Numeracy and the Slide Rule

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Numeracy is defined as having the capacity for quantitative thought and expression. It is the mathematical equivalent of literacy, which is the ability to read and write, and the state of being literate, that is, versed in literature or creative writing. In reviewing John Allen Paulos' book *Innumeracy...,* Douglas Hofstadter, author of *Gödel, Escher, Bach...,* wrote, "Innumeracy—the mathematical counterpart of illiteracy—is a terrible disease that has ravaged our technological society." [4]

This is not to suggest that the forced retirement of the slide rule in the early 1970s led to an abrupt increase in innumeracy. However, the disappearance of the slide rule did result in some modest loss of numeracy among those who, in the absence of the handheld electronic calculator, would otherwise have used a slide rule.

Slide rule jockeys have repeatedly lamented the demise of the slide rule, not that the electronic calculator isn't easier to use and more accurate, but because calculator operators lost a sense of numeracy as they began to rely wholly on their new electronic devices. Old-time slide rule users will remember the attention required to track the decimal point and the need to retain a sense of the "correctness" or proportion of slide rule readings before they were accepted and committed to paper.

In addition to tracking the decimal point, a slide rule user was continually challenged in selecting scales and in transferring readings from one scale to another. This required the attention of the slide rule user and directly involved him/her in the sequential steps of each calculation. However, this awareness of the progression of the calculation was dulled when it became possible to punch a series of numbers into an electronic calculator. It can be argued that the slide rule user remained more alert in moving through the intricacies of a calculation while the user of an electronic calculator is more apt to make "silly mistakes" which inevitably occur in the lulling routine of simply punching numbers into a keyboard.

In 1981, Henry Petroski in writing for *Technology Review* [5] observed that:

> "The limitations of the slide rule were also its strengths. The absence of a decimal point meant that the engineer always had to make a quick mental calculation independent of the calculating instrument to establish whether the job required 2.35, 23.5 or 235 yards of concrete. In this way, engineers learned early an intuitive appreciation of magnitudes."

Petroski went on to observe that there are various ways of checking calculations, " . . . but it is unfortunate to have lost one of the most reliable—reflection."

The fact that the accuracy of a typical ten-inch slide rule was limited to three significant digits taught generations of engineers the folly of perfection. They knew not to worry about accuracy to three decimal places when the concrete contractor, for example, worked to the closest cubic yard, or to prepare cost estimates to the nearest dollar when the estimate involved unknowns and uncertainties amounting to hundreds or even thousands of dollars. In short, a sense of numeracy encouraged the user to avoid spurious accuracy.

The use of the slide rule is normally associated with the engineer and technician. However, the value of the slide rule as an educational tool was recognized among educators for some 30 years, before that stalwart calculating device lost out to the electronic calculator. The following were among the conclusions reached by Willie Ashby, Jr., in 1974, in his Ph.D. thesis, *The Slide Rule: Its Effects on Interest, Computation and Reasoning Among Seventh Grade Mathematics Students.* [1]

- Slide rule instruction increases the interest of students in mathematical computations and in the drawing of conclusions through the use of mathematical concepts.
- Slide rule instruction does create an improvement in mathematical reasoning and computational ability.

He went on to observe that educators have concluded that, if students have not acquired a sincere interest in mathematics before they reach high school, they are unlikely to become interested in the subject thereafter. Thus, it is important that arithmetic in the elementary school be presented in such a way as to stimulate interest and encourage a positive attitude toward the subject. To this end, Ashby noted:

> "The slide rule is one instrument that could be used to motivate the study of arithmetic, and possibly stimulate interest in the subject. There is a need for more thought on the part of the student as he manipulates the steps of a multiplication or division problem, especially while using decimal fractions. The slide rule, if used properly, is a thought-provoking instrument and could be a valuable instructional aid. Each value handled on the slide rule must be thought of quantitatively—one of the basic aims in teaching mathematics. The use of the slide rule requires estimation, which is good practice for rounding numbers and checking answers." [1]

Interestingly, Ashby's bibliography includes references to no less than eight articles dating back to 1949 on the use of slide rules as an aid in teaching mathematics. These appeared in various educational publications, such as *School Science, Mathematics Teacher,* and *Arithmetic Teacher,* and reflect the prevailing view that slide

rules could be used to good advantage in pre-high school math and science classes. [2,3]

Clearly, the relationship between numeracy and the use of the slide rule was recognized by teachers and educators from the 1940s through the demise of the slide rule in the 1970s. However, when the slide rule disappeared, the developing interest among educators in using the slide rule in the classroom to help promote numeracy evaporated. All of this seems to suggest that with progress there are, inevitably, associated losses. In the case of progressing from the slide rule to the electronic calculator, there has been an unfortunate loss in numeracy. Correspondingly, one might add that there has been an unfortunate loss in literacy with the advent of television.

On a final note, further evidence of waning numeracy is the wallet and purse size cards that are beginning to appear showing what 15% gratuity is on one's meals!

Bibliography

1. Ashby, W.R. Jr., *The Slide Rule: Its Effects on Interest, Computation and Reasoning Among Seventh Grade Mathematics Students,* submitted to the Faculty of the Graduate School of East Texas State University in partial fulfillment of the requirements for the degree of Doctor of Education, July, 1974.

2. Gramlich, J.J., "Slide Rules for the Upper Elementary Grades", *Arithmetic Teacher,* 5, p29-33, February, 1958.

3. MacCubbin, J.E., "The Slide Rule in the Junior High School", *Mathematics Teacher,* 42, p164-165, March, 1949.

4. Paulos, J.A., *Innumeracy, Mathematical Illiteracy and its Consequences,* New York, Hill and Wang, 1988.

5. Petroski, H., "Reflections on a Slide Rule. The now-obsolete slide rule, although far less accurate than the electronic calculator, made the student reflect", *Technology Review,* 83:4, p34, Massachusetts Institute of Technology, February/March 1981.