Scorpio Technology NEWSLETTER

INSIDE THIS ISSUE

SALE ITEMS: Check out the diverse range of Sale items. Includes great gift ideas : https://www.scorpiotechnology.com.au/sale-items.

TEACHER CONFERENCES & WORKSHOPS

Scorpio is attending or supports these Design & Technology teacher activities:

DATTA AUSTRALIA – 12 to 18-10-2020, Design & Technologies Week *Developing creative problem solvers*. New 2020 website launched! https://dattaaustralia.com/design-technology-week-2019/
DATTA VIC – 4-12-2020 *Design Disruption*, VIRTUAL conference, 5-12-2020 MAKERSPACE - Various locations

LEARN TO MAKE, MAKE TO LEARN

WELCOME

Spring is here and we are excited to be with you again to show you more "goodies". We hope these ideas help through the rest of this difficult year

As always, we are here to help, so if you have any issues or questions, don't hesitate to contact us at (03) 9802 9913 or email us at sales@scorpiotechnology.com.au

PRIMARY STEM: EXPLORING AIR POWER

MIDDLE & UPPER PRIMARY: Motion and Forces are a fascinating STEM topic. We've all tried the Balloon rocket experiment. Here is the next level. To get you started we suggest:

AERO CAR (Code: **HJ1800)**
Construct this easy to build racing car and watch air power (air compression) propel it. Learn about dynamic energy. Great for racing.

AIR POWER ENGINE CAR (Code: **FS631**)

Construct an air powered car that requires no batteries, electric motor or fuel. Simply use the pump to fill the air chamber with compressed air. Release and watch it travel up to a distance of 50m in around 35 seconds. Includes instructions. Ages 10+

- Vehicle Dimensions: 227mm L x 160mm H x 160mm W
- Tools required for assembly: screwdriver, scissors, hammer and diagonal cutter.

But still try for who knows what is possible!
Michael Faraday

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DESIGN AND TECHNOLOGIES WEEK (12-18 October 2020)

The Design and Technologies week is fast approaching but there is still time to choose from Scorpio's fantastic, innovative and motivating range to make this week exciting for your students.

To find out more about this Australia wide initiative at https://dattaaustralia.com/design-technology-week-2019/

SECONDARY: TOOLS FOR YOUR CLASSROOM

TOOL KIT WITH CASE - 30 PIECES
Code: **TD2166**

Minor repairs in the lab or workshop are made simple with this 30 piece mini tool kit. The tools are held securely in a convenient zip-up case.

VERNIER CALIPER 15 CM DIGITAL CARBON COMPOSITE Code: **VERNCALDB**

This carbon composite digital caliper is ideal for general use and suited to the home handyperson who finds traditional calipers hard to read.

This Month's Q&A Technology Tips: Screws VS Bolts

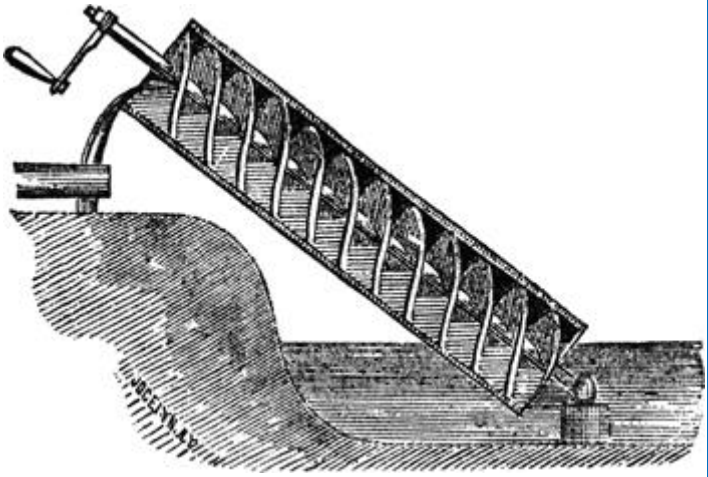
Q. What are the differences between a screw and a bolt?

A. What constitutes a screw or a bolt can vary dependent on time period, geographical location, and even just manufacturer preference. There are several practical differences, but most have some degree of overlap between bolts and screws.

Screws and bolts do many of the same things but there are many types and you should consider what you need it to do before choosing one or the other.

NOTE: In our teaching units we use the word Bolt instead of machine screw, as it is used with a nut, and to avoid confusion with the more usual usage of the word screw (being either a wood screw or a self tapping screw).

FEATURES:
SCREW: A tapered fastener that mates with an existing thread or creates its own thread in a material as it turns.
BOLT: Part of its shank is not threaded. Unthreaded portion (which sits inside the material) adds strength. A bolt is not tapered.
A bolt uses a pre-threaded nut (or tapped hole). A bolt is not self-tapping and requires a nut to stay secure. Using a washer under the bolt head spreads the load under the head, and also provides a hardened surface for the bolt head to turn against without digging into the clamped material. A nut reduces the wear and tear well as it prevents the loosening of the bolt over time while the nut secures the bolt in place.



Archimedes' screw

SCREW and BOLT

FASTENING:

SCREW: Fastened using a screwdriver so it requires a head to be bigger than the surface. Usually tightened clockwise.

BOLT: Fastened with a spanner or other tool which grips the head keeping it stationary whilst the nut is turned and tightened.

HOLE:

SCREW: Shorter than material thickness. Screws are wider than the hole into which they are fastened.

Mates with an existing thread or creates its own thread in a material as it turns.

BOLT: Requires a hole through the material. Bolt will be longer than the thickness of the material it is being used on so that the nut can be screwed on and then tightened.

USES:

SCREW: Used for light to medium construction projects.

BOLT: Used for heavy duty projects or when an item needs to be assembled/disassembled easily.

OTHER FACTORS:

SCREW: Manufactured in many variations e.g. head and drive types, fine / coarse pitch, left or right handed threads, self tapping.

BOLT: There are machine screws that are actually bolts. They do have threads all the way up their shank and rounded heads, so they look more like a screw, but they are actually still bolts.

Best holding strength, Easier to remove. Bolts tend to cost more than screws.

REFERENCES:

https://www.fastenright.com/blog/bolts-and-screws-what-is-the-difference

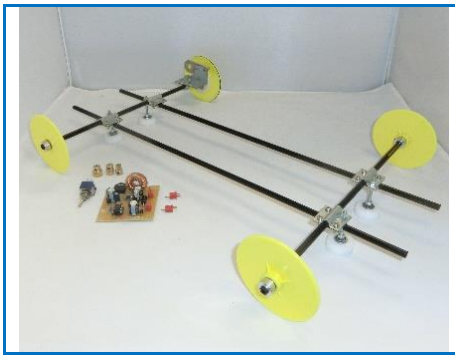
https://www.melfast.com/blog/2010/11/what-is-the-difference-between-a-bolt-and-a-screw

https://en.wikipedia.org/wiki/Bolt_(fastener)

https://cf-t.com/blog/when-to-use-bolts-instead-of-screws

Archimedes' Screw-Public domain, from Chambers's Encyclopedia (Philadelphia: J. B. Lippincott Company, 1875).

MODEL SOLAR VEHICLES



UPDATE:

We recently released the Challenger V2 kit, which replaces the original Challenger kit. The 2 items we upgraded in this kit are:

- Guide rollers (instead of bearings)
- The new Picaxe programmable Solar Panel Power Controller

(this replaced the original SPPC electronics unit)

https://www.scorpiotechnology.com.au/starter-solar-challenge-kits

Sustainability is a key topic in the wider community. Energy and resource sustainability are areas that are relevant to today's learning environment.

Model Solar Challenges have proven a great motivational and learning tool with measurable outcomes for many years. **What does Model Solar Challenge actually mean?** The students are given a set of guidelines and instructions to make a solar vehicle (car or boat). The complexity varies according to year level and ability. The students record their progress using the Design Process and other tools.

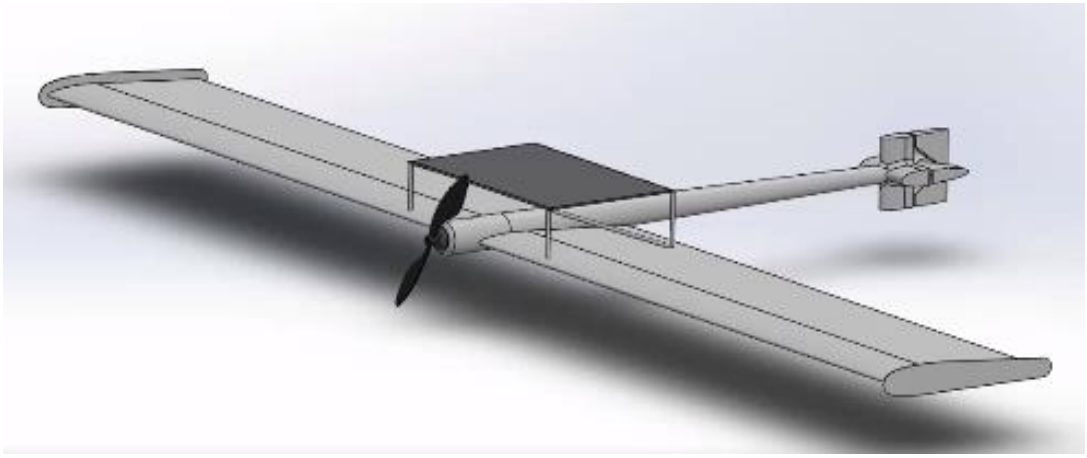
Then comes the fun part! Competing against other students or schools to determine which Solar Vehicle has the best performance, features and much more.

Most states have their own competition and the winning teams participate in National Championships. This year has changed this due to Coronavirus. Still schools are taking on the challenge in their own way. Victoria's Model Solar Vehicle Challenge has some interesting suggestions that we can share with you.

There are 3 key aspects to engineering design expertise in this project:

1. **Systemic thinking** – considering how different aspects of a system can interact to bring about a desired outcome or cause issues
2. **The use of first principles** – using theory or calculations to remove guesswork and the need for excessive experimentation (although of course testing is always ideal when possible to check assumptions)
3. **Framing** – understanding what the challenge is and then viewing it in a manner that allows for a solution

- Competition will be virtual based on video, PowerPoint (self-playing) or poster submission
- They have posted an example video (for a made up event - a solar plane) for reference on the type of thing the judges want to see (from those who submit a video). You can see it on their Facebook page - https://www.facebook.com/ModelSolarVehicleChallenge/videos/1039975109767298.



- Students can use online tools to progress a design such as CAD - TinkerCAD - https://www.tinkercad.com/
- Videos should be of mp4 format - https://screencast-o-matic.com is a free video system that can be used.
- Evidence of any physical testing can be presented to augment the quality of submission.
- Students are still involved in creative engineering and design work on solving a challenge with the tools that they have.
- Posters should be of A2 size (PDF format)– PowerPoint is an ideal tool to create the poster.
- Primary students are to show use of theory (basic principles) more so than calculations.

Extra tool: TinkerCAD
If you or your students are looking for a way to create a 3D design to demonstrate their vehicle, then take a look at TinkerCad. It is easy to use, free and an excellent way to show a design in a video. Main links are below:

- https://www.tinkercad.com/
- https://www.tinkercad.com/learn/designs
- https://www.tinkercad.com/learn/designs/lessons

And here are some tutorials:

- Getting Started in Tinkercad: A Tutorial for Complete Beginners
- How To: Use Tinkercad 3D Design Software 101
- tinkercad beginner guide : how to import from thingiverse to tinkercad and modify

FURTHER RESOURCES

- Scorpio's website has great information and tips: https://www.scorpiotechnology.com.au/solar
- Victorian Model Solar Challenge: https://www.modelsolar.org.au/
- Scorpio's website Resources section: https://www.scorpiotechnology.com.au/resources
- Australian – International Solar Challenge: https://www.modelsolarchallenge.com.au/

MICHAEL FARADAY AND THE TOY BALLOON

Article written by Alex Kapoyanis

Michael Faraday (1791 – 1867) is one of the handful of people to be known as the "father of electricity", joining Nikola Tesla and Thomas Edison with that honour.

Despite only receiving a basic education up to the age of 13, he was forced into employment to due to his family's lack of financial resources. At age 14, he began a 7-year apprenticeship as a book binder in London, which gave him the opportunity to read some of the books brought into the shop for rebinding. Faraday's enormous thirst for knowledge knew no bounds as he was introduced to the sciences. After some persistence, Faraday was taken on as an assistant to Humphry Davy, a lecturer, professor and pioneer of electrochemistry, at London's Royal Institution.

"No matter what you look at, if you look at it closely enough, you are involved in the entire universe."

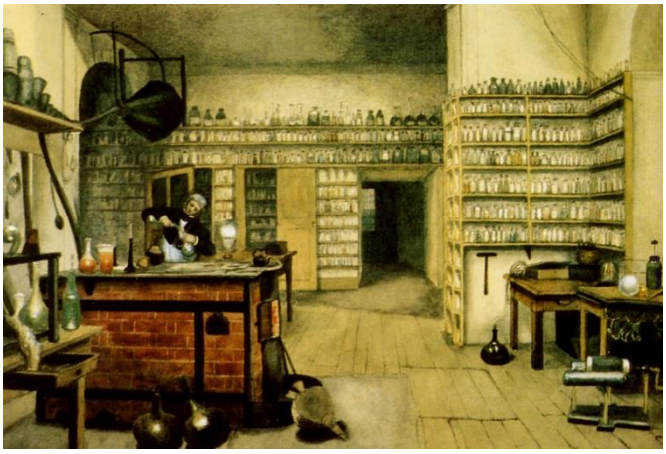
Michael Faraday

1791 – 1867)

Physicist & Chemist

Faraday was prolific in experimentation within numerous fields of chemistry, such as electrolysis and gas liquefaction. These resulted in achievements such as discovering benzene and other hydrocarbons. He took the field of electrochemistry, which originated with Alessandro Volta, to a new level. His experimental and analytical work in the field of chemistry was extraordinary. The inspirational Christmas Lectures that he begun in 1825, for both adults and children, are still presented to this day and even broadcast on national television in the UK.

One invention for which he may not be very well known is the rubber balloon in 1824. During experiments with various gases Faraday cut around two sheets of caoutchouc (raw rubber) laid on top of each other and pressed their edges together. The inside of the balloon was rubbed with flour in order to prevent the two sheets from joining together, while the "tacky rubber welded automatically".



According to Faraday's 1824 entry in the Quarterly Journal of Science, "the caoutchouc is exceedingly elastic", and once air was blown into them, the caoutchouc expanded and became quite transparent. When hydrogen was blown into them "they were so light as to form balloons with considerable ascending power…". Hence the birth of the modern-day toy balloon.

Faraday is best known for his work on electricity and magnetism, induction; inventing the first electric motor; and even building the first electric generator. His experimentation with the effects of magnetism on light led James Clerk Maxwell to fully described the link in his equations in 1864.

To get your students acquainted with Faraday's work in both electromagnetic induction and electrochemistry, we have a few teaching assets for you:

			
Faraday's Electromagnetic Induction Demonstrator Code: AR1070830 Demonstrate the important experiments performed by Faraday and how they lead to some of the significant conclusions in electromagnetism. Designed to perform studies even beyond the basic experiments.	**Faraday's Law** Code: AR1070710 For quick visualization of Faraday's Law, includes a 150-0-300 turns coil with 4mm sockets with a provision to freely slide on a transparent acrylic tube.	**Simple Cell** Code: PH0924 Simple voltaic cell comprising of glass jar 15 x 10 cm (length x dia.) and complete with zinc and copper plates.	**Variable Magnet Set** Code: PH0800C To study the effect of current and number of coils on the strength of an electromagnet.

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