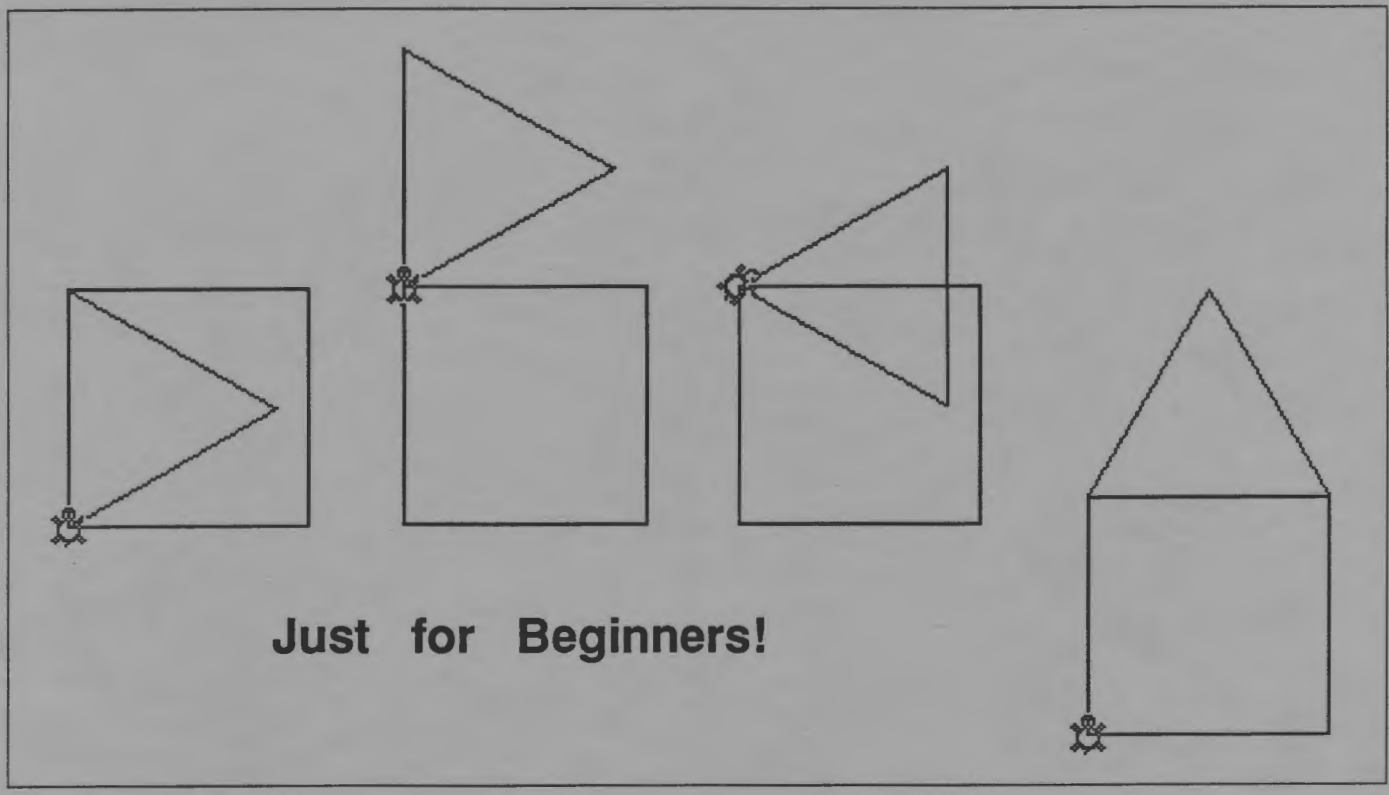
Journal of the ISTE Special Interest Group for Logo-Using Educators

LOGO EXCHANGE

October 1989 Volume 8 Number 2



International Society for Technology in Education

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LOGO EXCHANGE

Volume 8 Number 2 Journal of the ISTE Special Interest Group for Logo-Using Educators October 1989

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From the Editor

On Beginning

When is the last time you learned something new? Now I don't mean just a new tidbit of gossip or fact from the newspaper. Rather, I am thinking of the last time you immersed yourself in learning a new discipline. Perhaps you decided to master the art of French cooking. Or, maybe you took lessons on knitting or crocheting. You might even have gone to back to school to take a course in a subject new and different. Or, perhaps you decided to learn scuba diving or rock climbing. Take a moment to reflect on the most recent experience that you have had that involved learning about something completely new.

What were your feelings as you started this new venture? Were you nervous on that first class day? Did you watch your classmates to see if you were measuring up? Were there moments when you felt clumsy or inept or down right dumb? Later, as you mastered your new skill, what kinds of feelings did you have? Did you feel good about yourself? Did you bore your friends with tales of your victories however small? Has the new skill become a passion or simply a part of your daily repertoire? Did it broaden your horizons? What part will it play in your life in the future?

As you reflect on your new learning experience, think about your teacher. What part did he or she play in your experience? How much of what happened to you was because of you and how much was because of your teacher?

"Why," you ask, "all of these questions?" Ever since I returned to graduate school after 15 years away, I have felt that it is very important that teachers become students from time to time. That is, I think that teachers need to find themselves in a position where they are not the experts and are dependent on sources outside of themselves to learn. Better yet, I think they should be part of a class where others are learning the same skills.

Oh yes, it's a humbling experience. I recall finding myself in a graduate level probability class in which the professor expected me to remember all of my calculus, and worse, he expected me to know how to use a scientific calculator. (When I studied math in college, there *were* no hand held calculators!)

My experiences in graduate school made me much more able to empathize with my students. The same thing can happen to you. Whether you teach elementary or secondary students, teachers or teacher trainers, you need to remember what it feels like to feel inept, inexpert, or even "dumb." You need to feel the frustration of not knowing what to do next. You need to keep in touch with not having all of the answers. Johnny's tears of frustration and Mary's angry outburst make a lot more sense if you have had similar experiences recently.

Perhaps you are a beginner in using Logo. If that is the case, then you are in the midst of those moments of frustration and success as you try to master this new and complex discipline. Oh yes, it's easy to move the turtle, but then what? Your mind no doubt whirls with "How do I..." questions. Be patient. You *will* learn. But as you are learning, use your experience with the process to help you become more sensitive to your students' needs and frustrations.

If you are a more advanced user of Logo, you know that the learning in a Logo environment never ends. Just when you think you have "mastered" Logo, you discover some new corner that you know nothing about. Often those new bits of Logo are so different that they feel like learning something completely new. Logo really does help keep you in a learning and growing mode.

If you haven't learned anything completely new lately, put on your "to do" list to sign up for a workshop or course of your choice. While you are experiencing the learning of this new material, think carefully about your own students. Try to transfer your experiences to those of the people you teach. How can your experiences make you a better teacher? How can you be more sensitive to the needs of those you teach? How can you teach in such a way that fewer will experience frustration and failure?

As an adult learner, you have the experience of learning a lot of new things in your life. Bring that experience to your new learning environment. Can you step back from what you are learning and get a broader picture, or are you too immersed in the details? How can you give your students the broader perspective about the things that you teach them? How can you get away from teaching just "key presses" and move towards emphasizing higher order skills such as problem solving? Use your learning experience to transfer what you learned about learning to your own teaching. (Got that?)

Those of you who are experienced Logo users know that indeed the learning does go on and on in a Logo environment. Those of you who are just beginning can look forward to many exciting moments as your knowledge of Logo becomes richer. Use those learning experiences to become a better teacher!

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Monthly Musings

Upstart Startup
by Tom Lough

From the beginning, Logo was a kind of upstart among computer languages. It empowered students and teachers alike. Logo users could reconfigure the language by naming procedures whatever they wanted. These procedures became new commands in effect. Moreover, Logo encouraged a procedural style of programming with its simple syntax. Over the years, this upstart Logo has spread into tens of thousands of schools all around the world. More and more teachers are starting to use Logo. So upstart is probably not a good word to use any more. But it contains the syllables we need for this month's musing.

Several of the earlier versions of Logo had a special type of file and a special variable called STARTUP. (Want a quick list processing challenge? How would you change the word UPSTART to STARTUP using the FIRST and BUTFIRST commands?) If a Logo disk contained a STARTUP file, it was loaded automatically into the workspace as part of the booting process. If a file contained a STARTUP variable, then certain procedures would be run automatically when the file was loaded.

For example, if a file contained procedures called STAR and COMET and a STARTUP variable defined as

```
MAKE "STARTUP [STAR COMET]
```

then the STAR and COMET procedures would be run automatically whenever the file is loaded.

Since this issue of *LX* is dedicated to those who are just getting started wih Logo, it seemed fitting to think about suggesting a STARTUP variable for you. I wanted to find some ideas or processes which you could consider as you start up your own adventures in using Logo.

At the time of this writing, I was assisting with the instruction of Dennis Harper's *Logo in Paradise* course at the University of the Virgin Islands. Since several of the course participants were experienced Logo users, I thought I would ask them what advice they would have for teachers just starting up with Logo. They generously provided an excellent set of tips and ideas.

Here are their suggestions for your own STARTUP.

Glen and Gina Bull, Charlottesville, VA: Pay attention to your misconceptions and mistakes. Keep a journal of your learning experiences. Find a student and learn with him or her. Play, don't study.

Jim Crum, Orange, CA: Experiment yourself. Get familiar with the fundamental commands. Watch some experienced students work with Logo. Try to understand what they are doing. Purchase a Logo version with a total site license, including arrangements to send disks home with students. Make Logo an integral part of the curriculum, so you can use it on a regularly scheduled basis.

Judy Cru, Orange, CA: Don't be afraid to start. Involve students from the beginning. You don't have to know everything before you start.

Mary Ann Gillis, Mobile, AL: Display lots of enthusiasm. Grasp one aspect at a time. Be patient with yourself.

Tom Lough, Simsbury, CT: Try to realize the full power of the ability to name procedures. Establish a Logo culture to the greatest extent possible. Make Logo matter. Explore a variety of procedure development styles, including top-down, bottom-up, and a combination. Provide your students with opportunities to share with and learn from each other. Include objects in the real world, such as robot turtles and sensors, as much as possible. Read every article in all the back issues of *LX*. Be willing to share your Logo experiences with others through articles in the *LX*.

Iliana Nikolova, Sofia, Bulgaria: Don't insist that students do exactly what you say. Give them [and yourself] the opportunity to make mistakes. Find a comfortable compromise between a strictly guided activity and completely free exploration. Give the students [and yourself] time to become confident. Gently encourage the students to program in a good style, splitting the operation into several small pieces.

Debbie Roth, El Paso, TX: Remember that the turtle is your friend. A turtle knows only four directions: FORWARD, BACK, LEFT, and RIGHT. You can't get lost.

Sandy Smolinsky, Chicago, IL: Don't panic. Keep it simple. Give the students written directions.

Connie Widmer, Cincinnati, OH: Have fun! Learn your primitives. Learn with your students. Read Papert, but read him critically.

Firmin Widmer, Cincinnati, OH: Walk out your proposed projects. Don't be afraid to make mistakes. That is when you really learn.

Oh, yes, I forgot to tell you, the STARTUP variable can have regular Logo commands associated with it, too. So,

MAKE "STARTUP [FD 100!]

Tom Lough, Founding Editor
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Logo Ideas

You've Got LEGO® TC logo. How Do You Begin? Try Traffic!

by Eadie Adamson

As I thought about this "beginners" issue, I found myself reflecting on my own beginning experiences last year with LEGO® TC logo. I used LEGO® TC logo with four different groups with varying abilities during the year, so I actually had four "beginnings" to think about. I have come to some conclusions about my experiences that seem worth sharing.

I work in an independent school for boys. My students for these activities were sixth grade boys, many of whom had already had experience playing with LEGO® at home or at school when they were younger. Many were still fascinated by the prospect of building cars. Even though they were familiar with LogoWriter, the concept of connecting Logo and LEGO® was a new idea for all of them. We had only a limited time, approximately ten weeks for forty minutes twice per week. The idea of building things seemed to be uppermost in the boys minds. To me, on the other hand, the computer connection was the most fascinating idea.

As I think back through the year, I believe the most successful introduction which made the computer connection most clear was with the group of students that began by building traffic lights. Building a traffic light is one of the simplest building projects, a clear advantage if you wish to begin using the computer interface quickly. The building process can be completed in less than our typical class period, allowing time to experiment with the computer almost immediately.

I gave my students a help sheet for their traffic lights which also contained some initial programming challenges for them to try. (See the COPY ME page which follows.) We used this first, then continued to try out the ideas in the LEGO® TC logo *Getting Started* book for Project Three: the traffic lights, pages 16 - 34.

A Field Observation Trip

Since we are located in New York City, with many busy streets, we also decided to go out and observe and time the traffic lights. Results of timing were charted on a sheet I had prepared (see the COPY ME page which follows this column). You will probably want to adjust street directions for your own area. For this excursion we took stopwatches and also used digital watches which had times. The boys paired up, one to do the timing, the other to take notes.

Programming the Results

Results in hand, the next class involved setting up two sets of lights and writing procedures to reflect the information gathered on the observation trip. We elected to shorten the timing of the lights, but to do this proportionately. Since 10 equals one second, if a light was on for one minute, a value of 600, we simply divided by 10 as we programmed our lights. A typical sequence looked like this:

```
to red
talkto 1
onfor 60
end

to green
talkto 3
onfor 60
end

to yellow
talkto 2
onfor 20
end

to traffic
red
green
yellow
traffic
end
```

My students were already familiar with recursion and moved rather quickly to using it in the traffic light procedures. If your students are not yet using recursion, you will find that the student booklet with the section on traffic lights forms an excellent introduction. If you are new to LEGO® TC logo, you will also find the teacher's manual to be a very useful guide.

WALK and DON'T WALK

Some of us thought about making WALK and DON'T WALK signs as well. Using the LEGO® TC logo page on the screen along with a procedure which runs lights may be tricky, but it's fun to experiment with. When you run LEGO® TC logo commands, the computer screen remains unchanged. However, any procedure which calls a standard turtle graphics command will cause the page to flip to the front. In fact, adding a command as simple as ht to the beginning of a procedure, whether using the page or not, will make the page flip to the front. This can be a rather elegant way of using LEGO® TC logo when showing models.

Creating WALK signs provides an opportunity to use the **label** command on the LEGO® TC logo page. The **label** command places text on the screen as graphics. To remove it, one must **label** the same message on top of itself. (If your students are also using LogoWriter, they may already be familiar with the flashing signs activity card.) This sequence will make a WALK sign flash:

```
to walk
repeat 10 [ label [WALK]  wait 10 ]
end
```

The number of flashes and length of the wait can be adjusted. We found we needed to go back and observe these lights also to find out how they worked. New Yorkers all seem to know that when the DON'T WALK sign is flashing, they can still make it across the street if they hurry, but we don't often think about what the traffic light is doing at the same time. When does the yellow light come on in relation to the DON'T WALK sign, for instance?

Apply the Ideas to LogoWriter Too!

A traffic light project could as well be applied using LogoWriter and focusing on the WALK and DON'T WALK signs as part of a safety unit. Animation of people and cars could be added, something which cannot be done with LEGO® TC logo.

Cleanup Time

My only problems with working with LEGO® TC logo were those of time. When something so intensely interesting is going on in the classroom, even I forget to watch that inexorably moving clock! Cleanup time has to be planned for so that a sudden end to a class does not leave the whole mess for the teacher. I opted for large bins for storing parts and cleared some shelves for storing models. LEGO pieces could be quickly tossed into the bins, the lid could be replaced and the box put in its place, while a few boys took care of disconnecting models and saving work.

Observations

I particularly liked this way of beginning since it got the computer into use very early. I found that with other ways of beginning many boys became so preoccupied with building problems that they had little time left to explore the potential of the computer interface. If time is short, this quick way in, even if you do not do all of the activities, seems to me to be a good one.

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Call for Presentations for the Great Lakes/East Coast Logo Conference

Sponsored by: The Educational Computer Consortium of Ohio (ECCO)
Where: Cleveland, Ohio
When: May 4 - 5th, 1990.
(Preconference workshops on May 3.)

Categories of presentations:

Poster Presentations:

These sessions will offer you an opportunity to share a particular idea. Three presentors will be scheduled each hour. Presentations should cover specific teaching ideas, lesson plans, or classroom activities. An Apple IIc or IIe computer and appropriate monitor will be made available during the session.

Session Presentations:

These sessions will be approximately an hour long. Presentations should cover classroom ideas, research project reports, innovative uses of Logo, and Logo connections. An Apple IIc or IIe, overhead projector, and appropriate display screen will be made available.

PreConference Workshops:

These workshops will be six hours in length and will be held on May 3rd. Workshop topics should go beyond beginning turtle graphics and offer participants new ideas and challenges. Either IBM or Apple equipment will be available.

Conference Workshops:

These workshops will be held during the conference and will be approximately 3 hours in length. Workshops can cover either beginning or advanced ideas, but should be limited to material that can be meaningfully presented in a hands-on format in the allotted time. Either IBM or Apple equipment available.

Presentation Proposals are due November 15th, 1989

Contact ECCO for forms to use to submit presentation ideas.
ECCO
1123 S.O.M. Center Road
Cleveland, OH 44124
216-461-0800

Lego Traffic Lights

Getting Started

Plug the red light into port 1
Plug the yellow light into port 2
Plug green light into port 3.

[Generally, plug lights into numbered ports (0-5); plug motors into the letter ports. The letter ports (A, B and C) allow you to turn on a motor and also reverse its direction, something you don't need to do with lights.]

New terms:

talkto	(abbreviated **tto**)
on	
off	
onfor *number*	(**onfor 10** turns on for 1 second)

Try these commands:

talkto 1	Talks to port 1
on	Turns on the red light
off	Turns off the red light
talkto [1 2 3]	Talk to all 3 ports
on	Turn on all 3 lights
off	Turn off all 3 lights

Lights can be plugged into any outlet port (A, B, C, and 0 - 5) but you must be sure to talkto the correct port.

Talk to more than one light at a time by enclosing the port numbers in brackets:

talkto [2 3]

Challenges

1. Write a procedure to turn the red light on for five seconds.

2. Write a procedure which turns on the red light for two seconds, then turns on the green for two seconds. It should do this sequence four times.

3. Write a procedure which makes a flashing yellow light. DO NOT name the procedure FLASH; that is a Lego TC Logo primitive! (Hint: You need to use wait and a number to make it flash.) Can you make your light go on for one second, then off for one second?

Timing Traffic Lights

Traffic lights are programmed in sequences or patterns. Often, to improve traffic flow, lights are set so that a car traveling at a given speed may move along without coming to a red light.

Your task is to find out how the lights in our neighborhood are programmed. For each corner you should collect the following information (use a watch with a second-hand or a stop-watch for the timing in SECONDS):

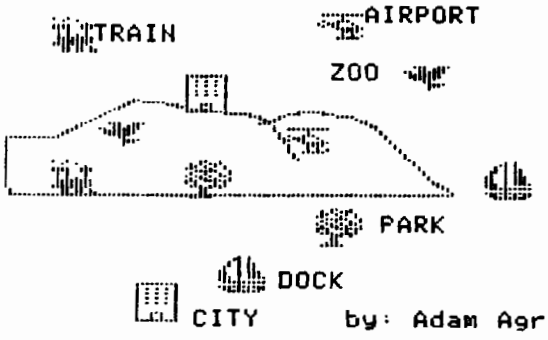
Street__________________	Street__________________
Direction (N/S or E/W)_____	Direction (N/S or E/W)_____
Red light time_____________	Red light time_____________
Yellow light time__________	Yellow light time__________
Green light time___________	Green light time___________
Street__________________	Street__________________
Direction (N/S or E/W)_____	Direction (N/S or E/W)_____
Red light time_____________	Red light time_____________
Yellow light time__________	Yellow light time__________
Green light time___________	Green light time___________
Street__________________	Street__________________
Direction (N/S or E/W)_____	Direction (N/S or E/W)_____
Red light time_____________	Red light time_____________
Yellow light time__________	Yellow light time__________
Green light time___________	Green light time___________

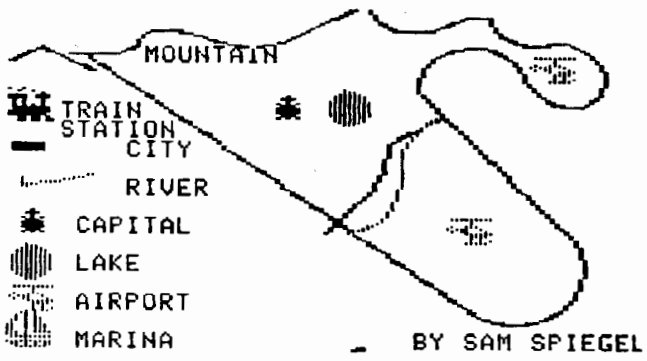
Questions you should now be able to answer:

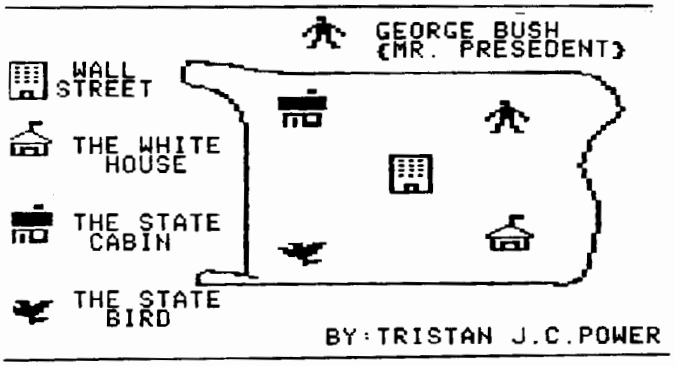
1. What is the pattern of light colors that is repeated?
2. Which streets have the longest green lights? Why do you think this is so?
3. Which streets have the longest red lights? Why?
4. Is there any difference in length of the yellow lights? Why?
5. Lego lights turn on with a command **onfor** which takes a number as input. An input of 10 equals one second. Figure out what the inputs should be for each of the lights you measured.

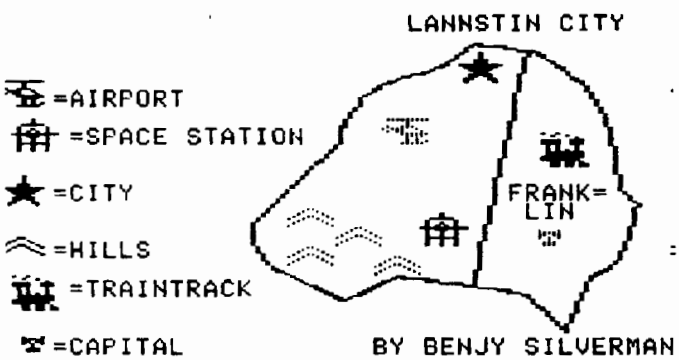
An LX Copy Me! page

Addendum:
Somehow, samples of figures drawn using the MAP tool in the September *Logo Ideas* column took an entire month to traverse the country. Of course, they arrived too late for inclusion in the September issue. These five drawings were created by third graders in Susan Hansen's class at Allen Stevenson School.





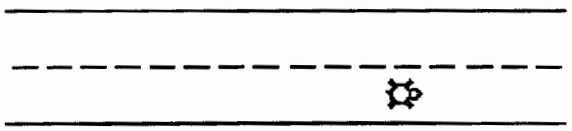




The Turtle As Car

by Diane Miller

Tom, a bright but very restless third grader, was interested in continuing to animate Logo pictures, after finishing a class project in which we had figured out how to make a watch face with moving hands. (See "Creating Moving Clock Hands" in March, 1989 *LX*) He wanted to make a car, and make it go FAST. He designed a road, running horizontally across the screen.



He designed an elaborate car, but found that animating it by erasing it and redrawing it at a new position would be quite a chore, and would not give the impression of blinding speed. Retrenching to a simpler car didn't please him, so I suggested that just as an experiment he try to make the turtle run along the road.

Tom soon figured out he that he could position the turtle and pick the pen up, then make it move by doing a REPEAT 100 [FORWARD 1]. This propelled it along the road, but at a disappointingly turtle-like pace. He wanted to make it go faster, and before long realized that increasing the distance input to FORWARD would do the trick. He experimented with a number of speeds, but soon got tired of typing the REPEAT line. This was a natural point to encourage him to use a procedure, so he wrote

```
TO CAR
REPEAT 999 [FORWARD 10]
END
```

(The pen was picked up at command level before CAR was run.)

He was disappointed at having to settle for a one-speed car at this stage, so I reminded him of procedure inputs, which he understood well,. I suggested maybe the distance/speed could be an input to his procedure. This was all the hint he needed to modify his procedure.

```
TO CAR :SPEED
REPEAT 999 [FORWARD :SPEED]
END
```

From here on he was the master of the turtle, typing CAR 1, or CAR 22, or CAR 100 to experiment with different speeds. He found that 20 was about the top speed at which the motion looked smooth but it is very fast compared to CAR 1, so he had a pleasing range of speeds available.

I showed him how to make the procedure recursive so he could let it run as long as he wanted it to:

The Turtle As Car--continued

```
TO CAR :SPEED
FORWARD :SPEED
CAR :SPEED
END
```

It was fairly easy for Tom to figure out how to write these procedures, with just a little guidance from the teacher, and the result was very rewarding for him. The display was quite attractive and fun to play with; the speed input gave him a significant and immediate control over the turtle — a real sense of power which he really enjoyed.

Another wonderful benefit of Tom's project was that he had not previously been motivated to polish procedures and save them,. However, with this project he had a strong desire both to show the result to the whole class and to be able to play with it another day. This was certainly a good incentive to save the procedures in a file.

In order to complete his project, he added a procedure to position the turtle on his road. He decided to end this procedure with the pen up so it would be up when CAR ran. When he finished playing with his car the pen was still up and he had to put it down again at command (top) level.

I have used the analogy of the turtle as a car because that is how Tom developed the idea. Several other groups developed the same procedures after seeing Tom's result, and some of them preferred to think of the result as a turtle running along a road. This shift in emphasis made the project more appealing to students who were not especially interested in fast cars.

The resulting simple procedure was fun to develop, fun to watch and use, and led to an interesting lesson in variables: the use of a variable for distance to control the turtle's speed. Tom had gone through the common Logo experience of first trying a project which was too elaborate, then backing off to a simpler and more elegant approach which gave much better results and which was easier to understand. He came across the need for recursion and had the chance to learn it in a simple situation. And he was so proud of his results that for the first time he had a desire to polish and save his project.

After this project was finished, I discovered that the procedure TO CAR is essentially the same as TO DRIVE described by Daniel Watt in his *Learning With Logo* book (p. 227). He goes a step further by giving a method to steer the turtle while it runs along. Perhaps that can be the next challenge for Tom!

References:

Watt, Daniel (1983). *Learning With Logo*. New York, New York: BYTE Publications, McGraw-Hill.

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Beginner's Corner

It's as Easy as...

by Dorothy Fitch

Tired of Logo squares and triangles? Why not experiment with letters and numbers instead! The alphabet provides you and your students, young or old, with letters that are easy to draw (T, L, I, etc.) as well as more challenging ones (K, R, Q, etc.). And don't forget numbers. They too provide a wonderful variety. And you can even design the letters in any style, from simple block letters to ones with fancy serifs, curves and curlicues.

The letters we'll try here use only FORWARD, BACK, RIGHT, and LEFT commands. Some of the designs also use REPEAT. If you know how to use these commands and can write a simple procedure, then you're in business!

The first step is to write a procedure to draw a letter. Note that the easiest way to draw the letter in Logo may not be the same way you'd draw it with a pencil! You'll probably want experiment with the size of the letter and the angles to use before you actually write the procedure.

We'll use the letter A as an example. Enter the Logo editor by typing

```
TO A
```

and press Return. Then type the instructions below and press Control-C when you are done. This defines your procedure and stores it in the computer's memory. *(These instructions are for M.I.T. versions of Logo, such as Terrapin Logo for the Apple or Logo PLUS. If you are using a different version of Logo, consult your documentation for instructions on defining a procedure.)*

```
TO A
RIGHT 30
FORWARD 70
LEFT 60
BACK 70
FORWARD 30
LEFT 60
FORWARD 40
RIGHT 120
```

Beginner's Corner--continued

```
BACK 30
LEFT 30
END
```

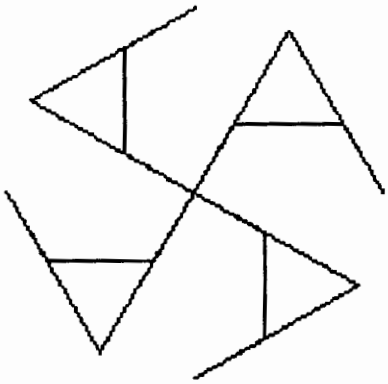
To test the procedure, type

```
A
```

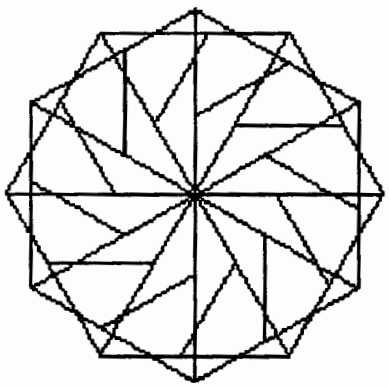
and press Return. The turtle should draw the letter, ending up exactly where it started. If it doesn't look like the A at the top of the page, make sure you typed the instructions correctly. (Type ED to re-enter the editor and make any necessary changes. Then press Control-C to keep the new version.)

After defining the procedure, you can use the A procedure in the same way as a built-in Logo command. These instructions draw the designs below them:

```
REPEAT 4 [A RIGHT 90]
```



```
REPEAT 12 [A RIGHT 30]
```



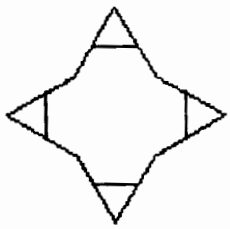
The more complex the design gets, the less it looks like the letter A. In fact your friends may not even be able to tell that you started with an A as a building block. Try your own variations on the A theme.

You can also experiment with where the turtle ends the letter. In the procedure above, the turtle ends in the same place it started. But you could also program it to stop at the bottom right hand corner, as in the next procedure. The designs below follow the same instructions as those above, but they look different because the turtle finishes the letter in a different place. In both versions of the letter the turtle ends pointing straight up.

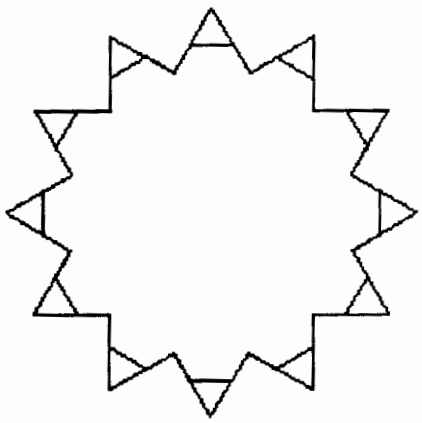
```
TO A
RIGHT 30
FORWARD 70
LEFT 60
BACK 70
FORWARD 30
LEFT 60
FORWARD 40
BACK 40
RIGHT 60
BACK 30
RIGHT 30
END
```

You may need to cut the distances for FORWARD and BACK in half for the designs to fit on the screen. (Don't change the angle numbers, though!)

```
REPEAT 4 [A RIGHT 90]
```



```
REPEAT 12 [A RIGHT 30]
```



The following "COPY ME" pages offer several other ideas for exploring letters and the procedures used to create these letters, as well as some other interesting designs. Don't limit yourself to the letters and designs included here—they are just idea-starters for you. Happy lettering!

The ideas in this column are extensions of ideas presented in *Kinderlogo*, a single keystroke Logo curriculum for young learners. This product is available from Terrapin Logo at the address given below.

Dorothy Fitch
Director of Product Development
Terrapin Logo
400 Riverside Street
Portland, Maine 04103

About the Cover

The cover was drawn by your *LX* editor. Don't you remember drawing your first Logo house? For those of you who are just starting, keep in mind that we all had our moments of frustration with Logo. For those of you who are more experienced, don't lose touch with those early moments of frustration that led to such wonderful learning experiences.

If you are interested in "ready made" alphabet letters, a copy of the LX Alphabet can be obtained from ISTE by filling out the order form below. Send with payment to:
ISTE, 1787 Agate St. Eugene, OR 97403

Please send me a copy of the Logo Alphabet on disk.

The Logo Alphabet is a set of procedures that draws all of the letters of the alphabet in the size of your choice. They were developed by Tom Lough, founding editor of the *Logo Exchange*.

Check which version you wish to have sent:

__Apple Logo (#LA1)
__Apple Logo II or LCSI Logo II (#LA2)
__Apple LogoWriter 1.1 (#LA3)
__Apple LogoWriter Version 2.0 (#LA4)
__Terrapin Logo (#LA 5)
__Terrapin Logo PLUS (#LA6)

Cost: $6.00 for SIGLogo Members; $10.00 for non-SIG Logomembers

Checks, VISA and Mastercard accepted.

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Name on Card _____

Card #: _____ Expiration date: _____

Name: _____

Address: _____

_____

State: _____ Zip/Postal code _____ Country _____

Phone: _____ SIGLogo member? _____

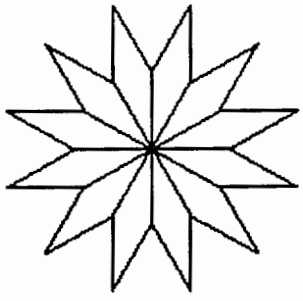
Letter Ideas

1. Choose a letter and draw it here with a pencil.

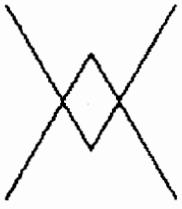
2. Next, write a procedure to draw it in Logo.

3. Make many of your letters in a row.
Here's an example using the letter M.

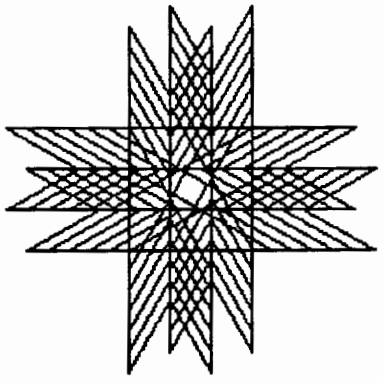
4. Make your letter turn around in a circle.
Can you tell which letter this is?



5. Make a reflection of your letter.
This example uses the letter W.



6. Try making a fancy design using your letter.
How many M's can you find in this design?



Letter Procedures and Designs

Here are more sample procedures for letters and numbers and instructions for some interesting designs. Since the distances are all in multiples of 10 and the angles are in multiples of 30, young children can create these designs using single keystroke programs, such as Instant and *Kinderlogo*.

```
TO Y
 FORWARD 40
 LEFT 30
 FORWARD 40
 BACK 40
 RIGHT 60
 FORWARD 40
 BACK 40
 LEFT 30
 BACK 40
END
```

```
REPEAT 12 [Y RIGHT 30]
```

```
TO W
 LEFT 30
 FORWARD 60
 BACK 60
 RIGHT 60
 FORWARD 30
 LEFT 60
 BACK 30
 RIGHT 60
 FORWARD 60
 BACK 60
 LEFT 30
END
```

```
W RIGHT 180 W
```

```
REPEAT 4 [W RIGHT 90]
```

```
REPEAT 6 [W RIGHT 60]
```

```
TO FOUR
 FORWARD 60
 LEFT 150
 FORWARD 40
 LEFT 120
 FORWARD 30
 BACK 10
 LEFT 90
 BACK 30
END

REPEAT 4 [FOUR RIGHT 90]
```

```
TO SEVEN
 FORWARD 70
 LEFT 120
 FORWARD 40
 BACK 40
 RIGHT 120
 BACK 70
 LEFT 30
END

REPEAT 7 [SEVEN RIGHT 360/7]
```

```
TO M
 FORWARD 60
 RIGHT 150
 FORWARD 40
 LEFT 120
 FORWARD 40
 RIGHT 150
 FORWARD 60
 RIGHT 180
END
```

Here's another interesting M design:

```
TO DESIGN
 REPEAT 6 [M RIGHT 180 M BACK 10 RIGHT 180]
END
```

Here is the instruction to make the M design on the previous page. You'll first need to type in both the M and the DESIGN procedures:

```
REPEAT 4 [DESIGN RIGHT 90]
REPEAT 4 [DESIGN BACK 20 RIGHT 90]
```

MathWorlds

edited by
A. J. (Sandy) Dawson

Two Turtles in a Hot Tub: Part Two
Logo and Language

Through a series of email messages initially between Tom Kieren and myself, but later joined by David Pimm, I suggested to Tom and David that they should sit down one day and tape record their conversation about the relationship between mathematics and Logo. This they did one evening whilst reclining in Tom's hot tub in Edmonton. They mailed the tape to me, and I had it transcribed. I did some editing on it, and then emailed the result to David in Britain and Tom in Edmonton. Within hours David returned a corrected copy to me by email. Tom's revisions came a few days later. Because of the limitations of space for any one column in LX, we have divided the conversation between David and Tom into three sections, the first of which appeared in the September 1989 Issue of LX and the second of which appears below.

(DP) What I have in mind by the phrase 'meta communication' are remarks about the content of what's going on built into the discussion about what it is that's going on. Can we look in general at some of the different uses of language that either encourage or are not allowed by working with the computer using Logo. It seems to me that one of the most striking things about Logo is it is a language which controls, rather then describes, action. And it necessarily comes before action, which is quite a different perspective from that which most language initially, I think, comes about with young children.

(TK) I rather like that aspect of Logo. I keep thinking that to come to grips intuitively with mathematics involves a close association of three things: some kind of imagery, some kind of thinking tools, (in this case maybe forming sequences of actions, or writing procedures, or things like that), and the third,is some informal use of language, that is, language which is closely related to action. So I have this very positive orientation towards the use of language in an Logo environment; that is, you are forced to focus on the language. On the other hand, I think your pointing out a really interesting feature which is that language comes before action in some real ways.

(DP) It is certainly one of the things that I think both Piaget and Vygotsky pointed to, even with young children; the constructive aspect of language,whereby to some extent they're creating the reality around them through the mediating influence of language. I've written elsewhere of the move, it seems to me, that initially, young children come to act on their world, the material world around them directly, through physical action, and later on, as they begin to acquire language, they acquire a further tool, which extends their grasp, a sort of action to distance that allows them to act on the world and particularly to the people in it. [Pimm] And it seems to me that Logo is a further extension of this which allows you to control, and I use the word quite deliberately, a machine. From time to time, I try to imagine what is it like for the turtle inside the machine. It seems to me that when you program with Logo it's a totally imperative language; you're just yelling at the turtle and telling it to do things, and the only feedback – there are lot of metaphor's around about talking with the turtle, and communicating, and so on – it seems to me, is an odd sort of communication where one person is doing a lot of yelling, and the only other participant in the conversation, all it can send back are bleeps and complaints like, "I don't know how to," and things of that sort.

(TK) I think that 's an interesting point. I kind of look at it on at least 3 levels. The first level is that the child is rather unaware of the turtle as being distinct from themselves. I think they really do think of telling themselves to do this action on the screen in a very...

(DP)... too close turtle identification...

(TK) ...yes, very close identification with the turtle. But I don't think it is identification with the turtle as much as, "I am doing this thing, and how do I tell myself to do it in this environment," which is a very awkward and odd use of language – its not a normal childlike use of language .

(DP) That's right, because particularly with this focus on action the child might think to itself , "I'm going to do "x" and then other things come into play, and off the child goes and does it. It seems to me that it's the constraints of the Logo environment that they can't directly act on the screen turtles, or even if it's a floor turtle, they're not encouraged to just pick the turtles up and move it around. In order to come to grips with some of the potential that the turtle offers, you need deliberately to use language. It seems to me another instance of what I have said about the difference between artificial teaching and natural learning. Provided the pupil is willing to take on the constraints of the situation, and in this case, they seem to be the constraints provided by the machine – you have to have a certain syntax and you have to put certain words in a certain order for example –provided they're willing to accept that, then natural learning can actually take place as a result.

(TK) I think in this initial "drawing mode" use of the language, if you will, particularly in direct mode, the syntax doesn't get so much in the way, because, in fact , you can use

one word at a time. However, this is a very strange use of language for anyone beyond eighteen months to just use one word at a time and have one word carry the sentence. You used the term imperative, and it seems to me that, one might almost think, the punctuation in Logo is an exclamation point.

(DP) Yes.

(TK) Or something like that, so you would be used to using these one word sentences. So, I don't think the syntax gets in the way, but nonetheless, this is an interesting use of language. I suppose the virtue of it is that something happens, almost simultaneously, or as I suppose Northrup Fry would call it, a hieroglyphic use of language – you use it only in the presence of the turtle, and you expect the turtle to do this. Its sort of like calling God down from the sky.

(DP) Summoning, yes, right.

(TK) I think that the syntax doesn't get in the way, but the use is still different.

(DP) And it can forge very strong links between the power of the language, and the action that the language produces. And it's that way round, rather than looking at something on the screen and describing it in terms of language.

(TK) Yes, there is no, "I have done something. Qu'est-ce que c'est. I have to have a name before I've done it."

(DP) You set up three levels of language and you told us about the first one, the one you termed, at least you cited Northrup Fry's calling it "hieroglyphic". I am curious about what the other two are.

(TK) The next level is you really do think of as shouting at the turtle, to tell it to do things. You're much more conscious that you are having something else – the turtle –do something for you. It probably makes sense, then, to think "well let me give it a complex set of commands". Now the syntax starts to come into play. Once you move into procedure, you have to think of the way which the language is put together, in and of itself, both the syntax and the semantics of the languages, as opposed to the action of the turtle. So at first the child is really thinking of extending itself through the turtle. Then, the second level is much more an action stage, not even action at a distance, but action whereby I get something else to do something for me because of my linguistic activity or my linguistic action.

A half way house in between is that the child has done something interesting, and then hits "text screen" to see what they have done, and then giving that list of commands a procedural name. The child realizes that the list is a critical feature, somehow, of the language without thinking of the list beforehand. A list is an after effect, if you will, of a set of singular actions.

So, the first move is to kind of pull yourself away from the action and make it more deliberately language oriented.

(DP) And so a second move is that you are pulling yourself away from the language.

(TK) Yes, you just simply look at the logic of what is ongoing, and then use the language just to describe that action, in and of itself. And it happens to be that you can run it of the screen again and test it. That happens to be a love bug, a nice consequence of almost any computer language. It's an implementing kind of language no matter how complex the ideas themselves become.

(DP) In relation to mathematics, this emphasis on action is something that is quite interesting. On the one hand, it seems to me initially a very powerful device for showing some of the effects, in practice, of symbolic statements that you can write down. In mathematics classes its very easy to get tied up in the syntax of the language without (in fact you're encouraged to do that!) paying any attention to the semantics going on. I'm thinking particularly of the pieces of work I've seen which Alan Schoenfeld is developing where, for example, you can point out any of the parameters in, say, a second degree equation in two unknowns, systematically vary those, and then the graph in parallel is drawn, showing you the effect of varying that particular parameter. This linking between one element of the syntax and the semantics that goes with it is a very powerful attribute that computers offer to us. On the other hand, I'm also curious that if, for example, you look at Balacheff's work, he's insisting on the importance for developing a concept of proof, of the three elements of depersonalization, detemporalization, and there's another "d" but I can't remember what the third one is. [Balacheff] But Balacheff is arguing that we should take students away from action and have them look at the form of the argument as a whole. Hence, I'm wondering to what extent the close tie-up between Logo language and action is eventually an anti-mathematical force. The connection between language and action in Logo insists that you remain in touch with semantics at all times. One of the important facilities that working syntactically for the doing of mathematics is that it allows you to suppress the semantics and work on similarities and links between the synthetic elements alone. When you are done you construct the semantics of where you've ended up might be.

Two Turtles in a Hot Tub--continued

(TK) I think there is a similar situation in Logo itself. Joel Hillel contends that repeat command is one of the most dangerous features of the Logo language. He seems to be arguing that repeat should be systematically suppressed with young children. The fear is that children just stick repeat in, wily-nilly, put some brackets, write something, close the bracket, and then some lovely Star Wars effect happens on the screen. The learners have simply used the language in an uninformed way to generate an effect. Nonetheless its just sort of playing with the language, but in quite a different way than Balacheff might have expected.

(DP) I agree

(TK) It certainly is detached from the action; there was no intent that the action would happen, but then they hit the return and suddenly things happen on the screen.

(DP) And as ever, I think there's the tension between the interest and orientation of the teacher, and that's the children, and the children themselves who would, I suspect, be delighted with the effect on the screen.

(TK) Yes

(DP) In terms of the things we were saying earlier, in this situation repeat is a very powerful primitive which is available to the children. The question then is what the teacher does to try to orient the children towards the teacher's focus on the language in relation to the action, rather than leaving the children with their attention focussed totally on the screen tied up with the action itself.

(TK) About your remarks about Balacheff, I think proof occurs at some different level. The question is, if the child needs to go back, is there anything to go back to, or do you just start teaching proof at some level of action? The history on this continent of starting to teach proof in Euclidian fashion at Grade 10 meant that we were working at the wrong level with geometry. We had the first two or three Van Hiele levels, and said, "Well lets treat level 3 or level 4 as if it were the beginning." Balacheff is absolutely right that you want to, in fact, Dis-associate level 3 or 4 from action, but there should be some action from which to Dis-associate it.

(DP) Right, and I think particularly the problem with non Euclidian geometry teaching, is that teachers get caught up with the mathematician's urge to be elemental in the sense of starting with minimum set of assumptions and proving as much as they can from them. This is related in some ways to the fact that Logo has the same intent with simple primitives from which you can generate quite a lot of exciting mathematics. In Balacheff's work he's talks quite a lot about action proofs as being an initial impulse towards proof. Action proofs are very procedural in nature. In terms of justification you just say, "Well you do this!" Later it is this doing notion of proof that learners must back away from so that they can move towards creating an argument that is self- sufficient and all those "d" words, detemporalized and so on.

(TK) It would require that Logo be approached in a different way if one was to approach Logo in way which parallels Balacheff's ideas about mathematical proof; that is, the essence of Logo would be structure or structured proofs where you would conceptualize a driver procedure that has a whole sequence of subprocedures. But this would a reversal of temporalization – reversing time – so that you would have to invent first the last thing you want to do. Or to put it another way, you would create first the most complex thing you want to do, and then find out what all the small pieces would have to be. It seems to me that the ability to do that could only comes as a, if you will, recursion on previous experience with a whole range of different kinds of procedures. You would have to be used to looking at a procedure as a thing as opposed to looking at the procedure as the collected action of something. Eventually one could look at the logic of the procedures as the reflection of the structure. I think there are these lovely levels that are available in Logo, whether or not the teachers are using them or thinking about them .

(DP) More explicitly, working or thinking about ways of suggesting to the pupils that they attend to these higher levels.

(TK) Yes. Coming back to our discussion of the use of the repeat command, for example, it is sometimes nice to have the children print out their lovely screen displays, but teachers have to realize that they may be reinforcing children's inattentive use of language

(DP) That is right

(TK) And that's a problem.

(TK) Instead of saying to the children, "Gee you've done this remarkable thing", teachers might ask, "How did you do that remarkable thing?" That's an interesting, problem in the use of teachers' language.

(DP) The remarkableness is attached to the end product rather than the language that gave rise to the end product.

(TK) Correct.

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About the discussants

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Logo LinX

Dot-to-Dot LinX

Judi Harris and Sue Eskridge

Some children's games stand the test of time. Jump rope, football, and tic-tac-toe, for example, were as popular in our grandparents' childhoods as they are in our own times. Dot-to- dot puzzles are examples of such classic activities that can be adapted for instructive use. Dot puzzles are often given to preschool and kindergarten children for recreation and number sequence review. Versions with numbers reaching close to 100 can be used for similar purposes with older children (i.e., Pomaska, 1983). Others appropriate for students in early elementary grades label successive dots with addition, subtraction, multiplication, or division facts.

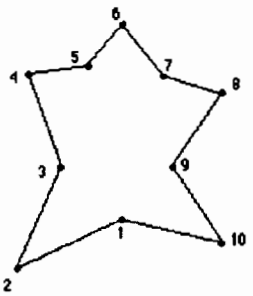
Descartes' Dots

Constructing dot-to-dot puzzles with Logo is an interesting programming challenge for students who are familiarizing themselves with the Cartesian coordinate system. Using the procedure DOT, students can place points that form a picture on the computer screen, label the points with number, letter, or arithmetic fact sequences, and save the puzzles on a class diskette. Their classmates can later retrieve the puzzles and use the turtle to connect the points in order to form a picture. This would give the "puzzle-solver" good turtle-based practice with estimating distance and angle size.

```
TO DOT :ACROSS :DOWN
PU
SETPOS LIST :ACROSS :DOWN
PD
REPEAT 4 [FORWARD 2 RIGHT 90]
END
```

(This procedure can be named BIG.DOT in versions of Logo that already have a DOT primitive).

```
TO PUZZLE
DOT 0 -40
DOT -60 -70
DOT -35 -10
DOT -55 45
DOT -20 50
DOT 0 75
DOT 25 45
DOT 60 35
DOT 30 -10
DOT 60 -55
END
```



Dot labels are most easily done by hand in LogoWriter, moving the turtle with the arrow keys and using the LABEL primitive from the Command Center, but a pre-labelled PUZZLE procedure can also be constructed, which uses the subprocedure OVER.

```
TO LABELLED.PUZZLE
DOT 0 -40
   OVER -3
   LABEL "1
DOT -60 -70
   OVER -3
   LABEL "2
DOT -35 -10
   OVER -3
   LABEL "3
DOT -55 45
   OVER -3
   LABEL "4
DOT -20 50
   OVER -3
   LABEL "5
DOT 0 75
   OVER -3
   LABEL "6
DOT 25 45
   OVER -3
   LABEL "7
DOT 60 35
   OVER -3
   LABEL "8
DOT 30 -10
   OVER -3
   LABEL "9
DOT 60 -55
   OVER -3
   LABEL "10
END

TO OVER :AMOUNT
PU
RIGHT 90
FORWARD :AMOUNT
PD
END
```

These puzzles can, of course, be formed in the immediate mode by children not yet familiar with procedure writing. Earliest beginners can make dot puzzles on the computer screen by moving the turtle with the arrow keys and STAMPing it in places where the dots should be, labelling the turtle-

shaped dots as they are STAMPed, then saving the puzzles as pages without procedures on the flip sides.

But Dots Not All!

A different type of dot-to-dot Logo puzzle that incorporates practice in sequencing or arithmetic can be made by xeroxing pre- drawn dot-to-dot puzzles (such as those offered here), and running them through a Thermofax machine with a heat-sensitive transparency master, so that the dot-to-dot puzzles are transferred to overhead transparencies. Then a transparency can be taped over a computer screen with Logo loaded into memory, so that users can (seem to) connect the dots by moving the turtle. Although the turtle is really underneath the transparency, it appears as if it is travelling from point to point on top. Be warned, though: these puzzles are more difficult to solve than they appear to be!

References

Pomaska, A. (1983). *Follow the dots coloring book.* New York: Dover Publications, Inc.

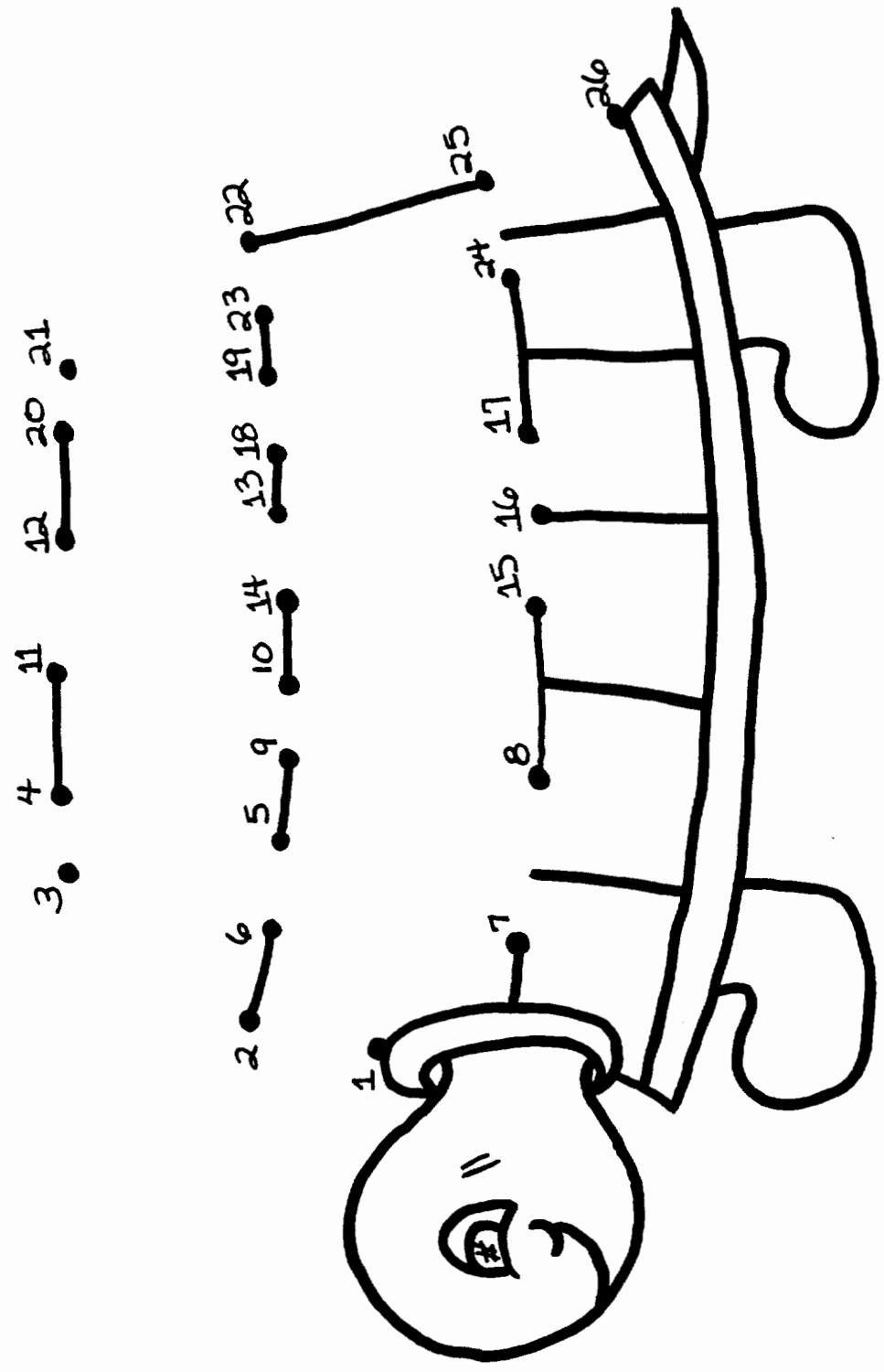
Dot Puzzle Resources

For transparency puzzles:
Big Dots to Draw and Color (c) 1964
Resource Publishers, Inc.
1329 Arlington Street
Cincinnati, Ohio 45225

Higher-level dot puzzles to solve by hand:
Follow the Dots Coloring Book ISBN #0-486-24543-8
Dover Publications, Inc.
180 Varick Street
New York, NY 10014

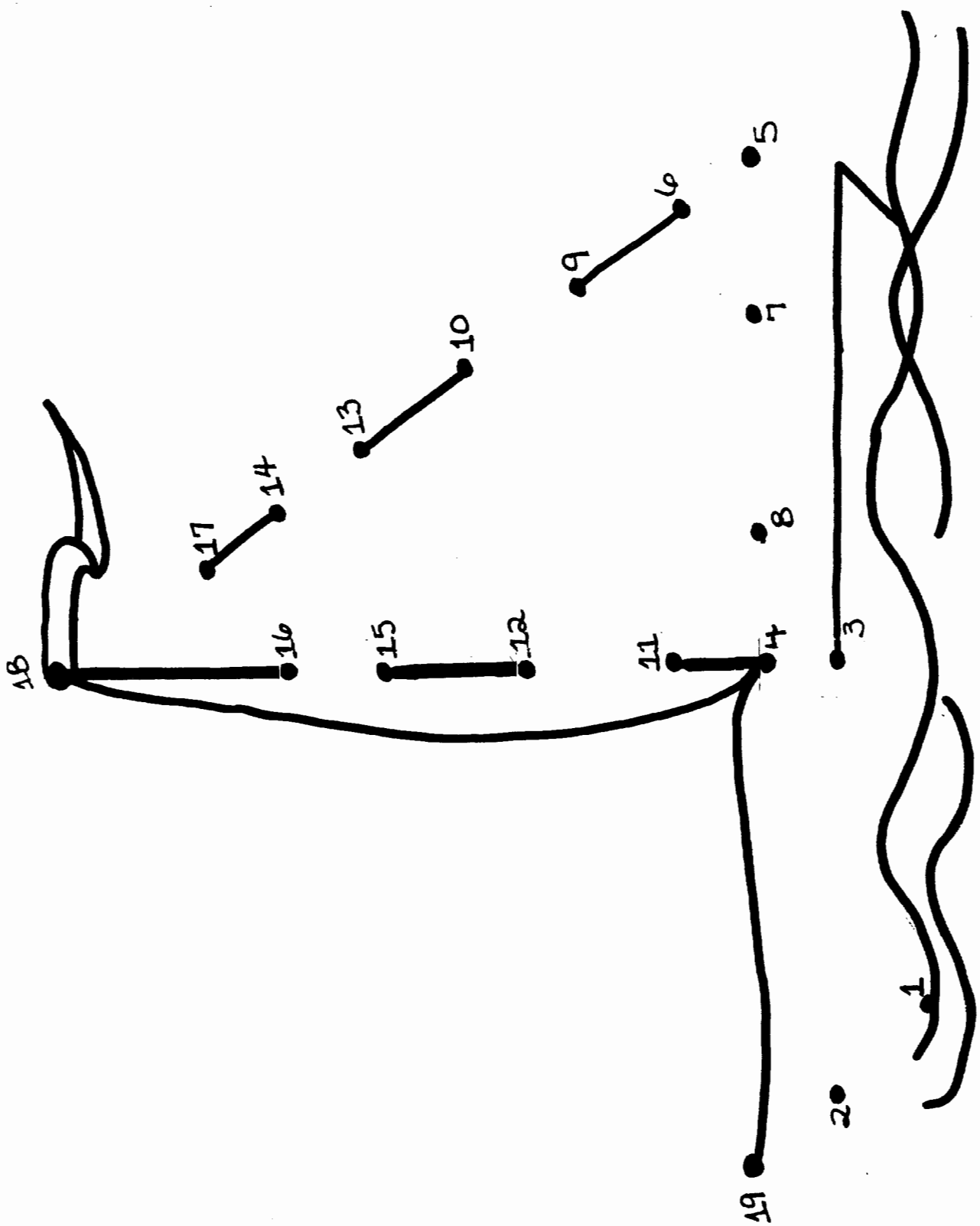
Judi Harris
621F Madison Avenue
Charlottesville, VA 22903
CIS: 75116,1207
BitNet: jbh7c@Virginia

An LX Copy Me! Page



An LX Copy Me! Page

An LX Copy Me! Page



An LX Copy Me! Page

Logo and Company

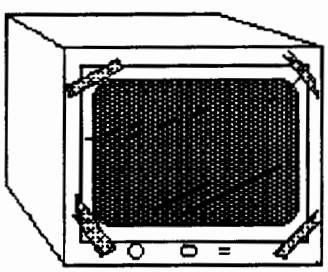
Multimedia for Beginners

by Glen Bull, Gina Bull, Paula Cochran, and Chris Appert

This series of columns is devoted to combining Logo with other technologies. An introduction to multimedia seemed appropriate in this special theme issue of the Logo Exchange devoted to Logo for novices. The term "multimedia" refers to combining different technologies - video, audio, and computer – in a single instructional application. Often media such as videodiscs, CD-ROMs, digitized sound, and video tape are utilized. Printed art and illustrations should not be overlooked, because digitizers and scanners can convert either to a computer image. Examples of popular multimedia systems include Hypercard on the Macintosh used in combination with a videodisc player, and the IBM Infowindows system which combines a touch screen with a videodisc player.

The techniques described in this month's column require no specialized technologies other than Logo. These techniques will lead to sophisticated applications which will be described in later columns. For many years teachers have used a technology that in some ways is more flexible than many sophisticated computer applications for creation of classroom displays. Often a teacher will want to transfer an illustration from a book or magazine to a bulletin board. It would be theoretically possible to digitize the picture and use an industrial CAD/CAM plotter to produce a poster the size of a bulletin board. However, teachers adopt the practical approach of tracing the drawing onto a transparency. The transparency is then placed on an overhead projector and projected onto the bulletin board. The relative size of the illustration can be adjusted by moving the projector farther or closer to the bulletin board. Once the projected image is satisfactorily adjusted, the drawing can be transferred to a poster.

The same technique of tracing a drawing onto a transparency can be used to create an overlay for the computer screen. At it simplest, the overlay can be taped over the computer screen. Despite advances in computer art programs in recent years, conventional markers and pens have an ease of use that few computer programs approach. The transparency can be used to create a "Turtle Town " or a maze or the frame for a theater stage.



Using an Overlay

A tracing of an illustration on a transparency can also be used to transfer a picture to the computer much as a scanner does. First tape the transparency over the computer screen. At this point you have several options. If you have access to a paint program, you can use the paint program to trace the illustration. Then use a command such as LOADPIC in LogoWriter (or the equivalent in other versions of Logo) to convert the image to a Logo picture.

The advantage of using a paint program is that paint tools are well suited for tracing curved lines. The disadvantage is that once a paint file is imported into Logo, it is fixed and relatively difficult to change. An alternative is to trace the transparency directly in Logo using turtle commands to move the turtle. This is a more laborious process, and works best for relatively uncomplicated shapes. However, if a record of the turtle moves is kept, the commands that form shapes can be put into a Logo procedure (HOUSE, TREE, etc). This permits the individual objects that form the illustration to be shifted and moved on the Logo screen. Despite the time consuming nature of the process, children who become intrigued can trace surprisingly intricate objects. A further advantage is that once an object has been traced and converted to a Logo procedure, it can be saved in an special "object library" and shared with other classes.

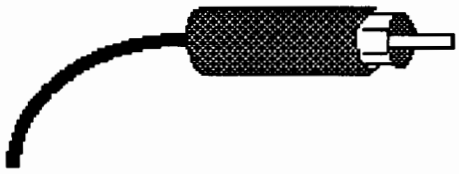
Printed illustrations are one medium which can be transferred to the computer through the transparency tracing process described above. Video tapes are another medium which can be transferred in a similar way. A 1988 survey found that 89 percent of all public schools in the United States owned videotape recorders (VCR's). Further, 62 percent of all households in the United States own videotape recorders, and another 15 percent own video cameras. The chances are good that a VCR will be available for use with Logo in your school.

Often it is possible to unplug the computer input to your monitor and connect a VCR to the monitor instead. In some cases,the monitors for Texas Instruments, Commodore, and other computers have outlasted the computers. In those cases we have often pressed the monitors into service for use with videotape recorders. If you have a computer with a composite video output such as an Apple IIe, II+, or IIc, the chances are that you can connect a VCR directly to its monitor. Newer models such as the Apple IIgs may require a slightly different approach.

A computer picture is composed of three colors: red, blue, and green. These three colors can be mixed together to form all the other shades on the monitor. In newer computers such as the Apple IIgs the video signal is sent to the monitor

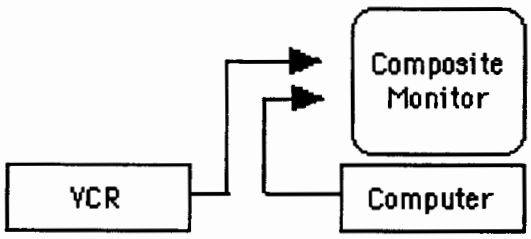
via three separate wires, one for each color. This type of monitor is called a red-green-blue (RGB) monitor. In older computers such as the Apple IIe, the three colors are mixed together in a single cable as they are sent to the monitor. This type of monitor is called a composite monitor.

An RGB monitor delivers a sharper image than older composite monitors, and therefore is favored in newer computers. However, a composite monitor has one very large advantage. It is usually possible to connect a VCR directly to a composite monitor. How can you tell if you have an RGB or composite monitor? Look on the back of your computer monitor. If the connector has multiple pins, it is probably attached to an RGB monitor. If the cable has a single pin in the middle, similar to the kind used to connect a stereo receiver to a turntable or tape deck, it is probably connected to a composite monitor. This type of connector, shown in the illustration below, is sometimes called an RCA or phono plug.



Jack for Composite Monitor

If you have a composite monitor, you can send the video signal from the video out jack of the VCR to the monitor, as shown in the diagram below. Just unplug the monitor cable from the computer, and plug it into the video out jack of the VCR. (Tip: we found that on several Comrex and Amdek composite monitors with audio and video inputs, it was necessary to connect both audio and video cables from the VCR before a clear picture appeared.)



Sending a VCR Signal to a Composite Monitor

Now insert a videotape and press PLAY on the VCR. A picture should appear on the composite monitor. Press the PAUSE button on the VCR to freeze the picture. It is possible that a band of static or noise may appear on the picture. Sometimes it may be necessary to press PLAY and then PAUSE several times to get a good pause that minimizes this visual noise. Also, more expensive VCR's with four tape heads typically provide better paused pictures than VCR's with only two heads. However, we found that we could usually get a usable pause even with VCR's with only two tape heads.

Once the picture is paused, you can tape a transparency to the monitor and trace the picture on the monitor just as you would trace an illustration in a book. After you have traced the image from the videotape onto the transparency, you can unplug the monitor cable from the VCR and plug it back into the computer. Then transfer the tracing on the transparency to the computer using a paint program or Logo, just as you would a transparency obtained from a tracing from a book.

When you and your students try this the first time, look for videotape images that are very simple. Look for large shapes and areas that have clear outlines. For example, we found a section on a Dr. Seuss story tape with a beautiful but simple staircase going the length of the screen. In another story, the perfect igloo appeared, in a plain background. We tried it with a six-year-old, who had little trouble tracing the basic shape with a marker.

There are several advantages to using an image from a videotape. One is that the size of the image from the videotape will always be the same as the size of the image on the computer, because both will be displayed on the same screen. A videotape can also be used for studies in visual perspective. By taking a tracing from one frame of a videotape and then a second tracing from a few frames later in the videotape, it is possible to compare how the visual perspective changes between the two frames. Objects in the distance appear to be smaller than similar objects in the foreground. What happens as the perspective changes? There are possibilities for explorations in art and science.

If a video camera is available, it is possible to explore visual perspective in more detail by allowing members of a class to create their own source materials. Two pieces of masking tape can be laid in parallel lines in the classroom and videotaped from various positions, or naturally occurring instances of the same phenomenon can be identified by the class and videotaped.

Logo and Company--continued

If your computer has an RGB monitor, it may still be possible to experiment with combining computer and video technologies. Some computers have both an RGB and a composite output. For example, the original IBM PC and IBM PC-XT with color graphic adapter (CGA) cards have both an RGB and a composite output. The RGB cable can remain connected to the original RGB monitor provided with the computer at the same time the composite video signal is sent to a second monitor. The Apple IIgs also has both an RGB and a composite video output. Newer IBM computers with enhanced graphic adapter (EGA) and other cards generally do not have composite video outputs. In this case, the schools with the older technologies have at least one advantage. :-) (This is a smile face. See "Sunny Side Up/to the Left" by Judi Harris, *LX*, April, 1988)

A number of technologies can be used to enhance the type of activities described here. For example, Apple has just introduced a Video Overlay Card for the Apple IIe and IIgs computers which makes it possible to display the video signal and the computer signal on the monitor screen at the same time, rather than switching back and forth between the two images. Digitizers such as Computer-Eyes allow the user to capture a television image and convert it to a computer picture via software rather than by tracing it onto a transparency taped to the monitor. Many of these multimedia hardware accessories are relatively inexpensive, costing $200 or $300. However, at the beginning of the column we promised that we would suggest some multimedia applications that do not involve new or exotic technologies. We think that applications involving only Logo and a VCR come close to fulfilling that promise, since nearly 90 percent of all public schools have VCR's.

In a future column we will discuss the potential of peripherals such as the Video Overlay Card. Prior to that we intend to continue the exploration of what can be done using only Logo and a VCR. The first step is to determine whether it is possible to connect a VCR to your composite monitor. Once it is hooked up, we will have some more suggestions involving Logo and multimedia applications.

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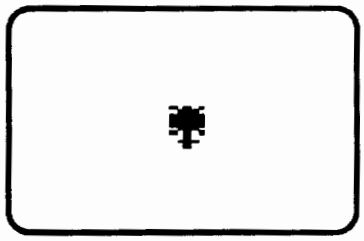
Logo: Search and Research

What's hard about beginning with Logo? The research

by Douglas H. Clements

Two kindergarten boys were videotaped working with the turtle for the first time. The turtle was facing "down" (i.e., at a 180° heading).

Steve: Let's make it go left.
Dave: Left is this way [points to his left].
Steve: [Presses L.]
Dave: [in a disappointed tone] Ohhh.
Teacher: What happened? What did the turtle do?
Steve: It...turned left.
Dave: But I want him to go left! (from Clements & Battista, 1988)



What makes it difficult for beginners of any age to begin to learn Logo? Logo was created as "an easy way into" computer science and mathematics. But that which is intellectually stimulating cannot also be entirely easy! And Logo does present difficulties for beginners. When we are beginners, it helps to know that everyone has the same problems as we are having. Further, if we as teachers understand these difficulties, we can help our students learn more and learn more happily. Let's look at some of the more frequent difficulties.

Talking to the Turtle

The first difficulty beginners have with Logo is often understanding the turtle. Everyone learns by making sense of things. The "new" is figured out in terms of the "old"; that is, what is already known. And in everyday language, "right" usually means "turn right and keep moving forward." So, it is no surprise that beginners bring this conception to their Logo work. Actually, when commands are given to the turtle, they are interpreted in reference to its current orientation and position. RIGHT 90 means "turn the turtle 90 degrees the the right, or clockwise, from its current orientation."

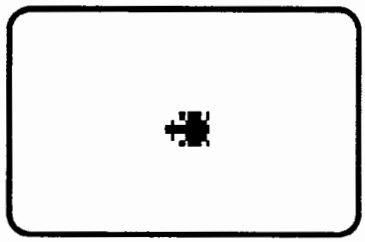
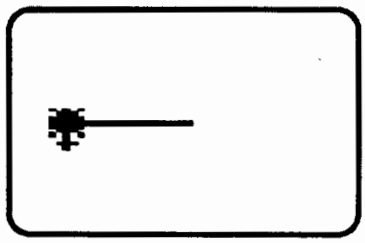
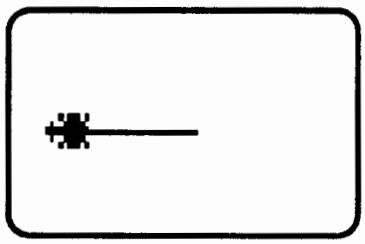
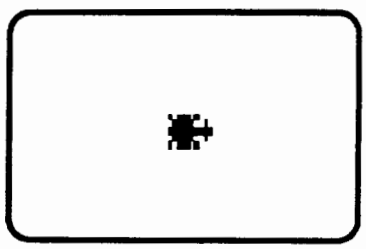
What specific types of bugs do beginners have? Two types are most common (Fay & Mayer, 1988). Interpretation

bugs are those in which beginners assign the wrong action to a command (e.g., interpreting a turn command to mean move, or turn-and-move). Egocentric bugs are those in which beginners interpret commands incorrectly (e.g., RIGHT 90 means to face the right side of the screen or to the beginners' right, rather than the turtle's right). This was Steve and Dave's bug. These bugs can occur separately or together.

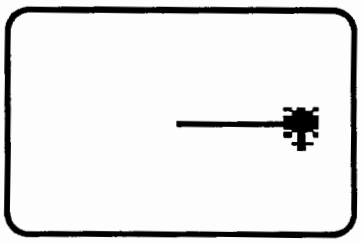
Let's say the turtle begins again at a heading of 180°. The diagram below shows what beginners with various types of bugs would predict for the command RIGHT 90 (Fay & Mayer, 1988).

Beginners might also believe, for example, that RIGHT 90 means turn the turtle 90° and move it forward 90 steps and that RIGHT 45 means turn the turtle 90° and move it forward 45 steps.

These bugs may result from an egocentric view of space (Piaget & Inhelder, 1967). Thus, beginners might fail to recognize that when the turtle is at a 180° heading, its "right" is the beginners' "left." They might also ignore the turning action itself, and concentrate only on the end state (e.g., facing right). How prevalent are such errors? After a hands-on introduction to Logo, 35% of a group of fourth and fifth grade

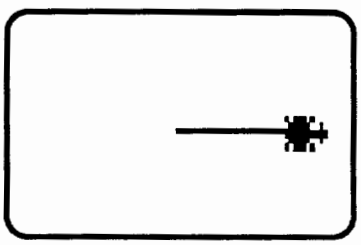
Type of bug	RT 90 means:	Drawing for RT 90
Correct (no bug)	Turn the turtle 90° clockwise	
Interpretation bugs	Move the turtle to its right	
	Turn the turtle 90° clockwise and move it forward	
Egocentric bug	Make the turtle face the right side of the screen	

Move the turtle to the right side of the screen



Interpretation and egocentric bugs

Make the turtle face and move to the right side of the screen



students displayed egocentric bugs on turn commands, compared to only 7% of sixth and eight grade students. More of the younger students (22% vs. 2%) also displayed this bug on FORWARD and BACK commands (Fay & Mayer, 1988).

As mentioned earlier, everyday language may account for the interpretation bugs. About 26% of the younger students and 7% of the older students interpreted turn commands to mean turn-and-move. Even adults in the study displayed these types of bugs, although to a lesser degree. Most of these bugs were interpretation bugs; few were egocentric bugs.

In summary, there are two possible difficulties for beginners. They might lack conceptual skills of taking the turtle's perspective, or they might interpret Logo commands in terms of everyday language. Can these misconceptions be overcome?

The researchers engaged the same students in three additional sessions. Most fourth to eighth grade students showed a decrease in misconceptions, but some did not. These results suggest that at certain ages or stages of development, certain misconceptions in the Logo environment are to be expected and may take some time to eliminate, even when beginners are given hands-on experience.

However, given the right Logo environment and careful teacher guidance, even younger beginners might be successful. For example, even four and five year old children learned three concepts of directionality: personal left/right, relativeness of left/right, and multiplicity of points of view. But they were learned only through structured, teacher-directed activities with an "Instant" or "SingleKey" Logo, not through unstructured free play (Longcar, 1986).

Even with indirect teacher guidance, some children manage to devised strategies to deal with directionality (Kull, in press). For example, first graders who turned the wrong way often typed the inverse command twice. If they made several turns in wrong direction, they turned 180° so they could "start over again." They also used a similar "back to the beginning" strategy to deal with distance errors. Later, children started to erase only the unneeded portion of a line segment. Once learned, they used this subtraction strategy for turns, too. In about 2 months, problem of directionality disappeared!

Whether using direct or indirect approaches, the teacher is essential. Note that Steve and Dave's teacher asked questions to help his students to reflect on the results of their actions and to attend to important features of the problem. Here's where we left off:

Dave: But I want him to go left!
Teacher: Which way is the turtle heading?
Dave: Oh, yea, turn him left and then go forward!

The teacher did not try to directly tell the children what to do. Later in the week, the boys seemed to have firmly constructed the idea of turn. Typical was the following exchange.

Steve: He's facing this way, right? And we want him to go...[turning his head so that he's facing the same way as the turtle]...right!

Dave: So that would be...R. [Taps his head repeatedly and emphatically.]
Steve: [Types R.] Now, F for forward!

The act of turning their heads to align themselves with the turtle may be sign that children really do "see" a change in direction as a result of turning motion. Importantly, children did not construct this critical and surprisingly difficult idea by watching the teacher's demonstrations or hearing his explanations. They used Logo as a tool to experiment with their own ideas. The teacher helped them reflect on their experiments (Clements & Battista, 1988).

The Big Picture

Stepping back, we see that beginners must realize that Logo is an invented world in which the turtle is the inhabitant. They must interpret spatial commands, including left and right, from the perspective of the turtle. So, a basic aspect of Logo learning is the understanding that despite this difference, their personal knowledge of moving applies to the turtle's actions—but from its in perspective. The child must imagine an independent but controllable entity with familiar spatial properties and its own distinctive perspective (Fein, Scholnick, Campbell, Schwartz, & Frank, 1988).

They also must see that the command are not just isolated words. There are connections among the commands. One way of looking at the turtle's "world" is shown in diagram below (Clements, 1989; Fein et al., 1988). Turtle commands can be seen as affecting either of two large areas, the turtle or the screen (the large upper and bottom boxes). Commands directly related to the turtle can be further subdivided. Those that affect the turtle's state answer "which?" and therefore are qualitative commands (the left top box). These address the visibility of the turtle and the turtle's trail and the color of the trail. Those that affect the turtle's position answer "how much" and therefore are quantitative commands (the right top box). The address the turtles heading, or orientation, and its position in space.

Such an organization helps students understand the logical nature of turtle commands and their relationships. In addition, it is an aid to programming. For example, students often write a procedure, a WINDOW for example, assuming certain states (e.g., the pen down and the trail color white). As they use WINDOW as part of a larger HOUSE program, however, they often put the pen up to move to the window's location. Then, they are confused that the WINDOW is not drawn (i.e., the turtle follows the path, but does not leave a trail). The organization of commands in the following diagram may help emphasize that, for each procedure, the state commands should be considered first (e.g., Is the pen up or down? Is the pen color set correctly?), followed by the position commands (Is the turtle oriented correctly? How far should it move?).

In sum, research shows that beginners must learn to perceive the turtle as possessing multiple attributes simultaneously, such as moving, changing pen color, and pen up or pen down (Fein et al., 1988; Kull, in press). They must realize the historical context of turtle commands, containing default and implicit values (Fein et al., 1988). Finally, they must learn that the sequencing of commands matters: state -> direction -> distance.

This is a lot to ask! It's not surprising that beginners, young and old, make so many errors. But the Logo philosophy is to "celebrate bugs" and use them as an opportunity for learning. We'll continue our own celebration next month with a discussion of other common Logo bugs.

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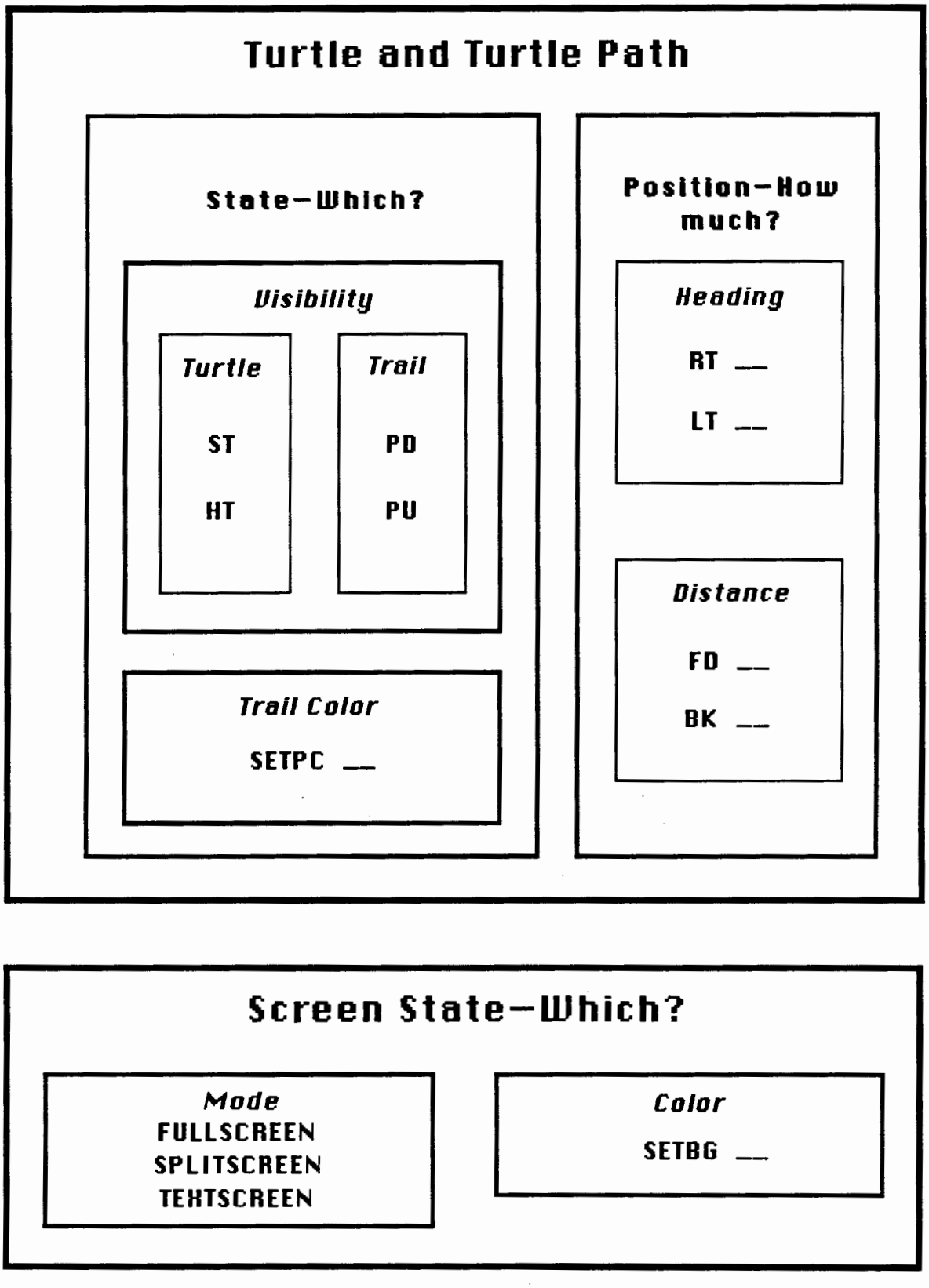
Turtle and Turtle Path
State—Which?
Visibility
Turtle
ST
HT
Trail
PD
PU
Trail Color
SETPC __
Position—How much?
Heading
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This month's Global Comments have a definite Latin flavor. First we look at the very successful Fourth International Logo Congress in Chile and then turn our attention to the MINERVA Project taking place in Portugal.

Fourth International Logo Congress

Fernanda M. F. Barrella of the University of Campinas in Brazil was the *Logo Exchange*'s reporter at the Chilean Congress and she files this report.

The IV International Congress took place in Santiago, Chile during the period of March 27-29, 1989. Approximately 1000 teachers and researchers from different countries in Latin America attended the congress. The congress consisted of:

- three main talks, the inaugural speech by Horacio Reggini from Argentina and lectures by Seymour Papert and by Steve Ocko;
- 2 mini-courses, one taught by Nora Guzmn (a teacher from the Hennigan School in Boston) and Seymour Papert on the use of Logo in the curriculum, and another taught by Lea Fagundes from the Federal University of Rio Grande do Sul, Brazil on cognitive interactions in a Logo microworld;
- presentation of experiences by teachers from Chile, Argentina, Uruguay, and Brazil working groups with the objective to raise issues concerning future research in each one of the main areas of Logo use in schools;
- and expositions of equipment, books, and educational technologies.

In his inaugural speech, Horacio Reggini talked about "El Pasajero de la Gondola" and used Held and Hein's famous experiment that showed the importance of being sensorially active in order to develop sensorial capabilities. This was demonstrated by using two sibling cats placed on experimental gondolas which provided both with the same visual stimuli, but permitted only one of the cats to explore the limited environment. After several days in this apparatus it was possible to show that the active cat had developed its visual abilities as a normal cat, whereas the passive cat had not learned anything. Reggini used the gondola metaphor to introduce the idea that the use of the computer should encourage the students to be active participants in the learning environment.

Papert talked about a particular style of doing Logo in Latin America, related to the cultural and educational idiosyncrasies of the Latin American people. He made the important point that we should provide students with tools for them to learn with instead of simply teaching them. Learning several things simultaneously, in several contexts, leads to better learning. Also, it is important to put our "heads into" Logo as opposed to simply putting our "hands on" these materials.

Steve Ocko's talk concentrated on the Lego-Logo experience taking place at Hennigan School. Lego-Logo is still a new idea in Latin America and this talk was very useful, showing that there is more to Logo than just the Turtle on the screen.

Another important contribution from the MIT Logo Group was the participation of two teachers from Hennigan School running two workshops about the use of Logo in the Elementary School. They concentrated on the curriculum aspect of the problem since the integration of Logo into the school curriculum is a challenge for most Logo teachers. Papert's presence in these workshops helped to create an important environment for discussion and learning experience.

The presentation of Logo experiences by researchers and teachers from several Latin American countries created the

Global News--continued

opportunity to know what has been done with Logo and the kind of interests and concerns these Logo users have. The majority of the papers presented were about experiences involving the use of Logo with elementary schools (19 papers) and special education (22 papers). There was only one paper about teacher training, one about the issue of Logo with adults, three involving preschool children, six about the use of Logo with high school students, and seven describing different types of Logo microworlds.

The fact that the majority of the work presented was about using Logo with elementary and special education students is not a surprise since the use of Logo with these populations is often easier than at the high school level. Often the educational environments of the elementary school for normal and special needs children are more tuned to the nature of the goals of Logo. In addition, less programming knowledge is needed by the teachers of these populations. With 30 to 40 hours of Logo use it is possible to develop exciting Logo activities. In fact the type of work presented demonstrated creativity and an effort that tried to take advantage of the computer's resources to introduce material from the curriculum.

Portugal's MINERVA Project

Joo Filipe Matos and Eduardo Veloso of the Department of Education at the University of Lisbon submitted the following report about Portugal's MINERVA Project. Mr. Matos teaches mathematics education and is preparing a Ph.D. thesis on Logo and students' conceptions and attitudes towards mathematics. Mr. Veloso is a researcher in the MINERVA Project. Both have been involved in the preparation of national Logo conferences in Portugal. They may be contacted at the Departmento de Educa o, Faculdade de Cincias, Universidade de Liboa, Portugal.

Since 1985 there has been in Portugal a national project called MINERVA whose general aim is the introduction of computers in primary and secondary schools. The main centers for this project are the universities and schools of Portugal. These schools are given great autonomy that has resulted in a diverse set of aims and results.

In most cases, a group of schools is associated with one center, which is in charge of teacher training and follow up support. As an example, the Department of Education of the Faculty of Science in the University of Lisbon works presently with 19 schools (3 primary, 6 middle, and 10 secondary).

Word processors, spreadsheets, databases, graphics designers and Logo are used both in the classroom and in informal learning settings. Almost no content specific software is used. Logo has been used since the Fall of 1985. It was first introduced in two elementary schools in Lisbon using a tool contained in the MSX computer that allowed children to construct procedures in drive mode. Now it has spread all over the country and is present in at least 50 schools. Most of these schools presently have PC compatible computers.

Since 1986, a national Logo Conference takes place every year in a different town. About 150 school teachers from all levels have the opportunity to exchange experiences and participate in workshops and discussion groups. In addition, three masters' theses were submitted concerning Logo related research. Two Ph.D. dissertations are now in process of completion.