Toolkit
Science, Technology, Engineering and Maths

Age **10+**

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Clickable PDF

LEGO education

10+ STEM
Product Overview

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Machines & Mechanisms

Simple & Powered Machines Set **9686**

Introducing Simple & Powered Machines **2009692**

Advancing with Simple & Powered Machines **2009693**

Renewable Energy Add-on Set **9688**

Activity Pack for Renewable Energy Add-On **2009694**

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LEGO education

LEGO® MINDSTORMS® Education EV3

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LEGO® MINDSTORMS® education EV3

LEGO® education

Simple & Powered Machines Set
9686

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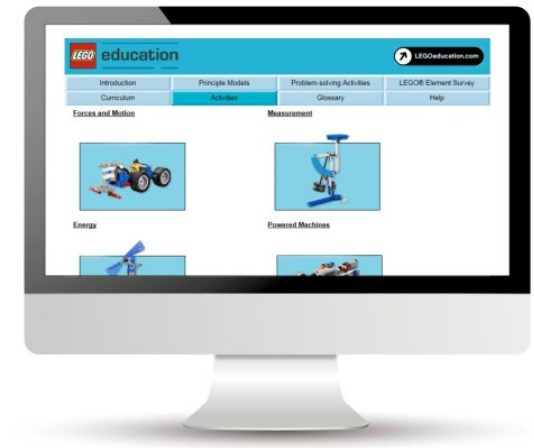
Product Description

The core brick set in our range of Machines & Mechanisms solutions, this set includes full-color building instruction booklets for 10 principle models and 18 main models. Combine with curricular relevant activity packs and add-on sets to carry out a broad range of activities within design technology, science and maths.

Brick Type:	LEGO® Technic
Storage Info:	Free storage box - Medium
Age Range:	8+
Piece Count:	396
Activities Included:	No
Also needed:	2009692 or 2009693
Versions:	N/A
Subjects covered:	Science, Technology, Engineering and Maths

LEGO education

Introducing Simple & Powered Machines 2009692
Advancing with Simple & Powered Machines 2009693



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Introducing Simple & Powered Machines - **2009692**

Product Description

With this activity pack students get a fundamental understanding of simple machines, structures and mechanisms. The pack features 37 principle model activities, 14 main activities, including extension activities, and six problem-solving tasks. Flash animations introduce the activities. Teacher's notes, student worksheets and glossary included.

Storage Info:	LEGO® Education Online Resources
Age Range:	8+
Piece Count:	1
Activities Included:	Yes
Also needed:	9686
Versions:	US, UK, ES, F, NL, DE, JPN, SE, DK, NO, RU
Subjects Covered:	Science, Technology, Engineering and Maths

Advancing with Simple & Powered Machines - **2009693**

Product Description

This activity pack allows students to get an in-depth understanding of simple machines, mechanisms, structures and mechanical advantage. It includes 38 principle model activities, four main activities, including extension activities, and eight problem-solving activities. Real-life video clips introduce students to the activities. Teacher's notes, student worksheet and glossary included.

Brick type:	LEGO® Education Online Resources
Age Range:	10+
Piece Count:	1
Activities Included:	Yes
Also needed:	9686
Versions:	US, ESSA, JPN, RUS
Subjects Covered:	Science, Technology, Engineering and Maths

Renewable Energy Add-on Set
9688

Go to product on lap.corp.lego.com

Product Description

This exciting add-on set allows students to learn about renewable energy sources and can be used with the Simple & Powered Machines Set (9686), LEGO® Education MINDSTORMS® EV3 Core Set (45544). The set includes a solar panel, turbine blades, a motor/generator, LED lights, an extension wire, a LEGO Energy Meter and full color building instructions for six real life LEGO models to build with 9686.

Storage Info:	Special
Age Range:	8+
Piece Count:	12
Activities Included:	No
Also needed:	2009694, 9686, 2009692
Versions:	N/A
Subjects covered:	Science and Technology

Specific Areas:

- Provides an insight into different Renewable Energy sources, e.g. solar, wind, hydro and hand generated power.
- Explores energy supply, transfer, accumulation, conversion and consumption

Activity Pack for Renewable Energy Add-On
2009694

Go to product on lap.corp.lego.com

Product Description

This activity pack provides six 45 minute lessons and four problem solving activities that allow students to explore the three major renewable energy sources, solar, wind and water, through real life LEGO® models. Includes a wide range of real life images, ideal for introducing them to the topic and task at hand. Teacher's notes, student worksheets and glossary included.

Storage Info:	Special
Age Range:	10+
Piece Count:	1
Activities Included:	Yes
Also needed:	9688, 9686, 2009692, 2009693
Versions:	UK, US, ES, F, NL, DE, JPN, SE, DK, NO, RU
Subjects covered:	Science, Technology Engineering and Maths

education

Pneumatics Add-on Set
9641

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Product Description

The Pneumatics Add-on Set for the 9686 Base Set provides five principle models and four real-life pneumatics models. Includes full color building instructions, pumps, tubes, cylinders, valves, air tank and a manometer.

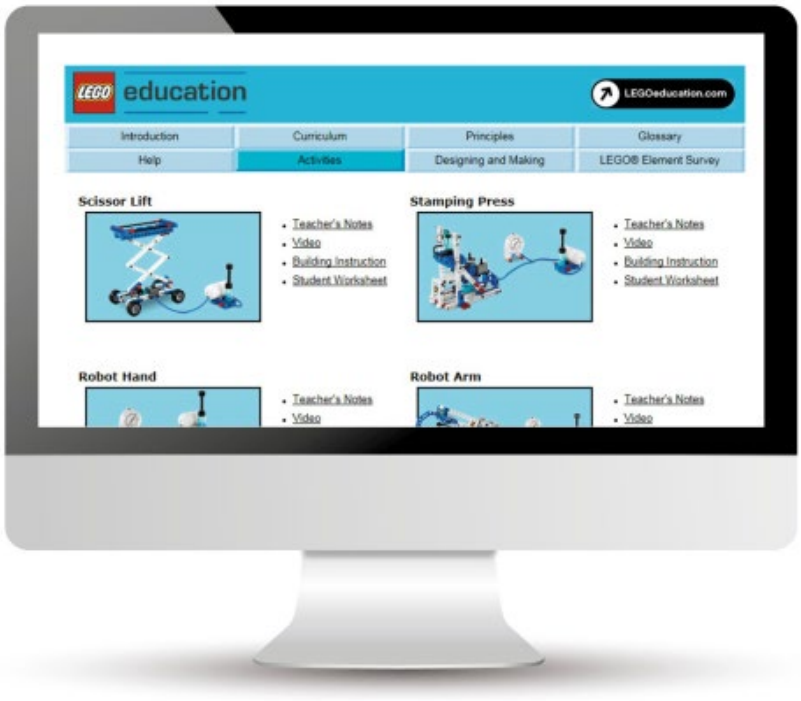
Storage Info:	Special
Age Range:	10+
Piece Count:	31
Activities Included:	No
Also needed:	2009695, 9686, 2009692
Versions:	N/A
Subjects covered:	Science, Technology, Engineering and Maths

Specific areas:

- Building and exploring pneumatics through real-life LEGO® models
- Investigating power systems and components
- Pressure measuring in psi and bar
- Exploring kinetic and potential energy

LEGO education

Activity Pack for Pneumatics
2009695



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Product Description

This activity pack provides 14 principle model activities, four 45 minute pneumatics lessons each with extension activities of up to 20 minutes, and two additional problem solving tasks. Video clips introduce the activities by showing real life machines, which are similar to the LEGO® models used in the lessons.

Storage Info:	LEGO® Education Online Resources
Age Range:	10+
Piece Count:	1
Activities Included:	Yes
Also needed:	9641, 9686, 2009692
Versions:	US, UK, ES, F, NL, DE, JPN, SE, DK, NO, RU
Subjects covered:	Science, Technology, Engineering, Maths

Power Functions - Light 8870 Extension Wire 20 8871 Rechargeable Battery box 8878 Battery Box 8881

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Power Functions Light - **8870**

Brief Description

Light up the dark! Add bright LED lights to your LEGO® Power Functions models to light your way in the darkness.

Storage Info: Bag
Age Range: 7+
Piece Count: 1
Language Versions: N/A

Power Functions Extension Wire 20 - **8871**

Brief Description

Extend the range of your LEGO Power Functions! Make your models bigger, better, and more mechanized than ever before with this 20" extension wire!

Storage Info: Bag
Age Range: 7+
Piece Count: 1
Language Versions: N/A

Power Functions Rechargeable Battery box - **8878**

Brief Description

This rechargeable battery box has built-in Li polymer batteries to ensure low weight and powerful action. Use this in your LEGO Power Functions models and end your need for disposable batteries!

Storage Info: Bag
Age Range: 7+
Piece Count: 1
Language Versions: N/A

Power Functions Battery Box - **8881**

Brief Description

Give even more movement to your LEGO creations with an extra battery box to supply power to your LEGO Power Functions models!

Storage Info: Bag
Age Range: 7+
Piece Count: 1
Language Versions: N/A

Power Functions - XL-Motor 8882
M-Motor 8883 Extension Wire 8 8886

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Power Functions XL-Motor - **8882**

Brief Description

Add an extra XL-Motor to your LEGO® creations! This super-strong motor will give plenty of power to your models, whether it's spinning a wheel or turning a system of gears.

Storage Info: Bag
Age Range: 7+
Piece Count: 1
Language Versions: N/A

Power Functions M-Motor - **8883**

Brief Description

Add an extra M-Motor to your LEGO creations! This medium power motor will give movement to your models, whether it's spinning a wheel or turning a system of gears.

Storage Info: Bag
Age Range: 7+
Piece Count: 1
Language Versions: N/A

Power Functions Extension Wire 8 - **8886**

Brief Description

Extend the range of your LEGO® Power Functions! Make your models bigger, better, and more mechanized than ever before with this 8" extension wire!

Storage Info: Bag
Age Range: 7+
Piece Count: 1
Language Versions: N/A

LEGO® Solar Panel 9667
Energy Display 9668

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Go to product on lap.corp.lego.com

LEGO® Solar Panel - **9667**

Product Description

The Solar Panel provides sufficient power to operate the LEGO® Energy Meter and motors. It delivers: 5V, 4mA in direct light from a 60W incandescent bulb positioned 25 cm from the solar panel (>2000 lux); and 5V, 20m A in direct light from a 60W incandescent bulb positioned 8cm from the panel (>10,000 lux).

Storage Info:	Bag
Age Range:	8+
Piece Count:	1
Versions:	N/A

Energy Display - **9668**

Product Description

This element displays input and output in volts, watts, amps, and energy storage level in joules. Combine with 9669 Energy Storage to form the LEGO® Energy Meter.

Storage Info:	Bag
Age Range:	8+
Piece Count:	1
Versions:	N/A

Energy Storage 9669
E-Motor 9670

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Energy Storage - **9669**

Product Description

This Ni-MH battery with connector is designed to be combined with the 9668 Energy Display. When combined, the two elements form the LEGO® Energy Meter. Storage capacity: 150 mAh.

Storage Info:	Bag
Age Range:	8+
Piece Count:	1
Versions:	N/A

E-Motor - **9670**

Product Description

The E-Motor is a 9V motor with an internal gearbox. Its 9.5:1 gearing ratio provides a maximum torque of 4.5 Ncm and approximately 800 rotations per minute without load.
It also functions as a very efficient generator.

Storage Info:	Bag
Age Range:	7+
Piece Count:	1
Versions:	N/A

LEGO® MINDSTORMS® Education EV3 Core Set 45544

Go to product on lap.corp.lego.com

Product Description

This core set is optimised for classroom use and contains all you need to teach using the exciting LEGO® MINDSTORMS® Education set. It enables students to build, program and test their solutions based on real life robotics technology. It contains the EV3 Intelligent Brick, a powerful small computer that makes it possible to control motors and collect sensor feedback. It also enables Bluetooth and Wi-Fi communication as well as providing programming and data logging. Students are encouraged to brainstorm in order to find creative solutions to problems and then develop them through a process of selecting, building, testing and evaluating them. This is also an excellent way of getting students to talk to each other and cooperate as well as giving them hands on experience with an array of sensors, motors and intelligent units. Instructions for additional models are included in the software.

Brick Type:	LEGO® Technic
Storage Info:	Free storage box - Medium
Age Range:	10-21
Piece Count:	541
Activities Included:	No
Versions:	Global
Subjects covered:	Science, Technology, Engineering and Maths

LEGO education

LEGO® MINDSTORMS® Education EV3 Expansion Set 45560

Go to product on lap.corp.lego.com

Product Description

This set contains a wide range of elements and is an ideal supplement to the LME EV3 Core Set. It has been designed to allow students to take their experience of robotics to the next level. There are plenty of special elements here, such as different gears, a large turntable, robot personalisation parts and unique structural elements. These are joined by many extra standard elements like beams, axles and connectors. This set both helps students build larger and more complex models while at the same time providing extra or replacement elements. The set is optimised for use in the classroom and after school programs or robotics competitions.

Brick Type:	LEGO® Technic
Storage Info:	Free storage box - Medium
Age Range:	10-21
Piece Count:	853
Activities Included:	No
Also needed:	45544
Versions:	Global
Subjects covered:	Computing, Technology, Engineering, Science and Maths

LEGO® MINDSTORMS® Education EV3 Space Challenge Set 45570

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Product Description

This space themed set guides students through LEGO® MINDSTORMS® EV3 building and programming and makes a great introduction to the exciting world of robotics. It contains: three learning mats, a Challenge mat, dual lock tape, and lots of elements needed for the Challenge models. The set will show your class how robotics can be applied to a range of real-world applications and get them working together to solve realistic problems.

Brick Type:	LEGO® Technic
Storage Info:	-
Age Range:	10-21
Piece Count:	1418
Activities Included:	Yes
Also needed:	45544, 2005574
Versions:	Global
Subjects covered:	Computing, Technology, Engineering and Science

LEGO® MINDSTORMS® Education EV3 Design Engineering Projects Curriculum 2005544

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Product Description

A curriculum package with 30 hours of classroom instruction and open ended problem solving activities that make learning science, technology, engineering and mathematics through real life robotics engaging and fun for students. The curriculum features three main sections (Make it Move, Make it Smarter, Make a System) with five design projects per section for a total of 15 projects. Throughout the process students gain and use knowledge of science, technology and maths as they engineer a solution. This structure is designed to help students develop the 21st-century creative thinking, problem solving, teamwork, and communication skills required for success in school and beyond. The inbuilt content editor enables teachers to customize the curriculum and create their own lessons. It enables students to capture their work directly inside the content creating their own digital workbook, making classroom management and assessment easier.

Brick Type:	LEGO® Education Online Resources.
Age Range:	10-21
Piece Count:	1
Activities Included:	Yes
Also needed:	45544
Versions:	IT, ES, DE, UK, DK, SE, NO, US, FR, RU, BE, CN, CH, AE
Subjects covered:	Computing, Technology, Engineering and Science and Maths

LEGO education

LEGO® MINDSTORMS® Education EV3 Space Challenge Curriculum 2005574

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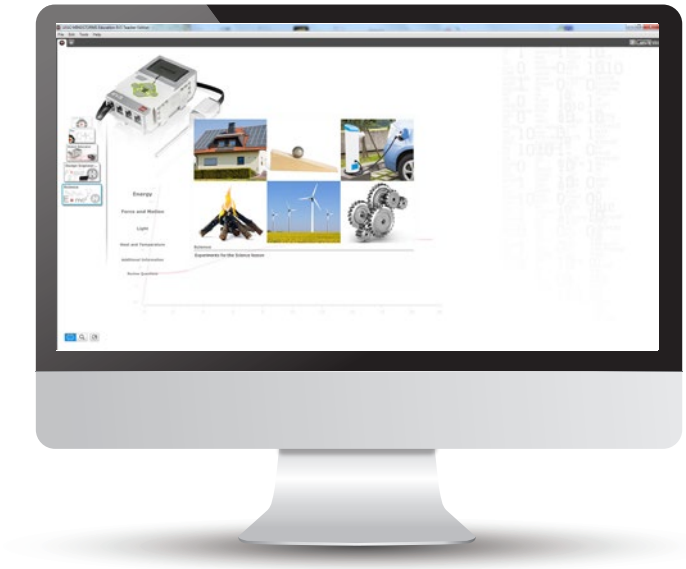
Product Description

This series of classroom-tested and easily-implemented lessons will help you teach STEM concepts. With over 30 hours of activities, students gain hands-on experience in solving real-life missions. The curriculum also includes three research projects including how to ensure humans can survive in space, how humans can create energy in space, and how robots can help humans explore space. It includes detailed teacher notes that ease implementation by providing explanations, sample programs, ideas for differentiation, and more. The Content Editor features all the tools students need to document and present their findings and results as they progress through the material.

Brick Type:	LEGO® Education Online Resources
Age Range:	10-21
Piece Count:	1
Activities Included:	Yes
Also needed:	45544, 45570
Versions:	IT, ES, DE, UK, DK, SE, NO, US, FR, RU, BE, CN, CH, AE
Subjects covered:	Computing, Technology, Engineering and Science

LEGO education

LEGO® MINDSTORMS® Education EV3 Science Curriculum 2005576



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Product Description

This curriculum consists of 14 physical science experiments for middle school. It utilizes the data-logging capabilities of the LEGO® MINDSTORMS® Education EV3 hardware and software, as well as the 9688 Renewable Energy Add-On Set and the 9749 Temperature Sensor. Experiments are centered on energy (energy production and consumption), heat and temperature (melting points, insulation, and heat transmission), force and motion (mechanics and kinematics), and light (light intensity). Each of the 14 experiments are structured to fit within a 45 to 90-minute science lesson with small, engaging LEGO® models that are easy to build and program.

Brick Type:	LEGO® Education Online Resources
Age Range:	10-21
Piece Count:	1
Activities Included:	Yes
Also needed:	45544, 9688, 9749
Versions:	ES, DE, UK, DK, SE, NO, US, FR, RU, BE, CN
Subjects covered:	Computing, Technology, Engineering, Science and Maths

LEGO education

EV3 Coding Activities

2005579

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Product Description

This curriculum pack provides extensive content for teachers to deliver the Computing or Computer Science curriculum, providing cross-curricular opportunities in design, technology, science, and math. Engage your students with real-world examples, enabling them to apply and develop their programming knowledge. The activities are delivered in PDF format for easy printing, and help teachers inspire students to discover the importance of coding in our everyday lives. The EV3 Coding Activities conforms with national curriculum standards and consists of 12 activities, providing approximately 36 hours of classroom teaching. It includes student worksheets, teacher notes, sample programs, and examples of text-based programming solutions.

Brick Type:	LEGO® Education® Online Resources
Age Range:	10-21
Piece Count:	1
Activities Included:	Yes
Also needed:	45544, 45517
Versions:	US, UK, DE
Subjects covered:	Computing, Science, Math, Design and Technology

EV3 Intelligent Brick
45500

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Product Description

This programmable, intelligent brick serves as the heart and brain of LEGO® MINDSTORMS® Education EV3 robots. The brick features:

- ARM 9 processor with Linux-based operating system
- Four input ports for data acquisition of up to 1000 samples per/sec
- Four output ports for execution of commands
- On-board program storage including 16 MB of Flash memory and 64 MB of RAM
- Mini SDHC card reader for 32 GB of expanded memory
- Hi-resolution 178x128 pixel display
- On-brick programming and datalogging - can be uploaded into the EV3 software
- Computer-to-brick communication through on-board USB, external Wi-Fi or Bluetooth dongles
- Powered by six AA batteries or the 2050 mAh lithium ion EV3 Rechargeable DC Battery.

Brick Type:	N/A
Storage Info:	Special
Age Range:	10-21
Piece Count:	1
Also needed:	45517, 45501
Versions:	Global

LEGO education

EV3 Rechargeable DC Battery 45501, Transformer 10V DC 45517, Temperature Sensor 9749

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EV3 Rechargeable DC Battery - **45501**

Product Description

The lithium ion EV3 Rechargeable DC Battery is designed for use with the EV3 Intelligent Brick and features a capacity of 2050 mAh. It provides longer run time than AA batteries and can be charged without taking the model apart. The battery has a charge time of around three to four hours. It requires the 45517 Transformer 10V DC.

Storage Info: Bag
Ag e Range: 10-21
Piece Count: 1
Versions: Global
Also needed: 45517, 45500, 45544

Transformer 10V DC - **45517**

Product Description

This standard 10V DC transformer allows you to recharge your 9693 NXT Rechargeable Battery DC, 45501 EV3 Rechargeable DC Battery, or 8878 Power Functions Rechargeable Battery Box.

Storage Info: Special
Age Range: 8+
Versions: Global
Also needed: 9693, 45501

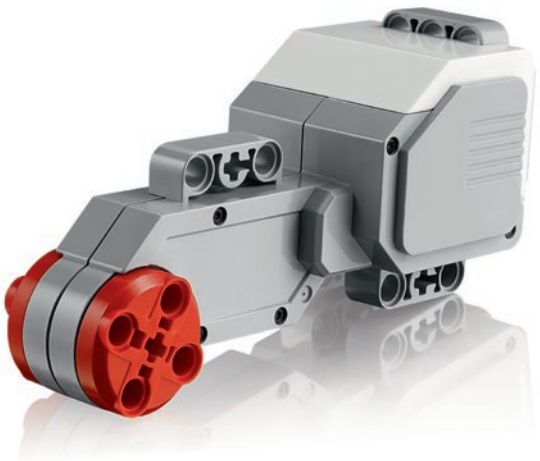
Temperature Sensor - **9749**

Product Description

The temperature sensor is a digital sensor powered by the EV3 Intelligent brick. Using the EV3 Intelligent brick and EV3 software, it can be calibrated to measure both Celsius and Fahrenheit (-20 C to +120C /-4 F to +24 F).

Storage Info: Bag
Age Range: 8+
Piece Count: 1
Versions: Global
Also needed:
9797, 2000080, 2000078

EV3 Large Servo Motor 45502
EV3 Medium Servo Motor 45503



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EV3 Large Servo Motor - **45502**

Product Description

The EV3 Large Servo Motor is a powerful motor that uses tacho feedback for precise control to within one degree of accuracy. By using the built-in rotation sensor, the intelligent motor can be made to align with other motors on the robot so that it can drive in a straight line at the same speed. It can also be used to give an accurate reading for experiments. The motor case design also makes it easy to assemble gear trains.

- Tacho feedback to one degree of accuracy
- 160-170 RPM
- Running torque of 20 N/cm (approximately 30 oz/in)
- Stall torque of 40 N/cm (approximately 60 oz/in)
- Auto-ID is built into the EV3 software.

Storage Info:	Bag
Age Range:	10-21
Piece Count:	1
Also needed:	45544
Versions:	Global

EV3 Medium Servo Motor - **45503**

Product Description

The EV3 Medium Servo Motor is great for lower-load, higher speed applications and when faster response times and a smaller profile are needed in the robot's design. The motor uses tacho feedback for precise control within one degree of accuracy and has a built-in rotation sensor.

- Tacho feedback to one degree of accuracy
- 240-250 RPM
- Running torque of 8 N/cm (approximately 11 oz/in)
- Stall torque of 12 N/cm (approximately 17 oz/in)
- Auto-ID is built into the EV3 software.

Storage Info:	Bag
Age Range:	10-21
Piece Count:	1
Also needed:	45544
Versions:	Global

EV3 Ultrasonic Sensor 45504
EV3 Gyro Sensor 45505

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EV3 Ultrasonic Sensor - 45504

Product Description

The digital EV3 Ultrasonic Sensor generates sound waves and reads their echoes to detect and measure distance from objects. It can also send single sound waves to work as sonar or listen for a sound wave that triggers the start of a program. Students could design a traffic-monitoring system and measure distances between vehicles, for instance. There is an opportunity to discover how the technology is used in everyday items like automatic doors, cars and manufacturing systems. • Measures distances between one and 250 cm (one to 100 in.) • Accurate to +/- 1 cm (+/- .394 in.) • Front illumination is constant while emitting and blinks while listening • Returns true if other ultrasonic sound is recognized • Auto-ID is built into the EV3 software.

Storage Info:	Bag
Age Range:	10-21
Piece Count:	1
Also needed:	45544
Versions:	Global

EV3 Gyro Sensor - 45505

Product Description

The digital EV3 Gyro Sensor measures the robot's rotational motion and changes in its orientation. Students can measure angles, create balancing robots and explore the technology that powers a variety of real-world tools like Segway®, navigation systems and game controllers.

- Angle mode measures angles with an accuracy of +/- 3 degrees
- Gyro mode has a maximum output of 440 degrees/second
- Sample rate of 1 kHz • Auto-ID is built into the EV3 software.

Storage Info:	Bag
Age Range:	10-21
Piece Count:	1
Also needed:	45544
Versions:	Global

EV3 Color Sensor 45506
EV3 Touch Sensor 45507

Go to product on lap.corp.lego.com

Go to product on lap.corp.lego.com

EV3 Color Sensor - **45506**

Product Description

The digital EV3 Colour Sensor distinguishes between eight different colours. It also serves as a light sensor by detecting light intensities. Students can build colour sorting and line-following robots, experiment with light reflection of different colors, and gain experience with a technology that is widely used in industries like recycling, agriculture and packaging.

- Measures reflected red light and ambient light, from darkness to very bright sunlight
- Capable of detecting eight colours. It can tell the difference between colour or black and white, or between blue, green, yellow, red, white and brown
- Sample rate of 1 kHz • Auto-ID is built into the EV3 software.

Storage Info:	Bag
Age Range:	10-21
Piece Count:	1
Also needed:	45544
Versions:	Global

EV3 Touch Sensor - **45507**

Product Description

The analogue EV3 Touch Sensor is a simple but exceptionally precise tool that detects when its front button is pressed or released and is able to count single and multiple presses. Students can build start/stop control systems, create maze-solving robots and uncover the technology used in devices such as digital musical instruments, computer keyboards and kitchen appliances.

- Cross-axle hole on button
- Auto-ID is built into the EV3 software

Storage Info:	Bag
Age Range:	10-21
Piece Count:	1
Also needed:	45544
Versions:	Global

EV3 Infrared Beacon 45508
EV3 Infrared Sensor 45509

Go to product on lap.corp.lego.com

Go to product on lap.corp.lego.com

EV3 Infrared Beacon - **45508**

Product Description

This has been designed for use with the EV3 Infrared Seeker Sensor. The beacon emits an infrared signal which the sensor can track. The beacon can also be used as a remote control for the EV3 brick through signals sent to the infrared sensor.

- Requires two AAA batteries
- Four individual channels
- Includes a beacon button and toggle switch to activate/deactivate
- Green LED indicating if the beacon is active
- Auto power-down if the unit is not in action for one hour
- Working distance of up to two metres

Storage Info:	Bag
Age Range:	10-21
Piece Count:	1
Also needed:	45544, 45509
Versions:	Global

EV3 Infrared Sensor - **45509**

Product Description

The digital EV3 Infrared Seeking Sensor detects proximity to the robot and reads signals emitted by the EV3 Infrared Beacon. Students can create remotely-controlled robots, navigate obstacle courses and learn how infrared technology is used in TV remotes, surveillance systems and even in target acquisition equipment.

- Proximity measurement of approximately 50-70 cm
- Working distance from the beacon of up to two metres
- Supports four signal channels
- Receives IR remote commands
- Auto-ID is built into the EV3 software

Storage Info:	Bag
Age Range:	10-21
Piece Count:	1
Also needed:	45544, 45508
Versions:	Global

EV3 Cable Pack
45514

Go to product on lap.corp.lego.com

Product Description

This Cable Pack contains the same seven RJ12 Connector Cables as included in the 45544 LME EV3 Core Set.

Storage Info:	Bag
Age Range:	10-21
Piece Count:	1
Activities Included:	No
Also needed:	45544
Versions:	Global

LEGO® MINDSTORMS® Education EV3 Workshop Kit 2000425

Go to product on lap.corp.lego.com

Product Description

This Workshop Kit consists of different pieces perfectly mixed for workshops with LEGO® MINDSTORMS® Education EV3.

Storage Info:	Bag
Age Range:	10-21
Piece Count:	117
Activities Included:	No
Also needed:	45544
Versions:	Global

Machines & Mechanisms
Event Material

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Roll-ups >

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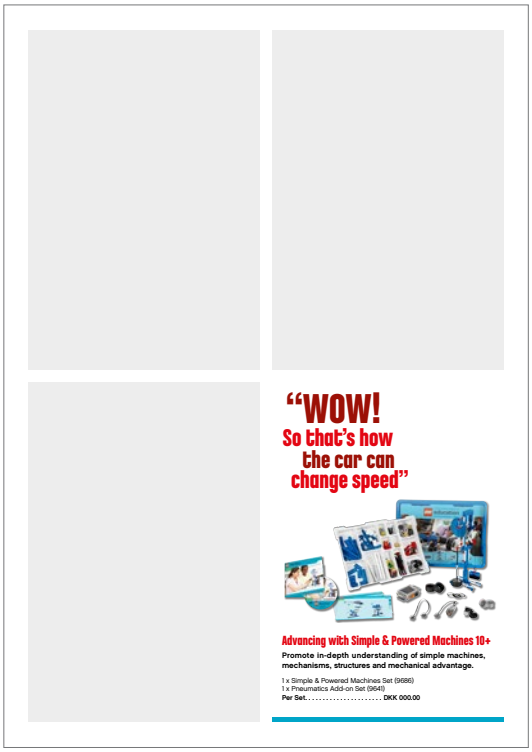

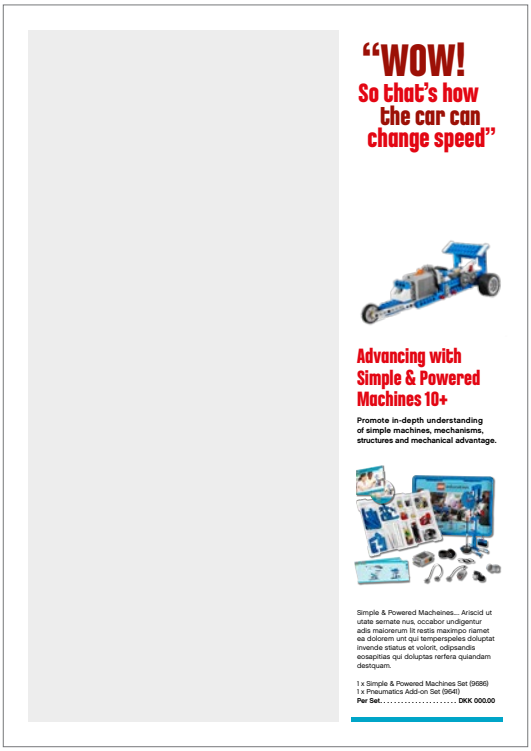

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Oneliners >

LEGO Education
M&M
One-liners

Early Simple Machines
Early Simple Machines from LEGO Education is an engaging hands-on tool that uses real-life LEGO elements to help kindergarteners and first-graders learn how gears, levers, pulleys, wheels and axels work, while gaining early insight into science and engineering.

Early Structures
Early Structures from LEGO Education gives kindergartners and first-graders a tangible understanding of how basic everyday structures like bridges, towers and walls works, while also sparking curiosity about the exciting world of engineering.

Simple Machines
Simple Machines from LEGO Education is an engaging hands-on tool that introduces second- and third-graders to the basic principles behind gears, wheels, axels, levers and pulleys, while laying the groundwork for further learning about science and engineering.

Introducing Simple & Powered Machines
Introducing Simple & Powered Machines from LEGO Education is a hands-on tool that helps students in grades 3–5 investigate everything from basic mechanical principles to advanced motor-powered machines, while also acquiring key insights in science, engineering and technology.

Advancing with Simple & Powered Machines
Building on already acquired skills, **Advancing with Simple & Powered Machines** from LEGO Education gives students in grades 5–7 a more in-depth understanding of how simple machines and mechanisms work, while helping them further investigate concepts such as forces, motion, measuring and energy.

Renewable Energy
Consisting of a Simple & Powered Machines set, a Renewable Add-On set and a special Curriculum Pack, **Renewable Energy** from LEGO Education helps students in grades 5–8 explore solar, wind and water energy, plus meet curriculum goals in science, technology and engineering, by building their own real-life models.

Pneumatics
Pneumatics from LEGO Education encourages logical and creative thinking and motivates students in grades 5–8 to engage in scientific inquiry and engineering design by building air-powered LEGO models such as a scissor lift, a robotic hand and a stamping press.

Oneliners and brand messages

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Workshop Kit >

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Case Studies >

CASE STUDY

LEGO® Education Featured Teacher

Laura Jackson

ELaura Jackson, a teacher at Summit Lakes Middle School in Lee's Summit, Missouri, uses the LEGO® Education Renewable Energy Add-On Set with the Simple & Powered Machines Set because it enables students to be interactive with scientific principles rather than to just learn about them. During a lesson with the Renewable Energy parts, students are engaged and actively building, collecting data, and solving problems the whole time. Similar to the energy rising on the e-meter (included in the set), Laura observes the energy go up in her science classroom! As Laura says, "getting a positive reaction from 13- and 14-year-olds is not an easy task, but LEGO® Education solutions do it every time."

With the Renewable Energy Add-On Sets, Laura is able to teach physical science, energy, scientific inquiry, and engineering design to her middle school students.

According to Laura, "the sets help the students see a coherent view of the sciences and engineering by starting with curiosity about what they already know and then guiding them to a more-detailed understanding."

Being able to engage students in scientific inquiry and engineering design with content knowledge is important in the science frameworks.

The Renewable Energy Add-On Sets can also be used with LEGO MINDSTORMS Education Base Sets.

About the School:
Summit Lakes Middle School
• Lee's Summit, Kansas
• Grades: 8th Grade Science

LEGO® Education classroom solution:
Renewable Energy Add-On Sets with Simple and Motorized Mechanisms
Also uses: LEGO MINDSTORMS® Education

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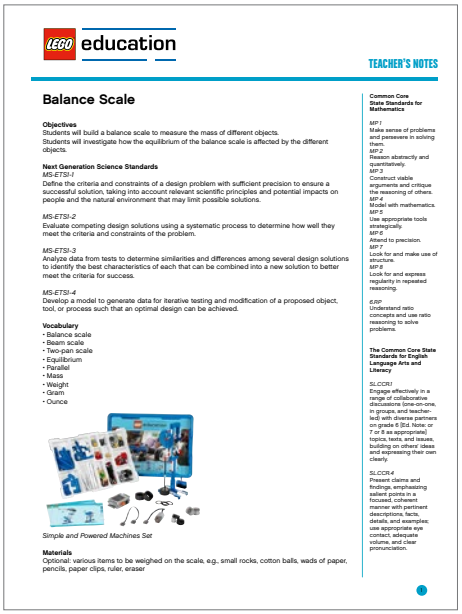

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TEACHER'S NOTES

Balance Scale

Objectives
Students will build a balance scale to measure the mass of different objects.
Students will investigate how the equilibrium of the balance scale is affected by the different objects.

Next Generation Science Standards
MS-ETS1-1
Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2
Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3
Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

MS-ETS1-4
Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Vocabulary
- Balance scale
- Beam scale
- Two-pan scale
- Equilibrium
- Parallel
- Mass
- Weight
- Gram
- Ounce

Simple and Powered Machines Set

Materials
Optional: various items to be weighed on the scale, e.g., small rocks, cotton balls, wads of paper, pencils, paper clips, ruler, eraser

Common Core State Standards for Mathematics

MP.1
Make sense of problems and persevere in solving them.
MP.2
Reason abstractly and quantitatively.
MP.3
Construct viable arguments and critique the reasoning of others.
MP.4
Model with mathematics.
MP.5
Use appropriate tools strategically.
MP.6
Attend to precision.
MP.7
Look for and make use of structure.
MP.8
Look for and express regularity in repeated reasoning.

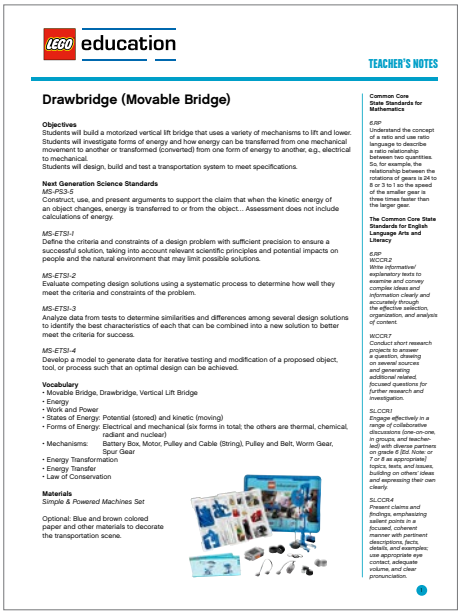
6.RP
Understand ratio concepts and use ratio reasoning to solve problems.

The Common Core State Standards for English Language Arts and Literacy

SL.CCR.1
Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 [Ed. Note: or 7 or 8 as appropriate] topics, texts, and issues, building on others' ideas and expressing their own clearly.

SL.CCR.4
Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.

LEGO_M&M Japanske Aktiviteter_ Balance Scale 10



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TEACHER'S NOTES

Drawbridge (Movable Bridge)

Objectives
Students will build a motorized vertical lift bridge that uses a variety of mechanisms to lift and lower.
Students will investigate forms of energy and how energy can be transferred from one mechanical movement to another or transformed (converted) from one form of energy to another, e.g., electrical to mechanical.
Students will design, build and test a transportation system to meet specifications.

Next Generation Science Standards
MS-PS3-5
Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object... Assessment does not include calculations of energy.

MS-ETS1-1
Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2
Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3
Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

MS-ETS1-4
Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Vocabulary
- Movable Bridge, Drawbridge, Vertical Lift Bridge
- Energy
- Work and Power
- States of Energy: Potential (stored) and kinetic (moving)
- Forms of Energy: Electrical and mechanical (six forms in total; the others are thermal, chemical, radiant and nuclear)
- Mechanisms: Battery Box, Motor, Pulley and Cable (String), Pulley and Belt, Worm Gear, Spur Gear
- Energy Transformation
- Energy Transfer
- Law of Conservation

Materials
Simple & Powered Machines Set

Optional: Blue and brown colored paper and other materials to decorate the transportation scene.

Common Core State Standards for Mathematics

6.RP
Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. So, for example, the relationship between the rotations of gears is 24 to 8 or 3 to 1 so the speed of the smaller gear is three times faster than the larger gear.

The Common Core State Standards for English Language Arts and Literacy

6.RP
WCCR.2
Write informative/ explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

WCCR.7
Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.

SL.CCR.1
Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 [Ed. Note: or 7 or 8 as appropriate] topics, texts, and issues, building on others' ideas and expressing their own clearly.

SL.CCR.4
Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.

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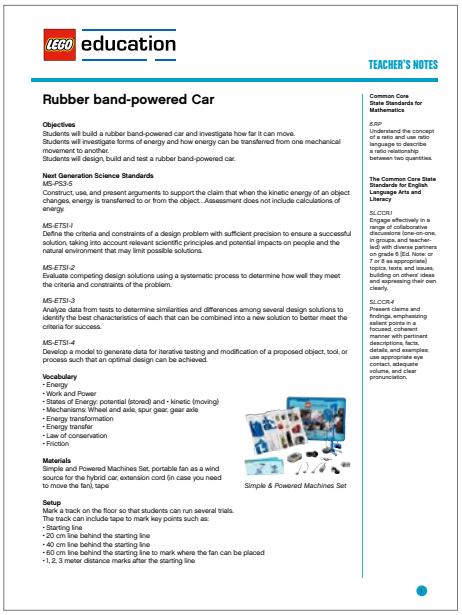

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TEACHER'S NOTES

Rubber band-powered Car

Objectives
Students will build a rubber band-powered car and investigate how far it can move.
Students will investigate forms of energy and how energy can be transferred from one mechanical movement to another.
Students will design, build and test a rubber band-powered car.

Next Generation Science Standards
MS-PS3-5
Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. Assessment does not include calculations of energy.

MS-ETS1-1
Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2
Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3
Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

MS-ETS1-4
Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Vocabulary
- Energy
- Work and Power
- States of Energy: potential (stored) and - kinetic (moving)
- Mechanisms: Wheel and axle, spur gear, gear axle
- Energy transformation
- Energy transfer
- Law of conservation
- Friction

Simple & Powered Machines Set

Materials
Simple and Powered Machines Set, portable fan as a wind source for the hybrid car, extension cord (in case you need to move the fan), tape

Setup
Mark a track on the floor so that students can run several trials.
The track can include tape to mark key points such as:
- Starting line
- 20 cm line behind the starting line
- 40 cm line behind the starting line
- 60 cm line behind the starting line to mark where the fan can be placed
- 1, 2, 3 meter distance marks after the starting line

Common Core State Standards for Mathematics

6.RP
Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

The Common Core State Standards for English Language Arts and Literacy

SL.CCR.1
Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 [Ed. Note: or 7 or 8 as appropriate] topics, texts, and issues, building on others' ideas and expressing their own clearly.

SL.CCR.4
Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.

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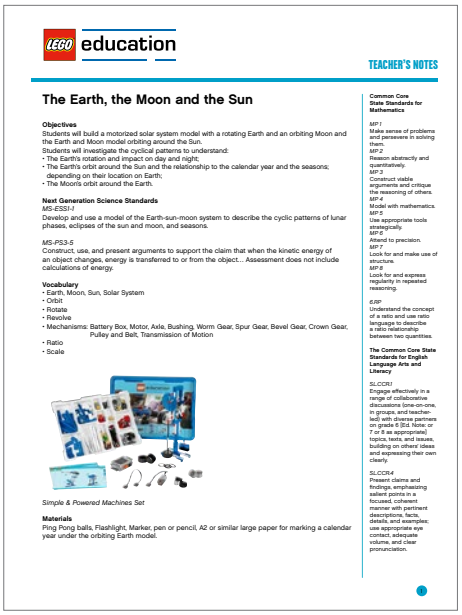

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TEACHER'S NOTES

The Earth, the Moon and the Sun

Objectives
Students will build a motorized solar system model with a rotating Earth and an orbiting Moon and the Earth and Moon model orbiting around the Sun.
Students will investigate the cyclical patterns to understand:
- The Earth's rotation and impact on day and night;
- The Earth's orbit around the Sun and the relationship to the calendar year and the seasons; depending on their location on Earth;
- The Moon's orbit around the Earth.

Next Generation Science Standards
MS-ESS1-1
Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

MS-PS3-5
Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object... Assessment does not include calculations of energy.

Vocabulary
- Earth, Moon, Sun, Solar System
- Orbit
- Rotate
- Revolve
- Mechanisms: Battery Box, Motor, Axle, Bushing, Worm Gear, Spur Gear, Bevel Gear, Crown Gear, Pulley and Belt, Transmission of Motion
- Ratio
- Scale

Simple & Powered Machines Set

Materials
Ping Pong balls, Flashlight, Marker, pen or pencil, A2 or similar large paper for marking a calendar year under the orbiting Earth model.

Common Core State Standards for Mathematics

MP.1
Make sense of problems and persevere in solving them.
MP.2
Reason abstractly and quantitatively.
MP.3
Construct viable arguments and critique the reasoning of others.
MP.4
Model with mathematics.
MP.5
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The Common Core State Standards for English Language Arts and Literacy

SL.CCR.1
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SL.CCR.4
Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.

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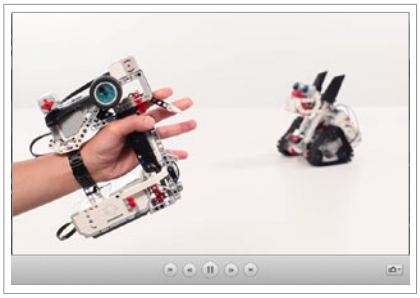

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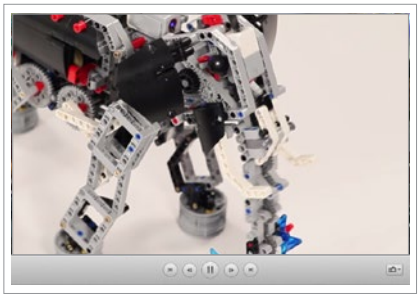
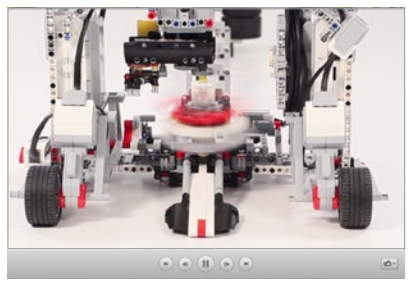
LME EV3_07 Stair Climber



LME EV3_08 Elephant



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LME EV3_10 Bot tank

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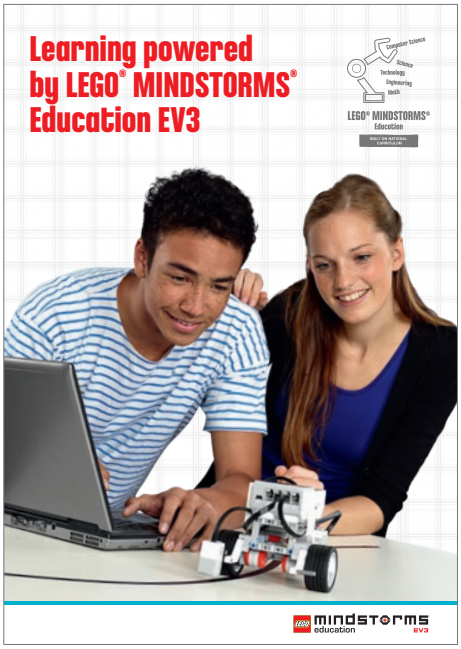

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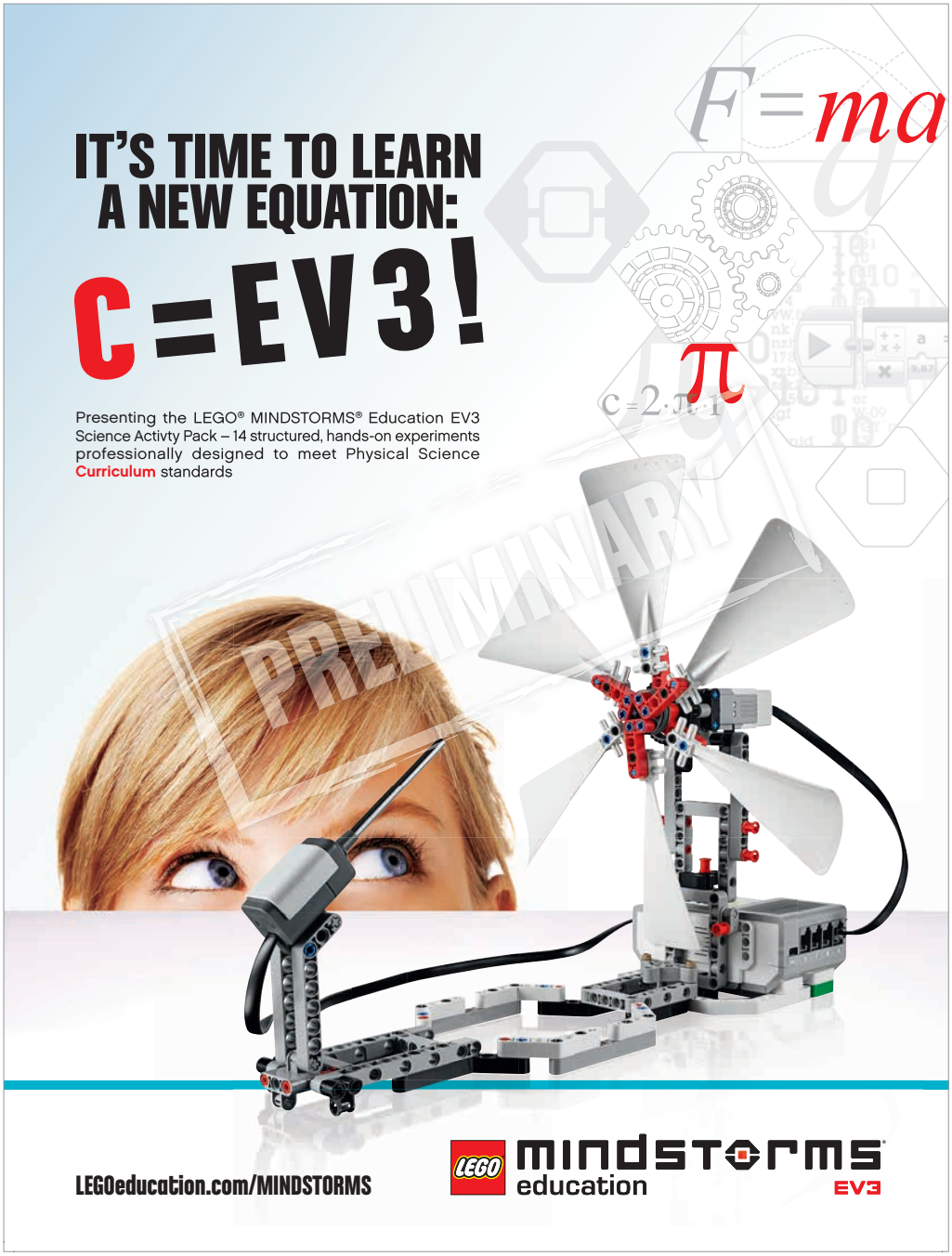

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