Mar 6th, 2:45 PM - 3:30 PM

FREE STEM Apps for Common Core

Daniel E. Rivera Mr.
Georgia Southern University, drivera@georgiasouthern.edu

STEM Apps for Common Core

Access/Edit this doc online: http://goo.gl/bLkaXx

Science is one of the most amazing fields of study. It explains our universe. It enables us to do the impossible. It makes sense of mystery. What many once believed were supernatural or magical events, we now explain, understand, and can apply to our everyday lives. Every modern marvel we have - from medicine, to technology, to agriculture- we owe to the scientific study of those before us. We stand on the shoulders of giants.

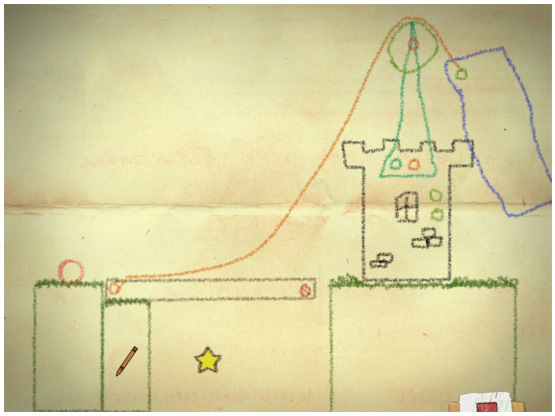
It is therefore tremendously disappointing that so many regard science as simply a nerdy pursuit, or with contempt, or with boredom. In many ways we stopped dreaming. Yet science is the alchemy and magic of yesterday, harnessed for humanity's benefit today. Perhaps no other subject has been so thoroughly embraced by the Internet and modern computing. There are hundreds of thousands of resources on the web to help kids understand science in meaningful ways, but sorting through the billions of websites can be daunting.

I share with you some of my favorite sites and software titles in the hopes that you will share them with your students. Let them play. Let them Think Differently. Let them discover wonders for themselves, and let them experience science. Inspire Moonshot Thinking in them, and have them Dare Mighty Things.

Daniel Rivera

Computer Games

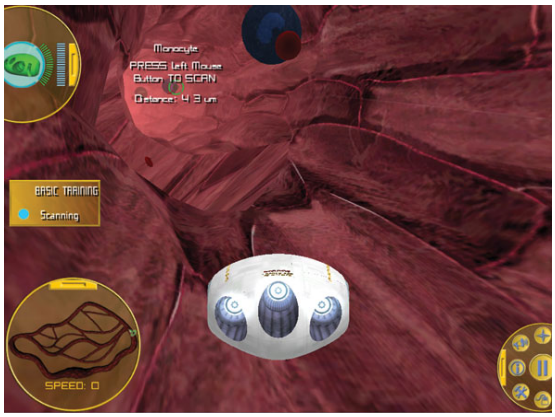
Crayon Physics



Crayon Physics is a 2D physics puzzle / sandbox game, in which you get to experience what it would be like if your drawings would be magically transformed into real physical objects. Solve puzzles with your artistic vision and creative use of physics. It's a true gem of a game: great sounds, level design, and music, coupled with a simple yet powerful concept. While this is a commercial game, you can download the demo for free.

- Download: http://bit.ly/lwxCQ
- Play video: https://www.youtube.com/watch?v=avkacGQKWec
- See Also: Microsoft Physics Illustrator
- See Also: Magic Pen a clone of Crayon Physics as a flash based game called Magic Pen. It's smaller but free, and requires no install. Just click the link above to play it! In fact, check out ALL the physics games on Physicsgames.net!

Immune Attack



Immune Attack is an educational video game created by the Federation of American Scientists and Escape Hatch Entertainment. The game is designed to teach immunology to high school students, although later versions will cater to college aged students as well.

The protagonist has a unique immunodeficiency in which the all the immune cells have forgotten what to do. The hero decides to take matters into her own hands, and allies herself with a team of scientists to create a nanobot with the abilities to teach cells how to fight bacterial and viral infections. The player assumes the role of a pilot remote-controlling the nanobot Explorer. With the help of advisors, the player must learn about the different cells and environments in the human body in order to determine how to train the immune system.

Each subsequent level of Immune Attack features a different infection, and a different cell type the player must train. Cells trained on previous levels are available for deployment as well, allowing the user to make use of a wide range of agents to accomplish their mission.immune attackport

- **Download:** http://immuneattack.org/players-2/download
- **Play Demo:** https://www.youtube.com/watch?v=tKgroDE4DHo

Portal 2

Portal 2 is a best-selling AAA game title by Valve that brings dynamic puzzle solving to millions. It's largely non-violent, very popular, and has a robust physics engine. It also comes with an editor to allow students to make their own puzzle levels. Mixing engineering, technology, and math, it's a great combination.

- **Teach with Portals:** **http://www.teachwithportals.com/** Used to offer a free version of Portal 2 for schools, but looks abandoned. Still has great lesson plans and hopefully will start accepting applications again.
- **Portal 1 Demo, First Slice**: http://store.steampowered.com/app/400
- **Puzzlemaker in Schools Overview:** https://vimeo.com/49772807
- Videos: Introduction and Trailer

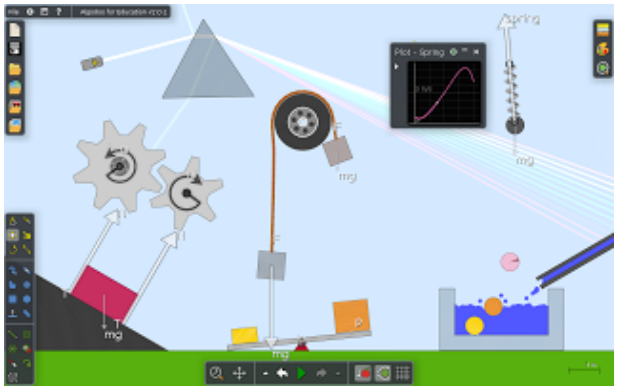
Computer Apps

SketchupMake

SketchUp (Make) is an easy-to-learn 3D modeling program that enables you to explore the world in 3D. With just a few simple tools, you can create 3D models of houses, sheds, decks, home additions, woodworking projects - even space ships. And once you've built your models, you can place them in Google Earth, post them to the 3D Warehouse, or print hard copies. SketchupMake is free for personal use. No registration is required.

- Download: http://www.sketchup.com/download
- Example - Sketchup cross-sections: http://youtu.be/lgCc5dFnvjY
- Science standards alignment
- 3D warehouse: https://3dwarehouse.sketchup.com/

Algodoo

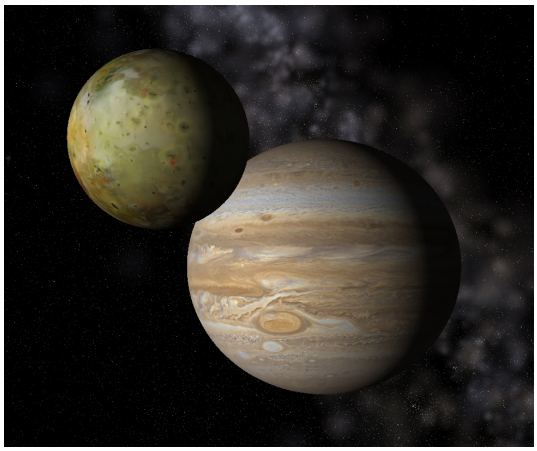


Explore physics, build amazing inventions, design cool games or experiment with Algodoo in your science classes. Algodoo encourages students and children's own creativity, ability and motivation to construct knowledge while having fun, making it as entertaining as it is educational. Algodoo is also a perfect aid for children to learn and practice physics at home.

With Algodoo you can create simulation scenes using simple drawing tools like boxes, circles, polygons, gears, brushes, planes, ropes and chains. Easily interact with your objects by click and drag, tilt and shake. Edit and make changes by rotating, scaling, moving, cutting or cloning your objects. You can also add more physics in your simulation like fluids, springs, hinges, motors, thrusters, light rays, tracers, optics and lenses. Algodoo also allows you to explore and play around with different parameters like gravity, friction, restitution, refraction, attraction, etc.

- **Download Algodoo:** http://www.algodoo.com/download/
- **Video:** http://youtu.be/0LGzTKINqJk

Celestia

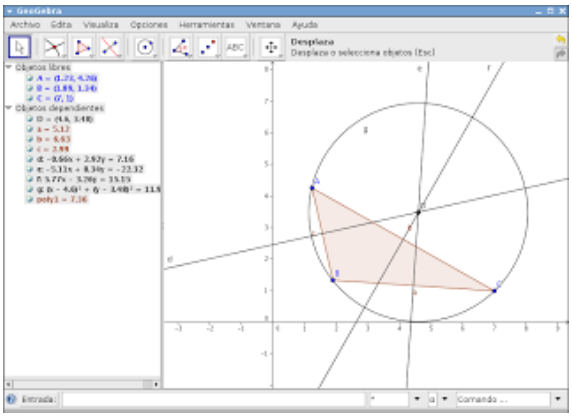


Celestia is a simulation of the entire universe, based on current astronomical information. It includes beautifully rendered planets, moons, and some smaller orbital bodies such as Mir and the International Space Station. Celestia is not limited to our solar system; you can visit other stars, or even travel outside the galaxy. You will find models of extra-solar planets in orbit around those stars for which we have evidence of planetary bodies. You have complete control over time and space, so you can view the stars from your chosen location and epoch. It is available for Windows, Linux, and MacOS X.

To get a good idea of Celestia's full capabilities, start the program and press D for Demo.

- **Download:** http://www.shatters.net/celestia
- Celestia User's Guide
- Celestia KeyChart PDF
- Get more add-ons for Celestia at the Celestia Motherload.
- **Youtube Demo:** http://youtu.be/I8UggsJzOgk

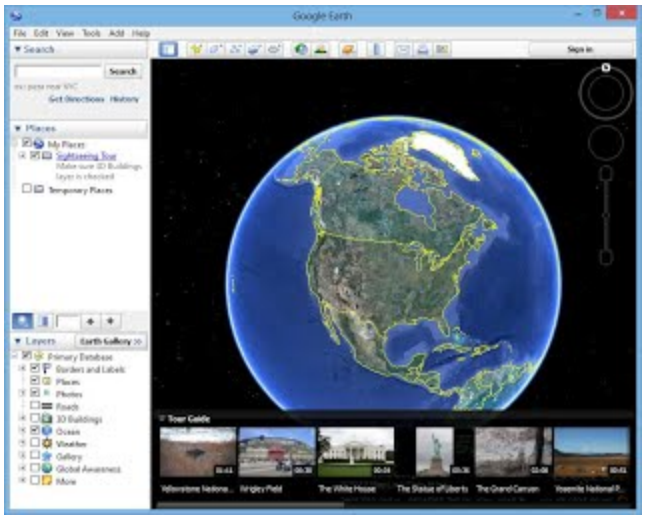
Geogebra



Pour a little Algebra & Geometry into an Open-source beaker, then add a dash of Calculus, offer it free, and what do you get? GeoGebra, a free and powerful program for exploring all three of the major math areas. Geogebra lets you create constructions with points, vectors, segments, lines, and conical sections as well as functions. You can change them later as well. You can also enter coordinates and equations directly, including variables, of course.

- Download: www.geogebra.org
- GeogebraTube, download sample content from other users, including dynamic worksheets.

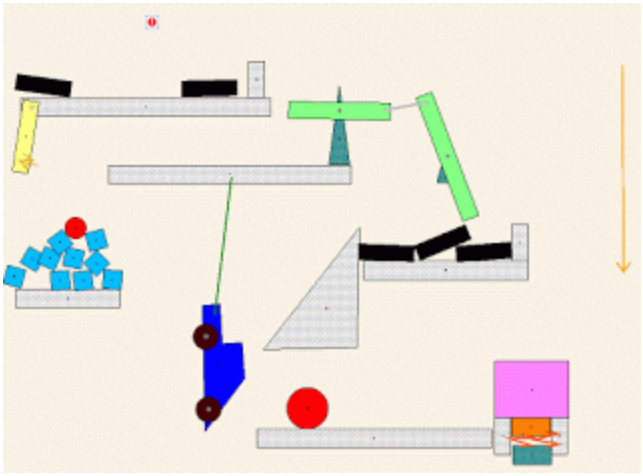
Google Earth



Every decade or so, a software resource emerges that forever changes the way people interact with the world. Google Earth is such a resource. The idea is simple. It's a globe that sits inside your PC. You point and zoom to anyplace on the planet that you want to explore. Satellite images and local facts zoom into view. Tap into Google search to show local points of interest and facts. View driving directions and even fly along your route! You can even save placemarks in KML files and share them with the world. Google Earth is very user-friendly, allowing you to create your own placemarks and content, which means that there is a very large online community to share content with!

- Download: http://www.google.com/earth
- Standards Alignment: goo.gl/5rxa7
- Juicy Geography's Google Earth Lessons

Microsoft Physics Illustrator

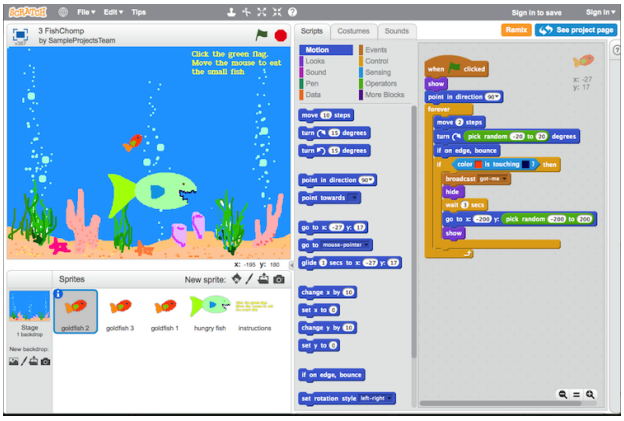


Microsoft Physics Illustrator, also known as Magic Paper, is software designed by Microsoft and MIT for a tablet PC. It is a 2-D editing plane, where the user can draw various shapes and bodies and apply forces between them to make them interact. Because of this, it is also referred to as Natural Interaction.

This is really one of those programs that has to be used to be belived. The program is supposed to be only for the Tablet PC, but we managed to find a version that has been modified to work on regular PCs. To run the program, click the file: PhysicsIllustrator.exe

- Download and Unzip

Scratch



Scratch is a programming environment for beginners, where kids can use a simple programming syntax to create their own interactive stories, animations, games, music, and art, and share their creations on the web. Scratch is designed to help young people (ages 8 and up) develop 21st century learning skills. As they create and share Scratch projects, young people learn important mathematical and computational ideas, while also learning to think creatively, reason systematically, and work collaboratively. Scratch is simply FUN, and it's easy for kids to create so many different kinds of programs or games. It's like Lego for programming!

Download: http://scratch.mit.edu/

Make Your Own Games

- **Sploder:** Kid friendly http://www.sploder.com/free-game-creator.php
- **Engine001:** Looks to be very robust 2D game maker
  - http://www.engine001.com
  - has an educationally restricted version too: http://www.engine001.com/education.htm
- **Sandbox Game Maker:** Used by schools http://www.sandboxgamemaker.com/free-game-maker/
- **RPG Maker:** http://www.rpgmakerweb.com/
- **Game Maker** - much more robust, with a free version https://www.yoyogames.com/studio/buy

Chrome Apps

- Wolfram Alpha: Instantly query Wolfram|Alpha from any page or tab.
- Angry Birds: Physics based viral game of avian destruction!
- Physics Games: A collection of physics-based games that can be played online for free.
- 3D Solar System Web: Like Celestia for your browser! Explore the Solar System in 3D, all in your Chrome Browser
- Biodigital Human: The BioDigital Human is a 3D platform that simplifies the understanding of anatomy, disease and treatments. Explore the body in 3D!
- Carrotsticks: An online multiplayer game that improves math skills for 1st-5th graders as they practice and compete with peers around the world
- Fraction Wall: Interactive fraction wall - explore equivalence between fractions, decimals and percentages.
- Geogebra: GeoGebra is free dynamic mathematics software for all levels of education that joins geometry, algebra, graphing, and calculus.
- Geogebra Tube: Free and interactive worksheets and lessons for learning & teaching mathematics and science
- Lego Builder: A free online Lego Builder
- Quick Earth: Explore the planet with Quick Earth, the most featured-packed Google Earth app in the Chrome web store.
- Graphing Calculator by Desmos: Easy, beautiful, powerful, free! Brought to you by desmos.com

Find more here: https://sites.google.com/site/freeloaderedu/chrome-apps=

Websites (that are app-like)

- **Google Drive (drive.google.com)**
  - **Drawings** (http://docs.google.com/drawings) really good for working with shapes, layout, models
  - **Docs:** has a rudimentary equation editor
  - **Slides:** includes really easy Youtube integration and drawing tools (shapes!)
  - **Spreadsheets:** fully functional with robust formulas, graphs
    - http://www.educationworld.com/a_curr/mathchat/mathchat025.shtml - good article on the use of spreadsheets in the Math classroom, including constructivist approaches and supporting research
    - Numeracy Software's 10 Math Activities with Spreadsheets
    - Ideas for spreadsheets from math cats: http://mathcats.com/spreadsheets/
  - Need to edit LaTex files (.tex) ? Drive Notepad!
  - Easy spreadsheet grading Flubaroo
- **Manga High (http://www.mangahigh.com)** Math games that are very well designed to be fun and educational. Many of them have definitely strategy components that reward high levels of mathematical skill and understanding. Solid game design. Subscription service but you can play many for free.
  - **Flower Power:** https://www.mangahigh.com/en-us/games/flowerpowerlite
  - **Sigma Prime:** https://www.mangahigh.com/en-us/games/sigmaprime
- **The Physics Classroom** (http://www.physicsclassroom.com): The Physics Classroom is an online, free-to-use physics website developed primarily for high school physics students and teachers. The website features a variety of sections intended to support both teachers and students in the tasks of learning and teaching physics.
  - Graphs & Ramps Interactive
  - Who can see who
- Common Core Science Resources
- http://www.corestandards.org/Math/Practice/

Mobile Apps

- See our STEM Apps for Android here: http://tiny.cc/androidstemapps

Misc

Tech Resources for Science

https://docs.google.com/a/georgiasouthern.edu/document/d/1ZJVkeyqWUQzcoDq5A8BXkU8w6XcrZKErDI-EKcOVQIM/edit A document I put together a while back, which includes links and software, tied to standards.