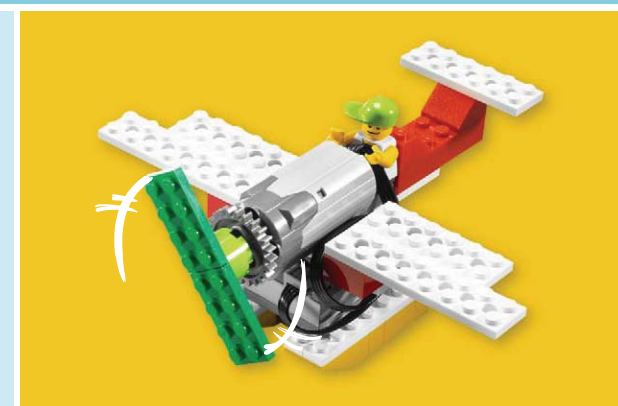
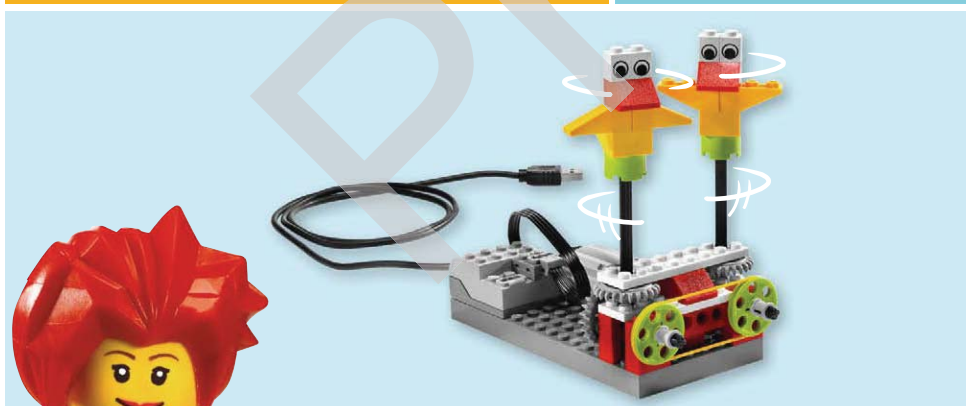


2009580



education



LEGO® Education WeDo™

Teacher's Guide



Table of Contents

Introduction	3
Who is it for?	3
What is it for?	3
What is in the box?	4
The 4C Learning Process	6
Organizing the Classroom	7
Lesson Planning Routes	8
Curriculum	12
Highlights	12
Themes	13
Curriculum Grids	15
LEGO® Education WeDo™ Software	17
Overview	17
Vocabulary List	18
Sound List	21
Background List	22
Shortcut List	23
Getting Started	24
Overview	24
Teacher Notes for Getting Started	
1. Motor and Axle	28
2. Gears	29
3. Idler Gear	30
4. Gearing Down	31
5. Gearing Up	32
6. Tilt Sensor	33
7. Pulleys and Belt	34
8. Crossed Belt	35
9. Decrease Speed	36
10. Increase Speed	37
11. Motion Sensor	38
12. Crown Gear	39
13. Worm Gear	40
14. Cam	41
15. Lever	42
16. Repeat Block	43
17. Add to Display	44
18. Subtract from Display	45
19. Start On Message	46
20. Labeling	47

Teacher Notes for the Activities	48
Overview	48
Amazing Mechanisms	52
1. Dancing Birds	53
2. Smart Spinner	61
3. Drumming Monkey	70
Wild Animals	79
4. Hungry Alligator	80
5. Roaring Lion	88
6. Flying Bird	97
Play Soccer	106
7. Goal Kicker	107
8. Goal Keeper	115
9. Cheerful Fans	124
Adventure Stories	132
10. Airplane Rescue	133
11. Giant Escape	141
12. Sailboat Storm	151
Resources	160
Be Inspired! Programs to Explore	161
Activity Data Tables: Amazing Mechanisms	
1. Dancing Birds	164
2. Smart Spinner	165
3. Drumming Monkey	166
Activity Data Tables: Play Soccer	
7. Goal Kicker	167
8. Goal Keeper	168
9. Cheerful Fans	169
Glossary	170
LEGO® Element Survey for 9580	172



Introduction

LEGO® Education is pleased to introduce the 2009580 LEGO Education WeDo™ Activity Pack which includes this LEGO Education WeDo Teacher's Guide.

Who is it for?

The material is designed for teachers in elementary school, especially second through fourth grade, although it can be used in higher grades as well. Working individually, in pairs or teams, students of any academic background from seven years and up can learn by building and programming the models and by investigating, writing about, and discussing ideas they encounter using the models in these activities.

What is it for?

The WeDo Activity Pack enables students to work as young scientists, engineers, mathematicians and creative writers providing them with the settings, tools and tasks for completing cross-curricular projects.

Using these materials, students are encouraged to build and program a working model and then use the model for different purposes, depending upon the theme of the activity and its focused subject matter in science, technology, mathematics or language.

The WeDo Activity Pack enables teachers to provide learning opportunities for developing these broader learning goals:

- Think creatively to make a working model
- Develop vocabulary and communication skills to explain how the model works
- Establish links between cause and effect
- Reflect on how to find answers and imagine new possibilities
- Brainstorm ideas and endeavor to bring some of them to fruition
- Make fair tests by changing one factor and observing or measuring the effect
- Make systematic observations and measurements
- Display and communicate data using tables
- Follow 2D drawings to build a 3D model
- Think logically and create a program to produce a specific behavior
- Write and present creative stories using models for visual and dramatic effects

See the Curriculum section for an overview of the highlights, a description of the themes around which the activities are organized, and curriculum grids showing how objectives in science, technology, engineering, mathematics and language are met by each activity.

What is in the box?

9580 LEGO® Education WeDo™ Construction Set

The 9580 LEGO® Education WeDo™ Construction Set enables students to build LEGO® models that attach to the LEGO® USB Hub and then control the models using computer programs. The set contains 158 elements including a LEGO Hub, motor, tilt sensor and a motion sensor that add movement and intelligence to the model.



LEGO® USB Hub

The LEGO® USB Hub controls sensors and motors from the 2000095 LEGO® Education WeDo™ Software. Power and data are transmitted from the LEGO motors and sensors to and from the computer using the two LEGO Hub ports. The WeDo Software automatically detects the LEGO Hub and any motors and sensors attached to it. Up to three LEGO Hubs can be attached.

Motor

The motor can be programmed to turn this way or that way and to move at different power levels. Power for the motor is supplied through voltage from the computer's USB port (5V). Axles or other LEGO elements can be attached to the motor.

Tilt Sensor

The tilt sensor reports the direction it is tilted. The tilt sensor detects changes within six different positions: Tilt This Way, Tilt That Way, Tilt Up, Tilt Down, No Tilt and Any Tilt.

Motion Sensor

The motion sensor detects objects within a range of 15 centimeters (or about 6 inches) depending on the design of the object.



2000095 LEGO® Education WeDo™ Software

The LEGO Education WeDo™ software is a powerful tool for creating and controlling LEGO WeDo™ robots. It allows you to design and build your own robots, and then use the software to program them to perform various tasks. The software is easy to use and is suitable for students of all ages. It is a great way to learn about programming and robotics.

The software is available for Windows and Mac OS. It is a free download from the LEGO Education website. The software is also available on a CD-ROM. The software is a great way to learn about programming and robotics.



The 4C Learning Process

All LEGO® Education materials support a process of learning that includes four phases: Connect, Construct, Contemplate, and Continue.

Connect

You add to your brain's knowledge when you connect a new learning experience to those you already have or when an initial learning experience is the seed stimulating the growth of new knowledge. Each LEGO Education WeDo™ activity presents an animated situation with minifigures, Mia and Max. Use these animations to illustrate, inspire, and stimulate discussion about the activity topic. Other ways to Connect are also suggested in the Teacher Notes for each activity.

Construct

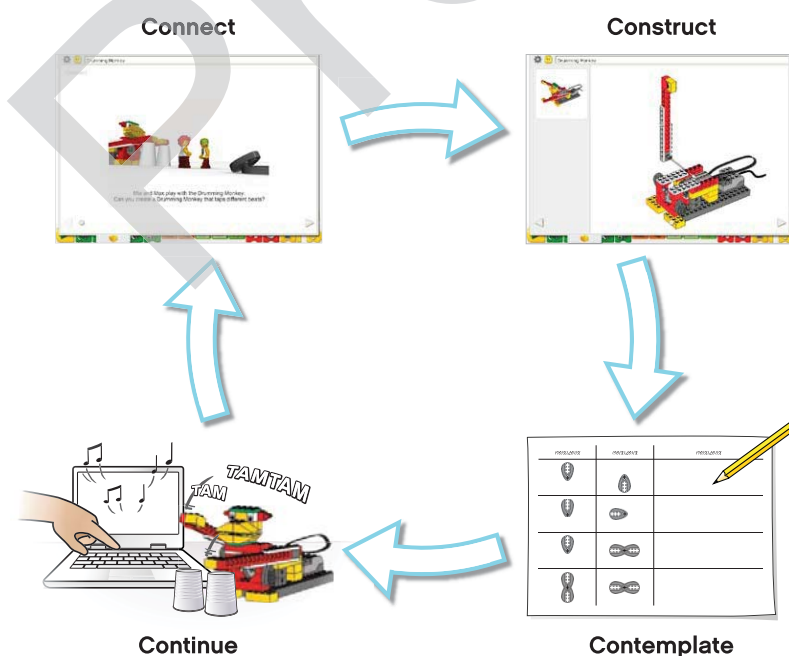
Learning is best when hands and minds are engaged. LEGO Education involves learning by making: the construction of models and of ideas. The WeDo activities include step-by-step instructions embedded directly into the Construct phase. Just click to see the next step. If you prefer, plan time for modifying this model or building and programming something of your own design.

Contemplate

When you contemplate what you have done, you have the opportunity to deepen your understanding. As you reflect, you develop connections between previous knowledge and new experiences. In the Contemplate section, students observe and report how specific changes in the pulleys, gears, or cams affects the movement of the model; they research and make presentations about the behavior of their “animals;” they count, take measurements and rate the performance of their soccer models; and they create different types of stories and act them out using their models for visual and sound effects. This phase offers a good opportunity for evaluating the learning and progress of each student.

Continue

Learning is always more enjoyable and creative when it is adequately challenging. Maintaining this challenge and the pleasure of accomplishment naturally inspires the continuation of more advanced work. The Continue phase of each activity includes a challenge to build and program more behavior or complex interaction with the model.



Organizing the Classroom

Lesson Planning Routes

There are many ways to use the LEGO® Education WeDo™ materials in your classroom. Here are two different ways to plan your class schedule.

Each activity can take one or more class periods, depending upon the time spent on discussion, the building and computer skills of your students, and the time you allow for experimentation.

Activities can be completed by an individual or a small team or group, depending upon the number of computers and LEGO Education WeDo Construction Sets available.

Route A: Getting Started Introduction Before Themed Activities

Introduce the building and programming ideas first to help the students become familiar with LEGO building using the WeDo Construction Set and with the LEGO Education WeDo Software. Then start on the themed activities.

You can have the students choose one of the three themed activities for each theme as this chart shows, or if you have more time, you can have the students try all of the activities. Some groups will be faster than others and may be able to complete all three in the same time as others complete one or two.

Extension ideas are suggested in the Teacher Notes for each activity. Some of the activity extensions involve combining models from other projects so extensions are recommended as useful ways to encourage cooperation.

You may wish to organize a class exhibition as a finale for the unit.

Route B: Focus on Themed Activities

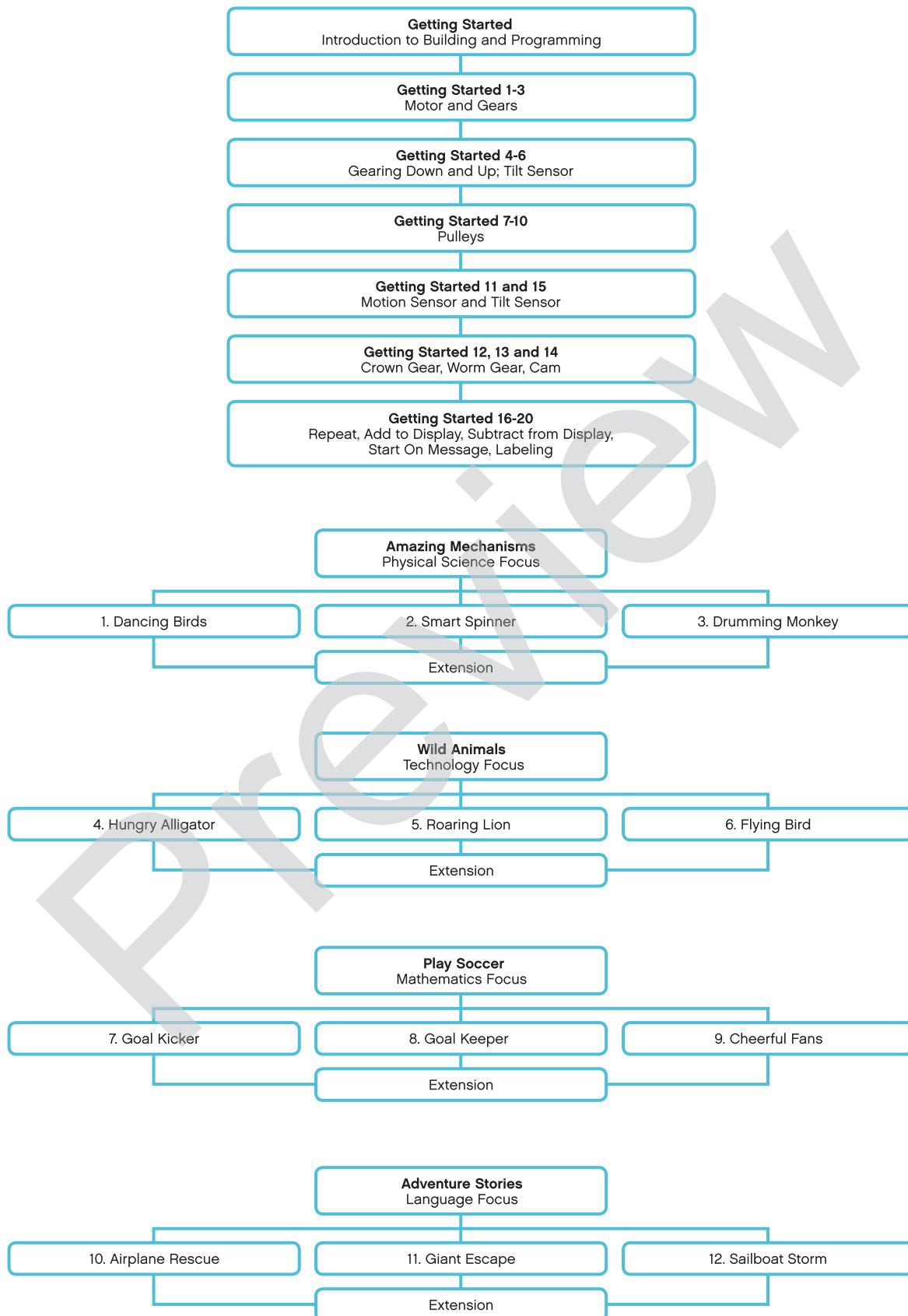
Start with the themed activities, spending more time with them as projects to encourage experimentation.

You can have the students try all of the activities as this chart shows, or if you have less time, you can have the students choose one activity from each theme. Some groups will be faster than others and may be able to complete all three in the same time as others complete one or two.

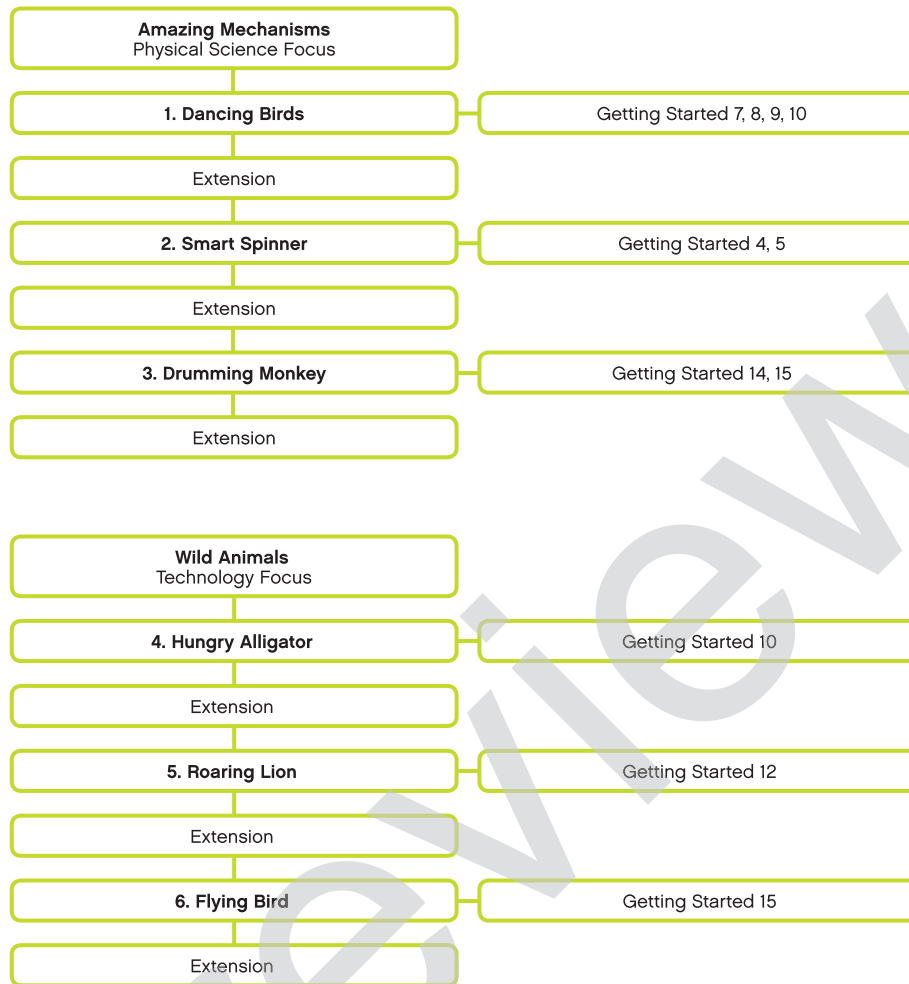
Use the Getting Started materials as a reference. Extension ideas are suggested in the Teacher Notes for each activity.

You may wish to organize a class exhibition as a finale for the unit.

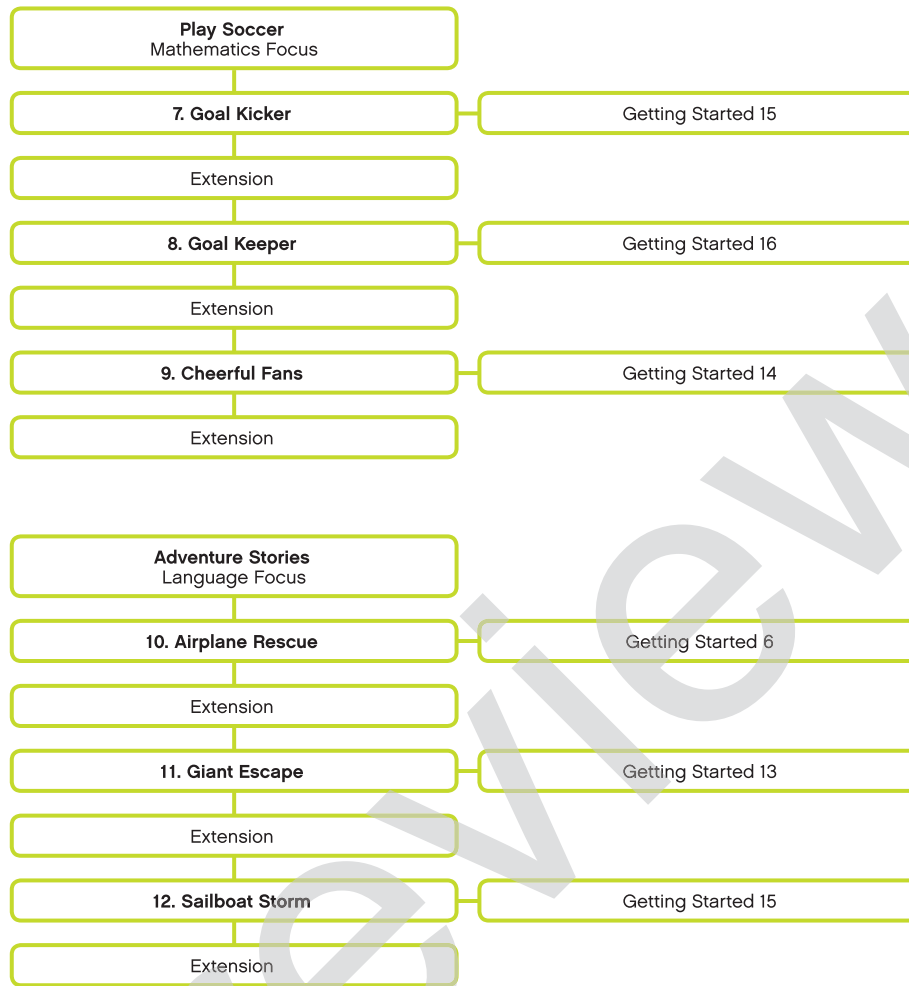
Route A: Getting Started Introduction Before Themed Activities



Route B: Focus on Themed Activities



Route B: Focus on Themed Activities





Curriculum

Highlights

The process of students actively building, programming, investigating, writing, and communicating benefits their development in numerous ways. The opportunity to integrate subject matter across the curriculum in projects provides a range of contexts for applying concepts, learning new skills, and broadening interests. Specific subject matter is also addressed in the activities. Here are the highlights. For more information, see the Themes and Curriculum Grids sections.

Science

Trace the transmission of motion and transfer of energy through the machine. Identify the simple machines mechanisms at work in the models, including levers, gears, and pulleys. Become familiar with complex motion using a cam, worm gear, and crown gear. Understand that friction can affect the movement of the model. Understand and discuss criteria for a fair test. Consider the needs of living animals.

Technology

Program and create a working model. Interpret 2D and 3D illustrations and models. Understand that animals use parts of their bodies as tools. Compare natural systems with mechanical systems. Use software media to acquire information. Demonstrate the knowledge and operation of digital tools and technological systems.

Engineering

Build, program, and test the models. Modify a model's behavior by changing the mechanical system or by adding a sensor to provide feedback. Brainstorm to find creative alternative solutions. Learn to share ideas and work together.

Mathematics

Measure time in seconds and tenths of a second. Estimate and measure the distance in centimeters or inches. Understand the concept of randomness. Compare the diameter and rotational speed. Understand and use numbers to represent the type of sounds played and the amount of time the motor turns on. Understand and use the distance between an object and to activate the motion sensor. Understand how the position of the model is measured by the tilt sensor. Understand and use numbers to measure and score qualitative characteristics.

Language

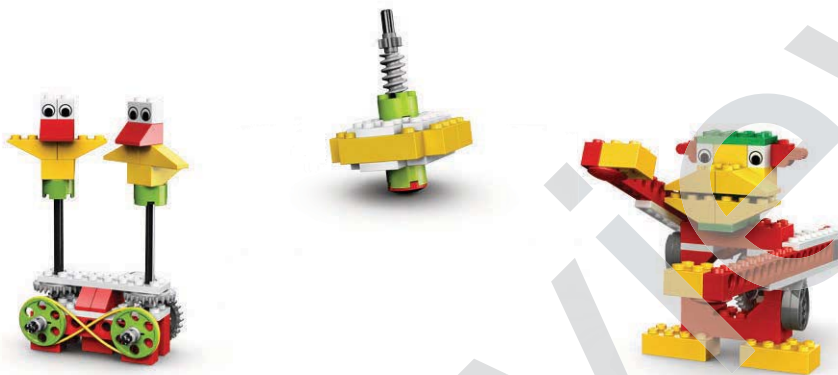
Communicate in spoken or written forms using appropriate vocabulary. Prepare and deliver a demonstration using a model. Use interview questions to find out information and write a story. Write a script with a dialogue. Write a logical sequence of events and create a story including main characters and dramatizing with visual and sound effects. Use technology to create and communicate ideas. Participate as knowledgeable, reflective members of the group and class.

Themes

The 12 activities have been organized around four themes with three activities in each theme. The themes use technology, the building and programming of the model, along with a project-oriented approach to integrate concepts across the curriculum. However, each theme does focus on one subject area more than others.

Amazing Mechanisms

The Amazing Mechanisms theme focuses on physical science concepts. In Dancing Birds, students learn about pulleys and belts, experimenting with the size of pulleys and the crossing and uncrossing of the belt. In Smart Spinner, students investigate the effect of smaller and larger gears on a spinning top. In Drumming Monkey, students learn about levers, cams, and patterns of movement. They experiment with the number and position of cams, using them as the effort causing the monkey's arms to drum up and down on a surface at different rates.



Wild Animals

The Wild Animals theme focuses on technology, emphasizing the concept of sensing and responding to external stimuli. In Hungry Alligator, students program the alligator to snap its jaw shut when the motion sensor sees something near its mouth. In Roaring Lion, students program the lion to sit up and then lie down and roar when it senses a bone. In Flying Bird, students program the tilt sensor to activate a flapping sound as they move the tail up and down, flapping the wings. They also program the motion sensor to activate a tweet sound when the bird tilts down to its feet.



Play Soccer

The Play Soccer theme focuses on mathematics. In Goal Kicker, students measure the distance the kicking leg model kicks paper balls. In Goal Keeper, students calculate the number of blocks, goals, misses as they try to flick paper balls past a mechanical goal keeper. They also learn to program an automatic score keeping system. In Cheerful Fans, students apply a numerical rating system to judging the best performance in three subjective categories.



Adventure Stories

The Adventure Stories theme focuses on language using the model to dramatize events. In Airplane Rescue, students learn important interview questions: Who, What, Where, Why, and How and report a story of Max the LEGO® minifigure's airplane ride. In Giant Escape, students act out the dialogue, role-playing as Mia and Max wake the sleeping giant and must escape the forest. In Sailboat Storm, students describe the sequence of events as Max endures a thunderstorm at sea.



For more details about the specific curriculum objectives covered by each activity, see the Curriculum Grids.

Curriculum Grids

	1. Dancing Birds	2. Smart Spinner	3. Drumming Monkey	4. Hungry Alligator	5. Roaring Lion	6. Flying Bird	7. Goal Kicker	8. Goal Keeper	9. Cheerful Fans	10. Airplane Rescue	11. Giant Escape	12. Sailboat Storm
Science												
Scientific inquiry												
Conduct investigation												
Use tools to gather information												
Communicate investigations and explanations												
Fair testing												
Observation												
Reasoning												
Teamwork												
Transmission of motion												
Transfer of energy												
Lever												
Pulley												
Gear												
Compound gearing												
Friction												
Needs of living animals												
Use evidence to support conclusions												
Technology												
Program and create a working model												
Interpret 2D and 3D illustrations and models												
Compare natural systems with mechanical systems												
Demonstrate the knowledge and operation of digital tools and technological systems												
Use software media to acquire information												
Understand that animals use parts of their bodies as tools												
Use feedback to adjust a programming system output												
Apply principles of motion and other concepts in physical science												

	1. Dancing Birds	2. Smart Spinner	3. Drumming Monkey	4. Hungry Alligator	5. Roaring Lion	6. Flying Bird	7. Goal Kicker	8. Goal Keeper	9. Cheerful Fans	10. Airplane Rescue	11. Giant Escape	12. Sailboat Storm
Engineering												
Build, program and test models												
Modify a model's behavior by changing the mechanical system or by adding a sensor to provide feedback												
Brainstorm to find creative solutions												
Teamwork: Learn to communicate, share ideas and work together												
Mathematics												
Whole number relationships												
Use standard units												
Calculate using numbers with one or two place values												
Estimate												
Count												
Time in seconds and tenths of seconds												
Measure in centimeters or inches												
Measure "soft" qualitative variables												
Use simple counting variables												
Use random numbers between 1 and 10												
Use numbers to represent sounds, displays, distance, tilt value and other data												
Ratio of gear teeth and pulley diameter affects speed												
Cams affect frequency and timing of sound												
Relate numerical values to patterns of movement												
Organize lists or tables of information												
Organize and display data												
Analyze change in many contexts												
Language												
Communicate in spoken form using the appropriate vocabulary												
Use visual props to illustrate and dramatize your presentation												
Communicate in writing to explain information using the appropriate vocabulary												
Use interview questions to find out information												
Write a logical sequence of events												
Organize events to create a story, maintaining a focus on the characters and objects												
Write a script with a dialogue among three characters												
Use technology to create and communicate ideas												
Participate as knowledgeable, reflective members of the group and class												



LEGO® Education WeDo™ Software

Overview

Connection Tab: Record your own sounds and view any Motors, Tilt Sensors or Motion Sensors.

Project Tab: Click to open the menu showing Exit
Open Project
New Project

Content Tab: Click to find Getting Started, the Activities, and your Browser.

Display Tab: Opens when numbers, letters or backgrounds are programmed in Display Blocks.



Click the **Arrow button** to open the Palette. The Palette shows all of the programming Blocks.

Click the **Stop button** to stop programs and motors.

Vocabulary List

	LEGO WeDo
	LEGO WeDo
	LEGO WeDo
	LEGO WeDo
	LEGO WeDo
	LEGO WeDo

Vocabulary List

Vocabulary List

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	LEGO WeDo

Sound List

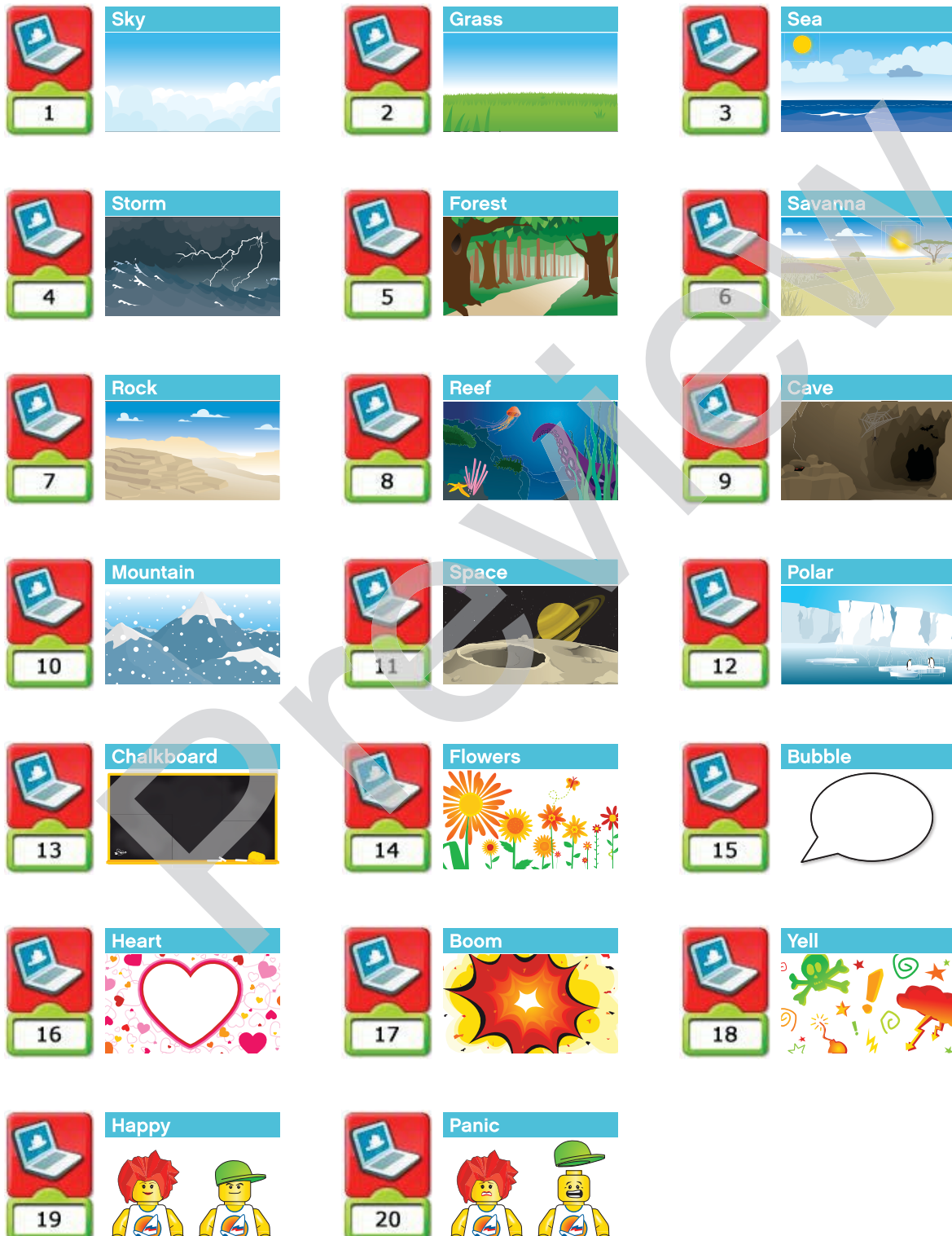
The following table lists the sounds that are available in the LEGO Education WeDo™ software. The sounds are organized into three categories: default sounds, custom sounds, and sounds that are created by the user.

Sound Name	Sound File	Sound Description
Default Sound 1	Default Sound 1.wav	Default sound 1
Default Sound 2	Default Sound 2.wav	Default sound 2
Default Sound 3	Default Sound 3.wav	Default sound 3
Default Sound 4	Default Sound 4.wav	Default sound 4
Default Sound 5	Default Sound 5.wav	Default sound 5
Default Sound 6	Default Sound 6.wav	Default sound 6
Default Sound 7	Default Sound 7.wav	Default sound 7
Default Sound 8	Default Sound 8.wav	Default sound 8
Default Sound 9	Default Sound 9.wav	Default sound 9
Default Sound 10	Default Sound 10.wav	Default sound 10
Default Sound 11	Default Sound 11.wav	Default sound 11
Default Sound 12	Default Sound 12.wav	Default sound 12
Default Sound 13	Default Sound 13.wav	Default sound 13
Default Sound 14	Default Sound 14.wav	Default sound 14
Default Sound 15	Default Sound 15.wav	Default sound 15
Default Sound 16	Default Sound 16.wav	Default sound 16
Default Sound 17	Default Sound 17.wav	Default sound 17
Default Sound 18	Default Sound 18.wav	Default sound 18
Default Sound 19	Default Sound 19.wav	Default sound 19
Default Sound 20	Default Sound 20.wav	Default sound 20
Default Sound 21	Default Sound 21.wav	Default sound 21
Default Sound 22	Default Sound 22.wav	Default sound 22
Default Sound 23	Default Sound 23.wav	Default sound 23
Default Sound 24	Default Sound 24.wav	Default sound 24
Default Sound 25	Default Sound 25.wav	Default sound 25
Default Sound 26	Default Sound 26.wav	Default sound 26
Default Sound 27	Default Sound 27.wav	Default sound 27
Default Sound 28	Default Sound 28.wav	Default sound 28
Default Sound 29	Default Sound 29.wav	Default sound 29
Default Sound 30	Default Sound 30.wav	Default sound 30
Default Sound 31	Default Sound 31.wav	Default sound 31
Default Sound 32	Default Sound 32.wav	Default sound 32
Default Sound 33	Default Sound 33.wav	Default sound 33
Default Sound 34	Default Sound 34.wav	Default sound 34
Default Sound 35	Default Sound 35.wav	Default sound 35
Default Sound 36	Default Sound 36.wav	Default sound 36
Default Sound 37	Default Sound 37.wav	Default sound 37
Default Sound 38	Default Sound 38.wav	Default sound 38
Default Sound 39	Default Sound 39.wav	Default sound 39
Default Sound 40	Default Sound 40.wav	Default sound 40
Default Sound 41	Default Sound 41.wav	Default sound 41
Default Sound 42	Default Sound 42.wav	Default sound 42
Default Sound 43	Default Sound 43.wav	Default sound 43
Default Sound 44	Default Sound 44.wav	Default sound 44
Default Sound 45	Default Sound 45.wav	Default sound 45
Default Sound 46	Default Sound 46.wav	Default sound 46
Default Sound 47	Default Sound 47.wav	Default sound 47
Default Sound 48	Default Sound 48.wav	Default sound 48
Default Sound 49	Default Sound 49.wav	Default sound 49
Default Sound 50	Default Sound 50.wav	Default sound 50
Default Sound 51	Default Sound 51.wav	Default sound 51
Default Sound 52	Default Sound 52.wav	Default sound 52
Default Sound 53	Default Sound 53.wav	Default sound 53
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Default Sound 55	Default Sound 55.wav	Default sound 55
Default Sound 56	Default Sound 56.wav	Default sound 56
Default Sound 57	Default Sound 57.wav	Default sound 57
Default Sound 58	Default Sound 58.wav	Default sound 58
Default Sound 59	Default Sound 59.wav	Default sound 59
Default Sound 60	Default Sound 60.wav	Default sound 60
Default Sound 61	Default Sound 61.wav	Default sound 61
Default Sound 62	Default Sound 62.wav	Default sound 62
Default Sound 63	Default Sound 63.wav	Default sound 63
Default Sound 64	Default Sound 64.wav	Default sound 64
Default Sound 65	Default Sound 65.wav	Default sound 65
Default Sound 66	Default Sound 66.wav	Default sound 66
Default Sound 67	Default Sound 67.wav	Default sound 67
Default Sound 68	Default Sound 68.wav	Default sound 68
Default Sound 69	Default Sound 69.wav	Default sound 69
Default Sound 70	Default Sound 70.wav	Default sound 70
Default Sound 71	Default Sound 71.wav	Default sound 71
Default Sound 72	Default Sound 72.wav	Default sound 72
Default Sound 73	Default Sound 73.wav	Default sound 73
Default Sound 74	Default Sound 74.wav	Default sound 74
Default Sound 75	Default Sound 75.wav	Default sound 75
Default Sound 76	Default Sound 76.wav	Default sound 76
Default Sound 77	Default Sound 77.wav	Default sound 77
Default Sound 78	Default Sound 78.wav	Default sound 78
Default Sound 79	Default Sound 79.wav	Default sound 79
Default Sound 80	Default Sound 80.wav	Default sound 80
Default Sound 81	Default Sound 81.wav	Default sound 81
Default Sound 82	Default Sound 82.wav	Default sound 82
Default Sound 83	Default Sound 83.wav	Default sound 83
Default Sound 84	Default Sound 84.wav	Default sound 84
Default Sound 85	Default Sound 85.wav	Default sound 85
Default Sound 86	Default Sound 86.wav	Default sound 86
Default Sound 87	Default Sound 87.wav	Default sound 87
Default Sound 88	Default Sound 88.wav	Default sound 88
Default Sound 89	Default Sound 89.wav	Default sound 89
Default Sound 90	Default Sound 90.wav	Default sound 90
Default Sound 91	Default Sound 91.wav	Default sound 91
Default Sound 92	Default Sound 92.wav	Default sound 92
Default Sound 93	Default Sound 93.wav	Default sound 93
Default Sound 94	Default Sound 94.wav	Default sound 94
Default Sound 95	Default Sound 95.wav	Default sound 95
Default Sound 96	Default Sound 96.wav	Default sound 96
Default Sound 97	Default Sound 97.wav	Default sound 97
Default Sound 98	Default Sound 98.wav	Default sound 98
Default Sound 99	Default Sound 99.wav	Default sound 99
Default Sound 100	Default Sound 100.wav	Default sound 100



Background List

This list shows the type of background picture that appears on the LEGO® Education WeDo™ Software Canvas when you use the Display Background Block with the Number Input shown.



Shortcut List

This list shows keyboard shortcuts for working with the LEGO Education WeDo™ Software.

Press **Escape** to stop motion and programs.

Press the **Shift** key and left click on a block or an input to select it.

Press the **Ctrl** key and drag to select and copy blocks.

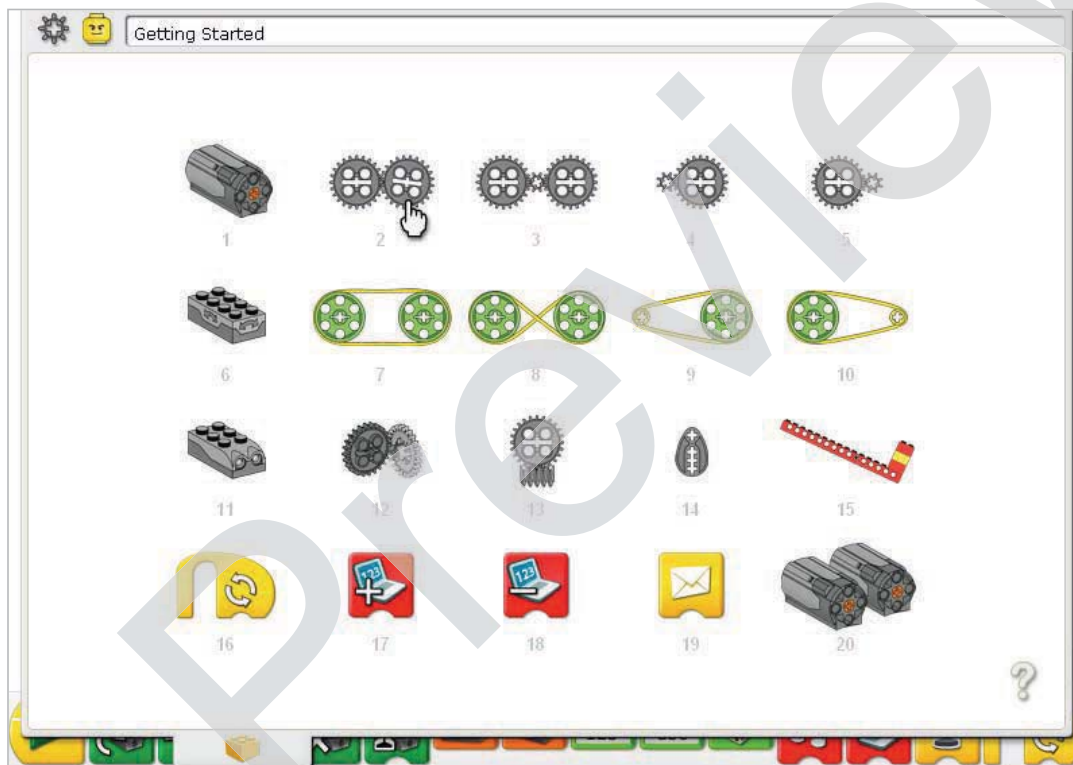
Preview

Getting Started

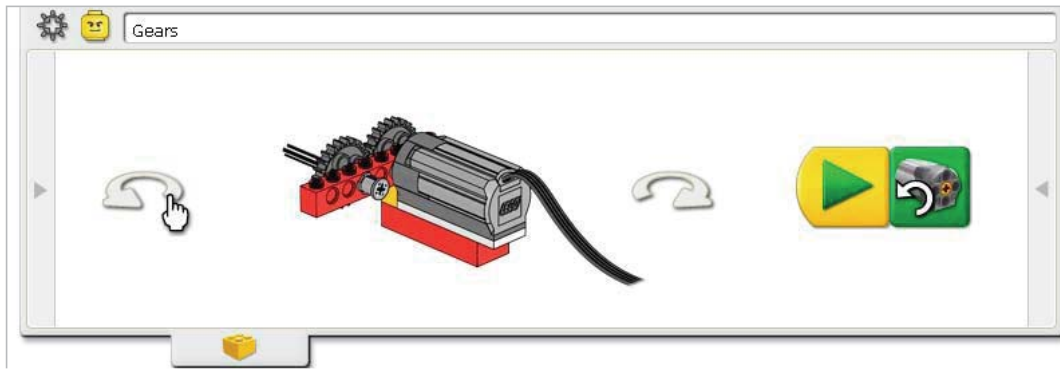
Overview

Getting Started shows fundamental building and programming ideas. These ideas are a useful reference for the themed Activities. Getting Started also provides examples that can be built and programmed as stand-alone lessons to aid students' understanding of science and programming concepts. See the section Lesson Planning Routes for more details about using Getting Started with the themed Activities.

From the LEGO® Education WeDo™ Software, click the Content Tab, then click the Gear button to see the Getting Started menu.

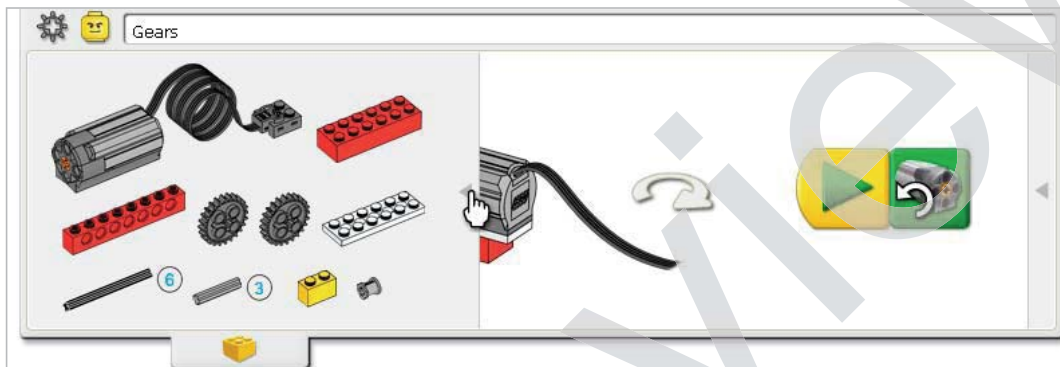


Click on a menu item to select it.

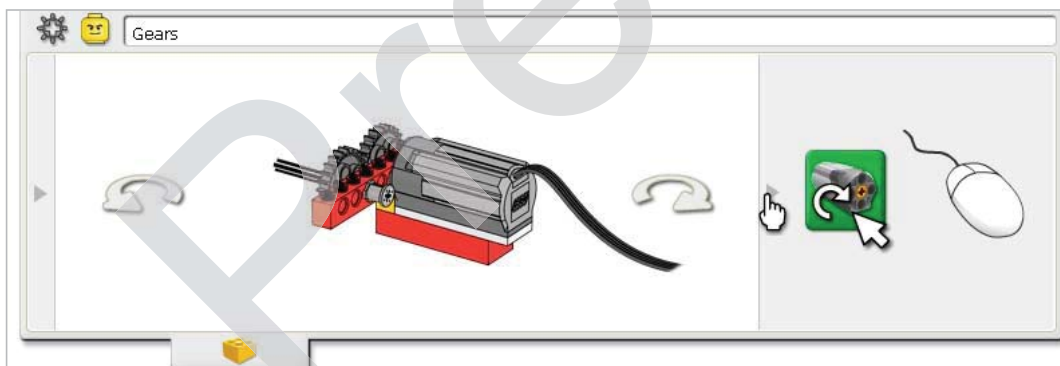


To rotate the model, click the arrows on the right or left.

The Content Tab is open halfway so you can create the program example yourself using the LEGO® Education WeDo™ Software Canvas below.



Click on the left side arrow to open the list of LEGO elements you need to build the model.



Sometimes a Programming Tip is included. Click on the right side arrow to open the Programming Tip.

Click the Gear button in the top left corner to go back to the Getting Started menu.



Engage students in learning by using the icons to create a story or a poem.



Use the icons to create a story or a poem.

Pages 27 to 47 are not included in this Curriculum Pack Preview

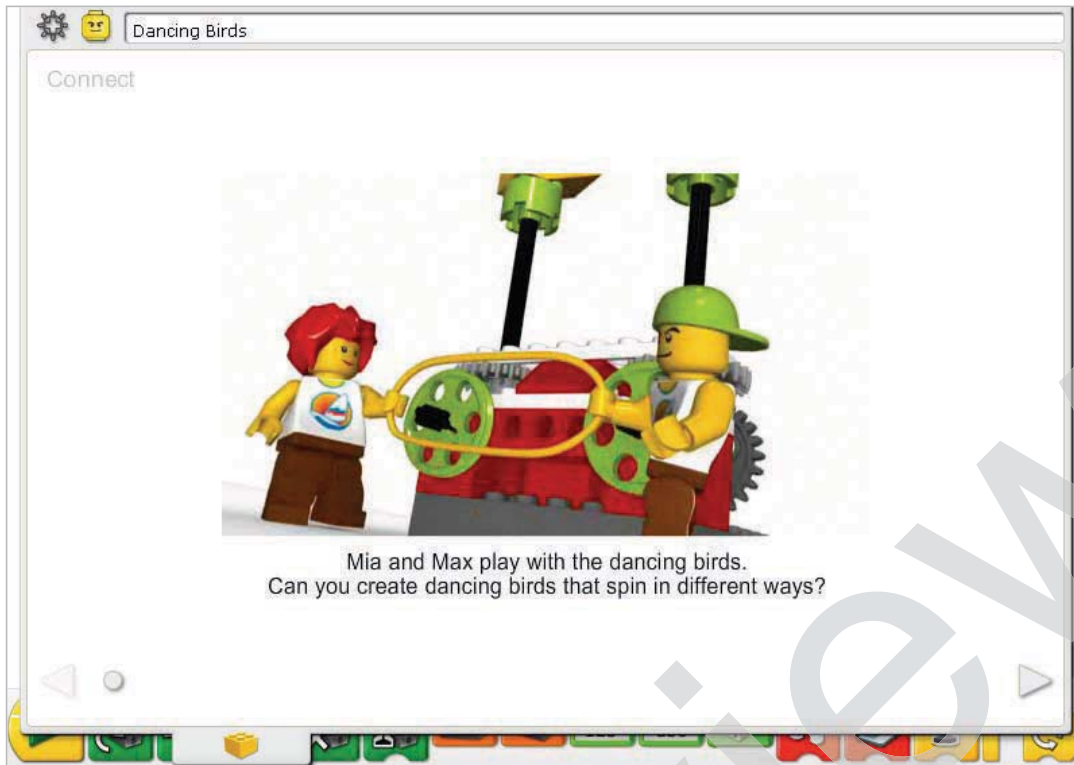
Teacher Notes for the Activities

Overview

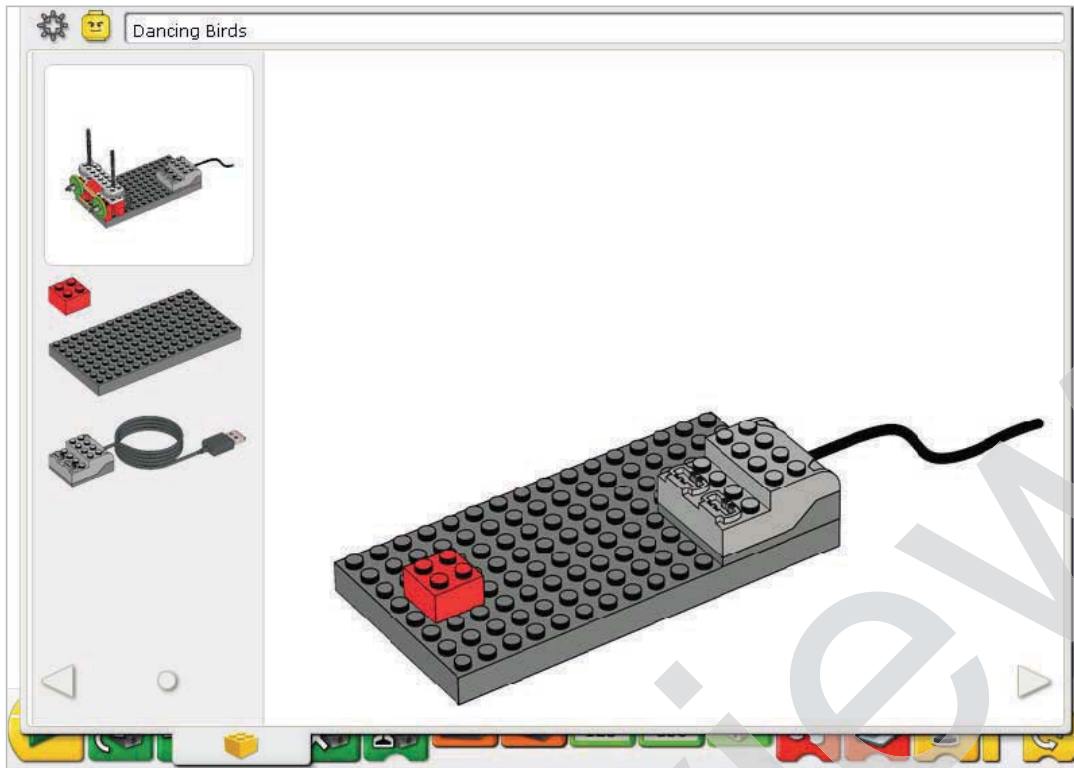
From the LEGO® Education WeDo™ Software, click the Content Tab then click the minifigure head button to see the Activities menu.



Click to open an activity.

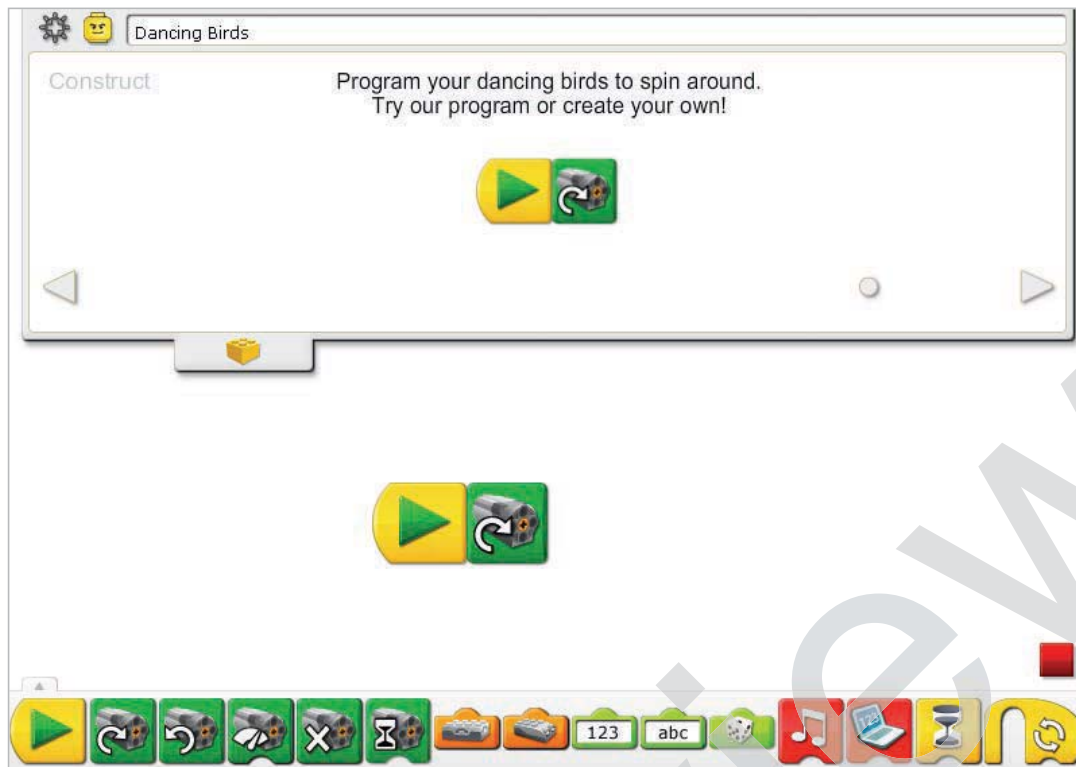


The movie starts automatically. Click on the movie to see it again.
Click the right arrow to go to the next step.



On the building instructions pages, the elements you need for each step are shown on the left.

Click the right arrow to go to the next step. Click the left arrow to go the previous step. You can also click and drag the ball to move more quickly to a page.



On the programming instructions pages, the Content Tab is open halfway so you can create the program example yourself using the LEGO® Education WeDo™ Software Canvas below.

Move the pointer over a Block to see a description of what that Block does in the program.

See the Teacher Notes following for support using the Activities in your classroom.

Click the minifigure head button to go back to the Activities menu.



Teacher Notes for the Activities: Amazing Mechanisms





1. Dancing Birds Teacher Notes

Students will build and program two mechanical birds that make sounds and are motorized to dance using a pulley and belt drive system.

Objectives

Science

Trace the transmission of motion and transfer of energy through the machine. Identify the pulleys and belt drive mechanism, and the effect changing the belt has on the direction and speed of the dancing birds' movement.

Technology

Create a programmable model to demonstrate the knowledge and operation of digital tools and technological systems.

Engineering

Build and test the dancing birds' movement.

Modify the dancing behavior by changing the pulleys and belt to affect the speed and direction of motion.

Mathematics

Understand how the diameter of the pulleys affects the speed of the dancing birds' movement.

Compare the diameter and rotational speed as a ratio.

Understand and use numbers to represent the amount of time the motor is turned on in seconds and in tenths of seconds.

Language

Communicate in spoken or written forms using the appropriate vocabulary.

Vocabulary

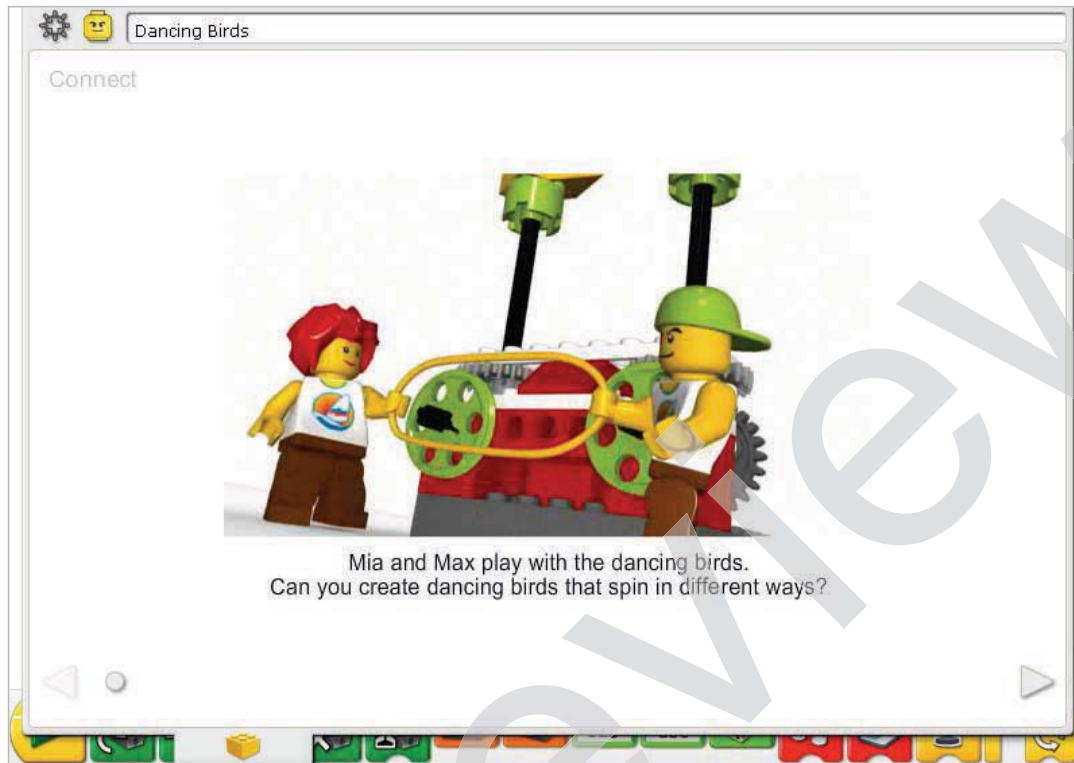
Belt, pulley, and random. Blocks: Motor Power, Motor This Way, Motor That Way, Random Input, Play Sound, Repeat, Start, and Wait For.



Connect

Review the Connect animation and discuss:

What do Mia and Max see when they look at the birds turning?
Can the birds go in the same direction? Opposite directions?
What is making the birds move?



Here are other ways of connecting:

Split into teams of three. Place two students inside a hula hoop or in a long rope tied together to form a circle. Hold onto the hoop or rope. The third student pushes the hoop or one of the students inside the circle to make them turn. What happens to the other student inside the hoop? That student turns the same direction.

Did you know...

The dancing birds are moving because they are connected with pulleys and a belt? See the models in Getting Started:

- 7. Pulleys and Belt
- 8. Crossed Belt
- 9. Decrease Speed
- 10. Increase Speed

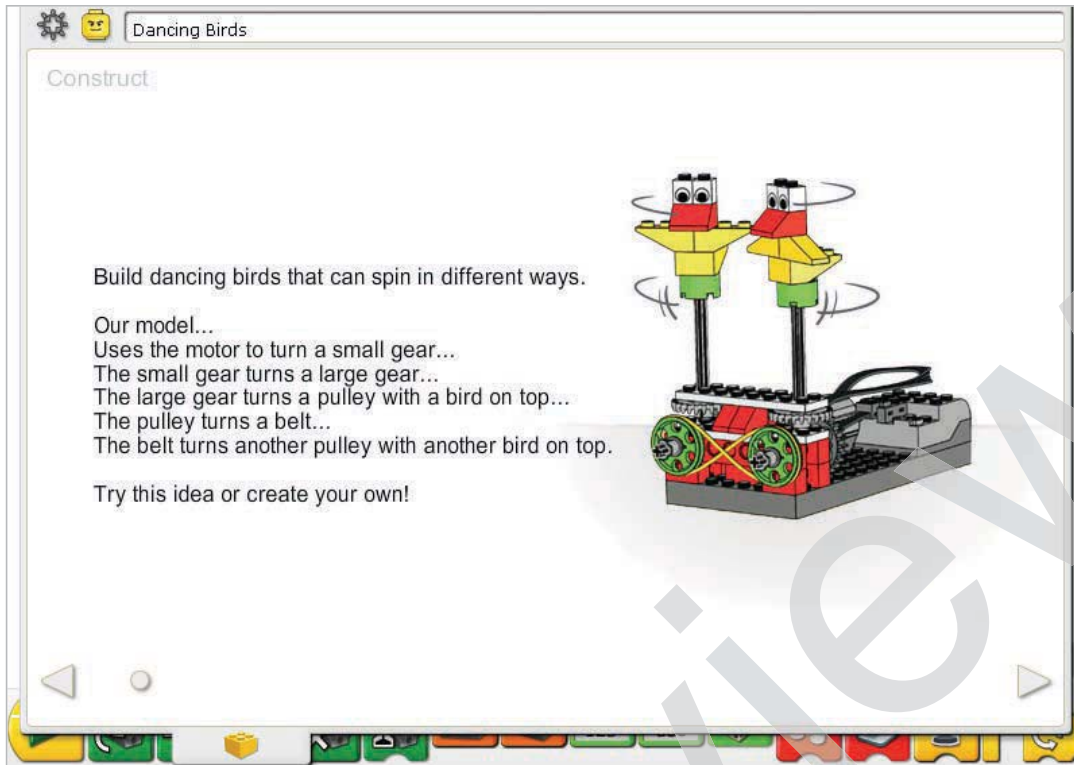
How can you reverse the direction of one of the pulleys?

Cross the belt.

How do you make one pulley spin faster than the other?

Change one pulley to a pulley with a smaller diameter.

Construct



Build the model following step-by-step instructions or create your own dancing birds. If you create your own, you may need to change the example program.

To operate the dancing birds best, make sure the pulleys and belt on the front of the model can move freely.

The energy transfers from the computer powering the motor to the small gear. The small gear turns a large gear. The large gear is connected on the same axle as a pulley so the pulley turns also. The pulley has a bird mechanism on top that turns as the pulley turns. Also connected to the pulley is a belt. As the pulley turns, the belt turns. The belt then turns another pulley with another bird on top. The speed of the birds can be changed by shifting the belt from the larger pulley to the smaller pulley on one side or the other. The direction of the birds can be changed by crossing or uncrossing the belt.

The energy changes from electrical (the computer and motor) to mechanical (physical movement of the gears, pulleys and belts, and axles).

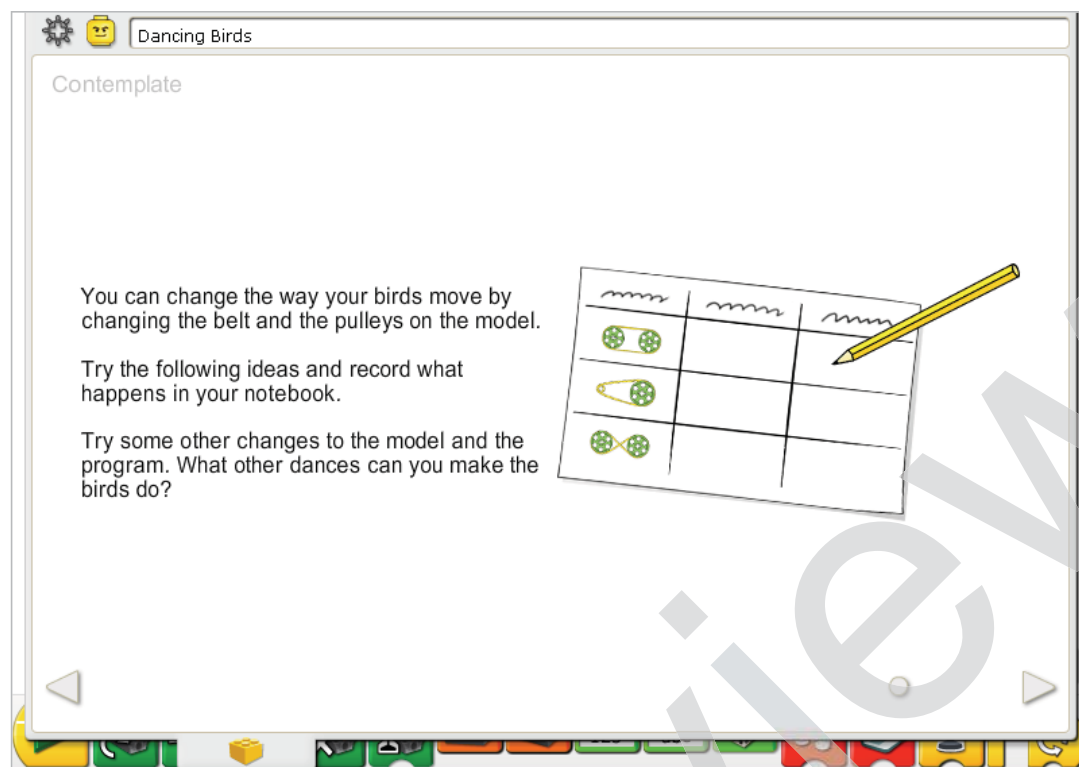


The dancing birds program uses the Start and the Motor This Way Blocks to turn on the motor.

The power level can be changed using the Motor Power Block if desired. More complex programs are shown in the Continue section of this activity.

See Getting Started for more examples with the Start and Motor This Way Blocks.

Contemplate



Set up enough space to experiment with the pulleys and belt and make notes of your observations.

Draw a data table on a separate sheet of paper.

Use the data table to record the changes in the pulley and belt positions and the effect on the speed and direction of the dancing birds.

After investigating the pulleys and belt, discuss conclusions to the data tables.

Use your hands to show how the birds move when the large pulleys are connected and the belt is not crossed as shown in the first line of the chart.

The birds turn the same direction and move the same speed.

What happens when you move the belt from one large pulley to the smaller pulley as shown in the second line of the chart?

The speed of the smaller pulley increases and so does the speed of the dancing bird connected to the smaller pulley.

What happens when you cross the belt so that it looks like a sideways figure 8 around the two pulleys as shown in the third line of the chart?

The pulleys and the two birds connected to the pulleys spin in opposite directions.

Alternative ideas...

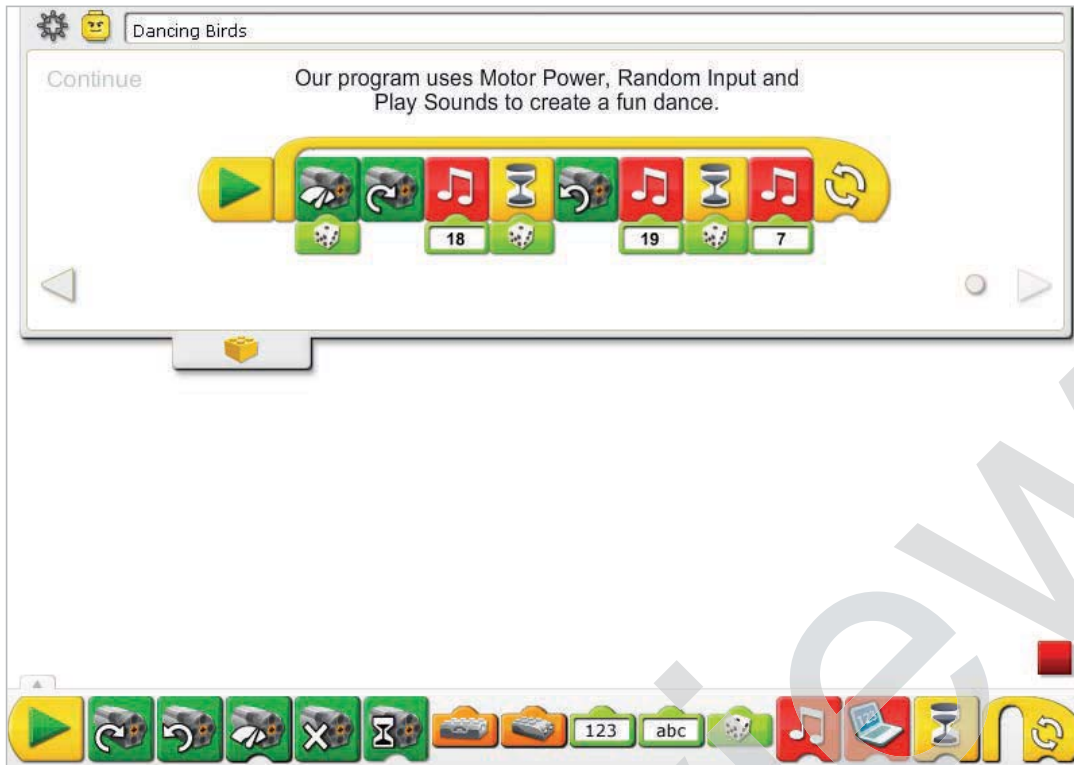
How much faster do the birds dance when they are on the small pulley compared to the large pulley? Work in pairs so that one person counts the rotations of one bird and the other person counts the rotations of the other bird. How much faster is the bird on the smaller pulley?

About 3-4 times faster. You can also measure the diameter of the pulleys. The ratio of the small to large pulley is about 1:3.8.

Continue



There are no building instruction changes required in this activity. Change the pulleys and belt to create a dancing pattern you prefer.



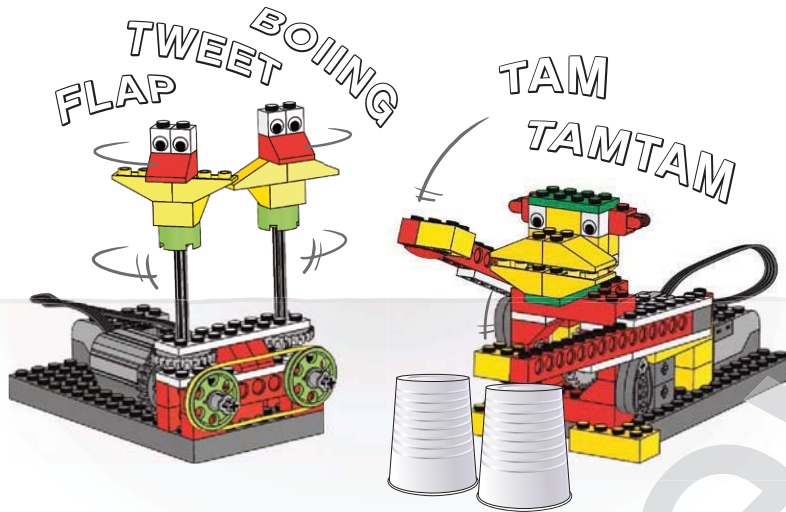
The Dancing Birds program is modified to change the power level of the motor randomly, play a sound, wait, change the motor direction and play two more sounds with a pause in between. The program repeats.

See the LEGO® Education WeDo™ Software section for the Sound List referencing the Play Sound Block numbers with descriptive names.

See Getting Started for more examples with the Motor Power, Motor This Way, Motor That Way, Play Sound, Random Input, Repeat and Wait For.

Extension

Join with another team that has a drumming monkey model. Program the monkey and the dancing birds to play and dance together.





2. Smart Spinner Teacher Notes

Students will learn how to use the Smart Spinner to create a probability model for a game.

Objectives

Students will be able to create a probability model for a game using the Smart Spinner.

Materials

Smart Spinner, probability model, game board, game pieces, game rules.

Procedure

1. Students will create a probability model for a game using the Smart Spinner.

2. Students will use the Smart Spinner to create a probability model for a game.



Connect

Students will be able to identify the main idea and supporting details of a text. They will be able to identify the main idea and supporting details of a text. They will be able to identify the main idea and supporting details of a text.



Be Inspired! Programs to Explore

Try the programs shown here to explore the LEGO® Education WeDo™ Software. Some behaviors are more advanced and may require experimentation and repetition. What kind of model can you create for these programs?

1. Super Random Wait

How long does it take for the sound to play?



2. Lottery

Run the programs to see who wins the lottery.



3. Keyboard Control

With the arrow keys, you are in control of the motor power.



4. Voice Control

Speak and then watch what happens to the motor power.



5. Joystick Control

Move the tilt sensor up or down and watch what happens to the motor direction.



6. Tilt Power

Tilt the sensor and watch what happens to the motor power.



7. Sound Shuffle

Play sounds 1-10 randomly.



8. Background Shuffle

Display backgrounds 1-10 randomly.



9. Sound Blaster

Play all the sounds.



10. Background Blaster

Display all the backgrounds.



11. Parrot

Speak and then listen for a reaction.



12. Count Down

Start the program and watch what happens when the count reaches 0.



13. Whistle Motor

For how long can you whistle the same note?



14. Vault

Start the program and type in your secret code. Can you unlock the vault?



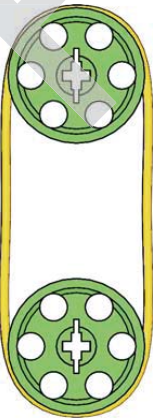
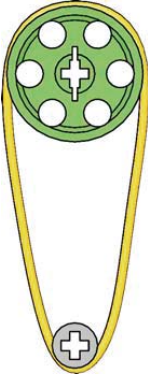
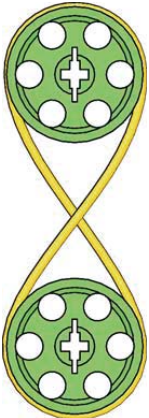
15. Random Chain Reaction

Right-click any program to start and watch what happens.



Activity Data Tables

Amazing Mechanisms: 1. Dancing Birds

How Bird 2 Turns			
How Bird 1 Turns			
Belt			

Amazing Mechanisms: 2. Smart Spinner

How many wheels does the spinner have?			
2			
4			

Amazing Mechanisms: 3. Drumming Monkey

Preview

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