



## Introduction

The LEGO® Pneumatics Set from LEGO Education is a superb way to learn and prepare for the Science and Technology in the real world.

### Who is it for?

The material is designed for use in key stage 3, but also has relevance in key stage 2. The teacher materials give full and complete guidance, plus explanations, and the student materials use instruction, questions and hints to ensure progress. Both you and your students will be guided through the material.

### What is it for?

LEGO Education Science and Technology solutions enable students to behave as technical investigators by providing them with tools and tasks that promote scientific enquiry. Using our solutions, your students are encouraged to pose 'What if ...?' questions. They make predictions or hypothesis, test the behaviour of their models, and then record and present their findings.

### What is it?

The set consists of 31 elements, including pumps, cylinders and valves – many of which are unique to this product. All of the elements and the 10 building instruction booklets fit into the bottom section of the 9632/9686 storage box.

The activity pack consists of 14 principle model activities, four main activities and two designing and making activities.

The set is designed for ease of use, easy classroom management, and lots of learning!



## What's new?

### Hands-on pneumatics

The set provides an opportunity for your students to get an in-depth understanding of pneumatics through hands-on activities.

The sections 'What are pneumatics?' and 'Principle models' will guide you and your students through the basics of pneumatics. The four main activities let your students explore pneumatic concepts in a motivating and exciting way that will encourage creativity and teamwork. They allow for the integration of a wide range of science, design & technology and mathematical concepts, thus supporting highly efficient learning.

## How to use it?

### Building instructions

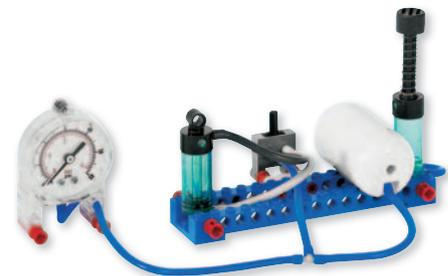
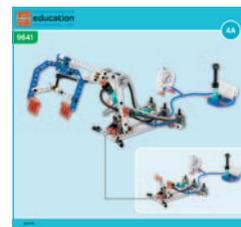
Unique to LEGO® Education Science and Technology solutions, the Buddy Building instruction booklets are designed for two buddies, so that each buddy builds only half a model. Using separate booklets (A and B), the buddies create their own sub-assemblies then collaborate to quickly bring the two together to create a single, more sophisticated and powerful model.

### What are pneumatics?

This section presents the basics of pneumatics: what it is, how it works and how it is used. The section also features a guide to the design and function of each of the elements, and includes four pages you can print out and display in your classroom. You may choose to use the section as part of your own preparation and/or hand them out to your students.

### Principle models

The principle models introduce the students to the basic concepts of pneumatics and provide an opportunity to gain an understanding and knowledge of how pneumatics work. They allow the students to experiment with easy-to-build models according to the progression of the activities and building instructions. Each principle student worksheet presents a selection of words that will encourage the students to use the correct terminology associated with pneumatics, in their investigations and explanations.



### Teacher's Notes

In Teacher's Notes, you will find activities as well as questions, answers, hints and ideas for further investigations. Every activity is carefully linked to the overall objectives of the Science, and Design & Technology curriculum. At the start of each activity, we list the outcomes unique to that particular activity. The outcomes that are common to all activities are listed in the section called 'What are the curriculum highlights.' We also list the specific vocabulary focus and the additional materials needed for each activity.

The Teacher's Notes follow LEGO Education's well-tested methodology – the 4C approach; Connect, Construct, Contemplate and Continue. This methodology enables you to naturally progress through the activities.

### Connect

A short text provides insight into the purpose and function of the specific model. The text is supported by a short movie of a real life machine similar to the LEGO® model. Use the text and movie as a starting point for a class discussion or you could draw on your own experiences. You can also draw from current events both near and far to set the scene for the students.

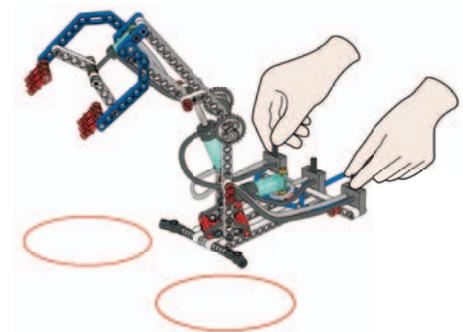
### Construct

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

### Contemplate

Through investigations based on scientific inquiry, the material encourages the students to discuss the specific technology learning areas, and to reflect and adapt their ideas to the task at hand.

Each activity requires the students to predict an outcome and record their findings. You can ask the students to present their findings together with their explanations and rationales. A series of questions are included to further deepen the students' experience and understanding of their investigations. This provides an opportunity for you to begin evaluating the learning and progress of the individual student.



**Continue**

Ideas are provided for additional investigations that draw on the students' previous investigations. The students will experiment with, design additions for, or focus on a specific model function. Ideas are also provided for the students' own investigations and inventions relating to real life machines and mechanisms.

**Student Worksheets**

The Student Worksheets guide the students through the investigations without requiring too much assistance from you. They will predict, test, take measurements and record data, and change the models to compare and contrast findings, and finally draw conclusions.

You can ask the students to compare their worksheets and share their findings with each other for a greater understanding of the concepts they have just explored. You could also use the students' findings as an opportunity to discuss concepts, such as fair testing and variables.

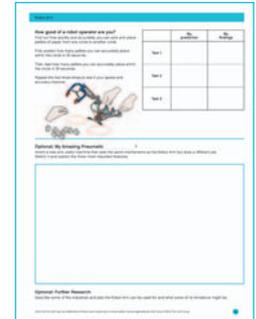
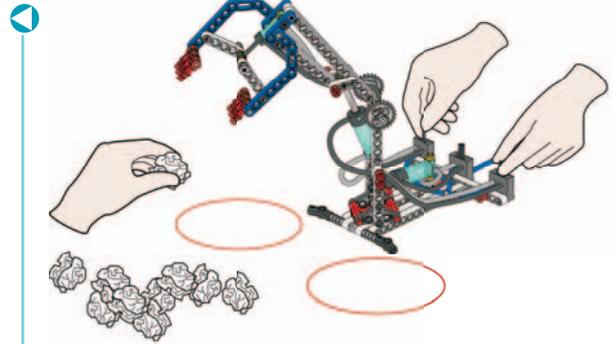
At the end of each activity, the students are challenged to invent and sketch a device that applies the major concepts they have just explored. This is ideal as an extra challenge or homework project.

The worksheets can help you in assessing the individual student's level and achievement. They also form a valuable part of a student log book.

**Designing and making activities**

The aim of these activities is for the students to design their own solutions to different real life needs. The students learn to design and create a solution. Then they evaluate and communicate the process they used and what they focused on to meet the design criteria. Each activity builds on the knowledge, skills and understanding gained from the principle and main activities. The Teacher's Notes for each activity provide you with a lot of advice on how to evaluate the proposed solution.

A picture of a model solution is provided. You can use this to help if students get stuck in the design process. Note that it is not the one and only solution! You should always encourage students to design their own solutions.



### **How much time do I need?**

The students should be able to do all of the principle activities within two 45-minute lessons.

When working with each of the main activities most students will be able to build, test, explore and have the parts put away again within 45 minutes. A double lesson is ideal for more in-depth investigations of the key learning areas.

For the Designing and making activities the students may need more time to build and explain their models.

### **LEGO® Education**