**Spring Term Overview Years 3/4 – Science**

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| **Spring Term Book(s) – How To Train Your Dragon** | | |
| **Topic – Forces and magnets** | | **Guide Time: 6 weeks** |
| **Assessment:** | Twinkl - End of forces and magnets assessment. | **Very Important Points (VIPs):**   * A force is something that pushes or pulls. * Friction is a force that acts between two surfaces or objects that are trying to move across each other. * Different surfaces create different amounts of friction. * The amount of friction created by an object moving over a surface depends on the roughness of the surface and how much force is behind the object. * Forces can change the motion of an object by either making it start to move, speed up, slow it down or make it stop. * A magnet is an object that produces a magnetic force to pull certain objects towards it. * Magnetic objects are attracted to a magnet containing iron, nickel or colbalt. * Magnetic field is the area around the magnet where there is a magnetic force. * The North and South poles are found at different ends of a magnet. * Repulsion is a force that pushes objects away. * Attraction is a force that pulls objects together. * Examples of magnetic objects are scissors, paperclips, and coins. * Examples of objects that are non-magnetic are wood, plastic and cotton.   **Fat Question: How would the world be different if there were no forces?** |
| **Links to prior learning (sequencing) and canon book** | Forces and magnets Children will build upon their prior KS1 learning about 'materials' and will use this to compare and look at the properties of objects; especially with regards to magnetic and non-magnetic materials.  Children should be able to build on their prior knowledge of grouping and classifying different materials based on appearance.  Children should have prior knowledge of working scientifically skills of asking questions, grouping and classifying and using investigative techniques. |
| **Links to other learning (cross fertilisation)** | Geography – Physical geography  Art – Mixed media, pushes and pulls to mainpulate objects to create art.  Maths – Using tables and diagrams to present and sort data. Shape to make and create compasses.  DT – Levers and linkages.  **Thematic Questions**  **The World Beyond Us**  How are forces different or similar in space?  Would magnets still work in space?  **Modern Britain**  Explain how pushes and pulls impact everyday life.  Have there been any ‘recent discoveries’ about magnets?  **Healthy Bodies & Healthy Minds**  How does friction allow us to stay safe whilst exercising?  **The World Around Us**  **Do all countries have the same amount of knowledge about forces and magnets?**  **How have Sir Isaac Newton’s discoveries impacted other countries?**  **Culture**  **How are magnets used to impact daily lives?**  **Technology in Action**  How can technology help us to understand the history behind the discovery of forces and magnets?  Has technology had an impact on new discoveries? |
| **Links to future learning** | This unit will support the children's learning when moving onto UKS2 science units, in particular:  Year 5: Forces. |
| **Character/Wider Development ('50 things', cultural capital, skills)** | Visit to-  Train depo to look at how the magnets work on the train and also the forces which are on the train. Having 56 carriages it looks at how the braking distance is used to allow the train to stop on surfaces- friction. |

**OVERVIEW OF TEACHING SEQUENCE**

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| **Key Facts/Learning** | **Learning Focus or Key Question** | **Learning Outcomes (NC)** | | **Key Words/**  **Vocabulary** | **Greater Depth/SEND** | **Misconceptions** | **Activities and Resources** |
| **Week 1**  What is a force?  What is a pushing force?  What is a pulling force?  Children will carry out different actions and look at a range of force cards to identify the force acting on an object. | To identify the forces acting on objects. | NC: notice that some forces need contact between 2 objects, but magnetic forces can act at a distance  Asking relevant questions and using different types of scientific enquiries to answer them.  Using straightforward scientific evidence to answer questions or to support their findings. | | Force  Push  Pull  Direct contact  Indirect contact  Forwards  Backwards | **GD:**  Year 3 –  Pose questions to children based on their grouping of the forces to extend their understanding. Freedom to record their results independently.  Year 4 – Use a Venn diagram to group the force. Can give reasons for choosing how they have grouped them. Pose questions based on their groupings- ‘how do you know this is a push?’ Put in ‘red herrings’  **SEND:** Give children the headings they will be grouping the forces into. Use pictures and real life actions for them to group. Photograph them working. | Children may think that:  Only pushes and pulls they can see are forces.  Not everything is a force. | Children will start by looking at a range of different force cards and grouping them based on their initial ideas as to whether they are pushes or pulls. How they want to group them should be left up to the children to see if they can correctly identify pushes and pulls.  After writing a hypothesis of what they think a push and a pull is they will be introduced to a variety of force cards and will test their hypothesis using these actions.  As a class we will share findings and children can demonstrate the forces they have said act on objects.  See planning slides on trust shared.  **Resources:** Force cards, Venn diagram template for SEN/Dev, toy cars.  **Other useful resources:**  <https://www.bbc.co.uk/bitesize/clips/zkw8q6f>  Year 3 TASKS:  Red- Use the picture cards and place each force under the right heading.  Blue-Use the table and record your findings.  Gold- Create your own table to record results and write a detailed explanation about your findings.  SEND- Write a simple sentence about each force.  Year 4 TASKS  Red - Use the table to record findings.  Blue - Create table independently to record findings from experiment.  Gold- Use a Venn diagram to group results and give a detailed explanation as to how you have come to these conclusions.  SEND- Write a simple sentence about each force.  **Year 3 Deepen the moment:**  Always. Sometimes. Never. Only one force acts on an object at one time. Prove it!  **Year 4 Deepen the moment:**  A tennis ball is small and therefore only needs a small amount of force to move it. True or false? Explain your answer.  Sarah says that direct contact must always happen for a force to take place, is she correct? Explain your answer. |
| **Week 2**  Friction is the force that always slows a moving object down.  Difference surfaces provide different amounts of friction.  Not all surfaces are suitable for the same purpose.  The amount of friction created by an object moving over a surface depends on the roughness of the surface and the object, and the force between them. | LO: To investigate the effects of friction on different surfaces. | NC: Compare how things move on different surfaces.  Carrying out tests to find out how far things move on different surfaces. | | Force  Push  Pull  Direct contact  Indirect contact  Forwards  Backwards  Surface  Friction  Distance | GD:  Year 3  Allow children to group the tested materials based on their predictions before carrying out the experiment. Compare the distances travelled.  Year 4  Compare the distances travelled.  Explain how the properties of the materials contribute to frictional force.  SEND:  Provide children with resources to test the surfaces on. Adult support to measure the distance. | Children may think that:  Smooth surfaces are the best because they let things go the furthest.  The best surface is the one that stopped the car straight away because that is the safest.  Friction is not useful because it slows things down. | Children will recap previous learning and will understand how this will support them in the testing of friction. They will recall that a pushing action will move the car forward and then will be introduced to the idea of friction. For their main task children will use a range of materials to explore which material created the most and least friction.  They will use a ruler to measure the distance travelled by the toy car and will then compare the surfaces to identify which material created the most and least friction.  See planning slides on trust shared.  Year 3 tasks  Red- Use provided table to record results.  Blue- Complete the test as a group and record results independently. Measure the height using ruler. Write a sentence to explain which surface provided the most friction.  Gold- Create table to record results, include a comparison to create an accurate conclusion.  SEND- Complete task as a group- record results using a word bank.  Year 4  Red - Use the recording table template to record results.  Blue - Carry out experiment and record results including comparing the heights to give a clear conclusion.  Gold - Complete the experiment and record results appropriately. Use a ruler to measure the height and give a detailed explanation of the results.  SEND - Complete task as a group and write a sentence about findings using a word bank.  **Resources:**  Toy cars, carpet, ramp, table, wood, cotton cloth, foil.  **Other useful resources:**  <https://www.bbc.co.uk/bitesize/topics/zsxxsbk/articles/zxqrdxs>  **Year 3 Deepen the moment:**  Kate says friction is just a force that makes things stop. Do you agree? Explain your answer.  **Year 4 Deepen the moment**  Friction always works in the direction opposite to the direction in which the object is moving. Explain why it must work in the opposite direction. |
| **Week 3**  Magnetic materials can be picked up by a magnet.  Magnetic materials are always made out of metal but not all metals are magnetic.    Magnetic forces can act at a distance, this is the magnetic field. | LO: To identify and sort magnetic and non-magnetic materials. | NC: Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. | | Force  Push  Pull  Direct contact  Indirect contact  Forwards  Backwards  Surface  Friction  Distance  Magnetic  Non-magnetic  Material  Attract  Repel  Pole  Magnetic field. | GD:  Year 3 – Pose questions to children based on their groupings prior to staring the experiment. How do you know this is magnetic? Why do you think this isn’t magnetic? Question children prior to them completing the experiment- ask them to create their hypothesis independently.  Year 4 – Ask children to create their own recording method to display whether a material is magnetic or non-magnetic. What makes a material magnetic? Put in some ‘red herrings’ such as materials which have magnetic elements but aren’t all magnetic- can children explain why?  SEND:  Accessible template for children to record results. Pictorial resources to show which side they want to record the magnetic/non magnetic materials. Photograph children’s work. | Children may think that:  All materials made from metal are magnetic.  If a material has metal inside of it, it will be magnetic.  All magnets will pick up magnetic materials. | Introduce children to a variety of different materials and ask them to group them with their shoulder partner. How they want to group them then should be left up to the children to see if they correctly identify magnetic and non-magnetic materials.  After writing a hypothesis of what they think makes a material magnetic and non-magnetic they will be introduced to a variety of materials to test their hypothesis and record their findings into their books. Ask children to explore the magnetic field- does a magnet need to be touching the object to pick it up?  As a class we will share our results and uncover what makes a material magnetic (at this point clarify any misconceptions about all metals being magnetic) Ensure children know that magnetic force does not require direct contact.  See planning slides on trust shared.  Year 3 tasks-  Red - Group materials using image cards.  Blue - Complete recording table whilst completing experiment.  Gold - Complete experiment and record results independently. Create a conclusion based on your results. What do all magnetic items have in common?  SEND - Use the picture cards to group magnetic and non-magnetic materials.  Year 4 tasks-  Red - Complete experiment and recording table.  Blue - Create recording table to group magnetic and non-magnetic materials. Write a conclusion to explain what magnetic and non-magnetic materials have in common.  Gold - Create your own recording method to record results.  SEND - Label the picture cards magnetic or non-magnetic.  **Resources:**  Steel paper clips  Bar magnets  Iron filings  Trays  Pile of magnetic and non-magnetic materials mixed together per group (e.g. coins, iron nails, steel paper clips, pens, pencils, drinks cans, food tins, wooden spoons or plastic tubs)  **Other useful resources:**  [**https://www.bbc.co.uk/bitesize/topics/zyttyrd/articles/zw889qt**](https://www.bbc.co.uk/bitesize/topics/zyttyrd/articles/zw889qt)  [**https://www.bbc.co.uk/bitesize/topics/zyttyrd/articles/zpvcrdm**](https://www.bbc.co.uk/bitesize/topics/zyttyrd/articles/zpvcrdm)  **Year 3 Deepen the moment:**  Sarah says that all metals are magnetic, is she correct? Explain your answer.  **Always. Sometimes. Never. Magnets need to have direct contact for them to work. Explain your answer.**  **Year 4 Deepen the moment:**  Kate thinks that magnets only attract objects when they touch them, is she correct? Explain your answer. |
| **Week 4**  Why are some magnets stronger than others?  Different magnets have different strengths.  Magnets have different sizes. | LO: To investigate the strength of magnets. | NC: Notice that magnetic forces can act at a distance.  Observe how magnets attract or repel each other and attract some materials but not others.  Explore the strength of different magnets and find a fair way to compare them. | | Force  Push  Pull  Direct contact  Indirect contact  Forwards  Backwards  Surface  Friction  Distance  Magnetic  Non-magnetic  Material  Attract  Repel  Pole | GD:  Year 3 – Promote child to ‘team leader’ within small group. Allow them to be the one who ensures the test is kept fair.  Encourage children to show other members how to measure the distances from each magnet to the paper clip.  Year 4 – Allow the children to work independently to explore how to test the strength. Let them explore the strength of magnets through their own method. Children should work together to record their findings.  SEND:  Children have support with step by step instructions for how to complete the task. Take pictures of children working collaboratively and question them to check their understanding. Accessible template for children to record results. | Children may think that:  All magnets are the same strength because they are all magnets.  Magnets must touch an object to pick them up.  All metals are magnetic. | Revisit VIPs with children from previous lesson, what is it that makes a material magnetic? Are all metals magnetic? Revisit magnetic field. Children are then to be introduced to a range of magnets before creating a hypothesis about which magnet they think will be the strongest and why. Using a range of magnets children are to test the strength of them by exploring how many paperclips are attracted to each magnet.  Children will then record their findings via bar chart or table.  Discuss with the class which magnet they found to be the most powerful- did all children have the same findings?  Create a conclusion as a class, drawing on technical language relating to magnetic strength.  See planning slides on trust shared.  Year 3 tasks-  Red - Record results using table provided.  Blue - Use the bar chart template to record results.  Gold - Complete experiment conducting a fair test and record results using a bar chart.  SEND - Work in a group to complete the experiment. Decide which magnet was the strongest.  Year 4 tasks-  Red - Use the bar chart template to record results from the experiment.  Blue - Create a bar chart and record results, labelling the X and Y axis.  Gold - Record findings using their own bar chart with labelled axis. Write a conclusion about which magnet is the strongest and how you know.  SEND- Work in a group to complete the experiment. Write a sentence about which magnet was the strongest.  **Resources:**  Steel paper clips  Cotton thread  Masking tape  Variety of different types of magnets  (horseshoe, bar, button, disc, arc, cylinder  or square)  **Other useful resources:**  [**https://www.bbc.co.uk/bitesize/topics/zyttyrd/articles/zpvcrdm**](https://www.bbc.co.uk/bitesize/topics/zyttyrd/articles/zpvcrdm)  <https://www.bbc.co.uk/bitesize/topics/zyttyrd/resources/1>  **Year 3 Deepen the moment:**  Daisy says that the magnet only picks up objects when they are close enough. Is she correct? Explain your answer.  Sarah says that the bigger the magnet the stronger is it, do you agree? Explain your answer.  **Year 4 Deepen the moment:**  Always. Sometimes. Never. The bigger the magnet the stronger it will be. Explain your answer in detail.  Kate says the only reason the magnet picks up the paper clips is because they are not heavy, is she correct? Explain your answer. |
| **Week 5**  Magnets have two poles.  If two of the same poles are placed next to each other they will repel.  Magnetic field works to attract magnetic objects around the magnet. | L.O. To explore magnetic poles. | NC: Describe magnets as having two poles.  Predict whether 2 magnets will attract or repel each other depending on which poles are facing. | | Force  Push  Pull  Direct contact  Indirect contact  Forwards  Backwards  Surface  Friction  Distance  Magnetic  Non-magnetic  Material  Attract  Repel  Pole | GD:  Year 3- Children give detailed reasoning as to why they believe the poles attract or repel each other. Children are to independently create their own hypothesis and complete the experiment following the instruction sheet.  Children can record results as a group.  Year 4-  ‘Children as teachers’  Detailed hypothesis before beginning experiment- why will the compass work? Children are to then conduct the experiment in a group and record the results independently before feeding back their results to the class.  SEND:  Working with an adult children will complete the activity step by step. Photograph the children completing the experiment. They can label the two poles of the magnet. | Children may think that:  Magnets will attract each other because they are both magnetic.  The ends of the poles are the same just with different names.  Magnets only work if they are big. | \*This lesson will require children to use pins/paper clips (school safe)- consider children who may need to work with an adult during this activity\*  Introduce children to the concept that magnets have two poles. North and South. Children are to create a hypothesis about whether they think the two poles (north and south) will attract or repel each other.  Children are to use their knowledge of magnetic and non-magnetic materials to create their own compass to test magnetic field. Create a hypothesis as a class- will the compass they make have a magnetic field?  The children will be introduced to the four points of a compass before creating their own to attract or repel other objects.  As a class create a conclusion to the experiment.  See planning slides on trust shared.  Year 3 tasks-  Red - Follow method to complete the task. Write a sentence to explain results.  Blue - Complete the experiment and write 3 sentences to explain your results.  Gold - Independently create hypothesis and carry out experiment independently. Write conclusion to show results.  SEND - Work in a small group and write a sentence to show method.  Year 4 tasks  Red - Complete the experiment and write 3 sentences to explain your results.  Blue - Independently create hypothesis and carry out experiment independently. Write conclusion to show results.  Gold - Using the instructions create a compass and test your hypothesis. Write a paragraph explaining your results and how the compass did or did not work.  SEND - Work in a small group and write a sentence to show method.  **Resources:**   |  | | --- | | Bar magnets  Flat plastic lids  Plastic bowls  Water  ‘Treasure’ for children to find *(e.g. pencils, erasers)* |   **Other useful resources:**  [**https://www.bbc.co.uk/bitesize/topics/zyttyrd/articles/zpvcrdm**](https://www.bbc.co.uk/bitesize/topics/zyttyrd/articles/zpvcrdm)  <https://www.bbc.co.uk/bitesize/topics/zyttyrd/resources/1>  <https://www.bbc.co.uk/bitesize/clips/zk9rkqt>  [037e446013da897d5686a](https://content.twinkl.co.uk/resource/85/e3/au-t2-s-1590-magnet-compass-science-craft-instructions-english_ver_2.pdf?__token__=exp=1606044527~acl=%2Fresource%2F85%2Fe3%2Fau-t2-s-1590-magnet-compass-science-craft-instructions-english_ver_2.pdf%2A~hmac=1c0ba8b84436c542b2d5895daf57f19f591732d40d2037e446013da897d5686a)  [**https://content.twinkl.co.uk/**](https://content.twinkl.co.uk/)  **Year 3 Deepen the moment:**  Paul says that the needle would have still worked even if it hadn’t been rubbed by the magnet because it is magnetic. Is Paul correct? Explain your answer.  **Year 4 Deepen the moment:**  Always. Sometimes. Never.  Kate says that the Earth’s magnetic field pulled at the poles to make them move, is she correct? Explain your answer. |
| **Week 6**  Why do magnets attract some materials and not others?  Children should be aware of attraction and repulsion. | Consolidation week and assessment.  L.O. To explain that magnets attract some materials. | | NC: Describe magnets as having two poles.  Identify how properties of magnets make them more useful in everyday life.  Suggest creative uses for magnets. | Force  Push  Pull  Direct contact  Indirect contact  Forwards  Backwards  Surface  Friction  Distance  Magnetic  Non-magnetic  Material  Attract  Repel  Pole | GD:  Year 3-  Allow some children some time at the start of the lesson to decide which game they want to create. Ask them to explain in detail how the game works and why the magnets attract the objects.  Year 4-  Allow some children some time at the start of the lesson to decide which game they want to create. Ask them to explain in detail how the game works and why the magnets attract the objects.  Place ‘red herrings’ into the equipment.  SEND:  Children are to be given a step by step game to complete as a group. Adult support and pictures to be taken of them completing the task.  If able children are to write a sentence about how the game worked and what they liked about it. | Children may think that:  Magnets will attract each other because they are both magnetic.  Magnets have to be big to attract objects.  Magnets are stronger the bigger they are. | Children will revisit all VIPs explored during this half term with a focus on consolidating knowledge. Children will look at the forces involved to move objects before continuing to focus on the fact that magnets do not need direct contact to work.  Children will work in groups to create their own game- teachers can decide whether children can pick or if you want one specific game for the class. Children need to consider how the magnets will allow their game to work before making it.  Create a conclusion as a class- round robin allow children to share and swap their games to test whether they work. Analyse the strengths and weaknesses.  See planning slides on trust shared.  **Resources: Magnets, paper, toy cars, straw, string, card.**  **Other useful resources:**  Year 3 tasks  Red - Use the step by step guide to create a game independently.  Blue - Use specifically selected equipment to create a magnetic fishing game.  Gold - Create a step by step method of how to create game.  SEND - Work with an adult using the step by step instructions.  Year 4 tasks  Red - Use the equipment to create a magnetic game.  Blue - Choose a game and create a method and a conclusion.  Gold - Create a step by step method of how to create game, watch out for any ‘red herring’ equipment. Write a detailed explanation of why you have chosen specific equipment.  SEND- Work with an adult using the step by step instructions.  **Year 3 Deepen the moment:**  Kate thinks it is a pushing force that made her car move around the track, is she correct? Explain your answer.  **Year 4 Deepen the moment:**  Always. Sometimes. Never. The force |
| Context (big picture learning) In LKS2, Science is a vital part of the curriculum that allows children to explore, examine and think about scientific ideas. It is an important part of the Science curriculum journey where there is a heavy emphasis on getting children to work scientifically, ask and answer questions and problem solve as they understand the knowledge behind each unit.  In this unit children will explore a variety of materials to decide whether they create friction and also whether they are magnetic; this builds on from KS1 learning about materials and Autumn 2 science.  They will complete a variety of different experiments with emphasis on objects which move using pushes and pulls, the amount of friction caused by surfaces and magnetic attraction and repulsion.  This will be cross fertilised through art- manipulating resources using pushes and pulls, DT- linkages, Geography- physical geography and Maths- statistics and data. | | | | | | | |

**Primaries > KS2 > Year 3/4 Planning > Cycle B > Spring 1 –How to Train Your Dragon > Science**



**Year 3/4 Science Knowledge Organiser: Forces and Magnets**

**Key Vocabulary**

**Forces-** Pushes and pulls.

**Friction-** A force that acts between two surfaces or objects that are moving, or trying to move, across each other.

**Surface-** The top layer of something.

**Magnet-** An object which produces a magnetic force that pulls certain objects towards it.

**Magnetic-** Objects which are attracted to a magnet are magnetic. Objects containing iron, nickel or cobalt are magnetic.

**Magnetic field-** The area around a magnet where there is a magnetic force.

**Poles-** North and south poles are found at different ends of a magnet.

**Repel-** Repulsion is a force that pushes objects away.

**Attract-** Attraction is a force that pulls objects together.

**Intent:** To enable you, as learners, to understand forces as pushes and pulls and magnets as objects which produce a magnetic field. You will understand the importance of forces and magnets in our everyday life.

Through your investigations, discussions and research you will know how forces and magnets impact on our everyday lives. You will identify objects that require pushes and pulls and will investigate materials to discover whether they are magnetic or non-magnetic.

**Fat Question:**

How would the world be different if there were no forces?

**VIPs:**

* A force is something that pushes or pulls.
* Friction is a force that acts between two surfaces or objects that are trying to move across each other.
* Different surfaces create different amounts of friction.
* The amount of friction created by an object moving over a surface depends on the roughness of the surface and how much force is behind the object.
* Forces can change the motion of an object by either making it start to move, speed up, slow it down or make it stop.
* A magnet is an object that produces a magnetic force to pull certain objects towards it.
* Magnetic objects are attracted to a magnet containing iron, nickel or colbalt.
* Magnetic field is the area around the magnet where there is a magnetic force.
* The North and South poles are found at different ends of the magnet.
* Repulsion is a force that pushes objects away.
* Attraction is a force that pulls objects together.
* Examples of magnetic objects are scissors, paperclips, and coins.
* Examples of objects that are non-magnetic are wood, plastic and cotton.

