



## Introduction

LEGO® Education is pleased to bring you the 2009694 Activity Pack for Renewable Energy Add-on Set.

### Who is it for?

The material is designed for introducing and teaching the topic of renewable energy for key stage 2 and key stage 3. Working in teams, students can build, investigate and learn from the models and activities.

### What is it for?

The Renewable Energy activity pack and Add-on Set enables students to work as young scientists, engaging them in science, engineering, technology, design and mathematics. The Renewable Energy activity pack and Add-on Set promotes a challenging classroom environment and actively engages students in scientific inquiries, reasoning and critical thinking. They are challenged to make assumptions and predictions, bringing together their many experiences and knowledge from different subjects. They utilize their skills, creativity and intuition to actively create new understanding.

Using the activity pack, students are encouraged to involve themselves in real world investigations and to come up with their own solutions for solving specific problems. They are asked to design and redesign, to build and reflect on the models. They are also asked to observe and explain how changing variables affect these models and then to record and present their findings. In this way, the students experience for themselves how engineers and designers use scientific knowledge and understanding.

### What is in the set and the activity pack?

#### The 9688 elements

The set consists of five full-colour Building Instruction booklets for the six main model activities and the following elements: LEGO Energy Meter (consisting of two separate elements: Energy Display and Energy Storage), LEGO Solar Panel, E-Motor, Blades, LED Lights and a 50 cm Extension Wire. This set is an add-on set to be built with the 9686 set. All of the 9688 elements fit into the bottom section of the 9686 storage box.

#### The 2009694 activity pack

The activity pack consists of six main model activities and four Problem-solving Activities that deal with potential and kinetic energy. Also included is a curriculum section that pinpoints the key learning concepts covered, Teacher's Resources with a short introduction to the topic Renewable Energy and a section regarding potential and kinetic energy, an element guide and a glossary with definitions of essential terms.



## How to use it?

### Building Instructions

There are two Building Instructions, booklet A and B, for each of the main models. The building instructions are designed for two separate building processes, each building only half a model. By combining the two sub-assemblies, students work together to create a single, sophisticated and powerful model.

### Teacher's Resources

This area contains the following three sections:

- Renewable Energy
- Potential and Kinetic Energy
- Element Guide

Each section includes materials that can be used to present the topic Renewable Energy to both students and teachers.

### Renewable Energy

This section describes how the Sun, as our primary energy source, drives our weather systems and our water cycle. The topic can be presented in class with the help of the illustrations provided. Following the illustrations is an introduction to some of the technologies behind capturing and exploiting renewable energy sources. This section also provides a potential consolidation and clarification of the concept Renewable Energy, including a section on class discussion.

### Potential and Kinetic Energy

This section describes how potential and kinetic energy can be introduced to students through hands-on and engaging investigations. Students are challenged to first study the definition and explanations of potential and kinetic energy. While progressing sequentially through the activities using the Student Worksheet and Building Instruction booklets, students will be challenged further to apply their knowledge while investigating and recording their findings. In Teacher's Notes, you will find suggested answers to the questions posed in the Student Worksheet.

### Element Guide

This section describes how to get started with the 9688 Renewable Energy Add-on Set. The elements, their features, functionality, technical specifications and their operating instructions are described. Before introducing the main activities, we recommend that you demonstrate the Energy Meter to your students.



**Teacher's Notes**

This section describes key learning areas, hints, questions, answers and vocabulary specific to the activity, and further ideas for investigation. In some cases, additional materials will be necessary for setting up the activities and investigations. These will be listed.

The lessons follow LEGO® Education's 4C approach: Connect, Construct, Contemplate and Continue. This approach enables your students to progress naturally through the activities.

**Connect**

Connect a new learning experience to those you already have and you add to your knowledge. An initial learning experience is a seed stimulating the growth of new knowledge.

Real-life photographs with a short text are provided to help students identify and connect to the chosen activity and the main model. We suggest using the text and photograph as a starting point for a class discussion or draw on your own experiences to provide an engaging introduction to the activity. Please also consider involving current events related to the topic, both near and far, to set the scene for the students.

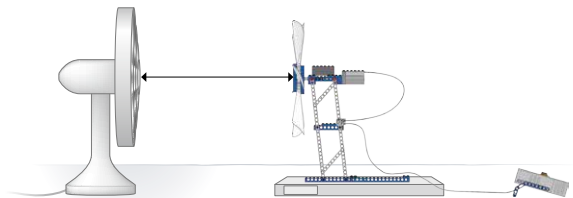
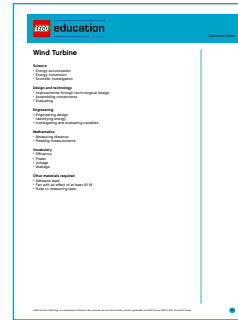
**Construct**

Constructing models engages both hands and minds. Using the Building Instructions, students build models embodying the concepts related to the key learning areas. Suggestions are provided for testing and ensuring each model functions as intended.

**Contemplate**

Contemplation provides the opportunity to deepen the understanding of previous knowledge and new experiences. The scientific nature of the activities encourages the students to discuss and reflect on their investigations and adapt ideas to the task at hand.

This phase provides the opportunity for you to begin evaluating the learning outcome and progress of individual students.



**Continue**

Continued learning is always more enjoyable and creative when it is adequately challenging. Maintaining a challenge and the pleasure of accomplishment naturally inspires the continuation of more advanced work. Extension ideas are therefore provided to encourage the students to change or add features to their models and to investigate further – always with the key learning area in mind. This phase allows the students to operate at different speeds and levels conducive to their individual capabilities. Activities challenge the students to creatively apply their knowledge and reflect on model design and the effect of changing certain variables.

**Student Worksheets**

Each worksheet has a focused approach following the 4Cs and includes easy-to-read pictorial guidelines. The students can use and explore their models with little teacher assistance. They will be able to predict, investigate, measure, read and record findings, change the models to compare and contrast findings, and draw conclusions.

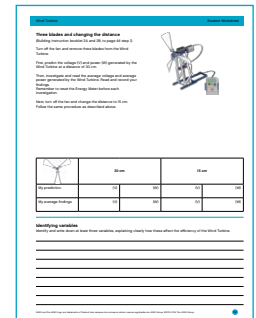
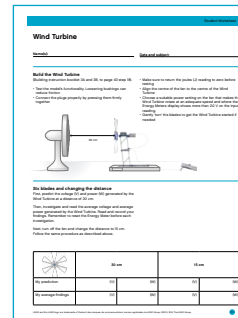
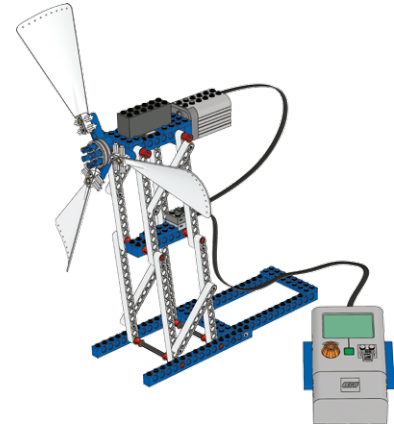
We suggest that students are allowed to work in teams. Each activity challenges students to predict an outcome, to investigate and finally read and record findings. Students should be encouraged to investigate their predictions at least three times to be confident that their results are reliable. When their main findings are recorded, they discuss their results, reflect on them and adapt ideas. Finally, students are challenged to identify variables and explain clearly how these affected the model's efficiency.

The worksheets are an easy-to-use tool for assessing the individual student's level and achievement. They can also form a valuable part of the student's log books.

**Problem-solving Activities**

The four Problem-solving Activities focus on applying knowledge of different renewable energy sources, engineering design, communication and team work. They all feature real-life settings describing a problem that needs to be solved. Students are then challenged to solve the problem through their own design.

The problem descriptions and the clearly defined design brief are meant to be copied and used by the students. A description of learning objectives, materials needed, and how to progress and evaluate the task at hand is teacher information only!



The suggested Problem-solving model solutions included are only meant as guiding principles to the problems posed. Students should always be encouraged to design their own solutions. The Problem-solving Activities are open to be differentiated to fit your current curriculum.

### How do I handle the Building Instruction booklets?

For easy classroom management we suggest storing the Building Instruction booklets in binders so that they are close-at-hand and ready to use at the beginning of each lesson.

### How much time is needed?

A double lesson is ideal to be able to explore, build and investigate in depth most of the extension ideas built into the activities. For the students to make any creative variations of their own, extra time might be needed with the Hydro Turbine and Wind Turbine activities. However, the remaining main models can be built, investigated and explored, and the parts put away again within a single lesson if the students are already experienced LEGO® builders.

Students can tackle the Problem-solving Activities in a sequence of two double lessons. However, it is worth organizing this time as two or more back-to-back double lessons so that they can immerse themselves in the problem as would a real engineer or designer.

Enjoy!  
**LEGO® Education**

