

Sphero and the Chocolate Factory

Year level band: 3-4 (can also be adapted for 5-6)

Description: Students are introduced to programming Sphero, using Sphero to represent a character from a story, fairy tale or book that they have read. This activity allows students to use the visual programming software Lightning Lab to control Sphero to act out the role of a fictional character.

This activity uses *Charlie and the Chocolate Factory* by Roald Dahl as an example, but you can use a story that your class is familiar with.

Resources:

- Spheros
- iPads with the [SPRK Lightning Lab](#) app.
- Paper and pens
- Cardboard boxes and glue / sticky tape

Prior Student Learning:

Digital Technologies: Students have done some work on algorithms and used some basic visual programming (possibly with Sphero).

Maths: Students have done some work on angles.

English: Students can identify key events and characters from the book covered in the activity.

Digital Technologies Summary

By the end of Year 4, students will have had opportunities to create a range of digital solutions, such as interactive adventures that involve user choice, modelling simplified real world systems and simple guessing games.

They record simple solutions to problems through text and diagrams and develop their designing skills from initially following prepared algorithms to describing their own that support branching (choice of options) and user input. Their solutions are implemented using appropriate software including visual programming languages that use graphical elements rather than text instructions.

Year	Content Descriptors
3-4	Define simple problems, and describe and follow a sequence of steps and decisions (algorithms) needed to solve them (ACTDIP010)
	Implement simple digital solutions as visual programs with algorithms involving branching (decisions) and user input (ACTDIP011)
	Innovate on familiar texts through play (ACELT1831) (English, 3-4)
Achievement Standards	By the end of Year 4, students define simple problems, design and implement digital solutions using algorithms that involve decision-making and user input. They explain how the solutions meet their purposes.



Element	Summary of tasks
Learning hook	<p>Show images of the four main rooms in <i>Charlie and the Chocolate Factory</i>: The Chocolate Room, The Inventing Room, The Nut Room and The Television Room. (Or choose places or scenes from the book that your class has read.)</p> <p>Ask students to discuss in pairs something important or memorable that happened in each of the rooms.</p> <p>Introduce Sphero (maybe dressed up as a character from the book). Explain that we are going to program Sphero to navigate a path to various rooms (or scenes) in the book and respond appropriately with colour and movement.</p>
Learning Map (Sequence)	<ul style="list-style-type: none"> ● Students describe the sequence of events in the story. ● Students work in teams to design their algorithm using SPRK Lightning Lab ● Students work in teams to implement their program for Sphero to interact with the various rooms or scenes ● Students can debug their algorithms
Learning input	<p>Show how to pair Sphero with an iPad and run a block-based program in Lightning Lab.</p> <p>Show a few of the basic control blocks and how to change their behaviour (e.g. angle, colour, speed). Do not show too much as students should be playing, discovering and problem-solving with Lightning Lab in their groups.</p> <p>Explain that students are going to construct their own paths around the Chocolate Factory for Sphero to follow.</p> <p>Sphero can play the part of Willy Wonka, or another character, or a visitor from your class. Students will need to program Sphero to move around the Factory and interact with the various rooms.</p>



<p>Learning construction</p>	<p>Students work in small groups or pairs to construct a path on the floor using cardboard boxes (or similar) as the different rooms.</p> <p>This is an opportunity for students to play and find out how to control the Sphero.</p> <p>Encourage students to be imaginative and consider direction, speed, colour, and sound and how these might be relevant to points in the path or the story.</p> <p>E.g. Sphero could turn blue (like a giant blueberry) in The Inventing Room. Sphero could slow down and turn pink to represent the Pink Sweet Boat ride in The Chocolate Room.</p> <p>As students draw lines, teacher asks questions as appropriate:</p> <ul style="list-style-type: none"> ● Why have you used this block? ● How does Sphero know where to go next? ● How could you program Sphero to avoid crashing into the box? ● What have you changed? <p>Reinforce the fact that failure is a good thing! As students work, they should make notes on what works and doesn't work. They can also compare notes and help other groups out.</p>
<p>Learning demo</p>	<p>Once students have programmed Sphero, choose a couple of groups to present what they have created with the class:</p> <ul style="list-style-type: none"> ● What did you discover about the different blocks? ● How did you show what the character was thinking or doing? ● What worked well? ● What did not work well? ● What would you change if you were to repeat the task? <p>Take photos / video of the presentations and discussions about the learning process.</p>
<p>Learning reflection</p>	<p>Bring together the observations from the learning demo and, if possible, show some photos / videos.</p>



Assessment:

Formative Assessment:

- Teachers observe students using the Spheros, creating their algorithms and debugging.
- Use questioning to elicit student understanding of the functions of Sphero and the programming blocks in Lightning Lab and their algorithmic thinking.
- You might take photos/videos of the students' work to document their progress – or in the final presentations.

Criteria	Quantity of knowledge			Quality of understanding	
	Pre-structural	Uni-structural	Multi-structural	Relational	Extended abstract
Algorithms Programming	No programming shown	Program only contacts a limited number of blocks which are not linked	Program has enough instructions to complete the task but not linked or not linked in the correct sequence – or there are parts that do not work	Algorithm has instructions linked in the correct sequence to achieve the task – Sphero can follow a path programmed in Lightning Lab	Algorithm brings in prior learning and/or independent learning beyond the task and possibly includes advanced blocks such as loops
English linked to Design	No links to the story	Limited behaviour of Sphero linked to the story, e.g. change of colour or speed	Correctly programmed behaviours, e.g. change of speed, direction, colour but not for each room/scene or some not relevant	Sphero programmed correctly using blocks to relate to specific points in the story in the correct order	Program brings in prior learning and/or independent learning beyond the task and possibly includes additional blocks such as spinning, fading and decisions
Vocabulary	When describing the program, no specific vocabulary is used	The terms instruction or program may be used as a general description	The terms algorithm and program used as a general description	The terms algorithm and program are used confidently with specific reference to learner's work	Specific vocabulary like decisions, repetition and variable is used, going beyond the set language



CSER Professional Learning:

This lesson plan corresponds to professional learning in the following CSER Digital Technologies MOOCs:

F-6 Digital Technologies: Foundations

- Unit 7: Algorithms and Programming
- Unit 8: Visual Programming

F-6 Digital Technologies: Extended

- Unit 2: Algorithms & Programming
- Unit 3: English Connections

See: <http://csermoocs.adelaide.edu.au/moocs>

Further Resources:

<https://sprk.sphero.com/cwists/category> - lessons and activities designed to use with Sphero and Lightning Lab, including submissions from teachers across the world.

Digital Technologies Hub: www.digitaltechnologieshub.edu.au

CSER: <https://csermoocs.adelaide.edu.au>



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