

A woman from the UK emailed Don about his materials and asked him,

"How did you start teaching young children Calculus?"

Don took her question very much to heart. To answer the question he enthusiastically set out to create a timeline of his entire life's work. However, soon the project seemed to take on a life of its own, and as often happens, the more he added, the more he wanted to add. So here is Don's probably somewhat-incomplete answer to the question, "How did you start teaching young children Calculus?"

How did you start teaching young children calculus ?



The above shell is a copy of Don's watercolor painting of The Nautilus shell; it is Don's logo. It is one of the oldest living things in the world. The shell is beautiful; its shape is a mathematical curve, and can be obtained from conchking. Also see the equation for the shell, making a spiral, Xah Lee's work on spirals (and other curves) , student work on the growth of the Nautilus (chapter 6), and Don compares the Spirals of the Nautilus shell, the Fibonacci numbers, and the Equal Tempered Chromatic Music Scale

Year	Action
1930	Don was born in Jersey City, N.J.
1947	Went to Dickinson HS; graduated from Huntington HS, NY in Jan. '47
1951	B.A. SUNY, Albany-major in Math. Met Marilyn Joan LeFevre
1952	M.A. SUNY Albany- major in physics
1952	July 11: drafted into U.S. Army; worked on math and as a fiscal specialist
1952	December 28: Don married Marilyn Joan LeFevre, in Albany, N.Y. They will have been married 63 years on Dec. 2015- a great life!
1954	April 4 birth of first son Steven Whitney Cohen, at Camp Gordon, GA 12 June: Honorably discharged from the Army as a Corporal.

1. (1954-1960) Classroom teaching

August: Don had the choice of being an actuary, or teaching. He couldn't see working an old calculator 8-5 every day, so he chose teaching and never looked back! He taught 7th grade advanced students and 9th grade general math in The Bethlehem Central JHS, outside Albany, NY. (He also taught adult driving, including his Mother-in-law! She was so short we had to put the Albany telephone directory on the driver's seat so she could see out the front window - And she got her license! and we only knocked down one garbage can in 3 feet of snow!)

He had the students make electric circuits with batteries and bulbs, to count in binary arithmetic. He was always looking for things he could challenge the kids with.

Don realized early on, that his students solved problems in different ways than he did, and that made his teaching interesting because he was learning with them.

Don also realized early on, that he should **NOT** review earlier work that they had done (against the normal school philosophy). He decided to do harder things in which they would have to use their earlier math. Neither the teacher nor the students were ever bored.

One book he studied a lot, was "Mathematics And The Imagination" by Edward Kasner and James Newman. The one problem that Don was very interested in, was The Snowflake Curve, which needed an **infinite series** to find its area!

Don worked on math himself, but didn't feel he had to know everything to help his students! He had a sense of humor. He expected his students to do well, and he expected them to do it differently than he did it. He went to NY state math conferences to learn new things. He read Martin Gardner's articles in *Scientific American* beginning in 1956 and came to know W.W. Sawyer's books.

1955 birth of 2nd son Mark 9-16-55, in Albany

1957 birth of 3rd son Brian 1-6-57, in Albany

There was a lot of love within our family that carried over into Don's teaching.

In 1960 Don was asked to do a TV program ("The New Math"), for one semester. For one session he invited W.W. Sawyer to be a guest (from UK- but he was at U. of Connecticut at the time). He was one of Don's mentors. Don has at least 5 of Sawyer's books. See the photo of W.W. Sawyer showing his function machine to Don below.



The importance of guessing

Don saw a videotape of Nobel prize-winning Physicist Richard Feynman's lecture about making up a theory. He said the first thing one needs to do is **GUESS** what it should be. His students giggled at this, but it was very

important he said. Then one had to test the guess, do some experiments, and if it didn't work throw it away- no matter who did it, how smart they are, what their name is--throw it away! So when Don has his students guessing to solve equations, for example, he feels confident that he is going in the right direction.

Besides Feynman telling us, **guessing is very important, for at least 6 reasons:**

- 1) you start off right away.
- 2) it gets you into the problem, you don't have to have this "I haven't been taught this, so I can't do it" attitude and then feel you have to wait for someone to tell you how to solve it.
- 3) you can solve many equations this way, not a trivial few, as well as solving other types of problems. Don't be discouraged if you guess wrong the first few times; keep trying, you can do it. Along with guessing goes the question-are you getting closer? Is the guess too big or too small?
- 4) you'll also get better at guessing.
- 5) you might even come up with different ways to solve the same problem, which would be very good. Then **you** would have a check to tell you if you are right or not, like when taking a test, and without having to rely on someone else to tell you how to do something.
- 6) you don't have to be afraid of not knowing something

1958-1961 Don was the recipient of a 4-Summer Scholarship from Senator Jacob Javits for an M.S. in Science at R.P.I in Troy, NY.

1962 Don was asked to write: "An Experimental Course in Mathematics for the 7th year - Unit #1"; published by the Bureau of Secondary Curriculum Development, New York State Education Department, Albany, NY.

Articles all written by Don

1962 Jan- "7th Graders Discover"; New York State Mathematics Teacher Journal, Vol. XII

1963 Feb. 1963: "The Madison Project", Newsletter of the MO Council of Teachers of Mathematics, Vol. 9, No. 5

Feb. 1963: "Organizing a Mathletic League -- A Report"; in School Science & Mathematics Journal

1964 Dec. 1964. "A Lesson on Absolute Value" by Don Cohen; Arithmetic Teacher , Vol. 11, NO. 8.

1967 Jan. 1967 "Inquiry in Mathematics -- with Children and Teachers"; by Don Cohen, in The Arithmetic Teacher, NCTM.

1967 Don wrote the book "INQUIRY IN MATHEMATICS VIA THE GEOBOARD (teacher's guide); published with activity cards by Walker.

2. 1962-1976 The Madison Project years, with Dr. Robert B. Davis (Ph.D. in math from MIT)

Objectives for the Curriculum. The Project has three kinds of objectives that relate to the evolution of the school mathematics curriculum. First, especially for grades 2 through 8, the Project seeks to broaden the curriculum. The traditional curriculum for these grades was concerned most exclusively with the algorithms of arithmetic, with fractions, ratio, per cent, and applications to retail sales situations. This is, today especially, too narrow a slice of the world of mathematics. The Project seeks to broaden this curriculum by introducing, in addition to arithmetic, some of the fundamental concepts of algebra (such as variable, function, the arithmetic of signed numbers, open sentences, axiom, theorem and derivations), some fundamental concepts of coordinate geometry as graph of a function), some ideas of logic (such as implication), and some work on the relations of mathematics to physical science.

Don read an article by Dr. Robert B. Davis in the NYS Math Journal in which he talked about his work with 2nd graders! This caught Don's eye.

Don and Marilyn visited Bob Davis at Syracuse U. Don then decided he wanted to work with Bob at Webster College, in Webster Groves, MO. The Sisters of Loretto ran the college and hired Bob to teach the students to be elementary math specialists.

Don sent an audio tape of his teaching a 5th grade math class in Guilderland JHS, to Bob. Marilyn said we can do it if we get a raise in pay and have our moving paid for! Smart lady.

As a result, Don was offered and took a position 1. to teach an undergraduate math class, at Webster College, 2. Teach a Master of Arts math class in **calculus** at Webster College, and 3. teach a math class of 7th graders daily in the AM, and 4. give demonstration classes in the PM, at the four elementary schools, in the Clayton Public School District.

Don, his wife Marilyn, and his 3 boys, moved to Webster Groves, then to Clayton, MO.