

Logo Exchange

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



THE BEAUTY OF MATHEMATICS

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Logo Exchange

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Editor-in-Chief

Gary S. Stager, Pepperdine University
logoexchange@moon.pepperdine.edu

Copy Editing, Design, & Production

Ron Richmond

Founding Editor

Tom Lough, Murray State University

Design, Illustrations & Art Direction

Peter Reynolds, Fablevision Animation Studios
pete@fablevision.com

Contributing Editors

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Dr. Carolyn Dowling, Australian Catholic University
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Send surface mail to:

Gary S. Stager
21825 Barbara St.
Torrance, CA 90503 USA

Send electronic mail to:
logoexchange@moon.pepperdine.edu

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The More Things Change . . .

School math . . . Few words strike such fear in the hearts of the public. (Although I did once see an exhibit at my local shopping mall celebrating "Mobile Army Dentistry." Does the Army actually believe that this will boost recruitment?) For me, Logo has been the antidote for the years of psychic damage I endured at the hands of school math teachers.

School math should not be confused with the actual field of mathematics. There may be no other school subject whose teaching and curriculum bears so little resemblance to the actual discipline. School math is mechanics, mathematics is mystery. School math is a topic per week with test on Friday, mathematics is a way of understanding the world. School math is about marks on paper, mathematics is about beauty. Logo offers many children an opportunity to acquaint themselves with that beauty, mystery, and epistemology.

The 1990 National Council of Teachers of Mathematics Standards contain a statement that has challenged my thinking for several years now. The Standards state that "More than 1/2 of all mathematics has been invented since WW II." Where is this stunning piece of news reflected in most math curricula? To ignore this progress is to deny lots of kids access to exciting new branches of more playful, experimental, visual mathematics such as chaos,

fractal geometry, number theory, topology, and cellular automata. These emerging topics may provide a port of entry to the beauty and power of mathematics for learners, like myself, who were not moved by solving dozens of identical quadratic equations.


The Standards go on to explain the causes of this explosion in mathematical progress.

1. Science and technology make ever new demands on mathematics for assistance.
2. Each new, completed result becomes the potential starting point for several new investigations. The new technology not only has made calculations and graphing easier, it has changed the very nature of the problems important to math and the methods mathematicians use to investigate them. (1990 NCTM Standards, page 8)

When I discussed this at the recent NCTM conference, people in the audience predicted that closer to 80 or 90% of all mathematics has now been invented since World War II. I sincerely hope that the 2000 NCTM Standards (take a look at drafts at www.nctm.org) will acknowledge the rapid advances in mathematical knowledge as well as the reluctance of the math education community to seize upon the

exciting potential this progress holds for learners of all ages.

This issue is dedicated to thinking about mathematical thinking and teaching. There are wonderful ideas for classroom projects, as well as provocative essays challenging us to declare our intentions for the future. Logo pioneers Andy diSessa and Paul Goldenberg, both Logo users since the 1970s, have contributed thoughtful pieces to this issue. Andy proudly announces the long-awaited release of Boxer and states that we should all be using it because it's better than Logo. You decide and let us know what you think! Paul contributed part of a provocative paper in which he muses over what may actually be lost as we use computers and software, like Logo, to learn mathematics. Please think about their hypotheses and share your views with us at *Logo Exchange*.

I look forward to hearing from you! 

Gary

Gary Stager, Editor-in-Chief
logoexchange@stager.org

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Meaning and Math

Occasionally, it happens to each of us. You know what I mean. One of those cosmic connections, a serendipitous chain of events with ideas that seems to happen on their own, without warning.

For me, it came about as a result of two widely separated actions that seemed to have little relationship to each other. One was an appointment with my college dean, and the other was the simple act of reading my mail at home. Let me sketch them out for you.

Our college hired a new dean several months ago. One of the first things he did was to invite each faculty member for a one on-one appointment. I arrived a bit early for my meeting, and took advantage of the extra time to survey the books in his professional library. A slim volume with the title of *Logo Learning* practically leaped off the shelf and into my hands! Immediately after my meeting, I signed the book out and promised myself I would read it.

Several weeks later, I opened my mail to discover the February 1999 issue of *Phi Delta Kappan* magazine. The cover article for that issue was "The Mathematical Miseducation of America's Youth." I thumbed through the pages and promised myself I would give it a read sometime soon.

For one reason or another, I did not accomplish either reading. Then, when Gary Stager mentioned recently that he was collecting mathematics articles for this *Logo Exchange* issue, I remembered these two events. At last, things started into motion; I took out the publications and began to read.

The *Phi Delta Kappan* issue had two articles that caught my eye. In the fea-

ture article, "The Mathematical Miseducation of America's Youth: Ignoring Research and Scientific Study in Education," Michael Battista contrasts the traditional mathematics teaching style with that being urged by current educational reform. Lamenting that "the only time that Americans pay any attention to mathematics teaching is when educators attempt to improve it," he sketches out the formidable barriers to reform.

But then he focuses the reader on the nature of learning mathematics and its relationship to a constructivist point of view, suggesting that students personally construct mathematical meaning from their experiences. (Meaning. Hmm. Where have I seen that term before?)

A second article in the same issue (positioned outside the mathematics theme area) has the engaging title of "*Shazam! You're a Teacher: Facing the Illusory Quest for Certainty in Classroom Practice*." Author Selma Wassermann develops the idea that one of the most important tasks teachers do is to make meaning of events in the classrooms. By sizing up a situation and reflecting on what it means, teachers are able to choose appropriate actions. She goes on to suggest that the ability to make meaning is a learned set of skills, and outlines a way this might be done. (More meaning. Hmm. How is all this coming together?)

Aha! The *Logo Learning* book! I was disappointed when I first thumbed through it to discover that it was not about Logo! Perhaps that is why I did not rush to read it. But now I remembered the subtitle: *Searching for Meaning in Education*. In less than 150 pages, author Dale Parnell sketches out the importance of meaning in teaching and learning.

He defines Logo Learning as an educational philosophy and an educational strategy that centers on enabling students to find meaningfulness in their education. One of the major tasks of Logo Learning teacher is to "broaden the student's perceptions so that meaning becomes visible and the purpose of learning immediately [becomes] understandable."

I found my thoughts flashing back through the years to a book I remember that was about mathematics and about students performing learning tasks that were personally meaningful. Yes, *Mindstorms* had all the elements even then!

I am still marveling at how a non-Logo book named *Logo Learning*, an issue of *Phi Delta Kappan* magazine, and a computer language named Logo all came together in my life, each focusing on the importance of meaning in mathematics.

When a student asks, "Why do I have to learn this stuff?" I want to have an answer ready. In the meantime, I have a lot to think about!

FD 100!



Reference

Parnell, Dale. (1994) *Logo Learning: Searching for Meaning in Education*. CORD Communications, Waco, Texas.

**Tom Lough, Founding Editor,
Murray State University
Department of Elementary and
Secondary Education,
PO Box 9, Murray, KY 42071.
phone: 502.762.2538
fax: 502.762.2540
tom.lough@coe.murraystate.edu**



Stephen Costa

by **GARY S. STAGER**

Steve Costa is acting head of the Junior School at Methodist Ladies' College (MLC), in Melbourne, Australia. He has been an upper-primary teacher and administrator at the school for more than a decade. In 1989, Steve became perhaps the first teacher in the world to teach a class of children in which every kid had a personal laptop computer. MLC achieved international acclaim for their commitment to constructionism and personal computing. Steve played a major role in that success and welcomed thousands of educators from across Australia into his classroom to observe children learning with laptops and Logo. Few teachers have had more impact on their peers than Steve Costa.

Q: How did you get started with Logo?

In 1981 I began using an Apple computer. I quickly discovered how to turn it on, load a floppy disk and enjoy the excitement of playing a "computer game." After playing low-res, green screen, shoot em ups or spelling words to zap "killer bugs;" Logo was the first truly educational package I stumbled upon. Logo was "hard." It made me think but it was fun 'cause I was in control. I could have fun while learning and was able to "see" a graphical representation of my abstract commands.



Q: What is the most satisfying thing you and/or your students have done with Logo?

This sounds like a cop-out, but there would be numerous satisfying moments I have had with my students. One line of satisfying moments for me comes under the heading of "Eureka." This occurs when students are working on a "serious" project and they discover something by accident. They type some commands and the outcome is totally different from what they expected. The "unexpected outcome" instills in them a desire to find out

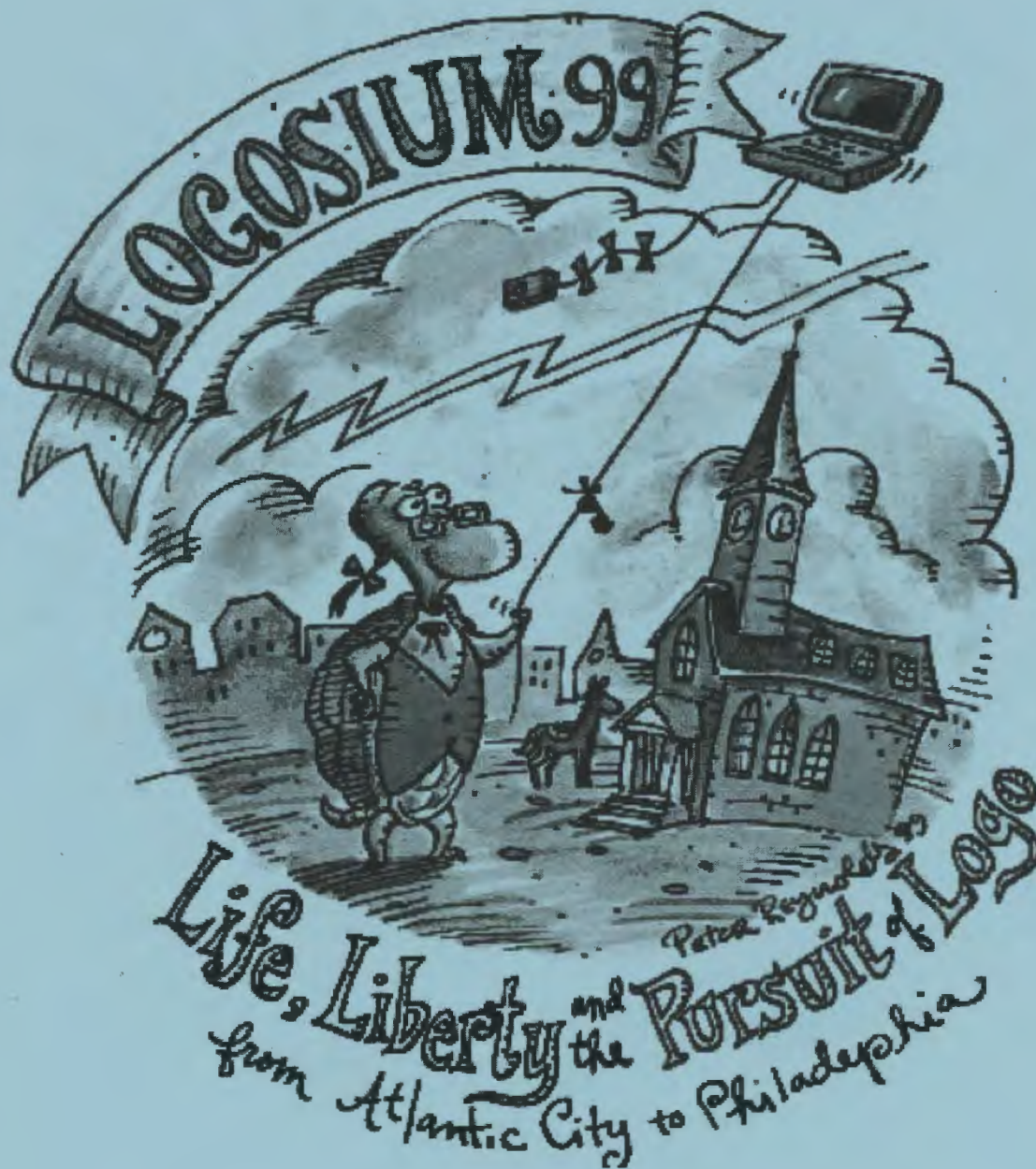
why! This self-directed, self-imposed, serious research into unraveling their commands is an exciting time for all involved. The learning is real, purposeful and helps to instill a sense of discovery and an enjoyment in "thinking" and "acting like a turtle," and a knowledge that they are being creative, in control.

Q: What did the laptop bring to the Logo experience?

The introduction of the laptop program provided an ideal setting to help foster a true sense of community and a setting where a collaborative learning environment could flourish. As each student had access to a computer, they became more willing to share. They not only shared their work, but their ideas and skills as well. Students began to gather around "interesting problems."

Discussions, suggestions and debates on the best way to do something, or how best to solve a problem sprung up around the room. No longer was one's own individual work the only important aspect or priority. Students were aware they had "time" to learn. Logo takes time to understand, enjoy and become familiar with so magic can happen. An ability to have time to learn—a chance to learn when they

See **TEACHER FEATURE (Page 6)**



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