project that involves taking something apart. Teaches: science, x-rays, exploration, mechanics, reading. Touch Press. www.touchpress.com, $8. Best for ages 5-up. [Rating: 4.4]

WHAT IS STEM?

An acronym for science, technology, engineering and mathematics. Say the word "stem" in any gathering of educators, and they'll generally start thinking about grants, or politically driven initiatives begun to address the perceived lack of qualified candidates for high-tech jobs. Inertia for STEM began back in the 1960's space race, and has been associated with a national effort to stay ahead of other countries. See, for example NSF's "What we do" at http://www.nsf.gov/about/what.jsp.

SpyClops Bionic Eye First released in 2007 under the name "EyeClops TV Microscope" by Jakks Pacific, we were able to find this composite video online for just $15. You put in five AA batteries, plug the yellow composite video cable into your TV and start exploring specimens at 200x power. Objects are illuminated by three white LEDs. There is one big drawback. There is no auto off feature. So if you leave the batteries on over the weekend, you have to come up with five fresh AA batteries. Teaches: science. Jakks Pacific, Inc. www.jakkspacific.com, $40. Best for ages 6-up. [Rating: 4.5]

Jim Henson's Sid's Science Fair. This playful, easy-to-use collection of three activities does an excellent job informally reinforcing an early math and science curriculum, where collecting, charting and noticing differences are the desired outcomes. For free exploration of some messy concepts that lie at the heart of STEM learning, you can't beat this app. And no cleanup is required. Created by Jim Henson Studios and Daren Carsten of Carsten's Studios for PBS Kids. Teaches: science, math, charts, noticing differences, collections, observation, counting. PBS Kids. www.pbskids.org, $2.99. Best for ages 4-7. [Rating: 4.7]

GEOGRAPHY

Barefoot World Atlas. Featuring a 3D spinning globe interface, this children's atlas makes it possible to zoom in and pull out of a globe view, and to explore surface-level facts and photos on several hundred topics, including basic facts about each country. These facts can be compared with a touch (for example, for Mali) to learn the current time, weather, distance from you (the app knows where you are), and then compare land area, highest point, currency, transport per 1,000 people, and average CO2 emissions. There's plenty to explore, and the spinning globe organization works far better than a book. Teaches: geography, science. Barefoot Books. www.barefootbooks.com, $7.99. Best for ages 8-up. [Rating: 4.4] or .88%

SPACE

NASA Science: A Journey of Discovery. This app is organized around four questions that have driven NASA research: What are the effects of space weather on the Earth's technology?; How are Earth's sea ice sheets changing?; Are there other habitable planets?; and Was Mars ever a habitat for life? Each leads to an encyclopedia-like set of interactive info-screens, of the variety that you can imagine at a kiosk in a hands-on museum. Using this app requires a lot of reading, and there is very little sugar coating. That's why it should be in every upper elementary and middle school iPad. Teaches: space travel, STEM, Mars. NASA. http://science.nasa.gov/connect/apps/, $free. Best for ages 8-up. [Rating: 4.6]

Spacecraft 3D. Amazing, but limited, this augmented reality (AR) app lets you explore different NASA spacecraft used to explore our solar system. To use the app, you need to first print a sheet of paper containing a marker, needed to unlock the spacecraft. Current options include the GRAIL (at the moon) and Curiosity rover (on Mars). After you have your sheet of paper, you lay it on the table and line up your iPad or iPhone's camera. Presto -- a 3D model of Curiosity Rover pops up on your screen. You can move around the craft, and a set of buttons on the bottom of the screen extend the robotic arm. Teaches: space travel, NASA, exploration. NASA. http://science.nasa.gov/connect/apps/, $free. Best for ages 8-up. [Rating: 4.5]

PHYSICAL SCIENCE

Bobo Explores Light. Here's a great example of how an app can let children aged 7-up play with -- and better understand -- an abstract concept; in this case light. What better way to understand how light changes when it hits a mirror, than to let a child manipulate the mirrors. Other noteworthy content includes a schematic of an eyeball, a conversation with Thomas Edison, and an experiment on mixing colors of light. The best part about this app is the way that it lets children directly manipulate the concepts, so they can "try the ideas on for size." See the demo, at http://youtu.be/G0LIP7pl08w. Disclosure: CTR Contributing Editor Bob Tedeschi helped produce this app. Teaches: science, light, angles. GameCollage LLC. www.gamecollage.com, $4.99. Best for ages 7-up. [Rating: 4.9]

Monster Physics. This invention construction kit contains 50 puzzles sorted into five challenge categories. In addition, an open-ended "build" mode lets you freely experiment with 68 parts such as blocks of ice, rubber band balls, fruit, wings, bombs, magnets, a mechanical claw, ropes, chains and shapes. You can also just freely build to create a car, crane or a rocket ship. Testers found the puzzles to be addicting and realistic, but requested hints on some of the puzzles. Of course, this lack of help is also one of the charms of such puzzles. Teaches: science, problem solving, deductive reasoning, logic . Dan Russell-Pinson. http://dan-russell-pinson.com/, $.99. Best for ages 6-up. [Rating: 4.6]

Painting With Time (See also **Painting With Time Climate Change Edition**). Helping a child understand long term temporal relationships -- things like how a plant grows or how a glacier retreats -- has always been a challenge for a parent, librarian or teacher. Now there's an app for that, and it works. Featuring a very basic design, Painting With Time (called "Paint With Time" in the app store) exemplifies how you can leverage the power of a multi-touch screen to make an abstract concept -- in this case time -- have meaning. A gallery containing 14 pictures includes such things as A Messy Room (showing how a child's playroom gets messy over just a few days), Growing a Beard (over 30 days), "Spring Comes to Boston" and "A Glacier Retreats." This app is part of a larger long term NSF initiative designed to expand the general public's notion of time relationships. www.exploringtime.org. Perhaps the best part -- the app is free. Teaches: science, time. Red Hill Studios. www.redhillstudios.com, $free. Best for ages 6-up. [Rating: 4.5]

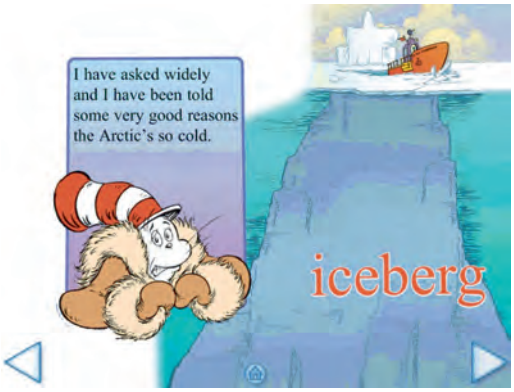
EARTH SCIENCE

Focus on Earthquakes. This interactive earth science textbook has an amazing and very useful feature -- a real time seismic globe that shows the most recent earthquakes, as they happen. As a result, this is a wonderful way to show that we live on a continually moving, shifting planet. Teaches: earth science, earthquakes. Tasa Graphic Arts, Inc. www.tasagraphicarts.com, $3.99. Best for ages 11-up. [Rating: 4.7]

Gems and Jewels. Similar in design to "The Elements" and "The Planets" Gems and Jewels lets you explore the large collection of glittering treasures on display at the Field Museum in Chicago. The app starts with a screen full of highly illustrated gems that slowly spin, 360 degrees, on a single plane. There are 165 types of gems, each with as many as six examples. As a specialized reference, this app is the best in it's class. Teaches: science, geology, gems. Touch Press. www.touchpress.com, $13.99. Best for ages 10-up. [Rating: 4.8]

OCEANOGRAPHY

Magic School Bus, The: Oceans Ms. Frizzle comes to the multi-touch screen, in the app version of the Scholastic book "The Magic School Bus: On The Ocean Floor." Arranged in ebook fashion, the app takes children on a tour of the basic parts of the ocean. At any point, you can touch any child to hear some dialog, and at several points, tilt the screen to interact with the graphics. Teaches: science, ocean life. Scholastic Media. www.scholastic.com, $8. Best for ages 2-up. [Rating: 4.5]



Ice is Nice Here's another solid addition to the Oceanhouse Media's "The Cat in the Hat's Learning Library." You climb aboard the SS Ice Chopper for an expedition to the North and South Poles to explore Seussian depictions of geography and native animals. Children can touch interactive diagrams to explore topics including how the Earth moves around the sun and affects the seasons, or how specially designed hairs keep the polar bear warm. See the CTR video review http://youtu.be/qMWyB6JmcfY. Teaches: reading, science, ecology. Oceanhouse Media, $5.99. Best for ages 5-10. [Rating: 4.5]

LIFE SCIENCE

Rounds: Franklin Frog This innovative app stretches the definition of ebook, with a dash of Nosy Crow irreverence. Rounds: Franklin Frog is the first title in a series of non-fiction apps that deal with life-cycles. Children can participate in a G-rated version of each stage of frog reproduction, helping a male frog hop, swim, croak, eat and find a female to reproduce. Next comes eggs and changing from a tadpole into a frog. Because the app is based on three generations, you play the app three times, with different characters (Franklin, Franklin's Son and Franklin's Grandson), hence the word "rounds" in the title. This is the first time we've seen this type of circular design, similar in ways to a play with different actors using the same sets. Teaches: science, life cycle of frogs, biology, reproduction. Nosy Crow. www.nosycrow.com, $4.99. Best for ages 3-6. [Rating: 4.3]

WolfQuest (www.wolfquest.org). If you're tired of being a frog, how about a wolf? This NSF-funded simulation puts you on the prowl for food and a mate. You start by creating your wolf avatar, choosing a coat, gender, strength and speed. Next, you find yourself in the middle of a forest, with hunger and stamina meters that could've come out of any video game. You move through the 3D landscape in search of food and eventually a mate. If you teach upper-elementary or middle-school-age children, make a note of this virtual world. Teaches: science, ecosystems, wolf habitats, logic, spatial problem solving. EduWeb. www.eduweb.com, $free. Best for ages 9-13.

SPACE

NASA Rocket Science 101 Can you match the rocket, and all it's components, with the NASA space mission? If so, you can get your satellite (or Mars rover) into orbit. If not, your rocket will never leave the ground. That's the basic challenge of this free NASA App. You start by choosing one of eight missions; each requiring a different payload. You learn that the Curiosity is very heavy, for example, weighing as much as a loaded SUV. Getting all that weight to Mars requires a very powerful rocket. There's a

hidden treasure in the credits, in the form of links to videos of actual launches, from the real missions. Teaches: problem solving, scientific vocabulary, Science. NASA KSC IT Mobile Team. , $free. Best for ages 4-up. [Rating: 4]

Star Walk
Point your iPod Touch, iPad or iPhone at the sky (or ceiling) to harness the power of an augmented reality system paired with a database of the stars. The program uses your camera, compass, current location and accelerometers to know which star you're looking at. A set of Wikipedia Links that let you select a celestial body and tap the "i" icon to activate a magnifier to read information, or you can tap the Wiki icon to open the Wikipedia page Teaches: astronomy . Vito Technology. www.vitotechnology.com, $3 for iPhone, $5 for iPad. Best for ages 8-up. [Rating: 4.9] or .98%

Solar System for iPad. Touch a planet, moon or comet to explore, in this carefully crafted interactive science poster that covers every corner of our Solar System. You notice a location-based slider on the screen bottom, that starts with the center of the solar system (the Sun) and moves out to the distant comets. This space-line serves as a constant table of contents, helping you to jump around quickly through huge distances. To learn more about a planet or moon, touch it or turn it to pull up more Hubble photos. Content includes about 200 "pages" of interactive information, presented book style. The best part of this app is the working model of the solar system where you can zoom in or out on the model, and adjust units of time or your view in the system, with a swipe. This feature helps children (and adults) understand how the solar system works, and the vast time/space relationships involved. See the demo at http://www.youtube.com/watch?v=lbGGe7B77VQ Teaches: science, astronomy, the solar system, planets. Touch Press. www.touchpress.com, $14. Best for ages 7-up. [Rating: 4.8]

There's No Place Like Space. Stretching the term "non-fiction," The Cat in the Hat's Learning Library is an ebook adaptation of the Dr. Seuss series, done in classic Oceanhouse Media style, where you can touch any item or word to see it labeled. So what's different? Some of the words, like Sun, appear in boldface form. If you touch it, a definition pops up. Touch the definition again and it is read aloud. For a good clean design with excellent language support and some embedded science content, it's hard to go wrong with this title. Teaches: reading, science, astronomy, outer space, the solar system. Oceanhouse Media. www.oceanhousemedia.com, $5.99. Best for ages 5-8. [Rating: 4.4]

We Choose the Moon (www.wechoosethemoon.org). A prime example of bringing history to life, We Choose the Moon (www.wechoosethemoon.org) is a real-time reenactment of the Apollo 11 mission (with Neal Armstrong), from take off to the start of the return to Earth. The site is divided into 11 stages, starting with the blastoff. At each stage, you can witness the events in realtime, as indicated by a flight clock shown on the left side of the screen. As the events pass, you can hear the real audio stream, with the transmissions between mission control and the spacecraft, you can see the transmission stream in more contemporary terms -- as a Twitter stream. See also www.google.com/moon. Teaches: science, space travel, history. John F. Kennedy Library Foundation. www.jfklibrary.org, $free. Best for ages 6-up.