STEM Activity 1:
How far does a wheel travel?

Background information and Science information

The aim of this experiment is to help learners understand in a practical way that larger wheels have a larger circumference. This means that they can travel a greater distance with each turn than smaller wheels.

Take photos at key points during the activity. You can use these later for activities such as sequencing, recalling, and improving vocabulary.

Method

Introduction

Research sizes of wheels, what type of vehicles use large wheels, and what type of vehicles or machinery use small wheels.

Development

1. Allow each learner to pick a wheel to work with. Choose a flat spacious area to test the wheels.
2. Mark a starting point for the wheels on the ground. Then mark a spot on the wheel with tape. Line up the starting point on the ground with the piece of tape on the wheel. Roll the wheel forwards until it has made one complete turn. The piece of tape should travel around the wheel and return to the original position to show that a full rotation has been made.
3. Mark the ground where the wheel has made the full rotation.
4. Now measure the distance between the start point and the finish point using the measuring tape, or by cutting a piece of string the same length.
5. Repeat this process with all the wheels.
6. You can put the wheels in order of size and then compare the length of string or the measurement you recorded.

Discussion

Ask the learners: 'Is there a pattern?'

The larger the wheel, the farther it will travel in one rotation. Talk about why this happens.

You can display the results on a graph on the wall.

Scientific Inquiry

How does the size of a wheel affect the distance it travels in one turn?

Learning Intention

A larger wheel will travel a further distance in one turn.

Equipment

- A variety of wheels – trundle wheel, rolling pin, toy wheels, bicycle wheels
- Tape measure
- Strips of paper

Safety

If you are using a retractable tape measure, make sure the children's hands are in a safe place when the tape measure is retracting, as it can cut the skin.

Extension

Take the cut pieces of string and wrap around the wheel. What do you notice? The string should wrap around the wheel once exactly. (This depends on the accuracy of the measurement and cutting.)

Mix up the strings and ask the learners to match the right piece of string with the right wheel.

Look for similarities and difference in the wheels, for example size, shape, and the way they are fixed.

Try making tracks in paint with all the different wheels.

Take a walk around the school and tally the number of vehicles and other things with wheels that you can see.

Allow the learners time with the construction sets in class so that they can discuss what way the wheels work in them.

Visit a garage or tyre fitters.

STEM Activity 2:
Make a simple car to race

Background information and Science information

Wheels reduce friction. Instead of simply sliding over the ground, the wheels dig in and rotate, turning around axles.

Wheels provide leverage. A cart with bigger wheels is easier to push because its greater-diameter wheels work like bigger levers, multiplying the pulling or pushing force and making it easier to turn the wheels around their axles.

Take photos at key points during the activity. You can use these later for activities such as sequencing, recalling and improving vocabulary.

Method

Introduction

Research cars and modes of transport that move along the ground. What do most of them have in common? Wheels!

Ask the learners to take a look at the construction sets in class. What way do the wheels work in them?

Development

1. Give each learner a set of equipment to make a car.
2. Cut two 4cm pieces of straws.
3. If using a matchstick, glue the ends to the buttons with the glue gun. If they are using bread twist ties, thread them through the straws and the holes in the buttons to secure them in place. How the learners make the cars will depend on your resources and what you feel will work best for your class.
4. When you have made both sets of wheels and axles, place one at the front in the natural grip of the peg. After this has been secured, place the second one in the back of the peg. Secure it in place using a piece of coloured tape.
5. You can now paint them if you wish.
6. When everyone has their car made, it is then time to race.
7. Was there a winner?

Scientific Inquiry

How do I make a car? How can I make it the fastest?

Learning Intention

The car wheels need to be able to turn so that the car can move.

Equipment

- Clothes pegs (one per car) (body of the car)
- Paint (optional to decorate)
- Large drinking straws (axles)
- Bamboo skewers cut to size/Matchstick/ Two bread twist ties (to fasten body of car to wheels)
- Buttons/Circular card (four per car, these are the wheels)
- Glue (we used hot glue)
- Coloured tape

Safety

Only use a glue gun under adult supervision and make sure that you wear the safety glove and goggles. The school staff can complete this step for some learners if they wish.

Discussion

Look at the different cars. Was one faster? How was it different to the rest? Different wheel size? Different weight? The wheels turned better? Did it travel in a straight line? Did button or cardboard wheels work best?

How might they improve the other cars?

Extension

Does the size of the wheels make any difference to the speed of the car? Try it out by using bigger or smaller buttons or card cut to size on some of the cars (if you have used the bread twist ties it is easier to change the wheels). Keep the rest of the car the same.

STEM Activity 3:
How can I make it move?

Background information and Science information

Forces affect how objects move, for example pushing and pulling. They may cause motion; they may also slow, stop, or change the direction of motion of an object that is already moving.

The wheel and axle consist of a wheel attached to a smaller axle so that these two parts rotate together and so a force is transferred from one to the other. On a bicycle when your feet push the pedals, this turns the chain, which turns the back axle and wheel. This makes us move forward.

Take photos at key points during the activity. You can use these later for activities such as sequencing, recalling and improving vocabulary.

Method

Introduction

Talk about equipment we use for outdoor activity. How many can the class name?

How many of these have wheels? Do any move without wheels? For example, a trampoline stays in the one position, but a pogo stick or a pair of stilts can move.

How many with wheels can move?

Development

1. Explain to the learners that today's experiment is to look at how our force and wheels help us to move.
2. Set up a start and finish line.
3. Give each learner a piece of outdoor activity equipment. If possible, give a mix of equipment with and without wheels. One or two learners should walk (not run) on each turn. Everyone should be at the start line. Staff can also join in to use the more difficult equipment.
4. Learners should try to travel with their piece of equipment to the finish line. Ask the learners: 'what are you doing to get the piece of equipment to move?'
5. Talk to the learners about how much force they are using.
6. Then talk to the learners about how fast they are travelling. Ask them: 'what happens if you stop using force?'
7. Ask the learners to record their finding for this piece of equipment.
8. Ask them to repeat the experiment with a different piece of equipment.

Discussion

Which equipment was the fastest? Does it have wheels or not?

Which equipment needed the most force (effort)? Does this have wheels or not?

Scientific Inquiry

How does the axle and wheel change the force you put in?

Learning Intention

The axle and wheel, together with my force, can make me move forward.

Equipment

- Bicycles
- Tricycles
- Scooters
- Skateboards
- Wheelchairs (self-propelled)
- Stilts
- Pogo sticks

Safety

Make sure that learners use equipment that is suitable for their needs.

Extension

Can you find any other examples of wheels and axles in use at home or in the classroom? (for example, a doorknob).

STEM Activity 4:
How can I make an exercise activity for a hamster?

Background information and Science information

All animals need to be able to exercise to maintain good health. A pet hamster has restrictions on how far they can run due to the size of their cage. This challenge is to design a piece of exercise equipment suitable for a hamster to use in their cage. Consider if a wheel might be a useful part of the equipment.

Take photos at key points during the activity. You can use these later for activities such as sequencing, recalling and improving vocabulary.

Method

Introduction

Allow the learners time to research the hamster exercise and play equipment that is already on the market.

After the research, talk about the type of things a hamster likes, for example a wheel.

Allow the learners to spend time working with the construction sets in class. Investigate and talk about the way the wheels work. Ask them: 'Are there different ways to make a wheel that will rotate?'

Development

1. Give the learners the design brief: design a piece of exercise equipment for a hamster. They can do this as a whole class, or in groups of two or three.
2. Create a design using lots of pictures of hamsters, their typical homes, and exercise equipment. Include a wheel so that the hamster will have the opportunity to run for long periods.
3. Record the learners' plans by:
   - drawing a picture;
   - copying and pasting pictures from the internet; or
   - making an audio recording.

Provide lots of junk materials and ways to fasten them together.

Ask the learners to create the equipment, giving them support if they need it.

Scientific Inquiry

How do I make exercise equipment for a hamster?

Learning Intention

Discovering methods to make a wheel that works as part of a piece of equipment.

Equipment

- Glue
- Tape
- Stapler
- Glue gun
- Junk materials (including plastic sweet tubs widely available after Christmas)
- Kitchen roll tubes
- Plastic bottles
- Various sizes of cardboard boxes
- Lollipop sticks, and so on.

Safety

Learners should only use a glue gun while being supervised by an adult. Ensure that they wear safety gloves and goggles.

Discussion

Discuss the finished equipment with the learners. Ask them to think of strengths and areas for improvement.

Talk about how their wheel can move around but not travel forward. How is this happening?

Extension

What other animals play with wheels? Is this always for exercise?

What sort of stationary exercise equipment do human beings use? Look at videos of gyms. If possible arrange a visit to a local gym to try the cardio equipment or borrow spin bikes for the class to try. (Many secondary schools have a gym which it may be possible to visit.)