TAG-ED STEM Day Resources

STEM Learning Videos: Middle School and High School

1. Georgia Public Broadcasting Fast Forward Series - http://www.gpb.org/fast-forward/episode

Description- 18 videos featuring exciting Georgia STEM based careers and how they connect to the classroom

2. STEM Shaping the World We Live In- http://www.youtube.com/watch?v=biWQZIUl-vE

Description- Energy Secretary Steven Chu and business leaders discuss how, with an understanding of Science and Math, individuals are shaping the world we live in.

3. NOVA - http://www.pbs.org/wgbh/nova/

Description- one of television's most acclaimed series, having won every major television award, most of them many times over. The Web site offers an extensive collection of teacher's guides with viewing ideas and classroom activities, interactive and related resources. Teachers can also sign up to receive a weekly e-mail reminding you of upcoming NOVA programs and related NOVA Web resources.

4. **Secrets of the Dead -** http://www.pbs.org/wnet/secrets/

Description- This program and site introduce students to topics in chemistry, forensics, physical sciences and life sciences through the investigation of age-old mysteries. Many of the lesson plans are enhanced with streaming video.

5. Jean-Michel Cousteau: Ocean Adventures - http://www.pbs.org/kqed/oceanadventures/educators/

Description- Designed primarily for middle school educators and students, Ocean Adventures resources are appropriate for use in both formal and informal educational settings. They are aligned with National Science Content Standards and Ocean Literacy Essential Principles and Fundamental Concepts.

6. QUEST- http://science.kqed.org/quest/

Description –Series that inspires students with stories that demonstrate science in the real world, from energy saving windows to the science of cheese. KQED's award-winning multimedia science and environment series *QUEST* aims to raise science literacy and inspire audiences to discover and explore science and environment issues for themselves. The series focuses on nine content areas: astronomy, biology, chemistry, climate, engineering, environment, geology, health, and physics.

7. Scientific American Frontiers - http://www.pbs.org/saf/educators.htm

Description - This program hosted by Alan Alda explores the latest trends in science, medicine, technology, and the environment. Each program is accompanied by an online, printable teaching guide with activity ideas and quizzes. To browse the math-focused lesson plans, use the Advanced Search available on the PBS Teachers Web site. Enter the keywords "Scientific American Frontiers" and narrow your search to the subject "Math" and the grade level of your choice.

8. The Ascent of Money - http://www.pbs.org/wnet/ascentofmoney/lessons/

Description-This groundbreaking four-part series examines the creation of the economic system by taking viewers on a global trek through the history of money. Lesson plans explore the role of banks, the concept of insurance, the basics of the stock market, and entrepreneurship.

9. Middle School STEM Careers - http://www.teachersdomain.org/asset/wpsu09-stemcareers_vid_midschool/

Description- This brief video from WPSU introduces a diverse group of middle school students with common interests that relate to STEM careers. Whether creating robots or designing solar cars, each of the student dreams of activities beyond the stereotypical view of a nerdy scientist.

10. STEM Flix - http://www.northropgrumman.com/CorporateResponsibility/CorporateCitizenship/Education/STEMFlix/Pages/default.aspx/

Description- STEM Flix™ is a new, interactive video series provided for your viewing pleasure by the Northrop Grumman Foundation and Science Bob. And they are all about having fun with STEM

11. Exploratorium - http://www.exploratorium.edu/

Description- The Exploratorium is a collage of 650 interactive exhibits in science, art, and human perception. Students can explore any of these subject: light color, sound, music, motion, animal behavior, electricity, heat and temperature, language, patterns, hearing, touch, vision, waves and weather. (Grades 3-12)

12. National Geographic Weird Science-
http://video.nationalgeographic.com/video/science/

Description- View national geographic videos that showcase the strange and exciting side of science in the areas of outer space, the human body, the pre-historic world, technology, biology and more!

13. National Science Foundation Videos-
http://www.windows2universe.org/olpa/videos/videos_menu.html

Description- A variety of short films ranging from 1-30 minutes from the National Science Foundation hosted by Windows to the Universe covering a broad range of exciting scientific topics!

14. Brain POP- http://www.brainpop.com/

Description- Animated **Science**, Health, **Technology, Math**, Social Studies, Arts & Music and English movies, quizzes, activity pages and school homework help for K-12.

STEM Learning Videos: Elementary School

1. Sid the Science kid -
http://pbskids.org/sid/videoplayer.html

Description-Each episode of The Jim Henson Company's Sid the Science Kid focuses on a single scientific concept that is presented using Preschool Pathways to Science (PrePS©), a practical science readiness curriculum used in preschool classrooms that was created by cognitive researchers and preschool educators, incorporating lessons learned from developmental research as well as classroom experience.

2. Dragon Fly TV-
http://pbskids.org/dragonflytv/watch/index.html

Description- This program provides children with opportunities to explore science and engineering to share the excitement of scientific discovery. The Web site includes a wealth of science related games, activities, and streaming video.

3. The Cat in the Hat Knows a Lot About That! -
http://pbskids.org/catinthehat/

Description- Discover the joy and wonder of science with Cat and his friends as he takes preschoolers on a wild learning adventure! Dr. Seuss's The Cat in the Hat guides friends Sally and Nick – with a little help from the Fish, Thing 1 and Thing 2 – on fun filled adventures where they make natural-science discoveries, from how bees make honey to why owls sleep during the day.

4. **SciGirls- http://pbskids.org/scigirls**

Description-SciGirls is out to change how tweens think about science, technology, engineering and math, or STEM! In each episode, join bright, curious real girls in putting STEM to work. Then check out the website to play games, watch episodes, share projects, and connect with other SciGirls in a totally safe social networking environment!

5. NEO k12- http://www.neok12.com/

Description- A repository of educational videos with corresponding games and lesson plans that include physical science, life science, geography, biology, as well as earth and space.

6. Exploratorium - http://www.exploratorium.edu/

Description- The Exploratorium is a collage of 650 interactive exhibits in science, art, and human perception. Students can explore any of these subject: light color, sound, music, motion, animal behavior, electricity, heat and temperature, language, patterns, hearing, touch, vision, waves and weather. (Grades 3-12)

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8. NASA's The SPACE PLACE-
http://spaceplace.nasa.gov/menu/explore/

Description- Here kids of all ages can have fun learning and exploring the world around us. NASA brings you an exciting way to look at our Sun and Earth, our solar system and the universe beyond with numerous video topics to choose from.

9. Zane Education-
http://www.zaneeducation.com/Videos/Science/Elementary_Science.php

Description- A selection of 30 of our online Elementary Science videos provides elementary-school students with the opportunity to learn about a basic science program. Each title introduces a lovable character who takes your child on a trip through the world of plants, the animal kingdom, the solar system, the earth, and the human body.

10. Scholastic Study Jams-
http://studyjams.scholastic.com/studyjams/index.htm

Description- Scholastic hosted site full of over 200 short, upbeat educational videos on math & science topics. The videos are organized by topic, so you can just find the video that matches the educational concept you're covering in class!

11. Brain POP- http://www.brainpop.com/

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12. Georgia Public Broadcasting Fast Forward Series -
http://www.gpb.org/fast-forward/episode

Description- 18 videos featuring exciting Georgia STEM based careers and how they connect to the classroom.

13. Count on it -
http://www.gpb.org/countonit

Description- *Count On It!* is a fun and innovative way to teach children mathematics. This video series features two puppets, Blossom and Snappy, who both love finding math in everyday situations. You can often find them shopping, baking, event planning, decorating and visiting attractions!

STEM Activities/Online interactive experiences: Elementary School

1. PBS Science Games for 1st and 2nd Grade-
http://www.pbs.org/parents/education/science/games/first-second/

Description- Try some of these free science games for grades 1 and 2 featuring PBS KIDS characters to boost your students' early development of science skills and interest in science.

2. Cyber Chase-
http://www.pbs.org/parents/cyberchase/activities/

Description - An entertaining variety of extensive math activities that engage students in math skills for use in your elementary classroom.

3. Math Active-
http://www.asset.asu.edu/new/mathactive/

Description- from the University of Arizona, Math Active lessons are Flash animated math modules designed for grades K-12. Each module features content that touches a geometry performance objective from the Arizona Academic Standards for mathematics. (Categorized by grade)

4. PBS EcoInvestigators-
http://www.pbs.org/teachers/ecoinvestigators/

Description- PBS and International Paper introduce EcoInvestigators! Using the Community Problem Solving model of inquiry-based instruction, students will use this website to build knowledge and develop projects that address local community and its environment. On these web pages you will find lesson plans, project ideas, media assets and assessments rubrics related to four primary environments: Air, Land, Freshwater, and Saltwater. (Grades3-5)

5. SCRATCH- http://scratch.mit.edu/

Description- Scratch is an educational programming language that allows people of any experience, background and age to experiment with the concepts of fully versatile computer programming by snapping together visual programming blocks to control images, music and sound. It is developed by the Lifelong Kindergarten group at the MIT Media Lab[3] by a team led by Mitchel Resnick.

6. STEKCHUP for K-12 Education- http://www.sketchup.com/intl/en/industries/edu/primary.html

Description- K-12 educators and students from all over the world use SketchUp to explore, explain and present their ideas using 3D models.

7. Khan Academy- http://www.khanacademy.org

Description - Provides refreshers on math skills from dividing fractions to solving for linear equations. Explains basic science concepts! Short (less than 10 min) explanations of everything from accounting to physics. (K-12)

8. **Engineering- Go for It- http://teachers.egfi-k12.org/**

Description- contains a repository of lesson activities divided by grade level and resources sponsored by the American Society for Engineering Education (ASEE). The site contains many exciting "buzz" topics of interest for teachers and students!

9. Invention at Play- http://www.inventionatplay.org/playhouse_main.html

Description- playful approaches cited by creative adults that form an interesting parallel to the four kinds of children's play that child-development experts identify as more or less universal:

- Exploration/tinkering
- Make believe/visual thinking
- Social play/collaboration
- Puzzle play/problem solving

10. Illuminations- http://illuminations.nctm.org/ActivitySearch.aspx

Description- Over 100 online STEM skill based interactive activities that students can engage in immediately. Categorized by grade for teachers!

11. GSU Bio Bus Program- http://www.biobus.gsu.edu/index.htm

Description- Georgia State University's BioBus program. The Bio-Bus Program is a science out-reach service based at Georgia State University. The program is named after its primary vehicle, a 30-foot long, self-contained, mobile laboratory (right). We also bring science programs into the classroom, traveling in smaller vehicles.

12. NASA Kid's Club - http://www.nasa.gov/audience/forkids/kidsclub/flash/index.html

Description- Fun interactive space learning activities featuring familiar characters like Elmo that students and entire classrooms of students can engage in immediately like Mars Fun Zone, Solar System Explorer, Elmo Visits NASA, and Buzz Lightyear Returns from Space.

STEM Activities/Online interactive experiences Middle and High School

1. Interactive Periodic Table- http://www.webelements.com/

Description- a helpful interactive periodic table where students can explore every aspect of the elements including history, biology, physics, compounds, electronegativity and more!

2. Wonderville- http://www.wonderville.ca/

Description- (grades 6-9) Explore exciting careers in science and technology, participate in innovative interactive games, and find effective STEM based lesson plans! Specific categories include resources for youth, families and teachers!

3. Exploratorium - http://www.exploratorium.edu/

Description- The Exploratorium is a collage of 650 interactive exhibits in science, art, and human perception. Students can explore any of these subject: light color, sound, music, motion, animal behavior, electricity, heat and temperature, language, patterns, hearing, touch, vision, waves and weather. (Grades 3-12)

4. HHMI's Bio Interactive-
http://www.hhmi.org/biointeractive/

Description- A diverse resource for teachers and students from the Howard Hughes Medical Institute, this website examines everything from evolution to neuroscience and features videos, animations, interactive activities, a virtual lab, and much, much more! (9-12)

5. Shodor- http://www.shodor.org/interactivate/

Description- Entertaining interactive modules for students that allow them to apply math skills through fun activities! Program topics include standard deviations, independent and dependant variables, initial velocity, energy, and many more. (9-12)

6. Nova - http://www.pbs.org/wgbh/nova/

Description- Focusing on a range of exciting STEM topics including engineering and tech, body and brain, space and flight, military and espionage, and more, this interactive site allows students to virtually build rockets, rebuild ancient ruins, investigate the force of impact, research solar storms, map the human heart and other innovative and fun online activities. (6-12)

Elementary(K-5) Lesson Plan Resources

1. Technology at Work-
http://www.discoveryeducation.com/teachers/free-lesson-plans/technology-at-work-2.cfm

Grades-(3-5) (2 class periods)
Description- explore the changes made by technology over the past 50 years both positive and negative

2. Rules of Forces and Motion-
http://www.discoveryeducation.com/teachers/free-lesson-plans/rules-of-forces-and-motion.cfm

Grades- (3-5) Hands on (1-2 class periods)
Description- Experiment with the effects of mass and friction on speed and motion

3. **Friction in our lives-**
http://www.discoveryeducation.com/teachers/free-lesson-plans/friction-in-our-lives.cfm

Grades- (adaptations for 1-5) (2 class periods) Hands-on
Description- Everyday life provides examples of how friction both helps and hinders everything we do!

4. Long Distance Airplanes-
http://illuminations.nctm.org/LessonDetail.aspx?ID=L323

Grades- (3-5) Math and Engineering/Hands on (1 class period)
Description- Students make paper airplanes and explore attributes related to increasing flight distances

5. Dinosaur Train: Smell This!-
http://www.pbs.org/teachers/connect/resources/7766/preview/

Grades- (k-1) (tasting) (1 class period)
Description- Help students investigate their sense of smell, and explore how it is connected to the sense of taste.

6. Eruption!-
http://www.pbs.org/teachers/connect/resources/7763/preview/

Grades- (Pre-K-1) (Hands on)
Description- Help students understand how a volcano forms and what causes it to erupt. Make a model of a volcano that demonstrates a safe chemical reaction.

7. Breaking Light -
http://teachers.net/lessons/posts/111.html

Grades- (k-2) (Hands on) (1 class with 20 minute activity)
Description- Students will discover that white light can be broken into colors!

8. Magnets and Polarity-
http://teachers.net/lessons/posts/1.html

Grades- (3-5) (Hands on) (45 minutes)
Description- Students will identify and describe the poles of a magnet. They will demonstrate how the poles interact with one another using magnets and moving around the classroom!

9. Making Your Own Recycled Paper-
http://teachers.net/lessons/posts/4446.html

Grades- (3-5) (Hands-On) (2 class periods)
Description- Students will understand the important of recycling as well as the process of reusing materials with this fun experiment and lesson plan!

10. Growing a Coral Reef Experiment-
http://www.seaworld.org/infobooks/Coral/gcoral.html

Grades- (k-8) (process takes 3 days)
Description- Students will make and observe the growth of crystals that develop in a way similar to how coral polyps create their calcium carbonate cups.

11. Get Energized! -
http://www.fit4theclassroom.com/sites/fit4theclassroom.com/files/downloads/Get_Energized_Final.pdf

Grades- (3-5 with k-2 adaptation) (one class period)
Description- In this activity, students will get physical and use analytical and graphing skills to explore the concepts of potential and kinetic energy!

12. The Phenomenon of Sound Waves!-
http://www.discoveryeducation.com/teachers/free-lesson-plans/the-phenomenon-of-sound-waves.cfm

Grades- (adaptations for K-5)(two class periods)
Description- Students will have a blast going through these 7 hands on stations allowing them to understand that sound waves can travel through different mediums, including solids, liquids, and gases!

Middle School (6-8) Lesson Plan Resources

1. Middle School Science Mania-
http://www.scienceoutreach.org/science_mania/activities

Grades - (6-12) (Hands on) (30-45 minutes)
Description- A unique repository created by the Vanderbilt Center for Science Outreach of over 50 fun, hands on science learning activities for the classroom including exciting topics like Aluminum boats, twirling tubes, electric pepper, and egg in a bottle!

2. Science Scavenger Hunt-
http://www.education.com/activity/article/Scientific_Scavenger_Hunt_middle/

Grades- (6 and 7) (Written and Hands on) (one class period)
Description- A simple more fun way to assess your students' basic knowledge of science terms and concepts from education.com

3. Extract DNA from Spinach!-
http://www.education.com/activity/article/pull-dna-spinach/

Grades- (6-8) (Hands on) (Life Sceince) (one class period)
Description- In this lesson, your students will see how a quick whirl of spinach in the blender will reveal this cobwebby "stuff" of life!

4. Bungee Jumping Eggs!
http://www.education.com/activity/article/egg-bungee-jump/

Grades- (6-8) (Hands on) (45 Minutes) (home or school)
Description- Students will use eggs to understand components of Newton's famous physics equation: force = mass × acceleration. Can be messy!

5. My Science Box! –Hands On Science for the Adventurous Teacher -
http://www.mysciencebox.org/explore/results/taxonomy%3A51

Grades- (6-8) (Hands On Activities, Lessons, Experiments)
Description- My Science Box hosts over 95 distinctive hands on lessons and activities varying from indoor/outdoor

activities to plate tectonics and genetics. There is something to excite every student here!

6. Five Technology Lessons *Every* Teacher Can Teach!
http://www.educationworld.com/a_lesson/lesson/lesson285.shtml

Grades- (6-8) (Hands on Technology)
Description- Five Lessons from Education World that reach across all Middle School subjects to improve students' knowledge and use of technology in the classroom and at home. Topics include "What's Inside My Computer?" and "There's a Monster in My Email!"

7. My Dream Room-
http://lessonplanspage.com/cimathspreadsheettobudgetroomexpenses78-htm/

Grades- (7 and 8) (Hands on Technology and Math)
Description- Students will use Excel to create and design their own "dream room" while implementing a budget plan.

8. Paper Towel Structure-
http://www.ces.ncsu.edu/depts/fourh/old/greenlight/afterschool/Paper_Towel_Stucture.pdf

Grades- (6-8) (Hands On) (One class period) (Engineering)
Description- From the National 4-H Council Rural Youth Development - Using only paper towel rolls and masking tape students will create bridges that can hold up to 15 pounds by copying the design of existing bridges!

9. Protect Your Melon!-
http://www.ces.ncsu.edu/depts/fourh/old/greenlight/afterschool/Protect_Your_Melon.pdf

Grades- (6-8) (Hands on) (One-two class periods) (Engineering)
Description- From the National 4-H Council Rural Youth Development- Students will design and construct a helmet that will protect a melon from breaking when dropped from increasing higher levels at the lowest cost possible. Can be messy and lots of fun!

10. Lip Balm Chemistry-
http://www.ces.ncsu.edu/depts/fourh/old/greenlight/afterschool/LipBalmChemistry.pdf

Grades- (6-8) (Hands On) (One-two class periods)

Description- from the National 4-H Council Rural Youth Development- In this engaging lesson, students get to create their own lip balm and reinforce concepts such as density of different ingredients, a solution vs. a mixture, measuring skills, and melting points of different substances.

11. The Engineering Place-
http://www.engr.ncsu.edu/theengineeringplace/educators/k8plans.php

Grades- (varied elementary and middle) (one class period) (hands on)
Description- NC State University Collection of fun classroom lesson plans and activities

High School (9-12) Lesson Plan Resources

1. My Science Box! –Hands On Science for the Adventurous Teacher -
http://www.mysciencebox.org/explore/results/taxonomy%3A52

Grades- (9-12) (Hands on Activities, Lessons, Experiments)
Description- My Science Box hosts over 50 distinctive hands on lessons and activities varying from indoor/outdoor activities to chemistry and physics for high school classrooms. There is something to excite every student here!

2. Modeling Real World Weather Data-
http://www.uen.org/Lessonplan/preview.cgi?LPid=25928

Grades- (9 and 10) (pre-calculus)
Description-This lesson from the Utah Education Network allows students to use real-world data to create a mathematical model for weather data and recognize that the data can be modeled using either a sine or cosine function.

3. Designing a Fort-
http://www.uen.org/Lessonplan/preview.cgi?LPid=19828

Grades- (9-11) (Geometry- Engineering/Architecture)
Description-In this lesson from the Utah Education Network, students will explore their knowledge of right triangles, concentrating on the 30-60-90 special right triangle. In cooperative learning groups, students will design and create a scaled down model of a life sized fort. Students will expand

and solidify their knowledge of right triangles in creating and constructing this real life model!

4. Spinal column Injuries-
http://www.sciencepioneers.org/sites/default/files/documents/Spinal%20Column%20and%20Injuries.pdf

Grades- (10-12) (hands on) (one class period)
Description- From science pioneers - In this activity, students will focus on the cervical vertebrae by creating their own model of the spine and simulating a spinal cord injury.

5. Lego Flywheels!-
http://csats.psu.edu/GREATT/Flywheels/Flywheels.htm

Grades- (9-10) (hands on) (2-3 class periods)(Physics)
Description- From Penn State- Students will learn how the concepts of inertia and momentum are applied in modern transportation technology. Student design teams apply what they have learned to invent their own flywheel-powered cars!

6. Exploring the Science of Automotive Air Bags-
http://csats.psu.edu/GREATT/Airbags/Airbags.htm

Grades- (9th) (Hands on) (6 parts 20- 45 minutes)
Description- From Penn State- Using chemicals from the kitchen, students will make and test mock air bags and learn about the chemistry behind real air bags in a fun, hands-on context.

7. Magnetic Fields Matter!-
http://www.teachengineering.org/view_lesson.php?url=collection/van_/lessons/van_mri_lesson_9/van_mri_lesson_9.xml

Grades- (11 and 12) (hands on) (50 minutes)
Description- From the School of Engineering, Vanderbilt University- This lesson introduces students to the effects of magnetic fields in matter addressing permanent magnets, diamagnetism, paramagnetism, ferromagnetism, and magnetization.

8. Heart to Heart and Blood Pressure Basics-
http://www.teachengineering.org/view_lesson.php?url=collection/van_/lessons/van_heartvalves/van_heartvalves_lesson02.xml

Grades- (9-11) (2 one class period lessons)
Description- School of Engineering, Vanderbilt University- Students will learn about the form and function of the human heart through lecture, research and dissection. Then they will study how heart valves work and investigate how valves that become faulty over time can be replaced with advancements in engineering and technology.

9. Shoes Under Pressure!-
http://www.teachengineering.org/view_lesson.php?url=collection/cub_/lessons/cub_convshoes/cub_convshoes_lesson01.xml

Grades- (10th) (90 minutes) (Hands on)
Description- from the Integrated Teaching and Learning Program, of Engineering, University of Colorado at Boulder- Students explore the basic physics behind walking, and the design and engineering of shoes to accommodate different gaits. They are introduced to pressure, force and impulse as they relate to shoes, walking and running.

10. Physics of the Flying T-Shirt-
http://www.teachengineering.org/view_lesson.php?url=collection/cub_/lessons/cub_flyingtshirt/cub_flyingtshirt_lesson01.xml

Grades (9-12) (50 minutes) (hands on)
Description- from the Integrated Teaching and Learning Program, College of Engineering, University of Colorado at Boulder- Students are introduced to the physics concepts of air resistance and launch angle as they apply to catapults. This includes the basic concepts of position, velocity and acceleration and their relationships to one another. They use algebra to solve for one variable given two variables.

11. Pot of Gold at the End of the Rainbow-
http://science.psu.edu/outreach/pot-of-gold-at-the-end-of-the-rainbow

Grades- (9-12) (hands on) (one class period) (chemistry)
Description- Using the process of galvanization pennies and a few simple chemicals, students will get to turn pennies from copper, to silver and then shiny bronze!