THERE IS A NEW ROBOT IN CLASS

Introducing

LEGO® MINDSTORMS®

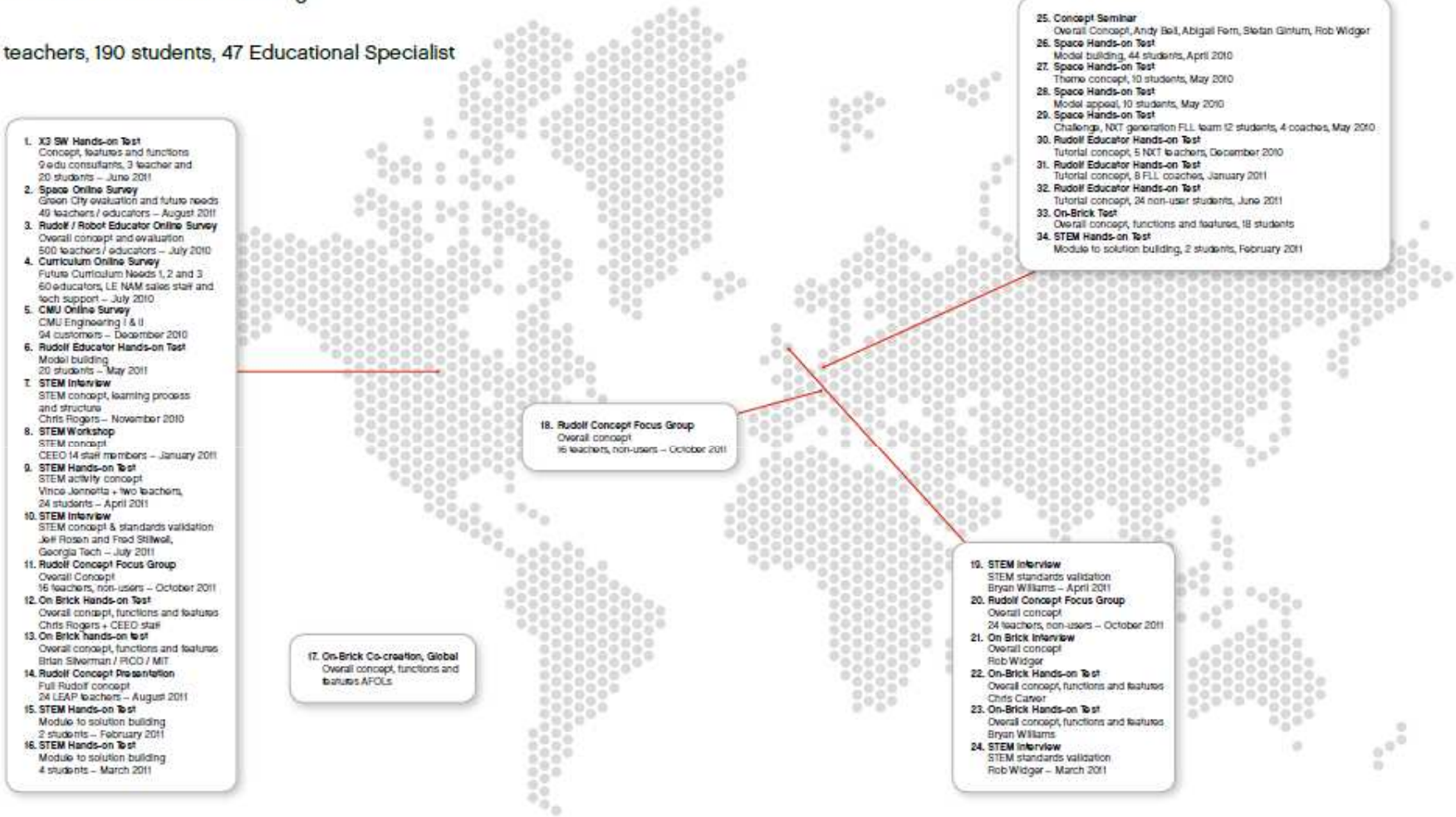
Education EV3

powered by LEGO MINDSTORMS Education

LEGO mindstorms education EV3

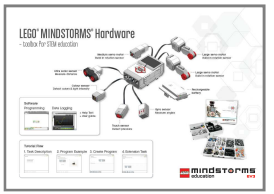
Insights
- Test, interviews and surveys

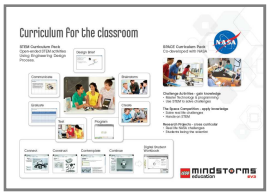
778 teachers, 190 students, 47 Educational Specialist



Research: New Users

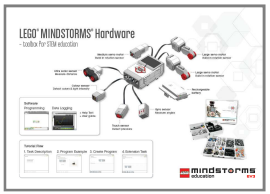
- New users are **daunted by technology** – need a safe route through educator support & training
- LEGO MINDSTORMS EV3 is seen as a good hands-on tools, **engaging, immediately capturing** attention
- It offers interesting features (**data logging, digital workbook, dynamic content** etc.)
- **Curriculum relevance is key** to demand - show how EV3 fits into their current curriculum
- **Show me!** - don't just tell me
- **Show how!** - lots of concrete examples to show realistic and practical use using scientific & informative information
- Communicate **ease of use** while holding up the scientific character

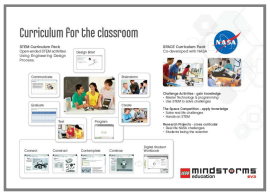




"You thought of everything. This is a complete package!"

Research: Existing Customers





New design

- **Contemporary design**, it looks 21st Century

New platform: lower floor, higher ceiling

- Features are **NOT** important **BUT what the feature s do for me!**
- Lower floor, ease of use – **classroom management** makes my life easier
- Higher ceiling, new functionalities – increased **teaching possibilities**

Digital workbook, students capturing their work

- Students can build a portfolio of projects
- I can **assess** their work
- **I can prove/show** what we do with LEGO MINDSTORMS
- Improved classroom management

Customization of content

- Makes **differentiated teaching** easier
- I can create my own content and **you just made it easy for me**

Strong software backwards compatibility

With EV3, LEGO Education worked hard to create **strong backwards compatibility**

- EV3 is based on the same Technic building system like the LEGO MINDSTORMS NXT
    - Reuse all of your bricks

- EV3 uses RJ12 connector cables just like LEGO MINDSTORMS NXT
    - Reuse all of your sensors and actuators

- EV3 software can program the LEGO MINDSTORMS NXT brick
    - Use NXT and EV3 at the same time

Reuse LEGO MINDSTORMS NXT sets together with LEGO MINDSTORMS Education EV3
- No investment lost
- Smooth transition
- Increased possibilities

THERE IS A NEW ROBOT IN CLASS

Solution

LEGO mindstorms education EV3

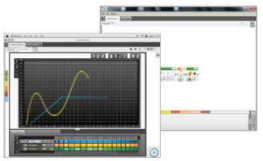
Robotics Competitions
Take Design Engineering Projects to the next level.

Curriculum Material
Linked to standards Design Engineering Projects, D&T, ICT.

Hardware Toolset
Sensors, motors, bricks
All you need.

Online Portal
One place for information.

MINDSTORMS® Training
Be inspired & prepared
For hands-on teaching.



Intuitive Software
Programming made easy.

Customize Content
Fully editable for your needs.

Digital Workbook
Students capturing their work.

Models

- **Core Set Models**
- **Expansion Set Models**

LEGO MINDSTORMS Education EV3 Core Set

LEGO MINDSTORMS Education EV3 Core Set Models

GYRO BOY

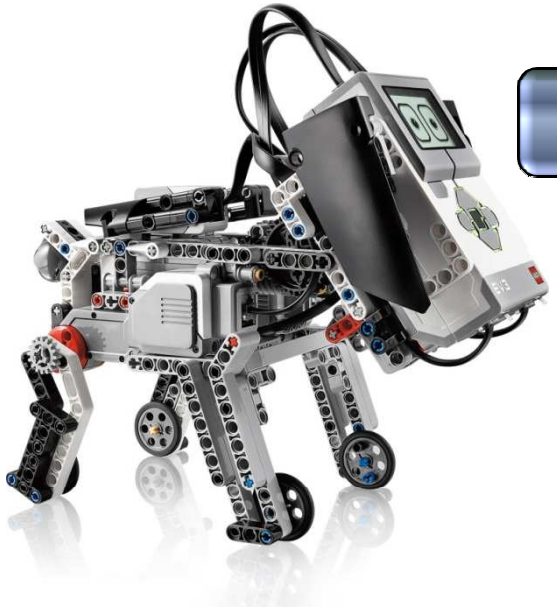
EDUCATOR MODEL

mindstorms education EV3

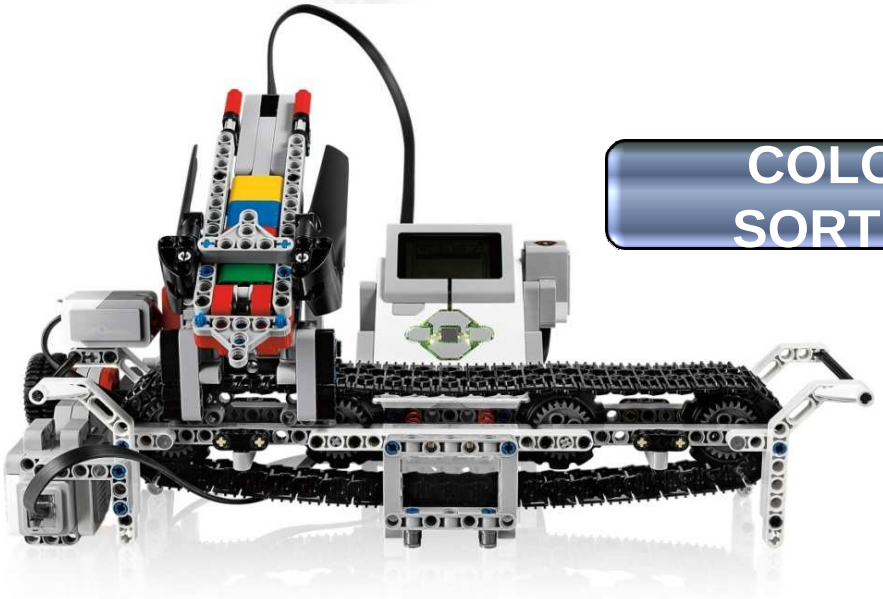
LEGO MINDSTORMS Education EV3 Core Set Models

ROBOT ARM

SMART PUPPY



COLOR SORTER



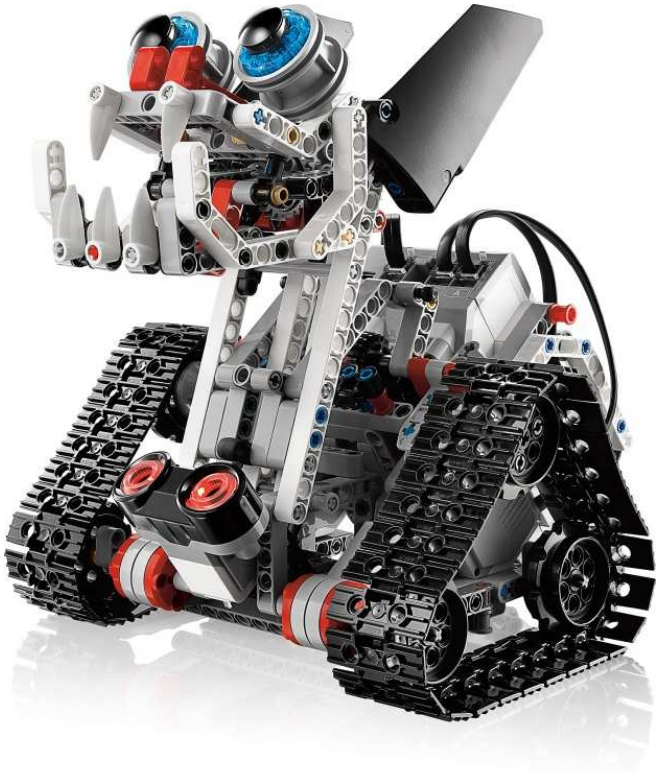
LEGO mindstorms education EV3

LEGO MINDSTORMS Education EV3 Expansion Set

mindstorms education EV3

LEGO MINDSTORMS Education EV3 Expansion Set

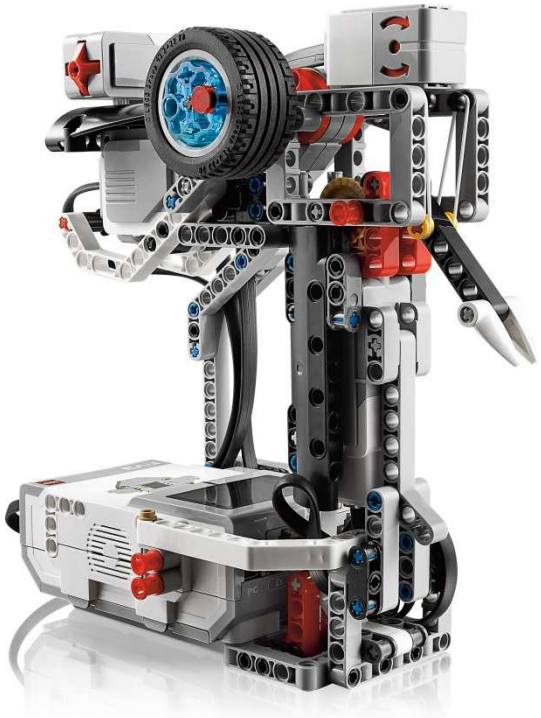
ELEPHANT



ZNAPP

LEGO mindstorms education EV3

LEGO MINDSTORMS Education EV3 Expansion Set

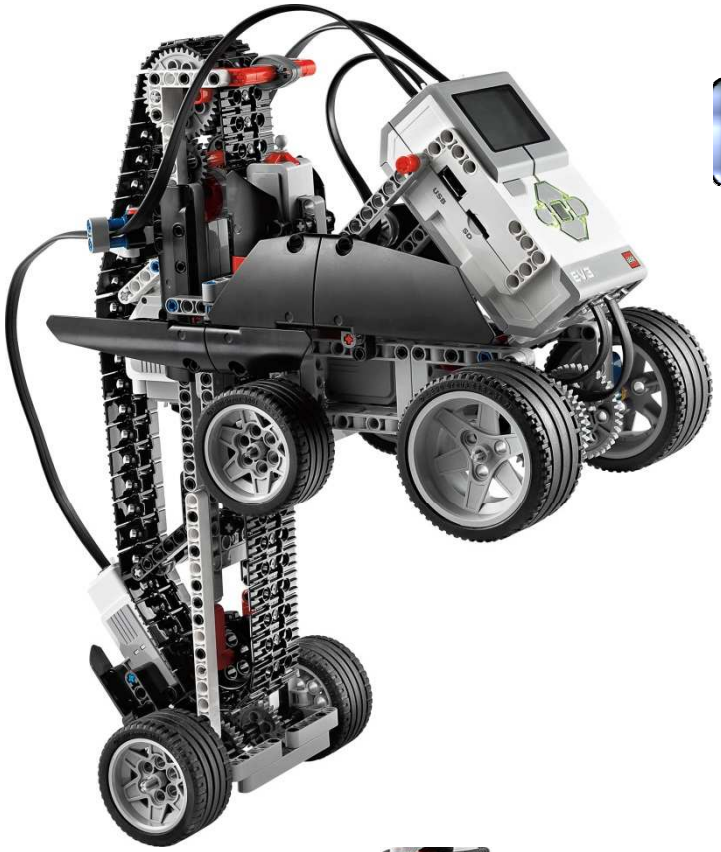


EV3 REMOTE CONTROL

TANKBOT

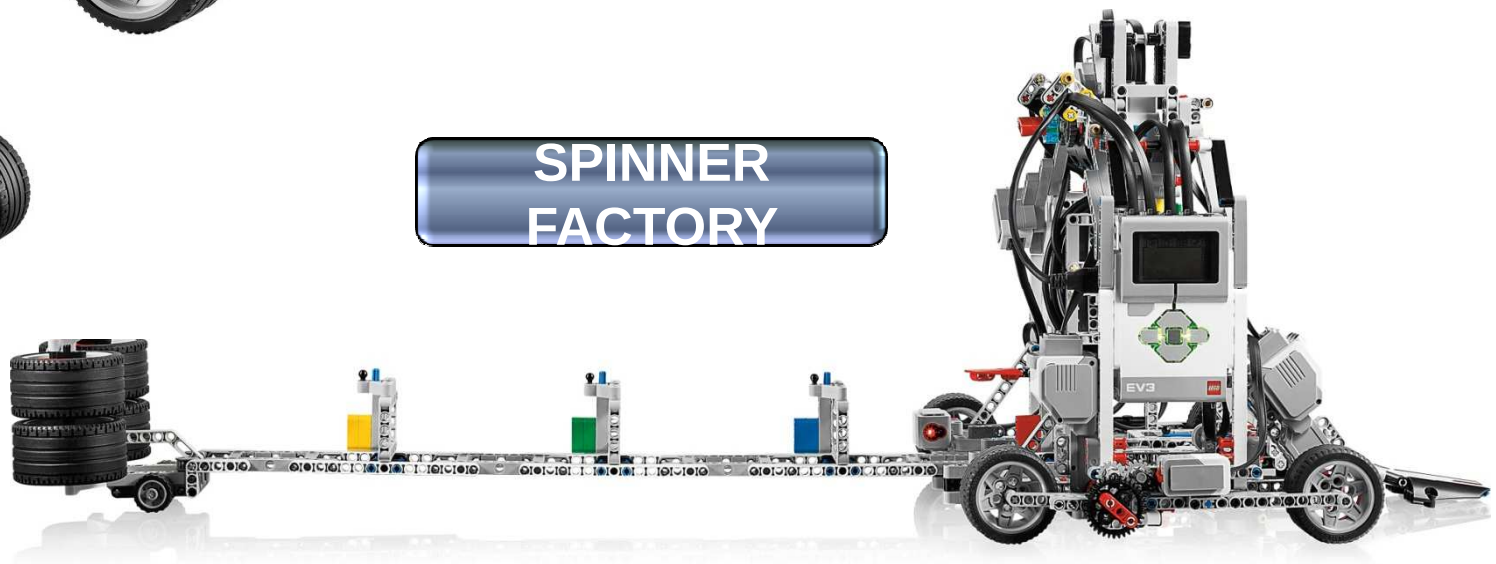
LEGO mindstorms education EV3

LEGO MINDSTORMS Education EV3 Expansion Set



STAIR CLIMBER

SPINNER FACTORY



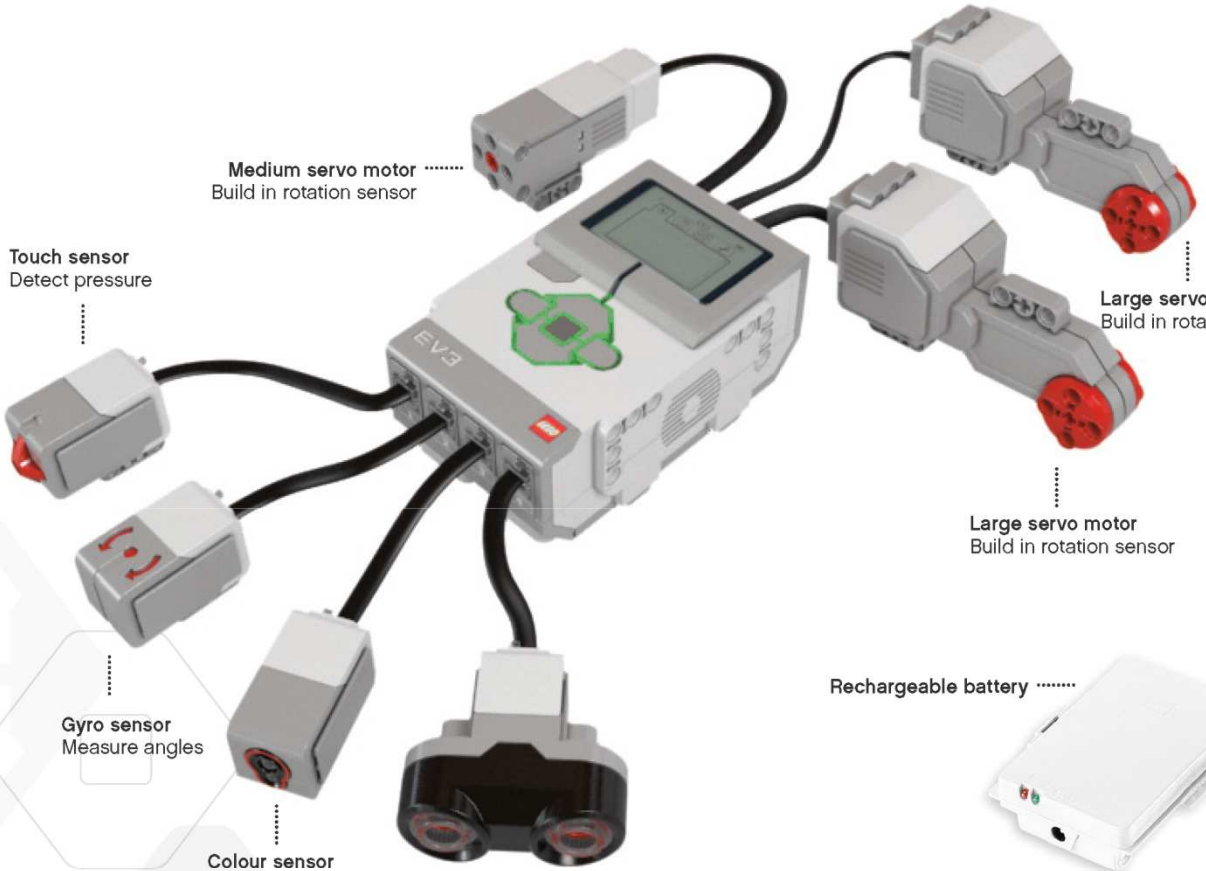
LEGO mindstorms education EV3

Hardware

- **Intelligent Brick**
- **Sensors**
- **Motors**
- **Classroom Management**

Hardware

LEGO mindstorms education EV3



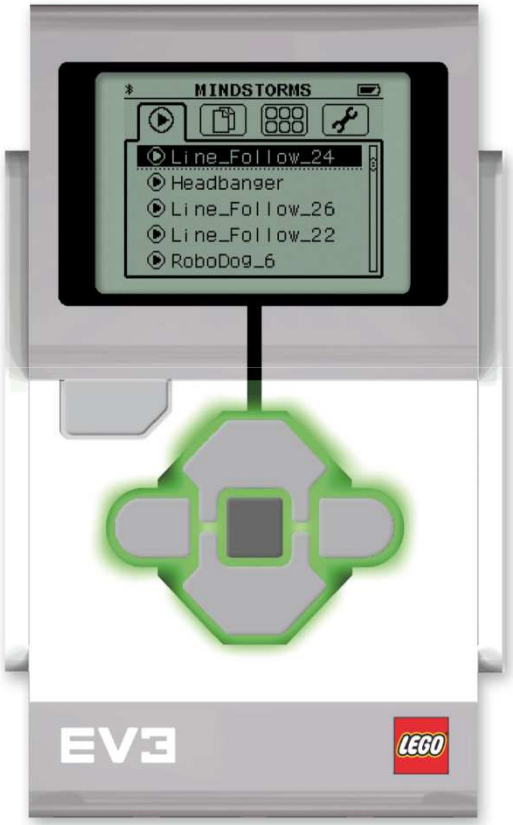
+ BT dongle
+ WiFi dongle
+ Temperature sensor
+ IR sensor
+ IR beacon

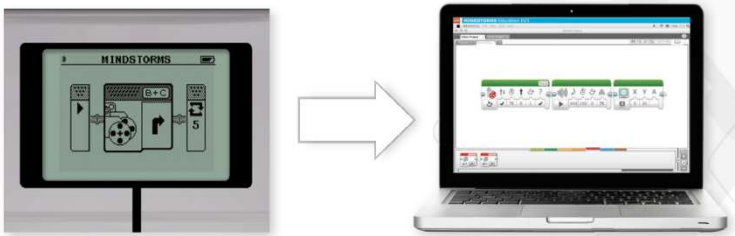
Intelligent Brick

- ARM 9 Processor, 300 MHz
- 4 input ports for data acquisition, 4 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
- Illuminated, 3-color, 6-button interface that indicates the brick's active state
- Hi-resolution 178x128 pixel display enabling detailed graph viewing and sensor data observation
- High-quality speakers
- On-brick programming and datalogging that can be uploaded into the EV3 software
- Computer-to-brick communication though on-board USB, or external Wi-Fi or Bluetooth dongles
- USB 2.0 host enabling brick daisy chaining, Wi-Fi communication, and USB memory sticks
- Powered by 6 AA batteries or the 2050 mAh lithium ion EV3 Rechargeable DC Battery

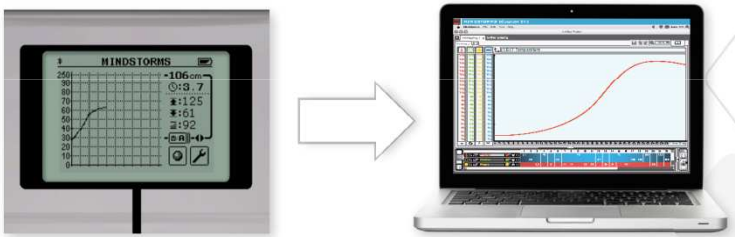
On Brick

Program, Datalog and view Onbrick with out PC for increased classroom managment possibilities.



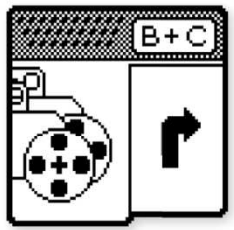


Easy Programming Onbrick – Upload to X3 and work further



Log and record data Onbrick – Upload to X3 and work further

Observe sensor data
Onbrick for quick overview

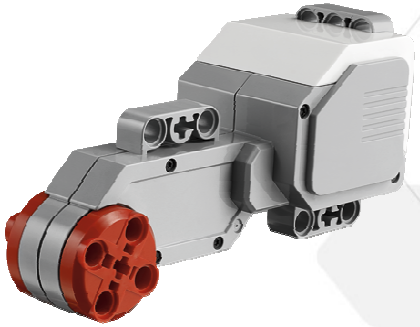


1:1 programming logic
towards X3

LEGO MINDSTORMS Education EV3 Servo Motors

LEGO MINDSTORMS Education EV3 Large Motor (2 included)

- Running torque of approximately 30 oz*in
- Stall torque of approximately 60 oz*in
- Auto-ID in the EV3 software
- 160-170 RPM

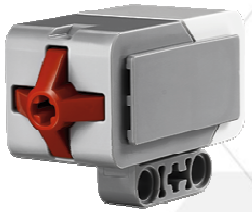


LEGO MINDSTORMS Education EV3 Medium Motor (1 included)

- 240-250 RPM
- Running torque of approximately 11 oz*in
- Stall torque of approximately 17 oz*in
- Auto-ID in the EV3 software

LEGO MINDSTORMS Education EV3 Sensors

LEGO MINDSTORMS Education EV3 Touch Sensor (2 included)



- 3 different modes
- Pressed, released, count number of presses

LEGO MINDSTORMS Education EV3 Ultrasonic Sensor (1 included)

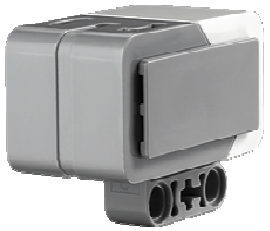
- Measures distances between 3 and 250 cm (1-100 inches)
- Accurate to +/- 1 degree (+/- .394 inches)
- Front illumination is constant while emitting and blinking while listening
- Returns true if other ultrasonic sound is recognized
- Auto-ID in the EV3 software

LEGO MINDSTORMS Education EV3 Sensors

LEGO MINDSTORMS Education EV3 Colour Sensor (1included)

- Measures reflected red light and ambient light from dark to bright sunlight
- Colors detected: no color, black, blue, green, yellow, red, white, brown
- 1KHz sample rate
- Auto-ID in the EV3 software

LEGO MINDSTORMS Education EV3 Gyro Sensor (1 included)



- Angle measurement accuracy +/- 3 degrees
- Maximum gyro output of 440 degrees/second
- Sample rate of 1 kHz
- Auto-ID in the EV3 software

LEGO MINDSTORMS Education EV3 Sensors

LEGO MINDSTORMS Education EV3 Infrared Seeker Sensor

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

LEGO MINDSTORMS Education EV3 Infrared Beacon

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

LEGO MINDSTORMS Education EV3 Rechargeable Battery

- Charge without dismantling the built model
- Included in the EV3 Education Core Set
- Uses same charger as the NXT Rechargeable DC Battery

Educator Storage and Accessories

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Curriculum & Software

- **Learning Values**
- **Graphical Programming**
- **Datalogging**
- **Digital Content**
- **Robot Educator**
- **Design Engineering Projects**

Software Learning Values

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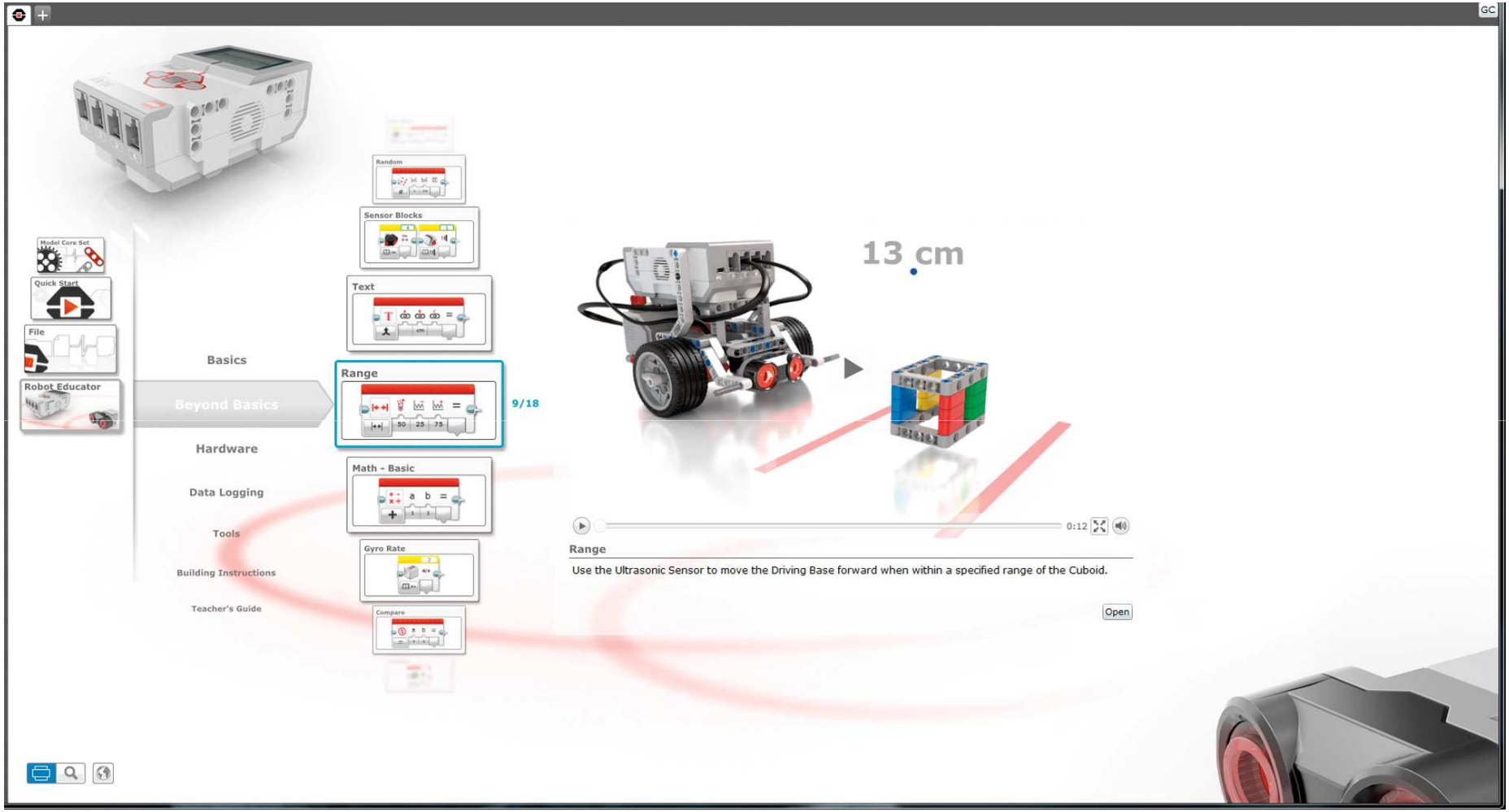
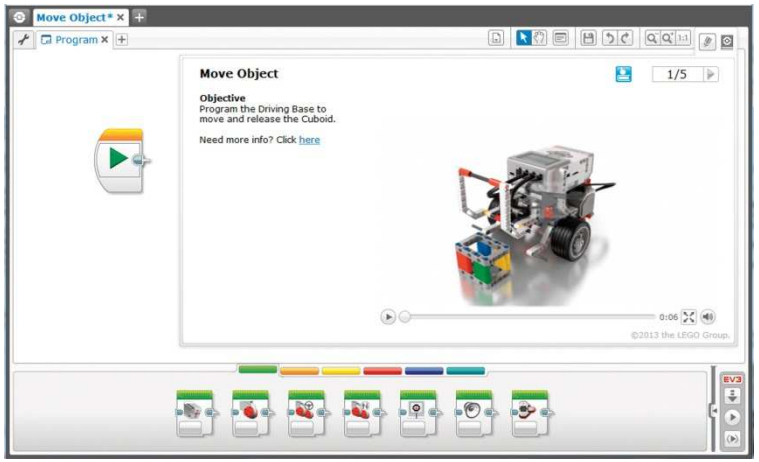
Lobby



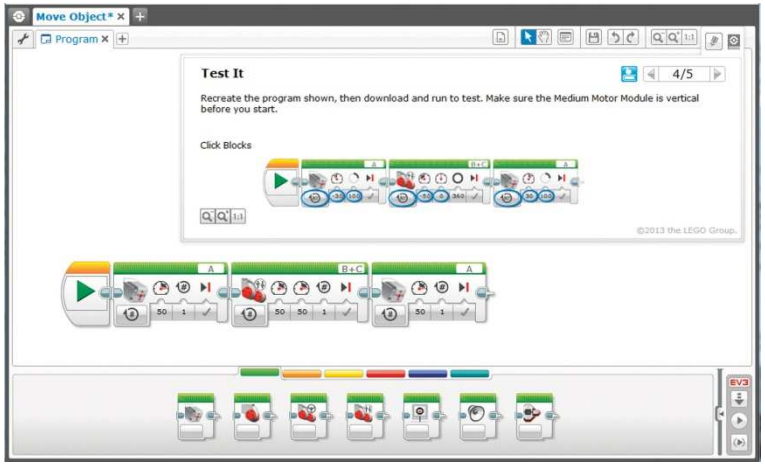
LEGO mindstorms education EV3

Tutorial Flow

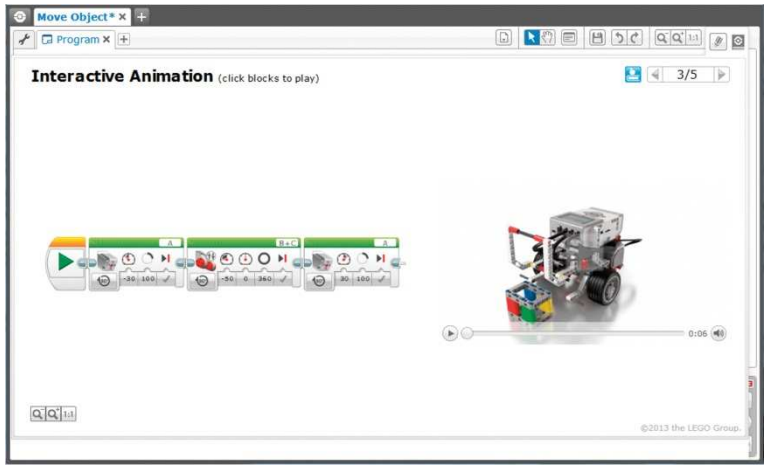
Understand the Objective



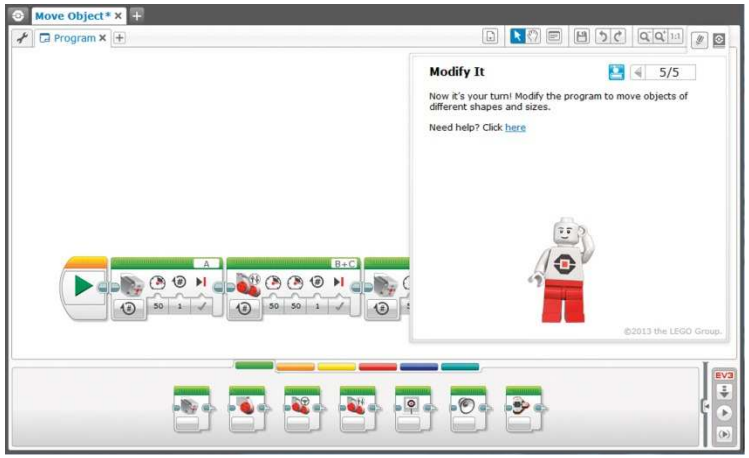
Build & Program Robot



Modify

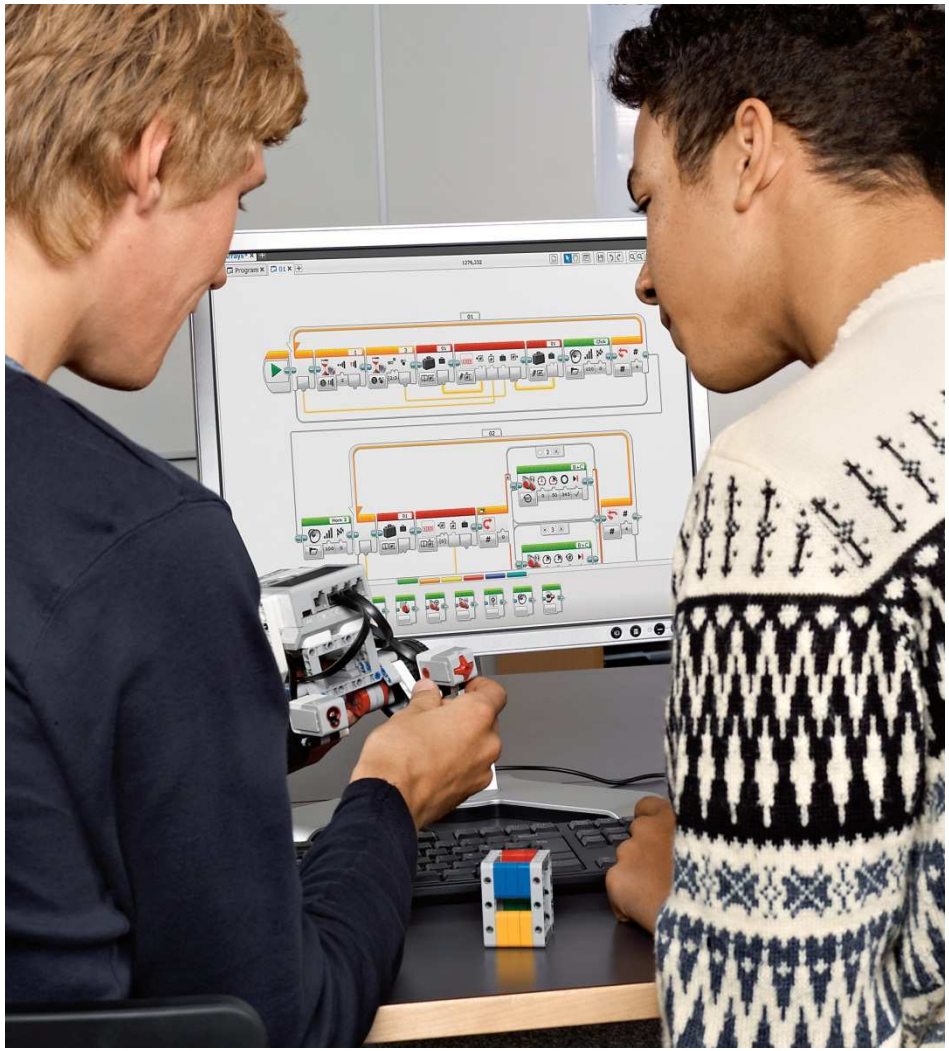


Test



LEGO MINDSTORMS education EV3

Graphical Programming

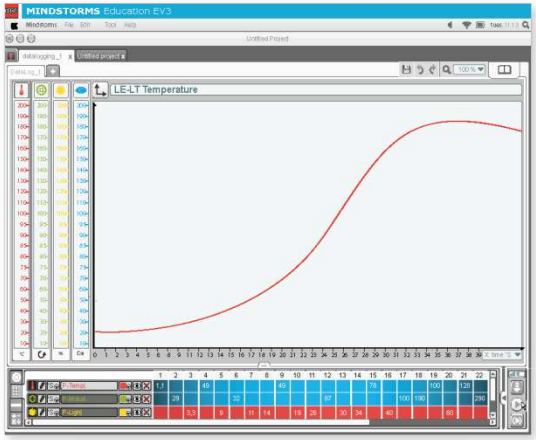


- Easy to learn, use and understand
- Intuitive Drag and Drop programming
- From simple to complex programs
- Comprehensive teacher guide

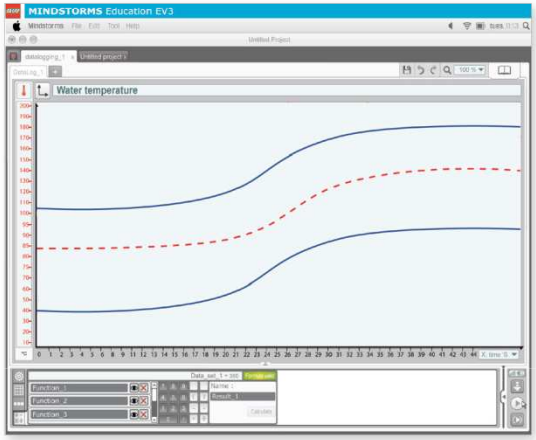
LEGO mindstorms education EV3

DAQ

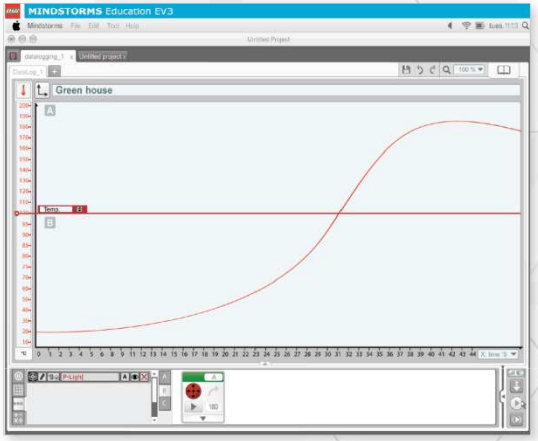
Log, manipulate and program with data increasing the science teachers possibilities in the classroom.



Datalogging
- Predict, Collect, and Analyze
- Remote Live Graphs
- AutoID
- Basic & advanced analyse tools
- Easy export of data to excel etc.



Graph Manipulation
- Unique and easy to use calculator interface
- Averaging 3 datasets and creating a new
- From Rotational counts via Speed to Acceleration



Graph Programming
- Unique new LEGO® feature
- Increase students understanding of graphs/data
- Basic use of LEGO actuators for the Science teacher
- Easy Migration to X3 programming

Robot Educator

Learn to robot

LEGO mindstorms education EV3

SW intro
Get to know the Software:
- Block interactions
- Hardware page
- Basic programming
- Datawires
- Datalogging interactions

3 tutorials
1 hour of class time

HW intro
Get to know the Hardware:
- EV3 brick
- Sound
- Display
- Light
- Motors
- Sensors
- On Brick

11 tutorials
4 hours of class time

Basics
Get to know how to:
- Drive
- Turn
- Avoid objects
- Move for dark line
- Grab and move
- Move for angle

8 tutorials
5 hours of class time

Advanced
Get to know:
- Loop
- Switch
- Basic math
- Trigonometry
- Variables
- Array
- Logic
- Send message
- Calibrate

17 tutorials
12 hours of class time

Graphing
Get to know:
- Datalog
- Predict
- Analyze
- Datasets calculation
- Graph programming

7 tutorials
5 hours of class time

Tools
Get to know the:
- Sound editor
- Image editor
- Remote control
- My Blocks

4 tutorials
5 hours of class time

Software Introduction & Navigation
Learn to use software features to create multimedia pages for documentation; Learn to control motors and movement; Learn to collect data from all sensors: Gyro (angular displacement); Ultrasonic sensor distance in cm or inches; Light (%) or color; Rotation of motors; and Touch sensor presses.

Hardware Introduction
Learn to build using the LEGO® TECHNIC system of motors, sensors, wires, and the intelligent P-brick; Understand the P-brick is the onboard "brain" controlling autonomous robots; Learn to follow step-by-step 2D building instructions to create 3D models.

Programming Structures
Learn to use logical structures and math functions to control the robot behaviors, including motor movement and sensor feedback; Learn to use graphing features to collect data from sensors; Learn to use graph programming to monitor and control behaviors based on conditions measured by sensors.

Design Engineering Projects

Robot to learn

Make It Move

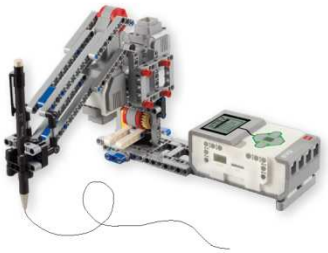
- Students are engineers!
- Engineering process: Start with a design brief, brainstorm, build, program, and test a robot performing a task. Then revise and communicate with others.
- Learn and use knowledge of science, technology and mathematics as they engineer a solution.

5 Design Brief projects
10 hours of class time
+ break out possibilities

Make It Smarter

- Add to skills and knowledge with sensor feedback from several sensors.
- More complex thinking and programming are developed further.
- Graphing skills and understanding of data collection and analysis are developed.

5 Design Brief projects
10 hours of class time
+ break out possibilities



Make A System

- Create more complex systems from subsystems.
- Measure the quality and reliability of their robotic system.
- Work with manufacturing, transportation, communication, and other technology applications.

5 Design Brief projects
10 hours of class time
+ break out possibilities

Teachers Resources

- Extensive teachers notes with programs, explanations, tips and tricks and ideas for further activities.
- Solution to the design brief, e.g. easy to follow building instructions and programming examples.
- Digital student worksheet.

Flexible routes through the materials but there is always a safe route

Video

- Real life videos engage, inform and inspire students:
  - What is a robot?
  - What is engineering?
- Three topic videos show real robots in action.

Design Engineering Projects

LEGO mindstorms education EV3

Use engineering process to solve Design Engineering Projects-focused design briefs based on standards.

Common Core math and science
ITEEA standards for technological literacy

US Science & Engineering
Matter and Its Interactions
Motion and Stability
Forces and Interactions
Energy Transfer and Conservation
Ecosystems: Interactions, Energy, and Dynamics
Biological Evolution: Unity and Diversity

Mathematics
Ratios and Proportional Relationships
The Number System
Expressions and Equations
Geometry

Technology
Design Process
Understand manufacturing, transportation, communication, and other technologies

National curriculum standards, key stage 2 and 3

Science
Obtaining and evaluating evidence
Friction, Forces, Light, Electrical systems

Mathematics
Working with integers, fractions, percentage ratios, and decimals
Reading and plotting coordinates
Combining understanding, experiences, imagination and reasoning to construct new knowledge
Using existing mathematical knowledge to create solutions to unfamiliar problems
Consider the assumptions made and the appropriateness and accuracy of results and conclusion

Design and Technology
Developing, planning and communicating ideas
Evaluating processes and products
Knowledge and understanding of systems and control

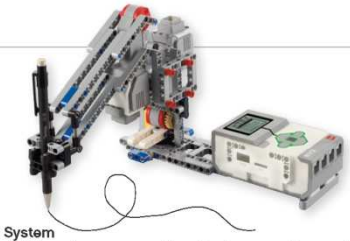
Mathematik
Measurement
Ratios
Estimating
Tabulating and interpreting data
Graphing

Informatik
Media Literacy
Programming
Systems and Subsystems

Natur & Technik
Design Process
Teamwork
Physics, e.g., Forces and Motion
Biological processes, e.g., Senses and Sensing

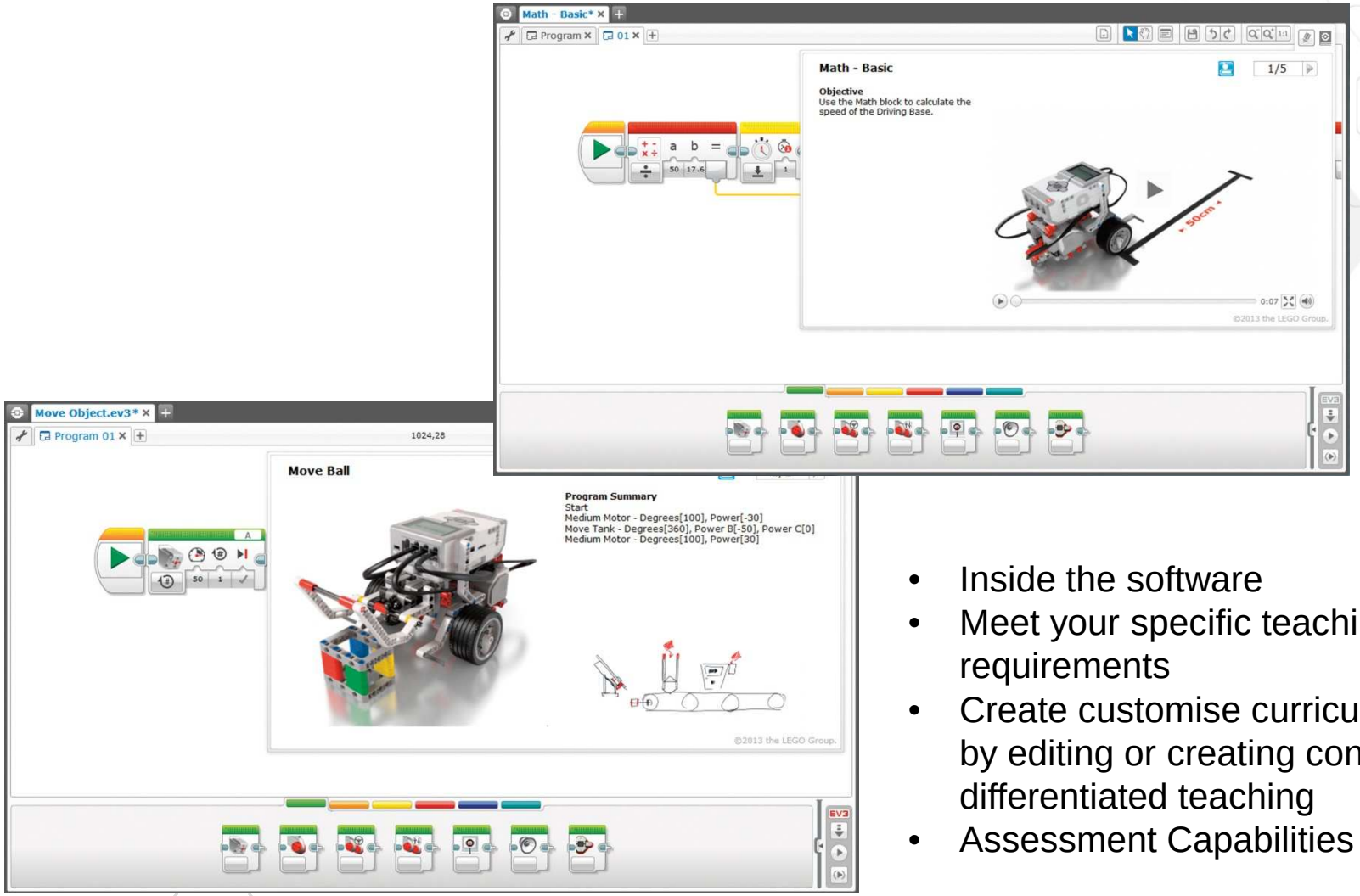
Make It Move
Forces and Motion; Measure and calculate average speed as a function of distance divided by time; Graph and interpret rotation sensor data; Observe and describe the transfer of energy driving motion; Use knowledge of simple machines to build more complex machines; Understand and program geometric figures using points, lines and shapes of a 2D coordinate system; Use ratios to describe proportional relationships.

Make It Smarter
Measure and graph light, color, distance, angle, rotation and other data; Interpret data to explain robot behavior in a variety of contexts; Use logical structures to control the behavior of robots; Program robots to imitate the sensing and response of living organisms; Calculate using decimals, fractions and various units of measure.



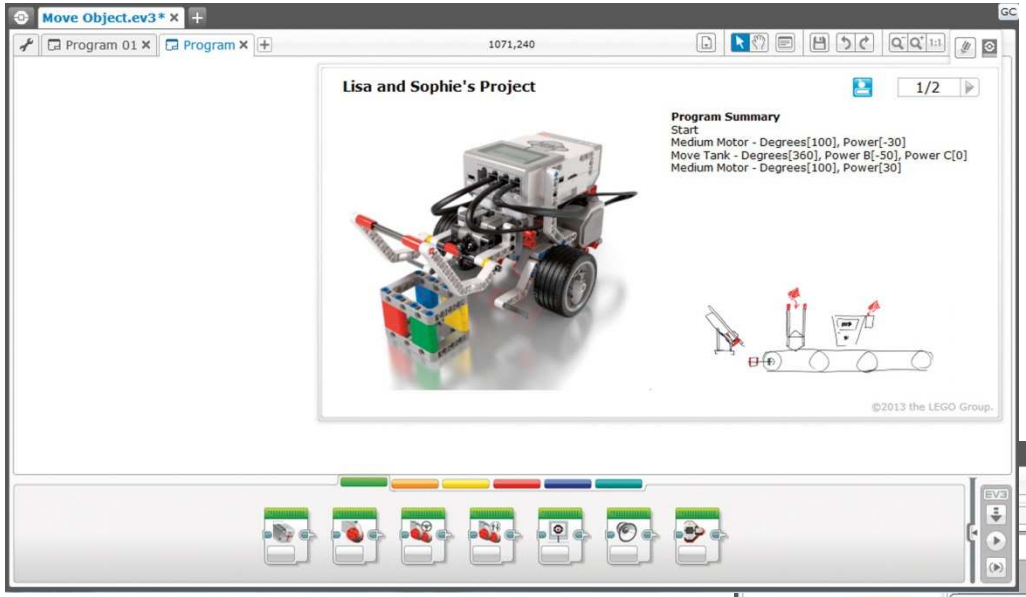
Make A System
Design, build and program a functioning complex system using subsystems; Use evidence to support decisions; Understand and use feedback to improve and optimize system functions; Develop systems for manufacturing, transportation, communication and other technologies.

Digital Content for Educators



- Inside the software
- Meet your specific teaching requirements
- Create customise curriculum materials by editing or creating content for differentiated teaching
- Assessment Capabilities

Digital Content for Students



- Students create their own digital workbook.
- One place for all student information, guidance and support
- Students can add text, images, web links, video & audio files
- Makes assessment and sharing easy

Educator Professional Development

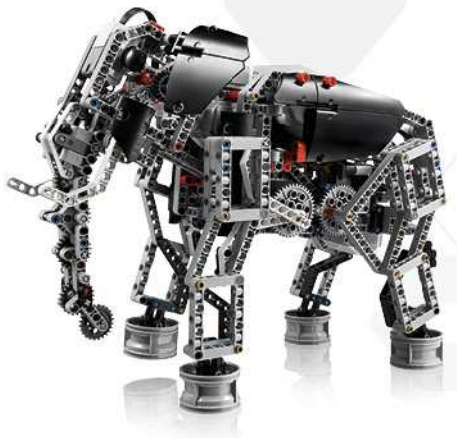
All courses cover:

- Hands-on lessons to take back to school
- Hardware and software overview
- Curriculum coverage in an exciting way
- Lesson Planning
- Classroom Management
- Customisable activities
- 21st Century Learning

**All courses are conducted by certified trainers

- Differentiation to Retail

Hardware and Software



Difference in the mix

Retail Box
- P-Brick
- Large motor (2)
- Medium motor
- Color Sensor
- Touch Sensor
- IR Sensor
- IR Beacon
- Less bricks than today
- Focus on Kids 10-14

Software
- Programming
- Create project
- 5 Models

LE Core Set
- P-Brick
- Large motor (2)
- Medium motor
- Color Sensor
- Touch Sensor (2)
- Ultrasonic Sensor
- Gyro Sensor
- More bricks than today
- Focus on Education

Software
- Lobby
- Programming
- Data logging +
- Dynamic content editor +
- Robot educator
-11 Models