

LEGO® Education WeDo 2.0

Curriculum Pack Preview

Computing
Designing
Investigating
Modelling



LEGO® Education
WeDo 2.0

BUILT ON THE NATIONAL
CURRICULUM



WeDo 2.0
LEGOeducation.co.uk

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What's in the Curriculum Pack preview?

In this preview, you will find an overview and highlights of the WeDo 2.0 Curriculum Pack. The complete pack includes a thorough introduction to using the Core Set and Software plus 40+ hours of standards-based projects to create engaging learning experiences that make science and computing come to life.

WeDo 2.0 is designed for Key Stage 2. With WeDo 2.0, your pupils will explore, create, and share their findings as they build, program, and modify projects while working collaboratively.

With this innovative solution, you can boost your pupils confidence to ask questions and solve problems by putting scientific discovery and computing skills in their hands.

Use this document along with the software to experience how WeDo 2.0 can help you meet curriculum objectives across science and computing.

Download the software for free at
LEGOeducation.co.uk/WeDo

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LEGO® Education is pleased to bring you the WeDo 2.0 Curriculum Pack preview.

In this preview, you will find a sample of the curriculum pack materials, as well as Part A of the Get Started with WeDo 2.0 project.

How to teach science with WeDo 2.0

WeDo 2.0 uses a project progression defined by three phases.

Explore phase

Pupils connect to a scientific question or an engineering problem, establish a line of inquiry, and consider possible solutions.

The steps of the Explore phase are: connect and discuss.

Create phase

Pupils build, program, and modify a LEGO® model. Projects can be one of three types: investigate, design solutions, and use models. Depending on the type of project, the Create phase will differ from one project to another.

The steps of the Create phase are: build, program, and modify.

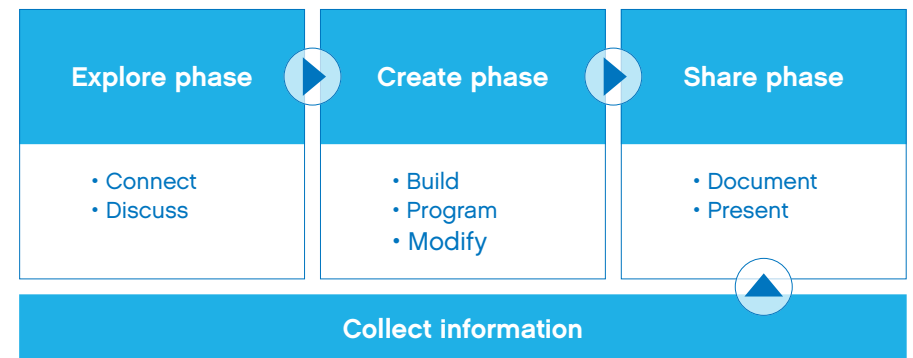
Share phase

Pupils present and explain their solutions and findings using their LEGO models and the documents they have created with the integrated Documentation tool.

The steps of the Share phase are: document and present.

▶ Important

During each of these phases, pupils will document their findings, the answers, and the process, using various methods. This document can be exported and used for assessment, display, or sharing with parents.





Document projects

Asking your pupils to document their work will help you to keep track, identify where they need more help, and evaluate their progress..

Pupils can use many different methods to express their ideas. During the ongoing documentation process, they can:

1. Take photographs of important steps of their prototypes and their final models.
2. Take photographs of their team working on important stages of the process.
3. Record a video explaining a problem they are facing.
4. Record a video explaining their investigation.
5. Make notes using the Documentation tool.
6. Find supporting pictures on the Internet.
7. Take screenshots of their programs.
8. Write, draw, or sketch on paper and then take photographs to record their information.

▶ Suggestion

A combination of paper and digital documentation can be the most effective, depending on the age group you are working with.

Share projects

At the end of the project, pupils will be eager to share their solutions and findings. This is a great opportunity to develop their communication abilities.

Here are a few examples of how your pupils can share their work:

1. Ask the pupils to create the display where the LEGO® model will be used.
2. Ask the pupils to describe their investigations or dioramas.
3. Ask a team of pupils to present their best solution to you, another team, or to the class.
4. Invite an expert or a group of parent to your classroom for a pupil presentation.
5. Organise a science fair at your school.
6. Ask the pupils to record videos explaining their projects, and post them online.
7. Create and display posters of the projects around your school.
8. E-mail the project documents to parents, or publish them in pupils' portfolios.

▶ Suggestion

To make this experience even more upbeat, ask each pupil to make a positive comment or to pose a question about another pupil's work during the sharing session.





WeDo 2.0 in the Curriculum

The LEGO® Education WeDo 2.0 solution combines LEGO bricks with the expectations of the National Curriculum Science programmes of study. The projects are designed to develop pupils' science practices.

In this chapter, you will be introduced to three innovative ways to use the bricks in your classroom:

- Model reality.
- Conduct investigations.
- Use design skills alongside the development of science practices.

Develop science and engineering practices with WeDo 2.0

WeDo 2.0 projects will develop science practices. They provide opportunities for pupils to work with and develop ideas and knowledge, and to gain an understanding of the world around them.

The progression and difficulty level of the projects allows pupils to develop competency while exploring and learning about key science topics. The projects have been carefully chosen to cover a wide variety of topics and issues.

WeDo 2.0 projects develop eight science and engineering practices:

1. Ask questions and solve problems.
2. Use models.
3. Design prototypes.
4. Investigate.
5. Analyse and interpret data.
6. Use computational thinking.
7. Engage in argument from evidence.
8. Obtain, evaluate, and communicate information

The guiding principle is that every pupil should engage in all of these practices across the projects in each year group.





Science practices and the engineering habits of mind

The science and engineering practices serve as the common thread throughout the curriculum, and all requirements should, in essence, be taught through them. While the academic definition of each process is important, it is probably a good habit to verbalise the practices in a way that is understandable to pupils at that level.

The following points identify the basic principles of these practices and give examples of how they are used in WeDo 2.0 projects.

1. Ask questions and define problems.

This practice focuses on simplistic problems and questions based on observational skills.

2. Develop and use models.

This practice focuses on pupils' prior experiences and the use of concrete events in modelling solutions to problems. It also includes improving models and new ideas about a real-world problem and solution.

3. Plan and carry out investigations.

This practice is about how pupils learn and follow directions for an investigation to formulate probable solution ideas.

4. Analyse and interpret data.

The focus of this practice is to learn how to gather information from experiences, document discoveries, and share ideas from the learning process.

5. Use mathematics and computational thinking.

The purpose of this practice is to realise the role of numbers in data-gathering processes. Pupils read and gather data about investigations, make charts, and draw diagrams resulting from the numerical data. They add simple data sets to come up with conclusions. They understand or create simple algorithms.

6. Construct explanations and design solutions.

This practice is about ways they might go about constructing an explanation or designing a solution for a problem.

7. Engage in argument from evidence.

Constructively sharing ideas based on evidence is an important feature of science and engineering. This practice is about how pupils begin to share their ideas and demonstrate proof to others in a group.

8. Obtain, evaluate, and communicate information.

Teaching children about what real scientists do is key to this practice. The way in which they set up and complete investigations to gather information, how they evaluate their findings, and how they document, are all important elements. It is important that teachers explore a plethora of ways to have pupils gather, record, evaluate, and communicate their findings. Ideas include digital presentations, portfolios, drawings, discussion, video, and interactive notebooks.

▶ Important

The WeDo 2.0 projects will engage your students in all science and engineering practices. Refer to the practices grid of this chapter to get the overview.



Use the LEGO® bricks in a scientific context

LEGO® bricks have been used in three different ways in the WeDo 2.0 projects:

1. To model reality
2. To investigate
3. To design

These three ways will give you the opportunity to develop a different set of practices, as the outcome of the project is different in each case.

1. Use models

Pupils represent and describe their ideas using the bricks.

Pupils can build a model to gather evidence or provide a simulation. Although only representations of reality, models enhance understanding and explain natural phenomena.

When implementing a modelling project, encourage pupils to focus their creativity on representing the reality as accurately as possible. By doing that, they will need to identify and explain the limitations of their models.

Examples of modelling Guided Projects are:

- Frog's Metamorphosis
- Plants and Pollinators

2. Investigate

Planning and carrying out investigations is an ideal framework for a science project. Pupils' learning is enhanced by active engagement with the problem. Pupils are encouraged to make predictions, carry out tests, collect data, and draw conclusions.

When implementing an investigation project, you should encourage pupils to pay special attention to ensure fair testing. Ask them to search for cause and effect in their tests, ensuring they change only one variable at a time.

Examples of investigating Guided Projects are:

- Pulling
- Speed
- Robust Structures



Use the LEGO® bricks in an engineering context

3. Design

Pupils design solutions for a problem for which there is no single answer. The problem may require pupils to design a combination of plans, models, simulations, programs, and presentations. Going through the design process will require pupils to constantly adjust and modify their solutions to meet criteria.

While designing a solution, it will be important to recognise that the idea of “failure” in engineering is a sign of growth in the cognitive process. Therefore, pupils may not reach a viable solution on their first attempt or within the provided time constraints. In that case, encourage them to reflect on their process and to identify what they have learned.

When you implement a design project, encourage pupils to focus their creativity on designing multiple solutions. Ask them to select the prototype they think is the best according to the criteria you have set.

Examples of designing Guided Projects are:

- Prevent Flooding
- Drop and Rescue
- Sort to Recycle

Important

Documents produced by pupils following the completion of these three types of projects may contain different types of information.

Use LEGO® bricks in a computational thinking context

Computational thinking is a set of problem-solving skills that are applied to working with computers and other digital devices. In WeDo 2.0, computational thinking is handled in a developmentally appropriate manner through the use of icons and programming blocks.

Computational thinking characteristics include:

- Logical reasoning
- Looking for patterns
- Organising and analysing data
- Modelling and simulations
- Using computers to assist in testing models and ideas
- Using algorithms to sequence actions

Its application in science and engineering projects enables pupils to use powerful digital tools to carry out investigations and build and program models, which might otherwise be tricky to do. Pupils use programs to activate motors, lights, sounds, or displays, or to react to sounds, tilt, or movement to implement functionalities to their models or prototypes.





Visual overview of Guided Projects

1. Pulling

Investigate the effects of balanced and unbalanced forces on the movement of an object.

2. Speed

Investigate the factors that make a car accelerate to help predict future motion.

3. Robust Structures

Investigate the characteristics that make a building earthquake resistant, using an earthquake simulator constructed from LEGO® bricks.

4. Frog's Metamorphosis

Model a frog's metamorphosis using a LEGO representation, and identify the characteristics of the organism at each stage.

5. Plants and Pollinators

Model a LEGO representation of the relationship between a pollinator and flower during the reproduction phase.

6. Prevent Flooding

Design an automatic LEGO floodgate to control water according to various precipitation patterns.

7. Drop and Rescue

Design a device to reduce the impacts on humans, animals, and the environment after an area has been damaged by extreme weather.

8. Sort to Recycle

Design a device that uses the physical properties of objects, including their shape and size, to sort them.





Visual overview of Open Projects

9. Predator and Prey

Model a LEGO® representation of the behaviours of different predators and their prey.

10. Animal Expression

Model a LEGO representation of different communication methods used in the animal kingdom.

11. Extreme Habitats

Model a LEGO representation of how habitat influences the survival of certain species.

12. Space Exploration

Design a LEGO prototype of a rover that would be ideal for exploring distant planets.

13. Hazard Alarm

Design a LEGO prototype of a weather alarm device to reduce the impact of severe storms.

14. Cleaning the Ocean

Design a LEGO prototype to help people remove plastic waste from the ocean.

15. Wildlife Crossing

Design a LEGO prototype to allow an endangered species to safely cross a road or other hazardous area.

16. Moving Materials

Design a LEGO prototype of a device that can move specific objects in a safe and efficient way.

9



10



11



12



13



14



15



16





Quick glance: Getting Started Project, part A

Preparation: 30 min.

- For information regarding general preparation, please see the “Classroom Management” chapter.
- Read through this project so you have a good idea of what to do.
- Prepare to introduce this project to your pupils.
- Define your expectations and theirs.
- Determine the end result of this project: Everyone should have a chance to build, program, and document.
- Make sure that timing allows for expectations to be met.

Explore phase: 10 min.

- Start the project using the introductory video.
- Have a group discussion.

Create phase: 20 min.

- Ask the pupils to build the first model from the provided building instructions.
- Ask them to program the model using the sample program.
- Allow pupils time so they can make their own experiments and change the parameters of the program.
- Challenge them to discover new programming blocks on their own.

Share phase: 10 min.

- Some suggestions for sharing include:
- Make sure your pupils take photographs of their models.
- Make sure they write their names and comments in the Documentation tool.
- Ask the pupils to export the results of their projects and share them with their parents.

▶ Important

It is recommended that you complete the four Getting Started Projects in a single sequence. If not, it is recommended that you complete these before moving on to other projects. This will give the pupils ample time to explore the materials. Approximate timing for the four Getting Started Projects is:

- Part A: Milo the Science Rover: 40 min.
- Part B: Milo’s Motion Sensor: 15 min.
- Part C: Milo’s Tilt Sensor: 15 min.
- Part D: Collaborate: 15 min





Explore phase

Use the introductory video

Scientists and engineers have always challenged themselves to explore remote places and make new discoveries. To make this possible, they have designed spacecraft, rovers, satellites, and robots that enable them to collect data and make visual observations of previously inaccessible places. They have succeeded many times, but have also failed many times. Remember that failure presents a chance to learn. Use the following ideas to start thinking like a scientist:

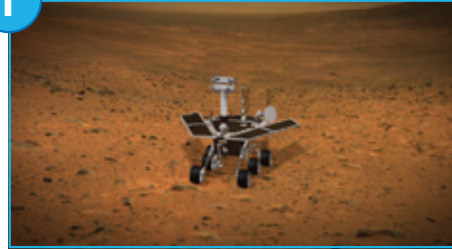
1. Scientists send rovers to Mars.
2. They use submarines in water.
3. They fly drones into volcanoes.

Questions for discussion

1. What do scientists and engineers do when they cannot go where they want to explore?

Scientists and engineers see these situations as challenges that need to be overcome. With proper resources and commitment, they will develop prototypes of possible solutions and ultimately choose the best option.

1



2



3





Create phase

Build and program Milo

Pupils should follow the building instructions to build Milo the Science Rover.

1. Build Milo the Science Rover.

This model will give pupils a “first build” experience with WeDo 2.0.

▶ Important

Make sure everyone can connect the motor to the Smarthub, and the Smarthub to the device.

2. Program Milo.

This program will start the motor at power eight, travel in one direction for two seconds, and then stop.

The motor can be started in both directions, stopped and turned at different speeds, and activated for a specific amount of time (specified in seconds).

▶ Suggestion

Give pupils time to change the parameters of this program string. Let them discover new features, such as adding sound.

Use this opportunity to guide pupils to the Design Library, where they can find inspiration to explore other program strings.

Share phase

Present

Before you move on to the next part of the Getting Started Project, allow the pupils to express themselves:

- Have a short discussion with your pupils about scientific and engineering instruments.
- Ask your pupils to describe how science rovers are helpful to humans.

Document

- Introduce the pupils to the Documentation tool.
- Ask them to take photographs of themselves together with their models.



Preview the Computing Extension Projects, which includes projects linked to the computing curriculum at Key Stages 1 and 2, at LEGOeducation.co.uk/WeDo

Getting Started Made Easy

LEGO® Education makes outfitting your classroom a cinch with a variety of purchase options designed to suit an assortment of needs.

Classroom
Solutions



Class Packs that accommodate your specific class size are available online. Visit LEGOeducation.co.uk to learn more.

Book a FREE workshop - visit
LEGOeducation.co.uk/primary-workshops

