An ICTM Charter Member Enters Her 100th Year
A Celebration of a Teacher-Scholar’s Life

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In 1964, the ICTM chose Gertrude Hendrix, Research Associate Professor at the University of Illinois, for its Distinguished Life Achievement in Mathematics Award. The criteria for this award require “distinguished and honorable service to mathematics education in Illinois.” Her contributions include editing the ICTM News Letter for five years, serving as ICTM representative to the Illinois Curriculum Program, serving on the Executive Board and as Section Chair, and being a member of the joint ICTM-MAA Committee on the Strengthening of Mathematics for six years, including four as chair. One might also suspect that she was chosen because she is what Professor Zalman Usiskin of The University of Chicago defined as a pioneer, one of those people who make progress possible. In “The Stages of Change”, a 1999 address about the major American mathematics reform movements, he said:

In the case of the new math, the original pioneers were in a group called The University of Illinois Committee on School Mathematics, UICSM. There were three principals in that group: Gertrude Hendrix, a professor of education who wrote about what was called unverbalized awareness; Herbert Vaughn, a professor of mathematics who felt that if mathematics were made rigorous by the precise use of language and notation, then children would better be able to learn it; and the person who put it all together, Max Beberman, who believed fervently that one learned better if one was led to discover mathematics rather than being told it. (4, 5)

Gertrude Hendrix entered DePauw University in the fall of 1922. Since she knew, or thought she knew from the time that she was six years old, that she wanted to be a mathematics teacher, she was a bit dismayed to hear when she arrived that the head of the mathematics department was “very skeptical about women in mathematics.” Years later she recalled that her reaction to that was “I’ve never been one to be deterred from doing anything I thought I could do simply because of the accident of having been born a girl, so I went ahead.” She graduated, Phi Beta Kappa, in 1926 with a major in mathematics and a minor in physics. She spent her first two years after graduation teaching at a small high school in southern Illinois, and the next two years at The University of Illinois where she earned an M.S. in Education and taught at the University High School. In 1930 she went to Eastern Illinois University where she would give long and distinguished service. It was there that she had her first opportunity to learn to ride horses. Eventually riding, raising and studying horses would become an extremely important part of her life. In fact, a part intimately connected to her life’s major research interest which she once described as the study of “the nature of unverbalized awareness traced from primitive animal learning to abstract human thought.” In 1935 Gertrude Hendrix earned a second masters degree from Illinois, an
M.A. in mathematics. She also spent two summers and the 1946-1947 academic year taking graduate courses in philosophy, mathematics and psychology at The University of Chicago.

For twenty-six years at Eastern Illinois, she taught, trained teachers, conducted her research and served in leadership roles in various professional organizations. By the time Max Beberman asked her to join the UICSM group as a senior member, she had a firmly established professional reputation. She later said “Believe me, that decision was an upheaval, but I knew it was the most significant thing in school mathematics that had come along in my lifetime, and I was thrilled to join the staff.”

What is this notion of “unverbalized awareness” which has been the focus of Hendrix’s research? We will start by examining a portion of Beberman’s 1958 Inglis Lecture at Harvard. In it he described the UICSM new math as being built on two principles – discovery and precision of language. In discussing the notion of discovery he said

It is important to point out here that it is unnecessary to require a student to verbalize his discovery to determine whether he is aware of the rule. The teacher can use a sequence of questions to determine whether the awareness is present. In fact, immediate verbalization has the obvious disadvantage of giving the game away to other students, as well as the more serious disadvantage of compelling a student to make a statement when he may not have the linguistic capacity to do so. … This technique of delaying the verbalization of important discoveries is characteristic of the UICSM program, and differentiates our discovery method from other methods which are also called ‘discovery methods’ but which always involve the immediate verbalization of discoveries. (26,27)

The word technique in the quote above has a footnote. The reader is referred to Gertrude Hendrix’s 1947 paper “A New Clue to Transfer of Training.” This paper is, in fact, the only reference cited in the entire section of the lecture dealing with discovery. The article was written during her 1946-1947 sabbatical year at Chicago where she conducted the experiments testing her belief that there was an unverbalized awareness stage in learning by induction, and that the learner could do something with a generalization even before it has emerged from the unverbalized form to a conscious level. Here are some of her own words from that paper:

Three hypotheses that are rather startling in relation to the theory of instruction are suggested by the results of a recent experiment in educational psychology. The problem, on which the writer has been working more or less informally for nearly ten years, is stated as follows: To what extent, if any, does the way one learns a generalization affect the probability of his recognizing a chance to use it? (197)

Her experiment led her to say

Hypotheses emerging from the data are:

1. For generation of transfer power, the unverbalized awareness method of learning a generalization is better than a method in which an authoritative statement of the generalization comes first.
2. Verbalizing a generalization immediately after discovery does not increase transfer power.
3. Verbalizing a generalization immediately after discovery may actually decrease transfer power. (198)

Not to belabor the issue, but a few more of Hendrix’s words. After all, this exercise is a celebration of her life and work.

“Yes. What is the next one after that?” “Twenty-sev – No! Twenty `-nine” He had it. Very soon almost every member of the class seemed to be finding the next prime independently. Something subverbal – something organic, if you please – had happened to them. … They had the prerequisite to meaning of the term [prime]. …I would like to call that sub-verbal, organic, dynamic state of awareness the possession of the concept, but most psychologists, linguists and philosophers today do not consider the concept complete in the person’s mind until he attached a symbol to it. The failure to recognize that awareness of an entity is independent of the existence of a symbol for the entity, promotes pedagogy that is not only wasteful, but often harmful. (1950, 334)

Critical Unanswered Questions
1. Why is something which has come to a person first as insight (i.e., unverbalized awareness) much more likely to “pop into his mind” when he needs it than something which he has acquired through interpreting a linguistic formulation? … 4. Under what conditions does attempting to verbalize (that is, name and define) a concept immediately after one has attained it mutilate the concept in his own mind? … 8. For a given individual, how can one know when it is not too soon for him to verbalize a discovery? (1960, 58, 59)

The issue of learning by discovery and teaching for learning by discovery is beclouded at present by the fact that each three very different procedures is being called ‘The Discovery Method.’ They are the inductive method, the nonverbal awareness method, and the incidental method. … The inductive method is nothing new in mathematics education. Colburn’s book on teaching arithmetic by this kind of approach was first published in the 1820’s. … The fallacy in the inductive method lies in its confusion of verbalization of discovery with the advent of the discovery itself. (1961a, 290)

In this latter paper Hendrix dismisses the incidental method as “an approach widely promoted in the Progressive Education era”; an “activity program” “doomed to triviality.” In this 1961 paper she also uses the word “multilate[d]”, which appeared in the 1960 paper above, and in the same context. Here it has a footnote: “I use the word ‘multilated’ deliberately and almost angrily. My feeling about this issue has been built up from several years experience in seeing this thing happen to children over and over again.” (297) This footnote is just a bit of the available evidence of how passionately Gertrude Hendrix felt about finding ways for children to best learn.

There are others who have looked at this notion of what Hendrix called unverbalized awareness, including Schwartz (1948), Wills (1967) and Haslerud and
Meyers (1958), who have provided evidence for her position. Haslerud and Meyers, in fact, claim that “[Their] results give strong support to the postulate of Hendrix …” (297). There are others who are skeptical. For example, Sowder (1974) says “[his] study does not support the Hendrix hypothesis with respect to short-term retention … “ (175). He does suggest that “further consideration of this problem is warranted” (175). However, there is not much doubt that the “Hendrix Hypotheses” of 1947 continues to be of interest to some researchers in the field. In November of 2003 an e-mail communication to me from Paul Goldenberg at the EDC Center for Mathematics Education included “Gertrude’s idea about the risks of too-early verbalization is generating quite a lot of current conversation. Despite the age of this research, its import is quite current, as asking students to explain mathematical ideas and processes orally and in writing is very much in vogue today.”

Gertrude Hendrix spent ten years with the UICSM project working with teachers, experimenting with curriculum, conducting training institutes and lecturing throughout the country. In addition, she was the content director for fifty UICSM teacher training films, a project for which Hendrix recruited Margaret Mead, the noted anthropologist, as consultant. Even with all of these responsibilities, she continued her research involving unverbalized awareness and the nature of language and communication.

When she left Illinois, she returned to land in Indiana which had been in her family since 1829. Polycreek Farm became her home, and the letterhead of her stationery told you it dealt in hardwood timber, Black Angus cattle and American Saddlebred horses. She did keep her hand in mathematics education, serving for a time as a consultant to the UICSM, the DePauw University mathematics department and to the Greencastle Community Schools. She also continued her research, produced a major paper in 1968, and in 1988 published her last work, Nature of Language, which appeared a mere fifty-six years after her first publication.

Gertrude Hendrix’s written legacy includes two books, over twenty mathematical articles, and several pieces dealing with horsemanship and training. She was listed in several editions of Leaders in American Science, was a member of Phi Beta Kappa, Kappa Delta Pi, Pi Mu Epsilon, and Kappa Mu Epsilon, and received an Alumni Citation from DePauw. She was never listed in Who’s Who of American Women. She was, however, asked several times, and her reply to one request includes “I do not wish recognition from any agency which classifies human beings into men and women before it classifies them according to achievement. The implication of Who’s Who of American Women is that a woman must not be expected to do as much as a man to achieve distinction. I find this degrading, almost insulting, and I have never comprehended why all self-respecting women do not feel the same way.”

Gertrude Hendrix lives in The Asbury Towers Retirement Community in Greencastle, Indiana. The party to celebrate her 100th birthday will be held there on May 24, 2005.

Selected Publications of Gertrude Hendrix


(1937) Plane Geometry and Its Reasoning, New York, Harcourt Brace (with Harry C. Barber.)


(1961a) Learning by Discovery. The Mathematics Teacher 54, 290-299.


Other References


