



Logo Stepping Stones for Young Minds

by

Jan Cardwell

Logo was originally designed so that its commands could be readily understood by school aged children. It has been very successful with students who can read and conceptualize symbols and graphics. But what about young children who have not yet learned to read?

Educators of the very young know that their students are eager to learn more about their environment, what makes it work, and how to control it. These children, when presented with material in the proper manner, can learn things which are not usually found in the preschool curriculum. The use of Logo is one such example.

In teaching Logo to young children at St. Anne's - Belfield Preschool, I found a clue to success. The concept of the turtle must be introduced in terms the young mind can comprehend. These terms first must make the turtle a concrete image, then clarify the concept of giving a command, and finally provide the opportunity for practice of skills (repetition).

When I did this in a series of motivating stepping stone activities, the children learned readily and easily. Additionally, they all had a lot of fun!

Here is a sequence of Logo skill building tools Etta Legner and I have used with our preschool children during the past year. With this Logo sequence, it was possible to accommodate the needs of a variety of learning styles: individually and by group; both teacher directed and student directed.

Traveling Triangle Turtle. This stuffed triangular shaped turtle becomes the children's first encounter with Logo. I initially guided their learning with questions, leading them to discovery of the movement and turn commands in a natural way. Then, as the children called out the commands, I moved the turtle for them. Early mastery of these commands with the "concrete" turtle seemed to facilitate the later transfer to the more abstract screen turtle. Also see Instructor Magazine, October 1983, page 166. For a free copy of the turtle pattern, send a stamped self addressed envelope to Jan Cardwell Turtle, St. Anne's - Belfield Preschool, 2132 Ivy Road, Charlottesville VA 22903.

Large Turtle Graphics. The traveling triangle turtle, equipped with a marker as its tail, traced its path as I moved it around on large sheets of paper mounted on a low table or on the floor. Students gave commands which I wrote down on a poster. The students counted the steps as I moved the turtle through the drawing. This idea is similar to using the robot turtles advertised, but is much less expensive!

Turtle Sandbox. Here was an opportunity for child directed learning and practice. Children moved plastic turtles around in a large tray or sandbox partially filled with sand or sawdust according to commands from each other. As the turtles moved, they left a furrow as a trace of their movement. The children copied the commands they used from a display chart. Thus, they saw the written commands as well as the graphic results in the sand. I set up our sandbox area to be used individually during center time (free choice) after a brief introduction.

Turtle Pencils. Students used pencils with paper triangular turtle shapes attached to draw on monitor screen outlines reproduced on paper. Drawings were produced according to turtle commands from me and from other students. Note that the sequence is leading up to closer association with the computer.

Stepping Stones continued

Turtle Magnets. I pasted turtle cutouts and triangular shapes onto small magnets. Then, the children moved these turtles around on metal cookie sheets. At first, I called out commands to them. Then they enjoyed giving each other commands. Later, I had the children tilt their cookie sheets to a vertical position, so they could discover that FORWARD still meant the same thing, regardless of how the cookie sheet was oriented. The transfer to the computer screen from this activity was a natural extension of what they had been doing, with little of the usual confusion of turtle orientation.

I believe that learning experiences in a sequence such as this should be presented to young children well before their first exposure to the computer. The introduction of the triangle shape on the computer screen should be the last step in a series leading from the highly concrete turtle shape (stuffed traveling triangle turtle) to the more abstract (turtle magnet).

For very young children, the added mystique of the "magic" computer turtle movements is especially motivating. It greatly enables children to personify the turtle. This makes it easier for the young to identify with the turtle when using the Logo commands and walking like a turtle.

When it comes to teaching young students about Logo and the computer, the only limit is the teacher's imagination. Success is determined by the educator's ability to bring concepts to students in a form they can appreciate and with which they can personally relate.

Jan Cardwell teaches in the preschool of St. Anne's - Belfield, a private school in Charlottesville, VA, and has published several Logo teaching tips in national educational periodicals.

NOVA Information

For information on transcripts and copies of the October 25 NOVA program which featured Seymour Papert and Logo, write to WGBH, 125 Western Avenue, Boston MA 02134, or call (617) 492-2777.

From The Editor

Over the years, my wife has given me many wonderful gifts. As I was sitting in church a few Sundays ago, the preacher said something which reminded me of a very special gift she gave me before we were married.

The sermon was on persistence, and the anecdote was about the classic race between the tortoise and the hare. (Of course, anything about a turtle claims my immediate attention!) The minister told how the hare jumped around all over the place, while the turtle persistently kept going forward a little at a time. By this point, I was leaning forward myself, in rapt attention.

As the story ended and the sermon turned toward heavier thoughts, I must confess that my mind wandered back in time to 1966. In that year, Posy presented to me a small book entitled, The Marvelous March of Jean Francois, by John Raymond. Published by Doubleday, it was barely 60 pages long.

It chronicled the adventures of a mythical drummer boy in Napoleon's army. The young lad fell under the spell of his charismatic commander's orders, "March forward, ever forward!" His dedication to these instructions led him on a fantastic journey around the world, full of excitement and interesting experiences.

The lesson of the book, of course, is similar to that of the tortoise and the hare. Problems can be solved, progress measured, challenges overcome, if we keep moving forward, ever forward.

Embedded here are implications for the Logo learning environment which merit serious thought. Isn't it a fortuitous coincidence that the drummer boy's movement was directed by the FORWARD command?

Let us all do our best to make progress toward our chosen personal and professional goals. In so doing, we will not only be coming closer to accomplishing what we set out to do; we will also be doing what the little drummer boy did for me: serving as an example of persistence for others.

FD EVER FD 100!



TIPPS for TEACHERS

by
Steve Tipps

Both Sides Now

In the strict mathematical sense, symmetry refers to the exact correspondence of shapes or figures around one or more axes. A more general definition of symmetry refers to correspondence or equivalence of events or objects in everyday life.

Recognition of symmetry is a thinking skill which is first cousin to recognition of patterns. Instead of being an exact repetition, symmetry requires recognition of movements which are moved or reversed or rotated. Logo can be used to create symmetrical designs and discover the rules needed to achieve symmetry.

USING MIRRORS TO DISCOVER SYMMETRY

The simplest form of symmetry is illustrated when a mirror reflects a pattern or design. Many commercial materials are available for mirror activities with pattern blocks and task cards. The same activities can be done with small metal or plastic mirrors from the drugstore or variety store. (Avoid cheap glass mirrors because they break easily.)

When a mirror is placed upright on a page of a book, a piece of wood, a large alphabet letter, a picture of a face, or an abstract design, it reflects exactly what is there. This is sometimes called folding symmetry because the line which the edge of the mirror makes is a fold line. The images on either side are exact duplicates from the fold line out.

Whether representational or abstract, the design and its mirror image complete a pattern. If the original design has a meaning in which directionality is essential, the mirror image has the reverse (reflected) direction. A child in front of the mirror raises a left hand; the image raises its right hand.

Print the word HELP in block letters on a piece of paper. Holding the mirror vertically, place the edge on the leftmost line of the H and observe the HELP reflection.

HELP

The design is still HELP, but the mirror image has the letters in reverse order and "wrong-side" out.

Some designs are already symmetric and have a natural fold line. The mirror can be put on the E so that half of it is covered up, but the visible part of the E and the mirror image together still form the letter. Try to find a fold line or lines for the H, L, P, S, T, etc., as well as other designs.

Students can make symmetric pictures by folding construction paper in half. When paint blobs are placed on one side of the folded paper and the other side is folded over, the result is a symmetrical "blob" picture.

String paintings can be done in the same way with the string dipped in paint and placed on one side of the paper. After the paper is folded over, the string is pulled out, leaving a symmetrical swirled design on both sides.

LOGO LINE OF SYMMETRY

Creating designs which are symmetric to a fold line entails development and refinement of many Logo skills. A vertical line drawn down through the middle of the screen divides the turtle world into a side for a design and a side for a mirror image.

Starting at HOME, a SQUARE.RIGHT will draw on the right side of the fold line.

```
TO SQUARE.RIGHT  
  REPEAT 4 [ FD 80 RT 90 ]  
END
```

This procedure also could be used to draw the mirror image on the left side by either LT 90 SQUARE.RIGHT or FD 80 RT 180 SQUARE.RIGHT. The results would be adjacent squares on either side of the fold line. The process, however, is not symmetrical. Making symmetric designs in a symmetrical manner requires skill with direction moves.

The following exercise is both fun and instructive. Hold a mirror upright on a piece of paper, as you did when observing HELP. Watch your hand in a mirror while you draw a square. Start with the pencil at the mirror/paper edge. Draw FORWARD along the edge, RIGHT 90, and FORWARD again and so on.

Tips continued

During each move note any differences between the drawn design and the mirror image. Does RIGHT in the design become LEFT in the image? Directionality is the main change in symmetrically drawing symmetrical images.

The symmetrical procedure corresponding to SQUARE.RIGHT is SQUARE.LEFT.

TO SQUARE.LEFT

```
REPEAT 4 [ FD 80 LT 90 ]  
END
```

A master procedure SQUARES could call both of them and draw the design and its mirror image. Any design which can be drawn on one side of the fold line can also be put on the other side. TRIANGLES, HEXAGONS, CIRCLES, and other regular polygon master procedures are made with appropriate right and procedures.

COMBINING SYMMETRICAL PROCEDURES

After creating a treasury of symmetrical designs, combine them in different combinations. Positioning moves are made along the fold line.

All of the regular polygons have the advantage of state transparency: the turtle returns to its original position and direction. When positioning turns are added, state transparency should be maintained by re-turning the turtle. For instance, with turns of 45, the procedures SQUARE.RIGHT and SQUARE.LEFT can be combined to produce DIAMONDS. TRIANGLE can also be turned to look like a BOWTIE. RECTANGLES rotate to look like wings.

Such ideas for designs are limitless. Abstract designs look like woven blankets. Butterflies and bugs are typical symmetry projects with combinations of all the shapes. I've been working on a leaf project with symmetry. Ideally, the shapes of the leaves and the veins are symmetric. However, children will find that real leaves are not precisely symmetric. People shapes and faces are other projects with many possibilities.

Combining shapes for a design points up the need for variable procedures. SQUARES or DIAMONDS are easier to manipulate if they have variable inputs.

AWAY FROM THE FOLD LINE

Limitations of drawing on the fold line become apparent as students create new projects. Eyes hooked together at the fold line make a funny face. Moving eyes away from the fold line produces more normal looking faces.

The mirror and pencil can be used once more to explore what happens as a line is drawn out and retraced back to the starting point. For a straight line perpendicular to the fold line, the turtle turns RIGHT 90, moves FORWARD, moves BACK, and turns LEFT 90. The mirror turtle makes opposite turns.

The forward and back motion may have been used in designs before to fill in circles or to draw other shapes. Two subprocedures could be created to take the turtle OUT.RIGHT and BACK.RIGHT. Then a subprocedure OUT.AND.BACK.RIGHT calls both of them.

```
TO OUT.RIGHT :ANGLE :DISTANCE  
  RIGHT :ANGLE  
  FORWARD :DISTANCE  
END
```

```
TO BACK.RIGHT :ANGLE :DISTANCE  
  BACK :DISTANCE  
  LEFT :ANGLE  
END
```

```
TO OUT.AND.BACK.RIGHT :ANGLE :DISTANCE  
  OUT.RIGHT :ANGLE :DISTANCE  
  BACK.RIGHT :ANGLE :DISTANCE  
END
```

The mirror procedures for this are OUT.LEFT, BACK.LEFT, and OUT.AND.BACK.LEFT. A master procedure OUT.AND.BACK pairs the symmetric lines.

```
TO OUT.AND.BACK :ANGLE :DISTANCE  
  OUT.AND.BACK.RIGHT :ANGLE :DISTANCE  
  OUT.AND.BACK.LEFT :ANGLE :DISTANCE  
END
```

The separate OUT and BACK procedures on either side are useful with PENUP, PENDOWN, and PENCOLOR to draw isolated shapes or shapes at the end of spokes.

```
PENCOLOR 3 OUT.RIGHT 30 30  
PENCOLOR 5 SQUARE.RIGHT  
PU BACK.RIGHT 30 30 PD
```

The above commands place a square 30 steps away from the fold line at an angle of 30 degrees.

more Tipps

NOT THE STRAIGHT AWAY

Expand the notion of drawing to the left and right symmetrically with ZIGs and ZAGs. Walk and talk through a zig procedure.

"Move forward, turn right,
move forward, turn left."

After a ZIG.RIGHT is drawn, the reverse ZAG.RIGHT is needed to bring the turtle back to the starting position. The most common problem with this step is failing to reverse each movement from the end of the zig description. In this case, the zag would be:

"Turn right, move back,
turn left, move back."

When the zig and zag on the right side are completed, develop ZIG.LEFT and ZAG.LEFT with the same size but the opposite order of direction moves from those of the right side procedures.

Next, symmetric curves can be developed. The lessons from the zigzags are important for creating the reverse actions and the changes in directions for curves on either side of the fold line. For instance, a CURVE.RIGHT with FORWARD and RIGHT would require a CURVE.RIGHT.BACK which uses BACK and LEFT. Curves are good for antennae on insects, eyebrows on faces, mustaches, plumes, and the like.

ALL SIDES OF SYMMETRY

Building symmetrical pictures and designs with Logo demands problem solving with distance and direction in a way which is more involved than simple drawings. The turtle's insistence on being the center of the universe means that the programmer has to constantly adjust his/her commands to obtain the desired symmetrical results.

Projects begin with simple shapes on either side of the fold line. Only the first four primitives are needed. Procedures ease the exploration of more complex designs and possibilities. Input variables to procedures increase the range and speed of symmetrical drawings.

Establishing symmetry as an issue for discovery with Logo opens many new projects which demand thinking and creativity. More

symmetry projects are suggested by Dale Burnett in Logo: An Introduction by Creative Computing Press (Ed Note: see review, NLX Vol 1 # 7 March 1983). Rotational and translational symmetry are included in addition to reflective or mirror symmetry.

Logo versions which have multiple turtles (Atari, Commodore, TRS-80 Color Logo, etc.) offer other methods of showing symmetry. With one turtle, each side must be drawn separately - one after the other. With multiple turtles, lines on the left can be drawn at the same time as those on the right. (Actually, the turtles take turns drawing on either side so that the two squares or two circles appear to be drawn simultaneously.)

Advanced students may want to create a procedure which will accept an instruction or a procedure for drawing on the right hand side and use list operations to transform it into the corresponding instruction or procedure for the left hand side and execute it!

Students may draw on paper or save (SAVEPICT) one side of a symmetric picture as challenges for each other. Drawing on both sides of a symmetric drawing means children will use all sides of Logo. It gives them the opportunity to develop their programming skills and problem solving strategies, and to produce some beautiful artistic work as well. They probably will have a little fun, too!

Steve Tipps is a professor in the University of Virginia's School of Education, and presents Logo workshops for school systems throughout the eastern United States.

The Computing Teacher Announces Logo Issue

The Computing Teacher will be publishing another Logo issue in December, as a followup to their extremely well received November 1982 Logo issue. To reserve your copy now, write to Sharon Franklin, ICCE TCT, University of Oregon, 1787 Agate Street, Eugene OR 97403, or call (503) 686-4414. Better yet, why not start a subscription to this outstanding journal?

MICROWORLDS

by
Glen Bull

Logo Grade Book Part I Grade Averager

Last spring, I discussed some ways of teaching a computer to form plurals through list processing (Ed. note: see NLX Vol 1 #8 & #9, 1983). These techniques can be used to teach the turtle to average grades as well. In this column and the next, I will discuss methods of using Logo to do this.

CHARACTERLISTICS

Before continuing, it may be desirable to review some of the characteristics of lists in Logo. In Logo, a list is anything enclosed between brackets. A list of words can be printed.

```
PRINT [ THIS IS A LIST ]  
THIS IS A LIST
```

A list may consist of just one word:

```
PRINT [ THIS ]  
THIS
```

or even no words at all!

```
PRINT [ ]
```

A list consisting of brackets with nothing in between them is called an empty list. Among other things, an empty list can be used to print a blank line.

LISTS OF NUMBERS

A list can consist of numbers as well as words.

```
MAKE "JOHN'S.Scores [ 89 94 83 91 ]  
PRINT :JOHN'S.Scores  
89 94 83 91
```

It is possible to print either the first item in a list,

```
PRINT FIRST :JOHN'S.Scores  
89
```

or to print everything but the first item in a list.

```
PRINT BUTFIRST :JOHN'S.Scores  
94 83 91
```

LIST OPERATORS

These two list operators (FIRST and BUTFIRST) can be used to gain access to each of the scores in the list, one after the other.

```
TO EXAMINE :SCORES  
  IF :SCORES = [ ] STOP  
  PRINT FIRST :SCORES  
  EXAMINE BUTFIRST :SCORES  
END
```

I was once told that, in England, the telephone is answered with the greeting of "Are you there?" The supposed reason for this is that if no one is there, there is no point in going on. I described this custom in class for a number of years until I was informed that people in England actually do not answer the phone in this way. (Would any of our British Logo Users Group colleagues care to respond?)

I was disappointed, but took solace in the existence of such a custom in Logo. The first line of the procedure EXAMINE asks if the list of scores is empty. If it is empty, of course, there is no point in going on.

If the list of scores is not empty, the first score in the list is printed. In the final line of the procedure, a new list is created, consisting of all but the first score in the list. In this way a series of smaller and smaller lists is created until, at last, the list is empty. Use of the procedure with John's scores produces the following result:

```
EXAMINE :JOHN'S.Scores  
89  
94  
83  
91
```

TRACING THE STEPS

The process in the EXAMINE function is found in so many different uses of lists that it warrants examination in a step-by-step fashion. If you are not familiar with recursion, I invite you to study the process

Microworlds continued

detailed below. In this illustration, the numbers which actually would be used by Logo are shown in place of the variable :JOHN'S.Scores.

TRACE

```
EXAMINE :JOHN'S.Scores
EXECUTING EXAMINE [ 89 94 83 91 ]
IF [ 89 94 83 91 ] = [ ] STOP
PRINT FIRST [ 89 94 83 91 ]
89
EXAMINE BUTFIRST [ 89 94 83 91 ]

EXECUTING EXAMINE [ 94 83 91 ]
IF [ 94 83 91 ] = [ ] STOP
PRINT FIRST [ 94 83 91 ]
94
EXAMINE BUTFIRST [ 94 83 91 ]

EXECUTING EXAMINE [ 83 91 ]
IF [ 83 91 ] = [ ] STOP
PRINT FIRST [ 83 91 ]
83
EXAMINE BUTFIRST [ 83 91 ]

EXECUTING EXAMINE [ 91 ]
IF [ 91 ] = [ ] STOP
PRINT FIRST [ 91 ]
91
EXAMINE BUTFIRST [ 91 ]

EXECUTING EXAMINE [ ]
IF [ ] = [ ] STOP
ENDING EXAMINE
```

SUMMING A LIST

The EXAMINE procedure does not do much, other than allow us to gain access to each score in a list. A slight change will allow us to add the scores and move a step closer to a grade book. To sum the list of scores, the first score in the list is added to a total, initially set to zero.

When all the scores in the list are exhausted, OUTPUT is used to pass the total to an operator, such as PRINT. The parentheses in the last line are not required, but are included in the listing for clarity.

```
TO SUM :Scores :TOTAL
  IF :Scores = [ ] OUTPUT :TOTAL
  OUTPUT SUM (BUTFIRST :Scores) (:TOTAL +
  FIRST :Scores)
END
```

Note that the initial zero state of :TOTAL is set by the input to the procedure.

```
PRINT SUM :JOHN'S.Scores 0
357
```

AVERAGING A LIST

The average of the scores consists of the summed total divided by the number of scores. Another input, :NUMBER, can be used to count the number of scores. At this point, there are now three inputs to the procedure:

- the list of scores
- the summed total of the added scores (initially zero)
- the number of scores in the list (initially zero)

A master procedure which supplies the second and third items minimizes the number of inputs necessary each time a student's scores are averaged.

```
TO AVERAGE :Scores
  OUTPUT AVERAGE.LOOP :Scores 0 0
END

TO AVERAGE.LOOP :Scores :TOTAL :NUMBER
  IF :Scores = [ ] OUTPUT (:TOTAL /
  :NUMBER)
  OUTPUT AVERAGE.LOOP (BUTFIRST :Scores)
  (:TOTAL + FIRST :Scores) (:NUMBER + 1)
END

PRINT AVERAGE :JOHN'S.Scores
89.25
```

ADDING NEW SCORES

There are two other functions which must be added before a usable gradebook is available:

- the ability to modify grades or add new ones
- the ability to save grades

A listing of global variable names (those created through use of a MAKE statement) can be viewed by the use of PRINTOUT NAMES (PONS in Apple (LCSI) Logo).

```
PRINTOUT NAMES
"JOHN'S.Scores IS [ 89 94 83 91 ]
```

These variable names can be edited just as a procedure can, by typing EDIT NAMES (EDNS in Apple (LCSI) Logo). This places Logo in the edit mode. Instead of displaying a procedure in the editor, however, the variable names and corresponding values are displayed instead. After using the editor in the usual way to add new scores or modify existing ones, type CONTROL C to define the new names and return to the text screen.

more Microworlds

When the workspace is saved under a file name, both the procedures and variable names are saved. Although this will make it possible to save both the averaging procedure and the student's grades in the same file, it is esthetically more pleasing to me to save the averaging procedure in one file and students' grades in a separate one. The following sequence is one way this could be accomplished.

- Type in the commands for the procedures AVERAGE and AVERAGE.LOOP

- Verify that they work properly, using a set of trial grades, such as "JOHN'S.SCORES

- Erase all names in the workspace with ERASE NAMES (ERNS in Apple (LCSI) Logo), then save the two procedures in a file name such as "GRADE.AVERAGER

- Clear the Logo workspace by typing GOODBYE (ERALL in Apple (LCSI) Logo)

- Type in the grades for all the students in the class:

```
MAKE "JOHN'S.SCORES [ 89 94 83S 91 ]
```

```
MAKE "SALLY'S.SCORES [ 92 91 89 94 ]
```

etc.

- Use the editor to correct any mistyped grades. This can be done by typing EDIT NAMES (EDNS in APPLE (LCSI) Logo) and making alterations just as you would in a procedure. Type CONTROL C to define the new changes.

- Save the grades in a file, such as SAVE "ENGLISH.GRADES

Placing the grade averager and the class grades in separate files makes it convenient to create files of grades for other classes as well. To use the averager, load the file containing the averager into the workspace, and then load the file containing the grades of the class you wish to average.

It is seldom the case that all students are present for every examination. It might be desirable to indicate which students were absent from an examination by including a note such as ABS in the list of scores. For example, assume that John missed the third examination. In that instance, the values for "JOHN'S.SCORES might be recorded as [89 94 ABS 91].

If this method of recording missed examinations is used, a slight change to AVERAGE.LOOP is necessary. Otherwise, the procedure will attempt to add ABS to the total of the other scores: $173 + \text{ABS} = ?$

Since letters cannot be "added" to numbers, Logo will complain:

+ DOESN'T LIKE ABS AS INPUT

This potential problem can be removed by including a test to determine whether an item is a number before adding it to the total of the other scores.

```
TO AVERAGE.LOOP :SCORES :TOTAL :NUMBER
  IF :SCORES = [ ] OUTPUT (:TOTAL /
:NUMBER)
  TEST NUMBER? FIRST :SCORES
  IFFALSE OUTPUT AVERAGE.LOOP (BUTFIRST
:SCORES) :TOTAL :NUMBER
  OUTPUT AVERAGE.LOOP (BUTFIRST :SCORES)
(:TOTAL + FIRST :SCORES) (:NUMBER + 1)
END
```

LCSI version of procedures

```
TO AVERAGE :SCORES
  OUTPUT AVERAGE.LOOP :SCORES 0 0
END
```

```
TO AVERAGE.LOOP :SCORES :TOTAL :NUMBER
  IF EMPTY? :SCORES [ OUTPUT :TOTAL /
:NUMBER ]
  TEST NUMBER? FIRST :SCORES
  IFFALSE [ OUTPUT AVERAGE.LOOP (BUTFIRST
:SCORES) :TOTAL :NUMBER ]
  OUTPUT AVERAGE.LOOP (BUTFIRST :SCORES)
(:TOTAL + FIRST :SCORES) (:NUMBER + 1)
END
```

Glen Bull is a professor in University of Virginia's School of Education, and teaches Logo courses at both the graduate and undergraduate level.

Logo Bulletin Board Test

The National Logo Exchange and the University of Virginia are conducting a pilot study of an electronic Logo bulletin board system. We are seeking volunteers to assist with the field test. If you have access to a computer with a modem and would like to help, please send your name and address to NLX LOGO BULLETIN BOARD, PO Box 5341, Charlottesville VA 22905.

Commodore Logo: Let's Take a Look

by
Steve Tipps

Commodore Logo, developed by Terrapin for the Commodore 64, is a giant turtle step in the right direction for Logo users.

Imagine all the features of Terrapin's Apple implementation. Then, add 7 programmable sprites which take advantage of the Commodore's highly regarded graphic capabilities. Next, include a handful of commands for easier list processing and additional graphics commands. Finally, consider 30% more working memory available. All of this is packaged with a good Logo tutorial and reference manual.

This is a Logo version that a skinflint could love. The Commodore 64 system with CPU-Keyboard, color monitor, and 1541 disk drive retails for \$750 and can be found on sale or on school contract for less. The Commodore Logo lists for \$60, but has been on sale in the Washington DC area for \$40 to \$50. A full fledged Logo system for under \$800 makes one want to run right out and buy. As resident skinflint at NLX, I did just that after a week of playing with a Commodore system loaned to me to develop an inservice for Falls Church VA Schools.

COMMODORE 64, LOGO AND ME

The transition to the Commodore 64 keyboard was easy, with CTRL being the irritant. Since Commodore's CTRL is located up a row from that of the Apple, my left little finger hits the RUN/STOP key. The mistake led to a happy discovery that the RUN/STOP key also defines a procedure and to the unhappy event that I "define" something inadvertently when I'm trying to use editing keys. My fingers will learn. I like the function keys being programmed to change TEXTSCREEN to SPLITScreen to FULLSCREEN.

Loading Logo requires typing instructions to Commodore's operating system. Loading is slow and noisy. Since I hate PLEASE WAITing, I boot up while getting organized to work.

All the old favorite turtle graphics commands are available with a new palette of 16 colors. Numbering of the colors is somewhat confusing because the colors written on the number keys do not work for Logo. The Commodore 64 uses a numbering system for colors 1 to 16, while Logo wisely uses 0 to 15. The "1" key is marked "black," but draws white in Logo. The "2" key is marked "white" and draws red, and so on. To correct the discrepancy between the labels and the Logo colors, I suggest that stickers be colored and taped over the printed names on the front of the numbers keys.

A new drawing command is DOUBLECOLOR. This draws a wider line. DRAWSTATE reports nine pieces of information about the state of the screen, such as pen color, background color, screen in use, pen state, and the like.

Here's a change Terrapin users will appreciate. CTRL P retypes automatically the last line entered, even if it includes a REPEAT command!

To me, the most exciting new graphics feature is stamping letters on the graphics screen. STAMPCHAR allows typing of single letters on the screen. Students often want to write on the graphics screen or label their drawings. My first major programming task with Commodore Logo involved procedures to write entire words and sentences on the graphics screen rather than one letter at a time. My sense of accomplishment was not diminished by the discovery that Terrapin had kindly provided similar procedures on the utilities diskette. In fact, I like mine better than theirs! My next Logo task is to attempt graphics from the KoalaPad with labeling.

Sprites on the Commodore are on the utility diskette. Assorted sprite shapes, such as animals, vehicles, geometric forms and an animated runner, can be read from the diskette. The demonstration program only hints at the possibilities for manipulating sprites. Many more examples of what to do with sprites will be needed.

I believe that these multiple drawing sprites will radically change what can be done in graphics. I am rethinking some of my old projects with the new possibility of having (nearly) simultaneous events. The multiple sprites are new objects to think with. These new capabilities enlarge the range of possibilities.

Commodore continued

BIGX and BIGY with SMALLX and SMALLY allow changing the scale for the sprites so that the kangaroo can be tall and thin or wide and short. The shape grid for creating the sprites is similar to other grids in TI Logo or Pilot — all of which I find frustrating. The triangle (sprite 0) can be turned into a real turtle shape or any other shape which is desirable. I am inspired by the idea of Multiple turtle Instant Logo.

The sprite demonstration game TRAP shows another new feature of line detection. The turtle detects when it touches a line drawn on the screen. Line detection should lead to many new projects in Logo. The game applications are most apparent, but applications such as science experiment simulations and map making should be developed also.

A major improvement has been inclusion of list primitives COUNT, EMPTY?, MEMBER? and ITEM. Some philosophical argument might be made that people need to create these procedures. However, my experience is that students need and can use these procedures before they have the sophistication to write the programs for them. I prefer them as primitives because they allow more immediate entry into interesting list projects.

The written documentation by Virginia Carter Grammer, E. Paul Goldenberg, and Leigh Klotz is comprehensive. It includes separate sections on graphics, computation, words and lists, sprites, and music. Various graphics projects and list projects are also included. My main use of the manual has been the excellent index, appendices and reference section at the end. I rate it much better than average for written documentation. The utilities disk has the usual games and demonstrations and also includes useful routines for printing and plotting on the Commodore peripherals.

THE ADMIRABLE COMMODORE

My admiration for Commodore Logo and the Commodore 64 has continued to grow in the six weeks I have been working with them. I have no serious complaints and quite a few compliments.

My positive reaction to Commodore Logo was supported by the local Commodore 64 fan, John Strang, with only a few specific quibbles. He doesn't like the manual organization as well as I do. He wishes sprites and

music were built in rather than on the utility disk. John, an eighth grade student, is pleased overall and has found the line detection excellent for his current project, a treasure hunt maze.

Testimonials are always suspect in computer land, but I put money on the line for this one. After waiting two years, I found a system which had enough power to do what Logo should do and was priced in the range I could afford personally.

The single biggest improvement for me is the luxury of increased working memory. The dreaded OUT OF STORAGE, PLEASE ERASE SOMETHING message has not appeared, even after two or three hours of programming without attention to cleaning up my workspace. Terrapin seems to have packed more for less in Commodore Logo. Congratulations on an excellent job.

Conference Notes

MIT's Laboratory for Computer Science has initiated plans for a series of National Logo Conferences to be held periodically, beginning in 1985. To be placed on the mailing list for information on the 1985 conference, send your name and address to 1985 Logo Conference, Attn: Jacqueline Karaaslanian, MIT Laboratory for Computer Science, 545 Technology Square, Cambridge MA 02139.

A limited conference will be convened in Boston, June 25-29, 1984, to give those most active in teaching and developing Logo culture the opportunity to interact and to construct the framework for the 1985 gathering. If you have ideas or suggestions which you feel should be incorporated into these plans, please send them to the address above.

The 6th annual National Educational Computing Conference (NECC) will be held in Dayton, Ohio, June 13-15, 1983. A call for participation has been issued for papers, presentations, and workshops. If you have been looking for a national forum for reporting your Logo work, here it is. For more information, write Lawrence A. Jehn, Department of Computer Science, University of Dayton, Dayton OH 45469.

NLXual Challenges with Robs Muir

The debate about the "best" computer language for education will undoubtedly rage for years to come. What makes one language better for education than another? The polemicists disputing the relative merits of APL, BASIC, Pascal, Logo, Lisp, and the like seem to have lost sight of the principal benefit of computational learning environments, that of practice in problem solving. It is hard to see the forest for the tree structures.

Although the descriptors may vary, there has been a fair amount of academic research into the nature of problem solving. The subject of heuristic thinking (or mathematics) has been examined repeatedly throughout history. Scholars such as Euclid, Pappus, Descartes, Leibnitz, Polya, and Bolzano have done much to articulate the methods and rules of invention, improvisation, and discovery. Yet, much remains to be discovered.

Academic research is one thing; the practical application is another matter. Problem solving techniques have had little opportunity to be included in the classroom curriculum except as an incidental byproduct of the traditional course of study. However, a number of teachers study the process of learning and successfully encourage their students to examine and refine their own heuristic techniques.

The importance of a computer in education may ultimately lie in its ability to stimulate problems of immediate importance to the student. Thus, the importance of a computer language lies in its ability to reflect a student's thinking.

Problems encourage active learners to wrestle with new knowledge, to invent solutions. In the course of discovery, a special excitement is generated that stimulates further inquiry. This heady experience is infectious. It can stimulate an entire group to "discover" great things which will not be easily forgotten.

But practice with problem solving must not stop outside the classroom walls, nor should it cease after one acquires a diploma (or a teaching certificate!). This must be so, if we truly believe in "life long learning." Indeed, teachers should be the group most aware of heuristic techniques.

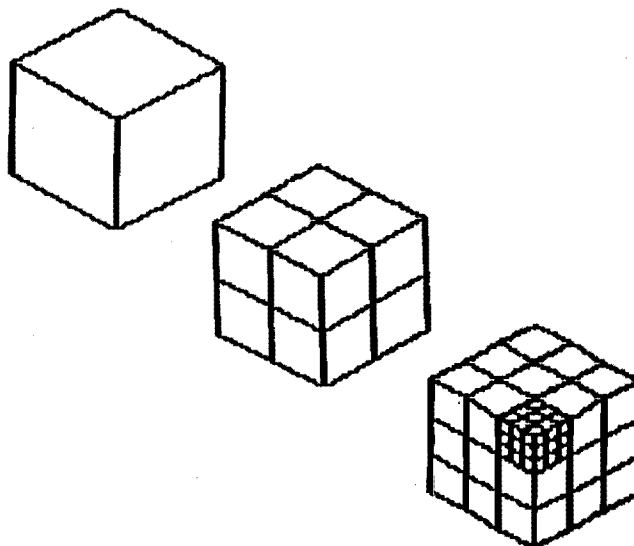
With this in mind, the NLX is beginning a series of articles devoted to Logo problem solving challenges. Each month, a problem situation will be presented, along with a suitable intellectual challenge. Your goal is to arrive at a personally satisfying solution.

There is no single solution to these puzzles; in fact, there may be a great many possibilities. We trust that, by striving for your solution, you will come to better understand the Logo philosophy and the Logo family of languages. More importantly, we hope that you will come to better understand your own unique approach to problem solving.

This month's problem grew from a desire on the part of Frank Nakase, a teacher in Huntington Beach CA, to familiarize his students with two dimensional representations of three dimensional objects.

This cube problem is a good exercise in procedure building. The goal here is to create a cubelike drawing that is capable of being extended to deep levels of complexity. As with most Logo programming (and problem solving in general), look for the simple case, find instances of repetition, and build from there.

Here are a few examples of some typical drawing developments.



Depending on the approach you take to this problem, you may discover some interesting things about the relationships of the sides (or cubies, as they sometimes are called). For example, is the simple case a hexagon with three radial lines, or three parallelograms rotated?

Challenges continued

If you are interested in exploring the mathematical ideas embodied in a cube, Chapter 6 of Abelson and diSessa's Turtle Geometry (see review, NLX Vol 1 #2 October 1982) contains an innovative treatment.

Note: As with all NLXual Challenges, if you want to receive a possible solution, send a copy of your solution (or your attempt) with a legal size self addressed stamped envelope to NLXual Challenges, Attn: Robs Muir, 1688 Denver Avenue, Claremont CA 91711. We will compile contributions and send you the most elegant solution.

If you would like to submit a challenge or puzzle for this column, send your ideas to the above address.

Robs Muir is a teacher in the Claremont CA Unified School District and Claremont Graduate School. He presents Logo workshops in the southern California area.

Help Wanted for Logo Book

Here is an opportunity for you to contribute to a Logo book! Ray Hammond, a member of the British Logo Users' Group, is gathering material for a book entitled, "Logo and Your Child." He is interested in collecting case histories of school Logo experiences, reports, and articles, and can reimburse reasonable expenses for duplication and shipping, if arranged in advance. Write to: Ray Hammond, Tivoli House, Greenway Lane, Bath BA2 4LL, England, for more information.

News from LCSI

Logo Computer Systems Inc. (LCSI) has announced the availability of several aids for Apple Logo users.

Two public domain diskettes, the Apple Logo Sample Program Disk and the Apple Logo Tool Kit, are both available for copying from most local Apple dealers. The reverse side of the Sample Program Disk contains extensive documentation in files compatible with Apple Writer II or IIe. Diskettes may also be ordered direct from LCSI, for \$12.95 US or \$14.95 Canadian.

A 64 page manual containing the print-out of the diskette documentation may be ordered for \$3.25 US or \$3.75 Canadian.

The Apple Logo Presentation Manual contains materials sufficient for organizing Apple Logo presentations from one-half hour overviews to five-day workshops. Included are the areas of Logo introduction, developing problem solving skills, and use in the content areas. The cost is \$29.95 US or \$34.95 Canadian.

LCSI also has organized a series of five "on the road" Logo courses which can be taught at your location. Included are Introduction to Logo, Teaching Logo, Advanced Logo, Inside Logo, and French Logo. School system consulting services are also offered.

LCSI addresses and telephone numbers are 220 Fifth Avenue, Suite 1604, New York NY 10001, (212) 684-0710, or 9960 Cote de Liesse, Lachine, Quebec H8T 1A1, (514) 631-7081.

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Editor.....Tom Lough

NLXTRA

Logo Notes

Atari Logo cartridges are in short supply! To locate the dealer nearest you with inventory, call 1-800-538-8543. In California, call 1-800-672-1404. The cartridge sells for \$99.95, and comes with two manuals and a reference guide. A special package for educators is also available. Rumors have it that Atari is also developing a French version for release shortly.

Harvard Associates is now shipping their PC Logo for the IBM PC. The package includes a Logo disk, utility disk (which, by the way, contains the NLX ABC's!), and an excellent manual, for \$199.95. The present version requires 128K, but a later version will run on the 64K computer. Also available is the Turtle Tot, a smaller cousin of the Tasman Turtle. This little robot turtle sells for \$299.95, and includes a 10-color pen set, instructions, and suggested classroom activities. Harvard Associates, 260 Beacon Street, Somerville MA 02143, (617) 492-0660.

In June, Waterloo Microsystems, Inc., released Waterloo Logo for the IBM Personal Computer. Boasting over 140 primitives, this full featured version takes advantage of the power of the IBM. Included in the package are a language diskette, reference manual, and reference card. It requires 128K RAM and a color monitor adapter, and is available now for \$180. For more information, write Waterloo Microsystems, Inc., 175 Columbia Street West, Waterloo, Ontario, Canada N2L 3B6. Telephone (519) 884-3141.

Since Digital Research has begun shipments of Dr. Logo for the IBM PC, rumors have sprung up about Digital versions of Logo for other computers. Ones I have heard mentioned include Sony and DEC. The more, the merrier! Digital is also starting up a Dr. Logo newsletter. For more information, write to Susan Raab, Digital Research, PO Box 579, Pacific Grove CA 93950, or call (408) 649-3896.

By the way, has anyone heard any rumors about a Logo version for the Hewlett-Packard personal computer? It uses the same micro-processor as the IBM PC, but may not be software compatible. A touch sensitive monitor screen is standard equipment, allowing the user to bypass the keyboard for input. (Actually, you don't have to touch the screen; you have to interrupt a "sheet of light" just in front of the screen.) This feature alone offers many exciting possibilities for a Logo version.

The new 64K Color Computer from Radio Shack will run TRS-80 Color Logo. Rumors have it that Radio Shack is also planning to develop a full featured Logo version for this computer and for the TRS-80 Model IV! Since Radio Shack was projected recently as number three of the top four surviving personal computer companies, this is good news for the Logo community!

Merrimack Education Center, Chelmsford MA, announces a two-day Logo workshop for educators which may be taken for graduate credit. "Advanced Logo for Educators" goes beyond simple turtle graphics, to include the use of variables, recursion, and text manipulation. Two separate offerings are scheduled: December 8 and 9, and January 19 and 20. Registration for inservice credit is \$160 and for graduate credit \$195. Merrimack Education Center, 101 Mill Road, Chelmsford MA 01824, (617) 256-3985.

The Young Peoples' Logo Association has added "The Toddler's Turtle" to their software exchange. Designed especially for kindergarten aged children, this single key-stroke implementation will be supported with YPLA booklets. It is available on several different computers for free exchange to YPLA members. For more information, write YPLA, Box 855067, Richardson TX 75085, or call (214) 783-7548.

Sunburst Communications announces Logo activity cards for MIT Logo for the Apple II and Terrapin Logo for the Commodore 64. Designed by Karl Zinn, the cards come with a diskette and teachers manual. The cost is \$39 per set.

Start Your Logo Olympic Project

The Olympics are coming! In the summer of 1984, the Games of the XXIII Olympiad will be held on Los Angeles. Why not take advantage of all the publicity this event is sure to get? Start your plans now for your classroom version of the "Logo Olympics."

Many Logo projects are possible. For example, your students could draw the five Olympic rings and the flags of different countries, or design interactive games based on Olympic events. Maybe your Logo Classroom Penpal Network partner and you could do a joint project. Your students will have lots of ideas, too.

The United States Olympic Committee has a number of classroom materials available to help with your Olympic project. You may obtain up to ten copies of a free pamphlet on the Olympic Games by sending a request on your school letterhead to Mike Moran, USOC Director of Information, 1750 East Boulder Street, Colorado Springs CO 80909, or call (303) 632-5551.

Excellent curriculum guides for grades K-6, 7-9, and 10-12 are available for \$3.50 each. Send a purchase order or school check with your order to the above address.

For information on Olympic films, write to Pat Olkiewicz, USOC, at the above street address.

For information on various countries and their flags, write to:

Office of Information
Embassy of (country)
Washington, DC 20013

Be sure to send us information about your Logo Olympic project to share with other NLX readers.

From the NLX Mailbag

Dear Editor:

I have used some of the great ideas from the newsletter - the Logo Christmas Tree and the overlays. Keep the ideas coming.

Linda Nix
Round Rock TX

Dear Editor:

I suggest that readers use the NLX to exchange Logo challenges (not necessarily with solutions) so others can also enjoy trying to solve them. About the drawing of the sine wave (NLX January 1983), I suggest using the SETXY command. For example, a parabola would be:

```
TO PARABOLA :X
  SETXY :X :X * :X / 100
  PARABOLA ( :X + 5 )
END
```

Is it possible to design a program which will ask the user (with REQUEST) what function to draw and make the turtle draw it?

Dan Novak
Asst Prof of Mathematics
Ithaca College

>>> Setting up Logo challenges is an excellent suggestion. See our announcement elsewhere in this issue.

Dear Editor:

I want to let you know how much I'm enjoying the NLX. I wasn't sure what I was getting when I sent for it and was apprehensive because of the price. But it's turned out to be a great publication full of new and useful ideas! A big THANKS to you and all involved in your efforts! FD 100!

Peg While
Muncie IN

>>> Thank you for letting us know how you feel about the NLX. In a very real sense, this is your publication. Your contributions and feedback are the main factors which determine our direction and distance. Keep us informed of your needs, your concerns, and your triumphs! FD 100!

Dear Editor:

I completed a 12 week course in Apple Logo and found myself 1000 miles from seeing how Papert's ideas could be put into action. Thanks to the NLX, I think I'm crawling closer!

Marie Pat Stevens
Santa Fe NM