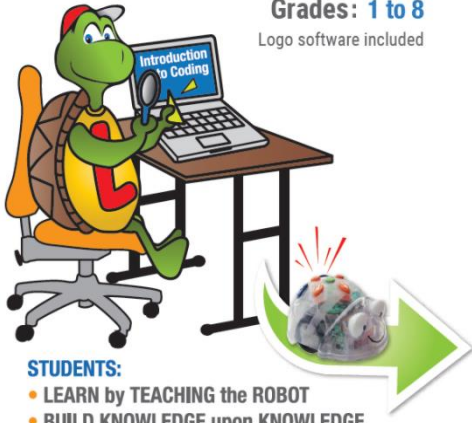


Introduction to Coding through Robotics & Logo with a Math Focus

INTRODUCTION to CODING through ROBOTICS & LOGO

Grades: 1 to 8
Logo software included



STUDENTS:

- LEARN by TEACHING the ROBOT
 - BUILD KNOWLEDGE upon KNOWLEDGE
- ...and have fun doing it!

R. Neufeld

70 Reproducible Sheets Included

(A Hands-On Workshop with Followup Opportunities)

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VIDEO #1 .. 5 min [Coding .. Part 1](#)

This session models a learning environment which encourages one to learn by coding (teaching) a robot. We capture interest through interactive video to introduce code and corresponding action and then encouraging further exploration through hands on activities by giving participants free access to control a robot on their own computer screen.

“This offers an intuitive, simple, yet powerful introduction through lessons to vital coding skills, personal access to a programmable robot on a computer screen, and great activities ... present hands-on opportunities to enrich STEM with a math focus.” ... *NCTM*

The material in this workshop is taken from the eBook above to the left.

It can be accessed at www.umathx.com/coding

Throughout this session we will refer to certain pages of the eBook.

You and your group can access them now or in your own time.

Introduction

- Check the **Table of Contents** to overview concepts discussed in this session.
- Note Comments in **Forward** and **Preface**.

Coding creates a learning path and gives learners direct participation in and responsibility for their own learning.

Manipulatives move the learner from concrete to abstract. This is critical in learning of and the understanding of mathematics.

Robots engage the minds of students in rich, exploratory, open-ended enquiries, thereby creating, “Communities of Innovation”

- Teachers and parents make learning possible for all by establishing an environment of trust for risk taking.

- **For the Flow of our Learning today:**

Step 1: We begin with activities for self movement for the “person robot”

Step 2: Follow that with activities with a mechanical robot, a Blue-Bot

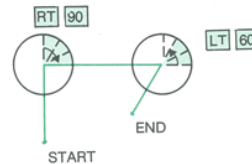
Step 3: Then the robot moves to the computer or tablet, controlled by keyboard. **Our hands-on activities in this workshop begin here.**



Step 1 .. First Steps to Coding

On (pg 17 ebook)

A person walks the code




shown here.



Step 2 .. Code a Floor Robot ..The Blue-Bot with KEYS

On (pg 27 ebook)

Prediction Activity Chart (RS#5 allows for duplication)

Blue-Bot CODE	PREDICT the path Blue-Bot will create	TEST The ACTION
XX ↑ ↗ ↓ GO		

In Step 2 .. we then move to ..

.. Code a Floor Robot ..The Blue-Bot by Tablet or Computer

The **Blue-Bot** brings **Science, Technology, Engineering and Mathematics** into the classroom and builds foundational skills for lifelong learning.

One can move the Blue-Bot forward, backward, turn left and turn right and teach sequencing, directionality, problem-solving, counting and estimation.

End of VIDEO #1:

A short live discussion & demonstration

- Summarize concepts in Video #1
- Demo Person-Robot & Blue-Bot

CODING Through ROBOTICS models TEACHING through UNDERSTANDING.

VIDEO #2 .. 8 min ..Introduce LOGO Environment & First Commands .. Coding .. Part 2



In Step 3 .. Ch 3 - 9 .. Coding on Logo Computer Screen On (pg 57 ebook)

Coding has become a vital skill for the 21st century.

It gives learners direct participation in and responsibility for their own learning.

The Computer Language, **LOGO**, models a **Learning Environment** which encourages one to **Teach** rather than to simply **Tell**.

Logo is a simple, yet powerful visual coding language.

Dr. Seymour Papert of MIT, developed a powerful coding language, LOGO, which uses code to direct a robot on the floor or on the computer screen.

LOGO is A MODEL FOR LEARNING ... one LEARNS from MISTAKES.

In examples, we learn by teaching a robot

In the first example, in 1990 in working with a hearing impaired class.

In 2020, we are working with the Blue-Bot

Logo is referred to as ... the **Language of Learning**.

The robot speaks mathematics, and through the use of challenges .. participants will discover how mathematics can build structure and design.

In this session we will ..

- Give access to coding and robotics to capture the interest of participants in interacting with mathematical concepts using video and exploring further, hands on activities.
- Give participants **FREE ACCESS** to a robot on your own computer screen as well as guided activities for you to follow along, if you wish, during this virtual or live session as well as after this session.

For free complete functionality to the Terrapin LOGO Learning Environment on your own computer, enter the following URL ...

<https://weblogo.terrapinlogo.com>

The following will appear:

Log in:



with Login Code



with Classroom Name

Click on the second graphic.

Then enter the .. CLASSROOM NAME .. that you will be given for this session.

Two Panels will appear



Graphics



>

The **GRAPHICS PANEL** has a robot at the center.

The **LISTENER PANEL** is where one writes code to command the robot.

Our examples will demonstrate the **LOGO LEARNING ENVIRONMENT**.

At the End of VIDEO #2: Give participants the PASSWORD

We summarize concepts and give time do simple coding in LOGO

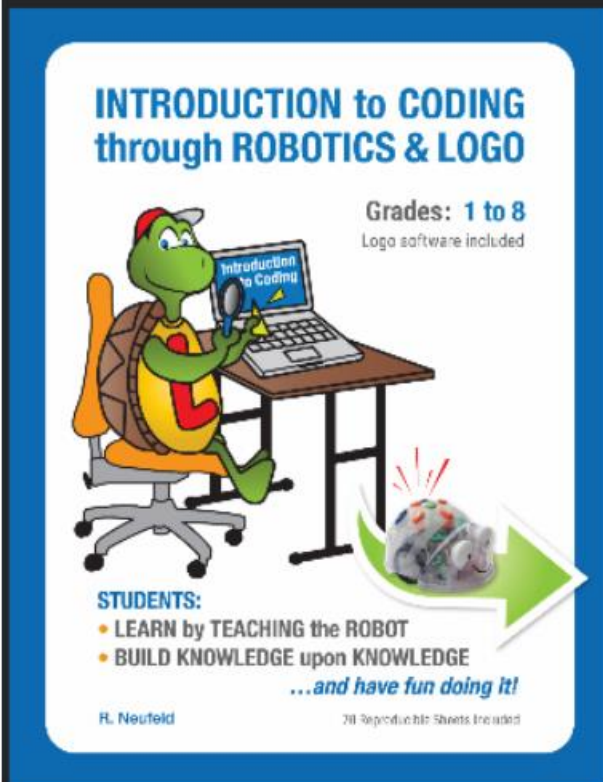
Video #3 ... Coding .. Part 3

TIME: 10 minutes

Extension of CODING Through ROBOTICS & LOGO with a Math Focus

The following appeared in their “TurtleTalk Newsletter” by Terrapin Inc, creators of LOGO, in 2021 ...

Logo, Robotics, and Math - Oh My!



New curriculum from **Neufeld Learning Systems** brings a fresh perspective to coding with **Terrapin Logo** and **Blue-Bot**. **Introduction to Coding through Robotics & Logo** leads students into an amazing world rich in math concepts. Students follow step-by-step instruction and examples to play robot, code **Blue-Bot** directly and interactively, and then into the mathematically immersive world of the Logo turtle.

Each chapter offers objectives and a plethora of fun activities to achieve them. Students lead themselves through the sequential exercises. The curriculum includes **Terrapin Logo** and a discount on **Blue-Bot**.

PLAN in Part 3 of the workshop:

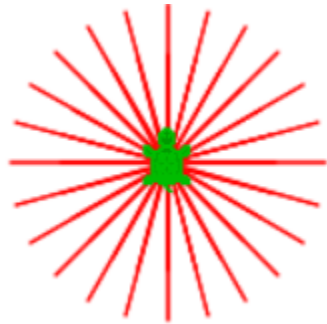
We will work with a few of the “fun activities” referred to in the “turtletalk newsletter” above.

You and your group may want to log into LOGO on your computer.

Recall that you were given the LOGIN PASSWORD to LOGO in Video #2.

Please see **eBook Page 61** ACTIVITY #1: INVESTIGATE, PREDICT, JOURNAL

Please see **eBook page 77**.



Predict .. Discuss a set of code that would result in the above design.

Test your prediction with LOGO on your computer.

Now **Pause** the video briefly to **discuss** your prediction Pause for 30 seconds.

Now **discuss** and **TEST** the 2 lines of code above the red design in the eBook on page 77 on your computer

PAUSE & DISCUSS .. SLOWTURTLE SETPC 12 SETWIDTH 1

REPEAT 24[FD 43 BK 43 RT 15]

TEST IT. Ah .. 24 X 15 = 360

Please see **eBook Page 88**

Read through the lines of text from the top of the page.

to the end of the second line of code.

>PD SETWIDTH 3 SLOWTURTLE

>SETPC 2 FD 80 SETPC 4 REPEAT 90 [FD 50 BK 50 RT 1] <enter>

DISCUSS code to generate the following on eBook page 88.



TEST the code using LOGO on your computer.

From diagrams above, in a SQUARE, 4 Exterior Turns are all the same.

They add up to a circle. Hence they add up to 360 degrees.

The CODE FOR DESIGNING A SQUARE IS ... _??_____

... REPEAT 4[FD 50 RT 90]

...

CONCEPT: LOGO in ..

Building New Learning on Existing Knowledge

See eBook page 122 ..

In Chapter 5, we will simplify our work by teaching the turtle a new lesson called a PROCEDURE based on previous command.

Note the graphics at the top of page 122.

The turtle is taught lessons.

It goes to school.

In the examples below, we will only give an overview.

We suggest that you and your group use the eBook for more steps to help in discussions leading to understanding.

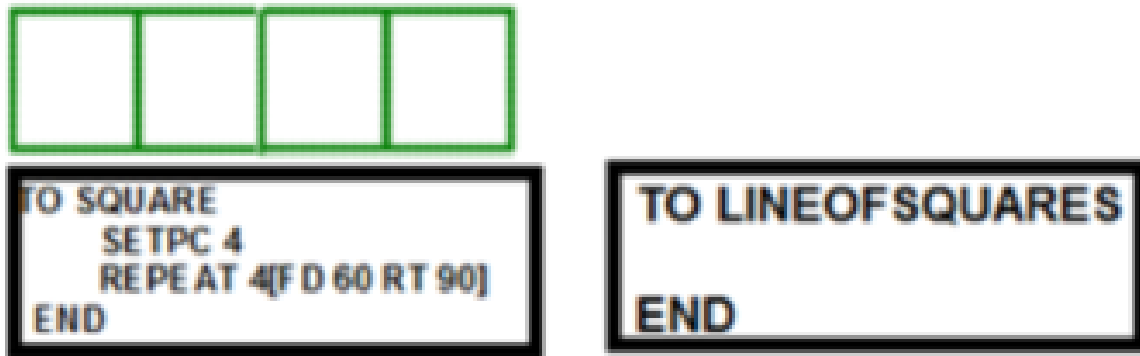
Refer to and read the selected lines on page 122.

In Overview ... To this point etc etc

In Concepts ... Understand that a procedure .. etc

We will build lessons and lessons on lessons.

TRY THIS: Consider the graphic and parts of the procedures below.



For the above, we will teach a lesson ... SQUARE within LOGO on your computer.

If you need help, recall the process by checking in Video #2.

Key in TO SQUARE in the listener window and TO SQUARE appears in the Editor window.

Then use SQUARE to teach LINEOFSQUARES

Try this yourself or with a group.

Now TRY the Following:

Key in TO SQUARE in the listener window

The Editor window will appear.

Complete the commands for SQUARE

Then click RUN and SQUARE is defined.

Then remember to TEST the lesson.

Key in SQUARE. Then adjust it by adding SLOWTURTLE within SQUARE.

Now teach LINEOFSQUARES using SQUARE by keying in TO LINEOFSQUARES in the Listener Window.

You will be asked to overwrite. Simply continue.

Then within LINEOFSQUARES, add .. REPEAT 4[SQUARE RT 90 FD 60 LT 90]

Test the lesson LINEOFSQUARES by entering .. LINEOFSQUARES in the listener window.

Make additional changes, press RUN and then TEST on your computer again.

Review and discuss the process.

.....

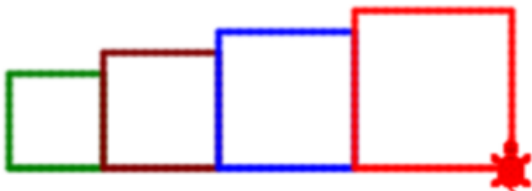
We will now introduce **VARIABLES** in lessons or procedures

We show the first page of Chapter 6.. *Coding with Variables* on pg 152 Ebook

In the Overview, “In this chapter, we will learn how to code using *a powerful tool, a PLACEHOLDER or a VARIABLE.*

On page 157 .. Our Task.

TEACH Chinese Nested Boxes with ONE VARIABLE



See page 157 and 161 of eBook .. to give you some ideas however you are not given full information here.

On Page 161 .. the procedure, BOX :L is shown.

Teach and Test the procedure BOX :L on page 161

When the value of L is 30, simply enter BOX 30 .. to substitute 30 for :L

Note that : before a letter or set of letters indicates that it is a variable.

... investigate ... TEACH, TEST, ADAPT using variables.

.....

We introduce RECURSION. See pages 182, 183 in eBook.



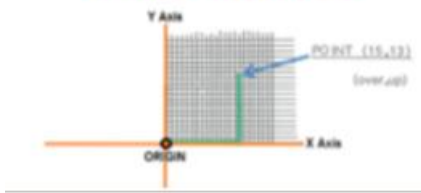
Teach the lessons ... **SQUARE** and **WORK1**.

Then teach **WORK2**, first example of **RECURSION**

See pg 196 to get ideas for stopping a runaway turtle.

Consider the LOGO learning environment in THE X-Y PLANE

The Address



Please see eBook pages 202 and 207

Read through Part A on page 202

Read through and test the new commands,

SETXY and SETPOS are at the bottom of page 207.

.....

FINALLY .. We will introduce PROJECTS WITH MULTIPLE TURTLES

We introduce a process for New Learning noted on page 233.

First **Explore**

Then do your best to **Describe** the function of given code.

Then **Predict – Test – Explain – Followup**.

Show page 237 on eBook. Use Logo on your computer to explore the functions

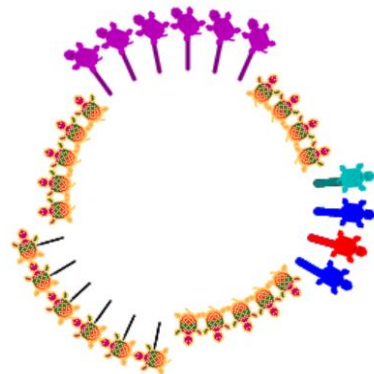
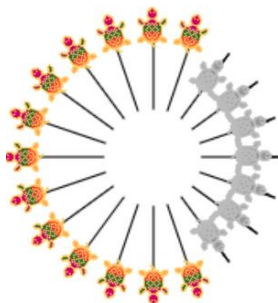
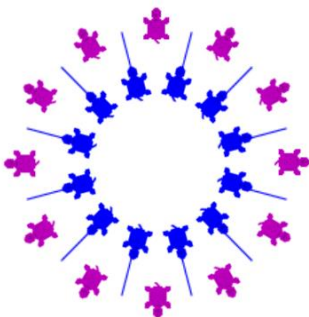
...

CTURTLES 20

TELLALL

The result will be groups of interacting turtles like the following...

Investigate by experimenting and challenging groups in a class.



THANK YOU !!