STEM/STEAM

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Benefits of STEM Education

STEM Education is widely known as the cross interdisciplinary approach of teaching science, technology, engineering and math in a way that increases student's interest in STEM related fields and prepares them to enter the modern workforce.

STEM Subjects help students:

- Improve their problem-solving skills
- Improve their digital literacy
- Think critically
- Think creatively
- Become innovators & inventors
- Become more flexible & adaptable
- Improve communication skills
- Improve collaborative skills

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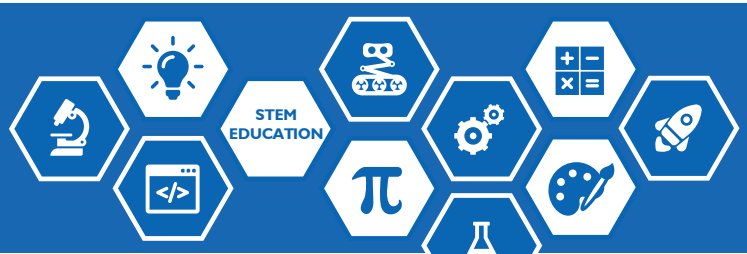

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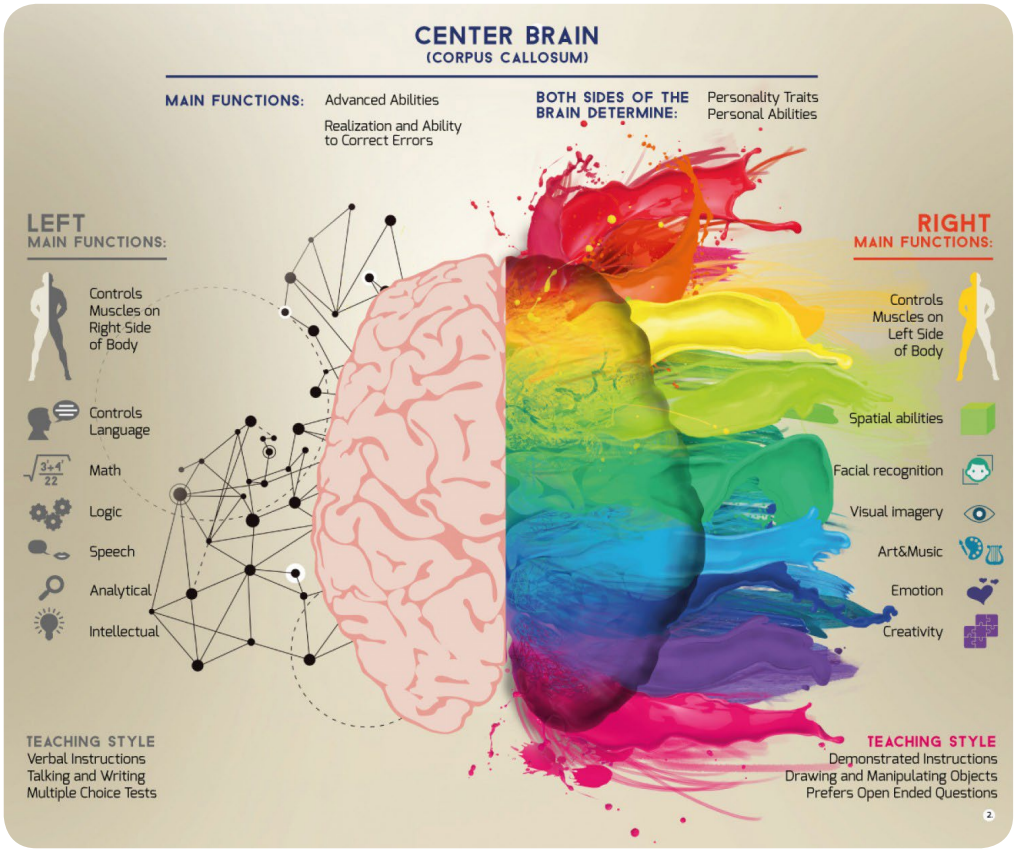


Image from University of Floria: www.ufl.edu

STEM or STEAM?

STEM isn't the only acronym that's getting traction in the education industry.

STEAM incorporates the arts in the STEM curriculum, but not in the way you think. The Arts enrich and expand the scope of STEM education by encouraging students to use their imagination and creative vision in their process.

Employers recognise that employees who excel in teams, think critically and who use their imagination to create new products and services are vital to the economic growth of their businesses.

Designing innovative solutions to the world's problems requires creative talent and just as the sciences help us understand how the world works, the Arts play a part in building upon our capacity for imagination.

STEM FACTS

Over the next 5 years, employment is predicted to increase in professional, scientific and technical services by 14 per cent and in health care by almost 20 per cent.

The Australian Bureau of Statistics has estimated that some STEM-related jobs, such as ICT professionals and engineers, have grown at about 1.5 times the rate of other jobs in recent years.

It's been estimated that changing 1 per cent of Australia's workforce into STEM-related roles would add $57.4 billion to GDP.

Reference:
Education Council (2015) 'National STEM School Education Strategy'
Retrieved from http://www.educationcouncil.edu.au/site/DefaultSite/filesystem/documents/National%20STEM%20School%20Education%20Strategy.pdf

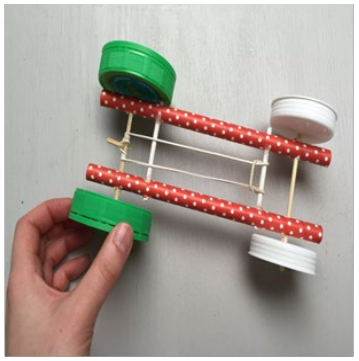
4 Free STEM Activities

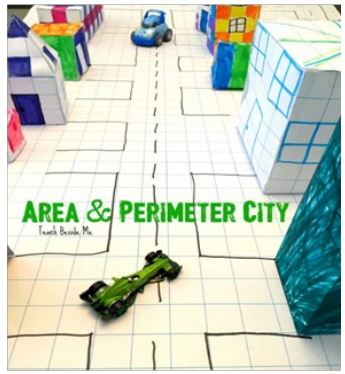
S Science Activity
Water Cycle in a Bag

T Technology Activity
Coding A Lego Maze

E Engineering Activity
Rubber Band Racer

M Math Activity
Area & Perimeter City





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STEM EDUCATION

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Science Activity

Water Cycle in a Bag

From Playdough to Plato
http://www.playdoughtoplato.com/water-cycle-bag/

Goal

Students create their very own mini water cycle in a bag to explore the natural water cycle and witness first-hand what evaporation, condensation and precipitation looks like.

What You Need:

- 1 resealable ziplock bag
- Blue food colouring
- Measuring jug
- ¼ cup of water
- Black sharpie
- Sticky tape
- A window

Method

Step 1 - Design your bag! Draw a sun and a cloud on the ziplock bag with the black sharpie.

Step 2 - Pour ¼ cup of water into the measuring jug.

Step 3 - Add 4 drops of blue food colouring and stir until the water changes colour.

Step 4 - Pour the dyed water into the ziplock bag and carefully seal it.

Step 5 - Tape the ziplock bag onto a window that will get plenty of sun and watch the water cycle in action!

Learning Outcomes:

This experiment gives students a first-hand look at the water cycle. The sunlight should heat the water in the ziplock bag and cause it to evaporate into vapor. You'll then see condensation droplets form as the vapor turns back into a liquid.

Technology Activity

Coding A Lego Maze

Goal

Students must get their LEGO figure through the maze using 'code' to arrange pathways to help their figure navigate their way.

From Research Parent
http://researchparent.com/coding-a-lego-maze/

What You Need:

- The printables
- A printer
- Scissors
- LEGO or DUPLO
- Toy figures
- A dice

Method

Step 1 – Print and cut out all the pieces in the Coding A Lego Maze free printable.

Step 2 – Set up your maze using any of the 5 provided mazes or make your own with the blank maze.

Step 3 – Arrange your Lego pieces around the maze of choice however you want.

Step 4 – Place your toy figure at the beginning of the maze.

Step 5 – Let your students arrange the directions into pathways to help their toy figure get out of the maze.

Learning Outcomes:

These LEGO mazes, which can be solved with "code" using paper rather than a computer, illustrate 4 levels of difficulty and include a variety of programming concepts simplified for students.

Technology Activity

Coding A Lego Maze

DOWNLOAD
The Printables From Research Parent

Level 1: This easiest level teaches younger students child to think from their LEGO figure's point of view to get out of the maze and gives them a basic understanding of coding pathways.

Level 2: Introduces the concept of 'for loops'. Essentially letting students command their Lego figures to "do this next command 7 times." Rather than directing them to 'move forward' 7 times in a row.

Level 3: Introduces the concept of "while loops" and "if statements". The programmer needs to consider all possibilities at any random location for their LEGO figure and decide the best generic sequence of actions. For example, "If I can turn left, turn left. Otherwise if I can turn right, turn right. Otherwise if I hit a dead end, turn around. After I'm done checking those conditions, go forward. Repeat."

Level 4: Introduces the problem and solution to the LEGO figure getting caught in an "infinite loop" of repeating the same behavior over and over again. By introducing a random number generator (a dice), older kids can write a 'code' that can get their LEGO figure out of any maze.

Learning Outcome: These LEGO mazes, which can be solved with "code" using paper rather than a computer, illustrate 4 levels of difficulty and include a variety of programming concepts simplified for students.

E Engineering Activity

Rubber Band Racer

By Try Engineering
http://tryengineering.org/lessons/rubberbandracers.pdf

Goal

Students must develop a car powered by rubber bands from everyday items. The rubber band car must be able to travel a distance of at least 3 meters within a 1 metre wide track. The car that can travel within the track for the greatest distance is the winner.

Method

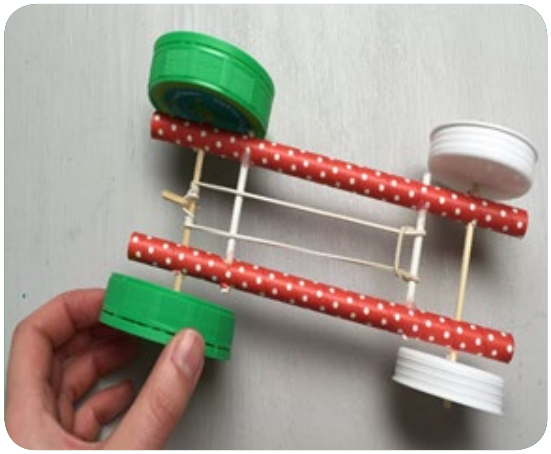
Step 1 - Divide students into groups of 3-4 and issue 1 set of materials per group.

Step 2 - Students develop a plan for their rubber band car. They agree on materials and write or draw their plan.

Step 3 - Student groups execute their plans. They may need to rethink their plan, request other materials, trade with other teams, or start over.

Step 4 - Teams will test their rubber band car. Students can create the 1 metre wide "track" using masking tape on the floor.

Step 5 - Teams then complete an evaluation/ worksheet, and present their findings to the class.



Learning Outcomes:

Students will have designed and constructed a rubber band car, measured distance and calculated speed, tested and refined their designs as well as communicated their design process and results.

What You Need:

- 40cm x 40cm piece of corrugated cardboard
- 4 'wheels' (CDs, lids ect...)
- 4 rubber bands
- 3 unsharpened pencils
- 4 metal paperclips
- Pack of thumb tacks
- Scissors
- Masking tape
- Ruler

Math Activity

Area & Perimeter City

By Teach Beside Me
https://teachbesideme.com/architecture-stem-area-and-perimeter-city/

Goal

Students must work together to build a whole city out of paper shapes on graphing paper including buildings, houses, streets and parks.

Method:

Step 1 – Follow the guide to create 3D paper shapes for a Cube, Cuboid (rectangular), Cone, Squared-Based Pyramid, Triangular Prism (tent-shaped), and Octahedron (Diamond-like). Measure and draw out the 3D Geometry shapes.

Step 2 – Let your students design and colour in the shapes any way they want.

Step 3 - Cut the shapes out and tape them together. Combining the shapes to make different structures. Eg, a cube and a pyramid to create a house.

Step 4 - Arrange the 'buildings' on the graph paper and draw in some roads too.

Step 5 - Once the city is assembled, let students solve area, perimeter and find the volume of the shapes and buildings they have created.

Learning Outcomes:

Students apply their geometry skills and creativity to build and measure a whole city. They will learn how to calculate the area, perimeter and volume of the shapes and buildings they have created!

What You Need:

- Graph Paper
- Scissors
- Sticky Tape
- Colouring Pencils/markers
- Ruler
- Toy Cars (Optional)
- Stopwatch

DOWNLOAD
The 3D Shapes From Teach Beside Me

Resources Used

Playdough to Plato	http://www.playdoughtoplato.com/
Try Engineering	http://tryengineering.org/
Teach Beside Me	https://teachbesideme.com/
Research Planet	http://researchparent.com/
Kiwico	https://www.kiwico.com/
University of Florida	https://ww.ufl.edu/
Education Council	https://ww.educationcouncil.com.au/

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