

Primary Science Resources – Teaching Inquiry & Investigative Skills – Roald Dahl Experiment Ideas from STEM Learning (<https://www.stem.org.uk/blog/roald-dahl-champion-stem-world?>)

The Roald Dahl stories below lend themselves to various STEM Challenges and developing skills of scientific enquiry: Observing over Time, Identifying & Classifying, Pattern seeking, Research, Comparative and Fair Testing. I have attempted to match up most of the ideas to relevant E&Os to help make the connections between literacy and STEM. However if you look from the perspective of developing science skills - **Scientific analytical thinking skills, Skills and attributes of scientifically literate citizens, Inquiry & Investigative Skills** all of the stories would encourage these.

If you use any of these stories in a different way, do let me know so that I can pass this on to other teachers ☺ janey.irving@moray.gov.uk

Benchmarks for Scientific analytical thinking skills		
Early	First	Second
<ul style="list-style-type: none"> • Demonstrates natural curiosity and shows development of basic skills of analysis in simple and familiar contexts, for example, through asking questions, experimenting and making predictions. • Demonstrates creative thinking by offering suggestions and solutions to everyday problems. • Demonstrates reasoning skills by explaining choices and decisions. 	<ul style="list-style-type: none"> • Applies learning in the sciences. • Provides creative solutions to scientific issues and problems. • Contributes to the design processes and uses components to make models. • Demonstrates reasoning skills and draws on understanding of science concepts to make and test predictions. • Provides explanations which are supported by evidence. 	<ul style="list-style-type: none"> • Applies scientific analytical thinking skills, with assistance, working with less familiar (or familiar but more complex) contexts. • Applies understanding, and a combination of more than one science concept, to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Benchmarks for Skills and attributes of scientifically literate citizens		
Early	First	Second
<ul style="list-style-type: none"> • Talks about science, showing developing understanding of risks and benefits, and listens to the views of others. • Demonstrates awareness of the importance of respecting living things and the environment and of managing the Earth’s resources responsibly. • Demonstrates a developing understanding of science in the world around them. • Explores the ways in which people use science and science skills as part of their job. 	<ul style="list-style-type: none"> • Expresses informed views of scientific issues, both orally and in writing, and respects the views of others. • Makes connections between science and their own health and wellbeing. • Demonstrates awareness of their own impact on the world. • Demonstrates awareness of how people use science in their everyday lives and in a variety of jobs and careers. • Discusses science topics in real-life contexts including those appearing in the media. 	<p><i>At Second Level, it is anticipated that learners will be able to demonstrate the skills below with assistance.</i></p> <ul style="list-style-type: none"> • Presents a reasoned argument based on evidence, demonstrating understanding of underlying scientific concepts, and engages with the views of others. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations. • Demonstrates increased awareness of creativity and inventiveness in science, the use of technologies in the development of sciences and the impact of science on society. • Expresses informed views about scientific and environmental issues based on evidence.

Benchmarks for Inquiry & Investigative Skills

Early	First	Second
<p><i>Plans and designs scientific investigations and enquiries</i></p> <ul style="list-style-type: none"> - Explores and observes through play. - Asks questions arising from play activities. - Makes simple predictions of what might happen. - Makes suggestions about what to do to answer the selected question. <p><i>Carries out practical activities within a variety of learning environments</i></p> <ul style="list-style-type: none"> - Discusses obvious risks and takes appropriate steps to protect themselves and others. - Uses their senses to acquire information. - Measures using simple equipment and non-standard units. <p><i>Analyses, interprets and evaluates scientific findings</i></p> <ul style="list-style-type: none"> - Presents and sorts data/information, for example, using displays, photographs, simple charts and drawings. - Provides oral descriptions of what was done and what happened. - Recognises similarities, patterns and differences in the findings and links these to the original question. - Discusses, with support, how the experiment might be improved. - Relates findings to everyday experiences. - Identifies and discusses new knowledge and understanding. <p><i>Presents scientific findings</i></p> <ul style="list-style-type: none"> - Communicates findings to others verbally and through drawings, photographs, displays and simple charts. - Responds to questions about their investigation. 	<p><i>Plans and designs scientific investigations and enquiries</i></p> <ul style="list-style-type: none"> - Collaborates with others to identify questions to find out more about a specific scientific concept, idea or issue. - Makes predictions about the scientific investigation/enquiry being planned. - Contributes to the design of procedures for carrying out scientific investigations. <p><i>Carries out practical activities in a variety of learning environments</i></p> <ul style="list-style-type: none"> - Identifies risks and hazards and ensures safe use of all tools, equipment and procedures. - Collaborates to undertake investigations. - Observes and collects information and makes measurements using appropriate equipment and units. <p><i>Analyses, interprets and evaluates scientific findings</i></p> <ul style="list-style-type: none"> - Records and presents data/information using a range of methods including tables, charts and diagrams, using labelling and scales. - Organises data and information and identifies significant patterns and relationships. - Interprets findings and discusses links to the original question. - Reports on limitations of their investigation and possible improvements. - Relates findings to their wider experiences of the world around them. - Identifies and discusses additional knowledge or understanding gained. <p><i>Presents scientific findings</i></p> <ul style="list-style-type: none"> - Presents data/information using a range of methods including tables, charts and diagrams, using labels and scales. - Reports in writing, orally or visually using a variety of media. - Structures a presentation or report, with support, to present findings in a coherent and logical way. 	<p><i>Plans and designs scientific investigations and enquiries</i></p> <ul style="list-style-type: none"> - Formulates questions and predictions (hypotheses), with assistance, based on observations and information. - Identifies the independent, dependent and controlled variables, with assistance. - Anticipates some risks and hazards. <p><i>Carries out practical activities in a variety of learning environments</i></p> <ul style="list-style-type: none"> - Applies appropriate safety measures. - Contributes to carrying out all the procedures. - Makes observations and collects information and measurements using appropriate devices and units. - Manages identified controlled variables to ensure validity of results. <p><i>Analyses, interprets and evaluates scientific findings</i></p> <ul style="list-style-type: none"> - Selects appropriate methods to record data/information. - Identifies relationships between the independent and dependent variables. - Makes links to original questions or predictions. - Relates findings to the wider world. - Draws basic conclusions consistent with findings. - Identifies and discusses additional knowledge and understanding gained. - Recognises anomalous results and suggests possible sources of error. - Evaluates the investigation and suggests one way of improving it if it was to be repeated. <p><i>Presents scientific findings</i></p> <ul style="list-style-type: none"> - Presents data/information by choosing from an extended range of tables, charts, diagrams, graphs, including bar graphs and line graphs. - Reports collaboratively and individually using a range of methods. - Collates, organises and summarises findings, with assistance, using headings or questions to provide structure for presentations. - Uses appropriate scientific vocabulary and acknowledges sources, with assistance.

The Roald Dahl Website has Lesson plans for his stories: <http://www.roalddahl.com/create-and-learn/teach/teach-the-stories>

Curricular Organiser: E&O and Benchmarks	Story	Activity
<p>I have investigated the everyday contexts in which simple fractions, percentages or decimal fractions are used and can carry out the necessary calculations to solve related problems. MNU 2-07a</p> <p>I can show the equivalent forms of simple fractions, decimal fractions and percentages and can choose my preferred form when solving a problem, explaining my choice of method.</p> <p>MNU 2-07b</p>	<p>Charlie and the Chocolate Factory</p>	<p>Dahl's most well-known book lends itself easily to many investigations. Exploring different 3D nets for packaging the chocolates or using chocolate blocks whilst displaying fractions are great maths activities.</p>
<p>Through exploring properties and sources of materials, I can choose appropriate materials to solve practical challenges. SCN 1-15a</p> <p>By contributing to investigations into familiar changes in substances to produce other substances, I can describe how their characteristics have changed. SCN 2-15a</p>	<p>Charlie and the Chocolate Factory</p>	<p>What temperature does different chocolate melt at? How does the taste change after melting? Can we design packaging that prevents melting? There is a lovely research opportunity to see how manufacturers in hot countries deal with the issue of chocolate melting.</p>
<p>Through exploring properties and sources of materials, I can choose appropriate materials to solve practical challenges. SCN 1-15a</p> <p>I can make and test predictions about solids dissolving in water and can relate my findings to the world around me. SCN 1-16a</p>	<p>The BFG</p>	<p>The BFG catches children's dreams in jars – ask your children to explore how best to create their own dream jars. Adding fizzy vitamin tablets to oil creates a wonderful lava lamp; adding glitter and colour creates a lovely dreamlike effect.</p> <p>Planet Science Lava Lamp Instructions – I used soluble vitamin C rather than Alka-Seltzer</p>
<p>I have participated in practical activities to separate simple mixtures of substances and can relate my findings to my everyday experience. SCN 2-16a</p>	<p>The BFG</p>	<p>Children could explore density columns, changing the liquids they add to ensure separation. A really challenging version of this is to create different coloured concentrated sugar solutions to create a rainbow of colours in the jar.</p> <p>Nice clear instructions and Video here: http://www.marthastewart.com/874975/density-column</p>

<p>I have collaborated in activities which safely demonstrate simple chemical reactions using everyday chemicals. I can show an appreciation of a chemical reaction as being a change in which different materials are made. SCN 2-19a</p>	<p>The BFG</p>	<p>You could also explore Froboscottle by creating recipes for the magical drink where bubbles go down instead of up. Is this possible? Bubbles usually obey the laws of Physics so this may be tricky but fun to create fizzing liquids using combinations of bicarbonate of soda and acidic liquids like vinegar or maybe try acidic juices. A good safety point of instruction – DO NOT EAT/DRINK IN A LAB!</p>
<p>I can use money to pay for items and can work out how much change I should receive. MNU 1-09a</p>	<p>Matilda</p>	<p>This story leads to a fantastic opportunity to work with profits and costs. Mr Wormwood explains how he cheats car buyers by adding sawdust to silence the gearboxes. Can children work out his costs and the profits received from his fraudulent cars?</p> <p>The Roald Dahl website has some fantastic questions to lead their maths exploration.</p>
<p>I can explore examples of food chains and show an appreciation of how animals and plants depend on each other for food. SCN 1-02a</p>	<p>James and the Giant Peach</p>	<p>James meets different minibeasts whilst travelling in the giant peach which leads to an exploration of the different animals and their natural habitats and diets. What size are they naturally? How much would they need to grow to be the size in the story?</p>
<p>Observation over time or could be adapted for fair testing by using a variety of solutions to see their effect.</p>	<p>James and the Giant Peach</p>	<p>To allow the children to observe swelling, just as the peach did, they could place a gummy bear in water and watch it grow as it absorbs the water.</p>
<p>I have collaborated in activities which safely demonstrate simple chemical reactions using everyday chemicals. I can show an appreciation of a chemical reaction as being a change in which different materials are made. SCN 2-19a</p>	<p>George's Marvellous Medicine</p>	<p>George creates the ultimate potion in this fantastic story of chemical exploration. It provides an opportunity to explore density of liquids, volume and capacity whilst the children create their own potions.</p>
<p>Early - Demonstrates awareness of the importance of respecting living things and the environment and of managing the Earth's resources responsibly. First - Expresses informed views of scientific issues, both orally and in writing, and respects the views of others. Second - Presents a reasoned argument based on evidence, demonstrating understanding of</p>	<p>George's Marvellous Medicine</p>	<p>George manages to make the farm animals swell to gigantic sizes, could this solve the world food shortage?</p>

<p>underlying scientific concepts, and engages with the views of others.</p>		
<p>I have collaborated in activities which safely demonstrate simple chemical reactions using everyday chemicals. I can show an appreciation of a chemical reaction as being a change in which different materials are made. SCN 2-19a Having taken part in practical activities to compare the properties of acids and bases, I have demonstrated ways of measuring and adjusting pH and can describe the significance of pH in everyday life. SCN 3-18a</p>	<p>George's Marvellous Medicine</p>	<p>Can the children create their own pH scales using things found around the house? What happens when you combine liquids of different pH? This story also provides an excellent opportunity to discuss health and safety: should we eat things found around our homes?</p>
<p>I can design and construct models and explain my solutions. TCH 1-09a I can extend and enhance my design skills to solve problems and can construct models. TCH 2-09a I explore and discover engineering disciplines and can create solutions. TCH 1-12a I can extend my knowledge and understanding of engineering disciplines to create solution. TCH 2-12a</p>	<p>Danny the Champion of the World</p>	<p>Danny's father in the story is a pheasant poacher. Can the children design an ingenious pheasant catcher that would allow Danny to collect all the pheasants in the wood without being caught by the landowner?</p>
<p>I can explore and experiment with digital technologies and can use what I learn to support and enhance my learning in different contexts. TCH 1-01a</p>	<p>Fantastic Mr Fox</p>	<p>Mr Fox enlists the help of his family and animal friends to escape the terrifying farmers in this classic tale. Working within Scratch children could design an escape path for the fox family, avoiding the diggers, guns and floods the farmers use to try to kill them.</p>
<p>I can design and construct models and explain my solutions. TCH 1-09a I can extend and enhance my design skills to solve problems and can construct models. TCH 2-09a I explore and discover engineering disciplines</p>	<p>Fantastic Mr Fox</p>	<p>This story also leads to control activities where the children could design an escape vehicle to navigate through the underground tunnels, perhaps incorporating a digging arm for the front?</p>

<p>and can create solutions. TCH 1-12a I can extend my knowledge and understanding of engineering disciplines to create solution. TCH 2-12a</p>		
<p>I can estimate how long or heavy an object is, or what amount it holds, using everyday things as a guide, then measure or weigh it using appropriate instruments and units. MNU 1-11a</p>	<p>Esio Trot</p>	<p>Alfie the tortoise does not grow in this charming story of love between two neighbours. The upstairs neighbour, in a bid to impress his love interest, starts to replace Alfie every night with larger and larger tortoises. This makes for a lovely sorting activity where children order different tortoises depending on mass and length. It's also an opportunity to explore the use of tessellating patterns on tortoise shells.</p>
<p>By investigating forces on toys and other objects, I can predict the effect on the shape or motion of objects. SCN 1-07a I can design and construct models and explain my solutions. TCH 1-09a I can extend and enhance my design skills to solve problems and can construct models. TCH 2-09a I explore and discover engineering disciplines and can create solutions. TCH 1-12a</p>	<p>Esio Trot</p>	<p>The contraption used to scoop the tortoises is a perfect opportunity to explore levers and pulleys, with the children designing and building their own tortoise retrieving device.</p>