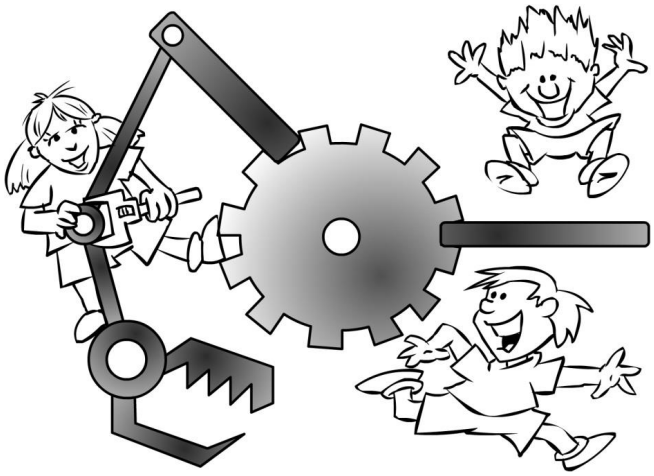

A G.A.T.E.WAYS JOURNEY

for gifted Year 1 and 2 students

with a love of science and technology

'HOW DOES IT WORK??'

G.A.T.E.WAYS is an independent organization offering challenging and enriching activities and experiences to develop and extend highly able children. This *JOURNEY* for both girls and boys will run over four sessions. What is a machine? We often think a machine must run on electricity or batteries but machines can be anything that help us to do work. They can be as simple as a bottle opener without any moving parts and be small enough to fit neatly into our hands. Alternatively, a machine can have thousands of moving parts like a car or a jet. Before we can understand these complex machines, we need to understand simple everyday machines. Open a draw in the kitchen or borrow a tool from the garage and the chances are you have a simple machine. The hammer is a type of lever, a pizza cutter is a kind of wheel and axle and a knife can be described as a kind of wedge.

This Journey will explore the six different simple machines that are contained within most complex machines. For each simple machine there are interesting demonstrations of power. Children will see and feel the power of various simple machines, make some simple machines to take home and learn about the forces involved in simple machines.

Requirements: Each session bring a blank exercise book and a writing pencil , and a snack (no nuts please). In addition:

Week one:	5 round 30 mm plastic lids (to make car wheels – ones from UHT milk cartons are ideal).
Week two:	Nil.
Week three:	One large straight, thick piece of cardboard (approximately 4mm x 600mm x 400mm).
Week four:	One C or D cell battery.

Session One: Round and Around

This session we will investigate whether the wheel and axle is humankind's greatest invention. The wheel on its own is not as useful as when it is attached to an axle. There are some obvious wheels like the ones on your bike or car but there are also everyday objects like a tap handle which are variations on the wheel and axle. Wheels can be as tiny as the gears in a watch or as large as the cutting head on a tunnel borer. We will make a simple vehicle which runs on four wheels. We can push it by hand or we have the option of converting it to move to wind power. We'll also look at another kind of wheel, the pulley, and experience the way a pulley magnifies our strength. We'll try some experiments with wheels to discover that a spinning wheel is very stable, which is why it is easier to balance on a bike moving fast rather than slow. We'll also become aware of friction and how to reduce it.

Session Two: What a Balancing Act

This session we will explore three different kinds of lever. We'll find out about important lever facts such as load, effort and balance point or fulcrum. Some levers are designed to lift heavy loads; these are sometimes referred to as first class levers. Other levers are sometimes disguised. Who would have thought a wheelbarrow is a kind of lever or that a fishing rod and a cricket bat are both another type of lever? We'll have fun experimenting with different kinds of levers found in the second drawer down in our kitchen. We'll also make our own set of scales, which is of course a kind of first class lever.

Session Three: Inclined to Work

This session we'll continue to think about some of the simple machines that we take for granted. We'll try to work out if the inclined plane is the oldest machine known to be used by people. We learn how the Egyptians built the pyramids without using cranes. We learn how a zip works and how a knife is like a wedge. We'll make a couple of toys that use gravity and an inclined plane. We'll look at how an inclined plane can be used to reduce the force of gravity. We'll ramp up our thinking about inclined planes to consider if it is possible to create a perpetual motion machine from an inclined plane.

Week four: Sprung!

In our final session we'll investigate lots of simple machines that use different kinds of energy. We'll look at springs and the way they can be used to store energy and then look for machines that use springs. We'll make a toy that stores energy in a rubber band, investigate how a battery stores energy and we'll learn how to control the release of that energy while making a simple torch. This torch will give us the opportunity to observe energy changing from one form to another, in this case chemical energy to electricity and then to light and heat energy. Finally, we'll look back at the many machines we have investigated to identify the machines within machines.

Homework
Some homework may be set between sessions.

About the Presenter

Tim Byrne has been stuck on simple machines since he first worked at Scienceworks years ago. He hopes one day to move on to more complex machines like his printer, which often stops working for no apparent reason. He has a collection of simple machines and enjoys sharing and analysing their many talents. His favourite simple machine is a third class lever or straw broom that sends an egg flying into the air only to be saved by a glass of water. It still amazes him every time it works.
Student requirements