

STEM & Air-Powered Dragsters

STEM (Science, Technology, Engineering and Math) can be seen in nearly everything.

Science

Science is the study of the world around us – it explains why and how things happen.

Considering the Air-Powered Dragsters, this is what is happening according to Sir Isaac Newton (a very famous scientist):

The dragsters are constructed around a straw that is closed off at one end. When the starting mechanism is pressurized and fired, a blast of air goes into the straw. Since the air has nowhere to go, it rushes back out the straw causing the dragster to move forward. This is due to:

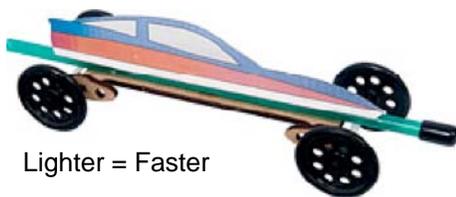


Newton's 3rd Law of Motion – “For every action, there is an equal and opposite reaction.”



The **action** is the pressurized air coming out of the straw. The **reaction** is the dragster moving forward rapidly.

The amount of acceleration of the dragster (how fast it speeds up) is controlled by **Newton's Second Law of Motion**. Simply put, with the same amount of force applied, the object with less mass will accelerate faster.



So, in most instances, the lighter dragster will have the greatest amount of acceleration – it will be the fastest dragster.

Once the dragster reaches its top speed, **Newton's 1st Law of Motion** goes into effect: This law says that once an object is in motion, it will stay in motion until something happens (like it hits the finish line).



As it happens, there are actually a number of things working to slow down the dragster before it ever hits the towel – all having to do with friction:

- friction between the wheels and the track
- friction between the axle & the dragster body
- friction from the dragster hitting air molecules as it races down the track (aerodynamic drag)

Technology

Technology involves systems and tools – its how things work and work together!



Systems

In the Air Powered dragster activity, the system is the launcher that becomes pressurized, starts the dragsters, and keeps them on a tight line as they race down the track. This system is designed for a specific purpose - keeping in mind safety, an equal start, and ease of use.

Tools



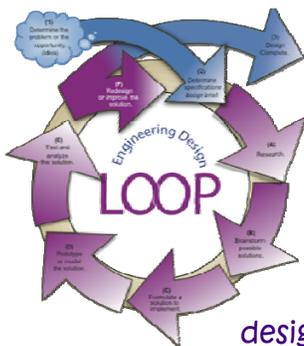
If we had an electronic timer connected, it could measure the amount of time to go down the track.

And, we can use electronic scales to measure the mass of the dragsters.

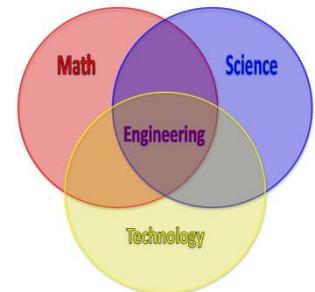


Engineering

Engineering is involved in designing and building things – like Air-Powered Dragsters! In fact, engineering is really a combination of Science, Technology and Math.



Each Air-Powered Dragster can be designed for how it looks and how it performs. Engineering considers all the different aspects (body shape, mass, wheels, axles and more) before a prototype (a first model) is built. Engineers use a process called the engineering design loop for the initial design and for more designs after they test their first designs.



Math

Math is an important tool that is used by science, technology and engineering.

It can be used for mass, time, and distance measurement measurements – and for solving problems that arise during other STEM topics. Being without mathematics would be like a Carpenter without a measuring tape – nothing would come out right.

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

In the example of Air-Powered Dragsters, mathematics can be used to determine the speed of the dragsters. To do that, the length of the track and the amount of time it takes the dragsters to go down the track must be measured. Then, those measurements are put into a

formula: **speed = distance ÷ time** For an average Air-Powered Dragster, they will go down a 32 ft track in about a second – which makes their average speed about 32 ft per second. Using math again, we can convert the 32 ft/sec to miles per hour by multiplying by 3600 and dividing by 5280. This gives us an average speed of about 22 miles per hour.