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Teaching As Though Students Mattered: A Biography of Alvin White As Told to Sandra Keith

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Teaching as Though Students Mattered

A BIOGRAPHY OF ALVIN WHITE AS TOLD TO SANDRA KEITH

I was born 1925 in New York; served in the U.S Navy in 1943-1946 during WWII; was sent to Ra dio Technician School and then served in the Pacific (the battle of Okinawa). Subsequently, I was sent back to the States for Officer Training School at Columbia University. I graduated from Columbia College in 1949 with a major in math but I took many other subjects, of course. Among my most memorable professors and courses were Moses Hadas teaching "Greek and Roman Mythology" and Bernard Stem in "The Family Past and Present." I feel I learned the most (and got the most enjoyment) from one course that required me to write a paper independently in Autumn and Spring term; in that course, I chose to learn and write about the history of public housing in New York City. Special apartment houses had been built in New York City for the waves of immigrants coming to the USA in the early part of the 20th century. These early houses were instant slums. Eventually, a law was passed that required every room to have a window; even that minimal ruling was barely satisfied. But I spent many happy hours in the Columbia Architectural Library reading Jane Jacobs and other architects and historians on the history and progress (albeit slow) toward improving public housing.

I received an MA in math from UCLA and went on to Palo Alto where I enrolled at Stanford. I worked with Stefan Bergman on partial differential equations related to fluid dynamics and received my Ph.D. 1961. 1 was hired by Harvey Mudd College, but spent the year 1961- 1962 at the Math Research Center at the University of Wisconsin, Madison.

While teaching traditional courses at HMC, I had found and read "Freedom to Learn," by Carl Rogers. As an attempt to apply my understanding of Rogers' book, I offered a seminar on Calculus of Variations in my living room. I received a small grant to purchase portable blackboards (green actually) and bean bags for sitting. (I visited the California Institute of Technology some time later and found that they had a room similarly furnished that was used every hour by many departments to teach various courses!) I wanted the course to be "student centered", as I understood that concept. At the first meeting I introduced ten or twelve books on the subject and explained the problems and topics from the early history of the subject. Each student was to report on a topic. I met with those six students once a week for three hours. As it worked out the students' reports paralleled the usual course. The reports were also distributed and used. But at the end of the course some students remarked, " I enjoyed the seminar and learned a lot. But I think that I would have learned more with lectures and a textbook." I was not aware of anyone teaching mathematics in this way at that time.

I tried to publish my experiences in that course with "The American Mathematical Monthly" but was rejected with the remark, "No numerical data." However, Carl Rogers, while guest editor of the journal Education, published my article under the title "Humanistic Math: An Experiment." A physicist from Purdue was inspired by another book by Carl Rogers and also taught a laboratory course in physics in the same student-centered manner. His students had a similar response:

> "We enjoyed the course but we would have learned more with a text and lectures." His comment, in an article, was: "I doubt that they would have learned more ... although they might have suffered more."

In the early 70's, I began to organize informal, interdisciplinary discussions among faculty of the Claremont Colleges. The discussions drew not only mathematicians but physicists, philosophers, historians, and psychologists. At this time, writing unsuccessful grant proposals was to become a repeated occupation of mine. In 1976-77, however, I was one of ten Danforth Faculty Fellows awarded year-long grants to study at various universities. I studied at Stanford, took a short stay at Northwestern, and spent the spring semester at Massachussetts Institute of Technology (MIT)-Harvard, where I taught a seminar at the Division for Study and Research in Education (DSRE). The seminar was described by a set of questions:

> "How does one acquire knowledge? What are the limits of certainty? What is the relationship between scientific knowledge and general knowledge? What is the role of beauty, simplicity or intuition in creative discovery? Our present knowledge in the arts, humanities and sciences is the legacy of creative imagination. How can this legacy influence education at all levels?"

There were twelve students in the course, representing Math, Art, Linguistics, Electrical Engineering, Biology, Artificial Intelligence, and Computer Science. We sat around a table discussing our readings and thoughts. We met twice, for an hour and a half, the first week. After that, everyone dropped their other courses and we ended up meeting the whole morning until we were eventually displaced by lunch hour. We became a community that cared for one another and learned from each other. Students invited other professors to participate. Visitors to MIT-DSRE would ask permission to observe quietly, although they usually joined in the discussion. One student remarked that the popularity of our seminar among visitors was probably due to the openness, honest listening and caring that were evident. We accepted all contributions in a non-judgmental way. No one was forced to speak, and everyone had a chance to speak. In that course, we examined writings of Dewey, Kant, Polanyi, Russell and others. The last week of the term became a time to discuss and evaluate the seminar. Why was it so successful? What had happened to us? How had we been transformed from a mere collection of strangers to a group of friends and colleagues? It was as if we had chanced upon a semester-long celebration, and, like Alain-Foumier's "Wanderer," we had been caught up in the "spirit of the place." A student observed that this was the first course where her presence in the room had "made a difference." We wondered: what had we learned and what should we do if we wanted to find that spirit of celebration again? An unexpected answer emerged, one that simultaneously addressed some of the questions of the seminar as well as questions about the seminar. The answer from one of the students was : "we learned with love and trust." This was more food for thought: what did that response mean? In my opinion, the meaning is well discussed in E.A. Burtt' s book: " In Search of Philosophic Understanding."

After I returned to HMC from MIT and the exciting, warm relationships that I had experienced there with students, I was disappointed by the relationships that students assumed or insisted upon between them and me as their teacher at HMC. To them the classroom could not be a community of mutual learning and teaching, and for some there was an invisible line between teacher and students. In an attempt to overcome some of these barriers, I started teaching my course in Calculus upon returning to HMC by reading with the class, J. Bronowski, "Science and Human Values." I wanted to investigate with my class Bronowski's statement that "the society of scientists is more important than their discoveries. What science has to teach us here is not its techniques but its spirit: the irresistible urge to explore." I have to admire the students' tolerance. Their fear was that they would not understand calculus and that we would not complete the syllabus . As it turned out, we completed the syllabus with time to spare, and students and I agreed that they understood the calculus more deeply than they would have in a traditional course of straight lectures. In addition to homework problems, students were encouraged to modify problems, for example, by increasing the dimension of the space or by changing a constant to a variable. They invented original problems and challenged classmates to solve problems. We also consulted several textbooks although we followed, more or less, the traditional syllabus of the "official" department text. Instead of one text, however, the students consulted at least two books for each topic in the course outline. The hope was that the difference in approach and notation would motivate the students to a deeper understanding of the material. Most students commented that the multiple text approach resulted in a deeper, more creative understanding of the material although it took more effort.

Although some calculus texts have over 500 pages, these books may represent a narrow path of the known. The problems students invented, for which solutions were known or not, were given to the class as challenges which many students accepted. They struggled, guessed, reasoned by analogy and tested their tentative solutions. Many students were highly motivated by these challenges. We were a society participating in doing mathematics. It often happened that a problem that was impossible to solve was the topic of a future chapter, which led us into the new material naturally. The most controversial (at the time) innovation was the cooperative exam where the whole class could discuss the problems and solutions. Students could not catch on to this idea on the first exam, but the second exam was more successful with students learning more by cooperating. My hope was to use cooperative exams to bring intellectual excitement into the mathematics classroom. One student, in a later evaluation, remarked that the cooperative exam was "one of the best of the innovations but is not suitable for performance evaluation."

In those experimental classes at HMC , in addition to cooperative testing, term papers were required. Students were asked to write a term paper on any topic. There were essays on creativity, responsibility of scientists, fractional integration, computer generated poetry and other topics. Class time was spent answering questions, comparing different approaches, and discussing invented problems and non traditional problems. The non traditional material and approach gave us insights about mathematics and learning that were wholly unexpected. Many students responded positively (one a year later!) and some were indifferent. A few were hostile. But class attendance was consistently high. Section A of the class then sent a message to section B, inviting them to meet in a large lecture hall on the weekend to discuss some solutions to problems. One student presented a solution that was rejected. Another student presented a different solution. There was arguing and some shouting. Finally a solution was presented that survived criticism. A consensus was achieved. The students were exhilarated. Most students remarked how much they had learned and how good they felt about themselves and their relationship to the material. In " A New Paradigm for the Mathematics Classroom" (Int. J. Math Educ. Sci Technol 1976 vol7, no2) I raised a number of issues.. Mathematics is exciting. Can it compete with a literature course where students are caught up in the intellectual clash of ideas? Can students recognize mathematics as a creative activity? After the article was published, I learned of others who had tried cooperative testing, some of whom were inspired by my account.

Before I embarked on my Danforth Fellowship, my colleagues and I submitted a proposal to FIPSE in 1976: "New, Interdisciplinary, Holistic Approaches to Teaching and Learning." The beginnings were informal, interdisciplinary discussions that I had organinzed among the faculites of the Claremont Colleges. While I was at MIT, I learned that proposal was denied. One reviewer said the idea was trivial; another said it was impossible! I traveled to Washington, DC, to consult with the FIPSE staff, who encouraged me to reapply the next year. The second application to FIPSE was successful and resulted in a three-year grant. Faculty from six colleges (all of the Claremont Colleges, a nearby state college and the neighboring community colleges) participated. The goal of the project was to make every participant an interdisciplinary scholar/teacher—to introduce scientists to the humanists' viewpoint and knowledge-and visa versa. Each faculty member was encouraged to understand and appreciate the viewpoints and problems of the whole range of knowledge. Prominent scholars from all over the US came to speak to us. We had as many as two speakers with discussions per day, every academic day for three years. A project which had begun as a personal vision of a few became a major part of faculty culture. Approaches that were first viewed with skepticism became accepted and even expected. Ideas which were on the radical fringes of academe about the benefit of integrating the sciences and humanities moved into the main stream of desired educational outcomes. Some faculty members who were timid about trying new modes of teaching or introducing new content, such as values and ethics, were supported and encouraged by the newly created setting. For example a chemist introduced humanistic themes into his classes and began holding discussions in his classes. We ended on a high note, with a three-day conference addressed by some of the nations' leading educators. Among the presenters were Nevitt Sanford of Berkeley's Wright Institute, Benson Snyder of DSRE and Harold Taylor of Sarah Lawrence. A participant commented that she had never expected to see any of these educational leaders in person, but here she was seeing so many altogether!

After the FIPSE project I was elected president of SIGMA Xi, AAUP, and co-president of the faculty senate (not concurrently!) The FIPSE project, 1977-81 was an exciting time for me as well as for many faculty colleagues.

My interest in interdisciplinarity le d me to solicit authors and articles for one of the Jossey-Bass series, " New Directions in Teaching and Learning (0)" titled "Interdisciplinary Teaching," which I edited. The other authors --Geoffrey Vickers, Ralph Ross, Kenneth Boulding, David Layzer, C.West Churchman, Richard M. Jones, Arthur Loeb, Owen Gingerich, Barbara Mowat, CArl Hertel, Miroslav Holub --were well-known people from many disciplines: Business, Law, Education, English Literature, General Systems Theory, Astronomy art and Environmental Design. They included a professor of design science at Harvard whose degree in chemical physics led to a collaboration with R. Buckminster Fuller, a professor of art and environmental design, and a Czech poet who became chief research immunologist for Clinical and Experimental Medicine in Prague. My article in this series discussed my seminar at MIT, and gave the title, for the Jossey Bass Series (#21): "Teaching as Though Students Mattered."

All my experiences contributed to my seeing mathematics as one of the humanities. I wrote to the Exxon Foundation for a grant (of a million dollars) to develop the concept of Humanistic Mathematics; to create an approach to teaching and learning mathematics that would be nonthreatening, but inviting to students, who would participate in a cooperative spirit with each other and with teachers. My dean was very discouraging about the whole idea and the possibility of receiving the grant. Within a week of sending the letter to Exxon, however, I received a phone call from the program director, who wanted to discuss the proposal and negotiate the particulars. After three weeks of conversations on the phone he suggested that he could give me $10,000 within a month to have a "Planning conference" for my colleagues and I to talk about the ideas and program of humanistic mathematics. There was no time for complicated arrangements and advertising. I asked some friends if they would come and recommend other friends for a three-day conference. For me this would be a singualar moment in time. As I recall, the attendants were Stephen Brown of SUNY Buffalo, Marion Walters of Oregon, Phil Davis of Brown, Reuben Hersh of New Mexico, Jeremy Kilpatrick of Georgia, Bob Borrelli of HMC, Paul Yale of Pomona College, Tom Tymozko of Smith College (who said at the 1992 Quebec meeting of ICME, "Alvin White started all this"), Sherman Stein of UC Davis, Ed Dubinsky of Purdue, a psychologist from Boston, two mathematicians from Cal Poly San Luis Obispo, several others, and myself -- thirty in all.

After three exciting days, we decided to start a newsletter; this was the birth of the Humanistic Mathematics Network Journal. Exxon Education Foundation graciously agreed to support this newsletter-journal. The first issue was sent out to thirty people, one year later in 1987. The second issue was sent to sixty people, and then distribution grew rapidly. The first three issues were unedited pages which I xeroxed and stapled together.. The fourth issue was edited and retyped by Susie Hakansson's staff at the Graduate School of Education, UCLA. I arranged for it to be printed with a blue cover with a painting by Blake and a poem fragment by Milton. Subsequent issues have been typed by a student from Harvey Mudd College and printed by a local printer. It now became possible to edit the articles before printing. The Foundation continued to pay for hardware and software, typing, printing, and mailing the issues. The typing (production manager) has been a student. Proof reading and refereeing etc. are done by worldwide colleagues and myself. We have a minimum of promotion, but people hear of the journal by word of mouth or by mention in an article in another publication; they eventually subscribed by contacting me, usually through e-mail. Most articles have been sent to me unsolicited, although I have invited some articles and made requests to reprint some.

The launching of the journal was followed by a number of conferences and workshops on Humanistic Mathematics across the country-a session in Boston and another in New York. At the 1987 winter meeting of the math societies in San Antonio, I organized an afternoon panel on " Mathematics as a Humanistic Discipline," that lasted 4 or 5 hours. We held somewhat shorter sessions as well as poetry readings at subsequent national meetings as well as conferences with the same title at a small Catholic college and a community college in New York.

A strong encounter in my life, although I'm not absolutely sure where it fits in, chronologically, was with the book "Personal Knowledge," by Michael Polanyi. I discovered it from a footnote in a paper by Abe Maslow that a psychologist at the campus counseling center had given me..

Every time I read Polynani's book, I underlined certain lines in colored pencil. When I reread it, I felt compelled again to underline many of the same passages in different colors. That cherished book is now quite personalized, in a colorful way. I cannot summarize the more than 400 pages of that book but I would like to close with a few tidbits and phrases From the preface"I start by rejecting the ideal of scientific detachment. In the exact sciences this false ideal is perhaps harmless, for it is in fact disregarded there by scientists. But ... it exercises a destructive influence in biology, psychology and sociology and falsifies our whole outlook beyond the domain of science.... "Tacit knowing is more fundamental than explicit knowing: we can know more than we can tell and we can tell nothing without relying on our awareness of things we may not be able to tell ... ... Thomas Kuhn in "Structure of Scientific Revolutions" expresses similar ideas. J.Hadamard in "The Psychology of Invention in the Mathematical Field" discusses the role of the unconscious in discovery and problem solving. According to Polanyi---" Such is the personal participation of the knower in all acts of understanding. But this does not make our understanding subjective. Comprehension is neither an arbitrary act nor a passive experience, but a responsible act claiming universal validity. Such knowing is objective in the sense of establishing contact with a hidden reality; a contact that is defined as the condition for anticipating an indeterminate range of yet unknown implications." Polyani mentions tacit skills of which we are not aware - such as swimming or riding a bike. "The complete objectivity as usually attributed to the exact sciences is a delusion and in fact a false ideal. "To learn by example is to submit to authority. You follow your master because you trust his manner of doing things even when you cannot analyze and account in detail for their effectiveness. By watching the master and emulating his efforts in the presence of his example, the apprentice unconsciously picks up the rules of the art, including those which are not explicitly known to the master himself. These hidden rules can be assimilated only by a person who surrenders himself to that extent uncritically to the imitation of another."

When I first started to teach, my ambition was to present a complete and masterful lecture (and I have witnessed several such lectures.) After I read Polanyi and others, my ambition became not to present a perfect complete lecture, but to inspire my students (or rather, conspire with them) to become interested in the subject and learn the subject for its own sake. Perhaps I have made some progress toward that goal and have had some partial success, but I am continuing to learn in my teaching, now, at age 77.