

Introduction

LEGO® Education is pleased to bring you the 'Early Simple Machines' curriculum pack, which provides ideal opportunities for young students to develop an understanding of science concepts through investigation and hands-on activities.

Who is it for?

This material is designed for use by teachers of students in grades K through 2. No prior science training is required – only creativity and enthusiasm. Working alone or in pairs, students of all abilities from 5 years and up can build, learn and enjoy with the eight models and activities.

Please refer to the Next Generation Science Standards (NGSS) and Common Core State Standards grids in the 'Curriculum' section of this curriculum pack to see which activities match your current teaching program.

What is it for?

LEGO Education STEM solutions enable young students to behave as young scientists, by providing them with tools and tasks that promote scientific enquiry. Using our solutions, students are encouraged to pose 'What if...?' questions. They make predictions, test the behavior of their models, and then record and present their findings.

The 'Early Simple Machines' curriculum pack enables you to partially cover the following Crosscutting Concepts and overall Science and Engineering Practices, which have been set forth in the NGSS.

Science and Engineering Practices:

- Asking questions (for science) and defining problems (for engineering)
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations (for science) and designing solutions (for engineering)
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

Crosscutting Concepts:

- Patterns
- Cause and effect: Mechanism and explanation
- Scale, proportion, and quantity
- Systems and system models
- Energy and matter: Flows, cycles, and conservation
- Structure and function
- Stability and change



What is in it?

The 9656 Brick Set

The set comes in a practical and durable storage box. Inside the storage box you will find the 101 bricks, eight building instructions numbered 1-8, and an element survey that displays the set's unique mix of LEGO® DUPLO® bricks.

Exclusive for this product is a plastic punch-out sheet with eyes, sails, scales and wings. The curriculum pack contains eight activities and four problem-solving activities. Each of these represents one level of progression and are described in more detail below.

Building Instructions

The eight building instructions support the students' building process step-by-step with clear instructions on how to build each model. To interpret the 2D building instructions and turn them into a 3D model can be a demanding task and some students may need your help and encouragement.

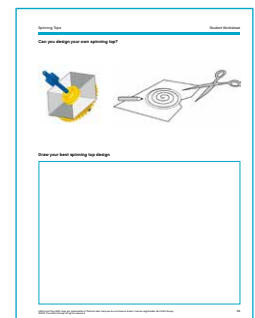
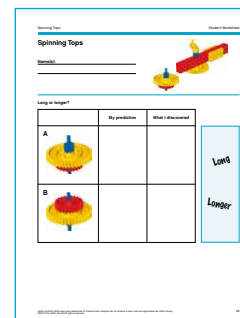
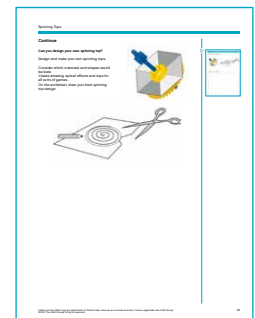
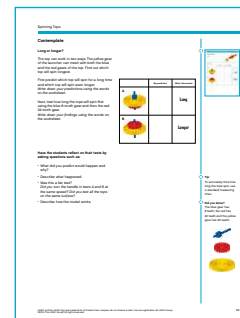
We recommend students try to build the exact models from the cards to ensure that the model will perform as intended for the activity. The building instructions will support the development of technical knowledge and understanding.

Teacher's Notes

In the Teacher's Notes you will find eight activities, each of which includes student worksheets, assessment tools, 'Connect' stories, and questions and ideas for further investigation. You will also find four problem-solving activities, which also include assessment tools and 'Connect' stories, as well as a design brief and a possible design solution – all ready for you to introduce to your students.

Activities and Student Worksheets

The illustrations in the student worksheets will guide the students to use and explore their models without too much assistance. The students will predict, test and describe outcomes using scientific words that are relevant to the NGSS, and presented in the student worksheets. These words will encourage the students to use the correct vocabulary to describe scientific concepts such as balance, direction, distance, speed and time.

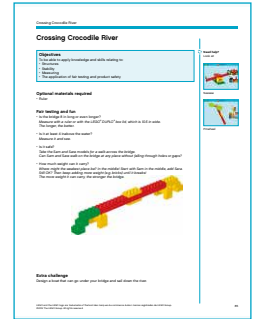
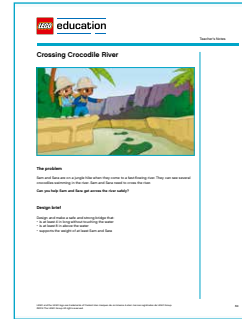


Problem-Solving Activities

Each of the four problem-solving activities starts off with a short story supported by an illustration featuring the problem that needs solving. To solve the problem, a design brief states a number of criteria the students have to incorporate into their model solution.

The 'fair testing and fun' questions and suggested answers help students focus on their models in order to meet the design brief criteria and support the test situation. The suggested model solution can help you in your preparation and differentiation, or when some of your students are struggling to create their own solution. However, it is not the one and only solution to the problem. Students must always be encouraged to build their own solution to a given problem.

If possible, take a picture of the students' model solution and have them explain how they have solved the problem. Keep the picture as inspirational material for future problem solvers.



Assessments

Assessment materials provided for all eight of the activities and the four problem-solving activities. These materials define clear learning goals before the students start each activity and motivate the students to challenge themselves throughout the learning process. You can also use these materials to assess your students' development in different learning areas.

Student Worksheets

The student worksheets should be used to document each student's work and to support them throughout each activity. These worksheets are an easy-to-use tool for assessing each student's level and achievement during the activities. They can also comprise a valuable part of each student's logbook or portfolio.

Student Self-Assessment Tools

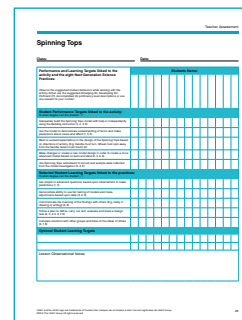
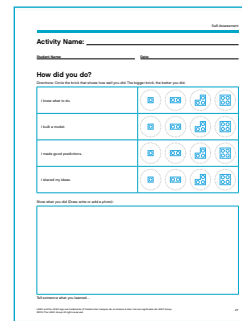
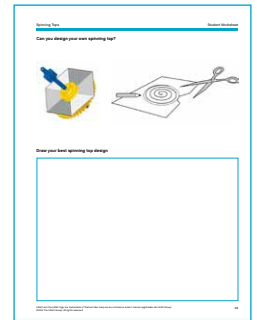
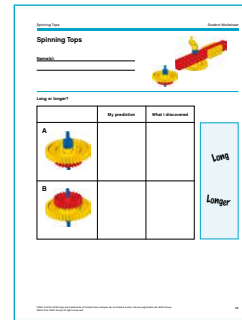
There are two generic student self-assessment rubrics. One has been developed for use during the activities, and the other is intended for use with the problem-solving activities. These rubrics help students to reflect on and evaluate their work during each lesson.

Using these rubrics, students assess themselves according to the 'Four Bricks Scale' in which the biggest brick represents the highest rating. In certain situations, you might consider asking your students to assess themselves using only two of the four bricks.

Teacher Assessment Tools

The Observation Checklists are linked directly to each of the activities and the problem-solving activities. You can use these checklists to assess the science and engineering practices of your students individually, in pairs, or in groups.

You either can use the Emerging, Developing, Proficient, or Accomplished proficiency level descriptions described on the next page, or use other assessment criteria that are relevant to your school context.



Emerging

The student is at the beginning stages of development in terms of content knowledge, ability to understand and apply content, and/or demonstration of coherent thoughts about a given topic.

Developing

The student is able to present basic knowledge only (e.g., vocabulary), and cannot yet apply content knowledge or demonstrate comprehension of the concepts being presented.

Proficient

The student has concrete levels of comprehension of the content and concepts, and can demonstrate adequately the topics, content, or concepts being taught. The ability to discuss and apply concepts outside of the required assignment is lacking.

Accomplished

The student can take concepts and ideas to the next level, apply concepts to other situations, and synthesize, apply, and extend knowledge to discussions that include extensions of ideas.

Where can I find the assessment materials?

You can find the assessment materials in the Teacher's Notes for each of the activities and problem-solving activities.



Classroom Management Tips

For Your First LEGO® Education Activity, and Beyond

1. Before Class

- Download the curriculum pack from the URL that is printed on the lid of each LEGO® brick set.
- Open one of the sets and get to know the bricks by working with one of the activities. Use the relevant student worksheets and assessment tools.

2. During Class

- At the beginning of the first lesson, allow the students some time get to know the LEGO brick set.
- Use a box to collect stray pieces.
- Make adjustments in order to challenge the students who are ready to improve and develop new skills.
- Label the boxes so that you can recognize which box belongs to which student(s).
- Plan to stop the lesson with enough time to allow the students to tidy up.

3. After Class

- If you did not finish the activity, store the LEGO sets and the models so that they are ready for the next lesson.
- Evaluate the lesson.

How much time is needed?

Each activity can be carried out within one lesson. A double lesson is ideal for more in-depth investigations of the key learning area(s) and to allow students to make creative model variations of their own.

For the open-ended problem-solving activities, students may need more time to build and explain their models.

How do I organize the building instructions?

For easy classroom management we suggest storing the building instructions either in a separate plastic folder or directly in the boxes so that they are at hand and ready to use at the beginning of each lesson.

What's needed in my classroom?

Tables may be pushed aside to let models roll across a smooth floor. A desk fan may be needed to create a breeze, boxes may be needed for a ramp, etc.

Students need to be able to construct in pairs facing each other or side-by-side. It is also an advantage to have a cupboard or shelves where you can store the sets lying flat with any unfinished models on top of them.

LEGO® Education's 4C Approach

The activities in the 'Early Simple Machines' curriculum pack follow LEGO® Education's 4C approach: Connect, Construct, Contemplate, and Continue. This enables you to progress naturally through the activities.

Connect

A short story introduces Sam and Sara and provides the students with the opportunity to help identify the problem and investigate how best to come up with a solution.

You may choose to read the story or retell it in your own words. Please also draw on your own experience and current events from both near and far to set the scene for the students.

Construct

Using the building instructions, students build models embodying the concepts related to the key learning areas. Tips are provided for testing and making sure each model functions as intended.

Contemplate

This involves students carrying out scientific investigations with what they have constructed.

Through their investigations the students will learn to identify and compare test results. The activities will introduce them to the concepts of measurement, speed, balance, mechanical movement, structures, force and energy. They will be encouraged to describe the outcomes of their investigations. You will find all test results presented in the same chart as in the worksheet.

It may be a good idea to carry out the tests several times as test results may vary.

A series of questions are included to further deepen the students' experience and understanding of the investigation.

This phase also includes the possibility for you to start evaluating the learning and the progress of the individual student.

Continue

Ideas are provided for further investigations drawing on the students' creativity and previous experiences. The students will experiment, design additions or changes to their models, and invent related games.

