The Arithmetic Mistake and A Year Off From Teaching Thirty-Eight IFs

The Principal's Visit

In The Two Job Interviews section of Chapter 5 – The Twenty-Two IFs of the Interns' Years, I mentioned that my Principal had told me what he looked for when he visited classrooms in his school. He liked seeing children quietly sitting at their desks, heads bowed over their work. That was not at all what my classroom turned out to be like. However, since my classroom was already being visited by my Intern Supervisors just about every week and since I never sent any of my students to the Principal's office for any kind of discipline, he never visited my class.

"Never" is more correctly phrased as "only once the entire year." The one time my Principal came to see what I was doing was for the annual visit he was required to make to every teacher's room. He had to observe each teacher in action at least once each year, so he could complete his mandatory written evaluation of every one of us. He had granted my Intern Supervisors permission to send a crew to film my class for all the other Interns to see, so he knew what I was doing was at least something that my Supervisors thought was worthwhile.

When my Principal entered my classroom for his pre-announced visit, all the children were engaged in a wide variety of activities, none of which involved any quiet head-bowing over anyone's desks. As soon as my students saw him, they began scurrying back to their desks. They knew quite well what kind of class he liked to see. I told them to go back to what they all were doing. I said, "The Principal is here because he wants to see all the different ways you are learning."

At the end of the period, I said to my class, "Time to clean up and get ready for recess." I held up my sand egg timer, placed it where everyone could see it, and turned it over to start its three minute count-down. By the time the three minutes had expired, everyone was back at his or her seat sitting quietly.

After I sent my students out for recess, my Principal said to me, "Be sure you do that egg timer trick when anyone visits your classroom." My class had seemed completely out of control to him. It was only when he saw my "out of control" students so quickly clean up and return to their seats when I held up the egg timer that he understood, not what I was teaching, but that at least my students were in control.

After he paid his visit to my classroom my Principle became quite concerned about how my "out of control" fifth grade students would be as sixth graders the next year. At this point in California, sixth grades

had not yet been joined with seventh and eighth grades in what would then be called "Middle School." My fifth grader would still be at his school next year. He was so concerned about what my students would be like for a different teacher that he changed my teaching assignment for the next year from fifth grade to sixth. Problem solved. No other teacher at his school would have to deal with my fifth grade class.

Next Year's Teacher

The philosophy of the Intern Program was, "What is being taught now isn't working, so try something different." With that philosophy as my starting point I had not used any of the teaching materials provided to me in any subject area by the school district and just started over.

The two main academic subjects parents and teachers care about and children are judged on are reading and math. I knew I could not create new curriculum for both of these subjects in my first year, so I decided to focus my attention on reading, with some image-building Black History included as something we would read about. I also added in some science lessons that I found that didn't rely on any district provided materials. I would let next year's teacher worry about math. That next year's teacher I was going to let worry about math would now be me.

Mathematics

My original plan as an Intern Teacher was to teach for a year in Richmond and then apply for a teaching position in East Palo Alto, which was just minutes away from my home. I planned to teach in East Palo Alto for so long that the children of the children I taught would be students in my class. I had not planned on being in Richmond for year-two, but when my fellow Interns and I were retroactively admitted to a two-year long Master's Degree program, my one year in Richmond turned into two. My focus in the Summer months before that second year was to come up with ways to teach my sixth grade students the mathematics their fifth grade teacher had ignored.

I did not bother enrolling in any courses at Cal that Summer Quarter related to the teaching of math. At the beginning of the Summer I had purchased sets of Cuisenaire Rods for every student in my class. Cuisenaire Rods would provide an interactive, hands-on way for my students to explore mathematics and learn mathematical concepts without my needing to use any of the textbooks or workbooks the district had provided and that I had ready declined to use the year before.

While I had not taught much math in year-one, I had become aware of the rods and their potential usefulness through the Intern Program. The Cuisenaire company had a companion reading program called "Words in Color" that my Intern Supervisors arranged for me to see in action. The

Words in Color program is what lead me to learn about Cuisenaire Rods. Words in Color did not impress me, but the Rods most certainly did.

While my soon to be wife Mary was still in her Intern team-teaching position, our Supervisors arranged for Mary to leave her class and be my substitute teacher, so I could take a few hours off during a school day to visit a Words in Color classroom to observe the program in action. My class enjoyed the fact that my girlfriend was their teacher for about two hours that day.

The Arithmetic Mistake

In the Our Berkeley Home section of Chapter 5 - The Twenty-Two IFs of The Interns' Years, I said there was a twenty-third IF from those two years. That twenty-third IF was the arithmetic mistake I made that, combined with all the many IFs that flowed from it, was such a big IF that it needed its own chapter. The home that Mary found for us to rent for our first year as a married couple gets its picture included again here. That home turned out to be a major IF, as well.

One way for teachers to move up the pay scale is based on the number of college semester units they have completed after receiving their Bachelor's Degree. In the three separate school districts in which Mary and I worked, the pay raise came for each additional fifteen semester units completed, up to a maximum of sixty semester units.

To receive a pay raise for my second year of teaching in the Richmond School District, I needed to earn twelve additional semester units by the end of that summer. Cal was on the quarter system, not the semester system. Three quarter units are equivalent to two semester units. To

reach my twelve semester units goal, I enrolled in fifteen quarter units of Master's Degree classes that Summer Quarter.

My calculation was that fifteen quarter units equaled twelve semester units. That was a really silly arithmetic mistake for me to have made. Eighteen quarter units is equivalent to twelve semester units, not fifteen. Once I realized my mistake, I knew I had to take an additional three quarter units class to reach the needed eighteen for my pay raise. However, by the time I realized my mistake, it was too late for me to sign up for an additional Summer Quarter class at Cal. So, I searched through the college's catalog of supplemental (also known as extension) classes taught off-campus that I could take.

I didn't care what the class was teaching. I just needed the three quarter units of credit. I found a three quarter units class being taught week-nights from Wednesday, July 5th through Friday July 14th, with a final class the morning of Saturday, July 15th. Even better than how quickly the class would be over, was the fact that it was being taught at an elementary school in the very same block as the Berkeley house Mary had found for us to rent. The school was within walking distance, just six houses away. I signed up for the class immediately.

The course title was Elementary Workshop in New Mathematics. At the first class session the instructor apologized to the class because he was not the instructor listed in the Extension Catalog. He was substituting because the actual instructor had encountered a scheduling conflict. I didn't care who the instructor was. I was just there for the units. In any event, what was being taught was textbook and workbook oriented, so I was not a all interested. I just sat in the back of the class quietly doing my homework for the other classes I was taking that summer.

The Beginning of Many New IFs

Then Friday happened. For the evening class on Friday July 14th, Bill Aho, the person who was the listed instructor for the class, showed up. Bill apologized for having missed the previous evenings. He then began introducing us to math materials that were all the kinds of things I did not know I had been looking for. As soon as Bill began showing us and teaching us about the manipulative materials he had brought with him, I stopped doing my back-of-the-class homework and started seeing ways I could teach my sixth grade students math that went way beyond what Cuisenaire Rods could do.

I stayed after Saturday's class to help Bill clean up and carry his many teaching materials to his car. Technically, I was there as a helper, but my focus was on quizzing him about math. Bill told me of a book I should get that would provide more answers than he could.

The Book: *Report of the International Clearinghouse on Science and Mathematics Curricular Development 1967.* It was a report on science and mathematics curriculum projects that were being developed throughout the world. Single copies of the Federally financed 448 page book were free for the asking, although a donation of 25 cents for postage was appreciated. I Paid my 25 cents and had the book within a week. When Mary and I returned from our trip to Europe, I ordered a copy of the 450 page *Sixth Report of the International Clearinghouse on Science and Mathematics Curricular Development 1968*, as well.

Two-hundred thirty-eight math and science projects, spanning forty-three countries. I searched the book for descriptions of innovative math and science programs in English speaking countries at the elementary school level and immediately began writing every project that I found for further information. And, the information came streaming in from all over the world.

While I corresponded with many projects, and learned useful things from most of them, the two mathematics projects that interested me most were the Nuffield Mathematics Teaching Project in London, headed by Geoffrey Matthews, and the Madison Project at Syracuse University in New York, headed by Bob Davis. More about these two projects later.

I asked Bill when his next class would be. He said it would be on campus at Cal in the Spring. When Spring came around, I asked Bill if he minded if I sat in on his class without enrolling. I explained that my wife Mary had decided that she and I would take a year off from teaching and simply travel around Europe until our money ran out. I wanted to sit in without paying because Mary and I were trying to save every penny we could for our European adventure. Bill said, “No Problem!”

When I mentioned to Bill that Mary and I were going to Europe, which of course included England, he said that I should contact Edith Biggs in London. When Edith had visited the Bay Area for a math conference and to meet with her publisher, Bill had ended up as her designated driver. If we told Edith he had sent us, Edith might be able to arrange a few school visits for us.

As much as Bill had taught me in our earlier Friday evening, Saturday time together, I found it interesting that when I was sitting in on his class in the Spring, I was not learning anything new. The information that had been streaming in as a result of the *Clearinghouse* book had allowed me to become so well-informed that I was not learning anything new at Bill's Spring sessions.

What I had Learned

My original plan for teaching math to my sixth graders was based on the sets of Cuisenaire Rods I had already purchased. The rods were definitely a great teaching material. However, I now understood how much more there was for me to cover. What I learned from Bill and from all the many organizations with which I was corresponding had completely changed my plans for my mathematics curriculum.

On that first Friday evening, Bill had introduced me to the Dienes Multi-Base Blocks. The Blocks entirely revamped my approach to teaching my students arithmetic operations. Teaching in bases other than ten had never occurred to me. However, as soon as I saw the Blocks, it was immediately apparent to me that teaching in bases other than ten would permit me to repeat lessons as often as necessary by simply changing bases. This would keep the students who caught on quickly from ever feeling they were being held back as we kept repeating lessons until every child mastered the concept. All I would have to do was tell my class that learning in different bases usually didn't happen until they were in high school or even college. The fact that we were learning in bases other than ten now was really quite special. I could even add that their parents probably didn't even know how to add or subtract in different bases.

Right after Bill's class I purchased a set of Dienes Blocks for my class. Preparing the geoboards to which Bill had introduced me took a little more effort. A trip to a nearby lumber store and a Saturday spent hammering nails into squares of wood produced geoboard for every student in my class. Geoboards added geometry and algebra and more to the list of math skills I would be teaching. They even added in the multiplying and dividing of fractions.

I had gone from contemplating how best to teach my students basic arithmetic operations, to truly teaching them mathematics. My lessons

would now include graphing (both pictorial representations and co-ordinate), probability, statistical analysis, sorting and classifying, negative numbers, using patterns for predictions, and integrating mathematics with the elementary science units I had also learned about through my International Clearinghouse on Science and Mathematics correspondence. My fifth grade students next year's teacher was now ready to teach them mathematics.

The Year Off From Teaching

My plan when I entered the Teacher Intern Program was to teach for a year in Richmond. Once I had earned my standard teaching credential through the Intern Program, I would apply for a teaching position in East Palo Alto, an inner-city type school district just across the freeway from my home in Atherton. When the one year in Richmond became two years, East Palo Alto became my third year destination.

Mary had a different plan for what we should do in year-three. She was quite willing to join me in applying for teaching positions in East Palo Alto. However, Mary felt we should first take a year off from teaching and spend it traveling around Europe. It would never have occurred to me to do anything like that. Not occurring is not the same as not doing.

When I was in the Navy, I was granted thirty days of leave each year for a three year total of ninety days. It never occurred to me to used any of my leave for any kind of vacation. Up to a total of sixty days of unused leave could be sold back to the Navy when my military service was over. I took the cash for the sixty days and let the thirty days remain unused. In all my years of work, taking time off had never occurred to me. However, if Mary wanted to skip working for a year, then I too, wanted to do it.

I had a little over three thousand dollars in my savings account. While I was in the Navy I had been saving up to pay for my teacher's credential program at Stanford. My switch to Cal brought with it a full-time teacher's salary. My salary combined with my Vietnam-era G. I. Bill benefits, had paid for my two years at Cal. So, the money I had set aside for my education was available to fund our trip.

Mary had nothing saved, so our trip budget was my (now our) three-thousand dollars. The most common travel guide at that point in time was *Europe on $5.00 a Day*. The bed and breakfast establishments all over Europe listed in the book would be our housing. Three-thousand dollars would carry us as far as we could stretch it for our $10.00 a day (2 people times $5.00) bed-and breakfast adventure.

Our European Adventure
On Thursday, August 29th, when the tourist season was mostly over, Mary and I left for what might be a year in Europe. I say "might be" because we were going to stay until our money ran out, or for a year, whichever came first. With two exceptions, we had no itinerary. We were free to go wherever our whims took us. Our two Exceptions: Edith Biggs and Lucille Brabant.

Edith Biggs
As Bill Aho had suggested, Mary and I had contacted Edith Biggs in London. We did not know then (no Google and no Internet), that Edith was one of the most well known and influential people in English mathematical education. I said "English" and not "England." Edith was known all over the world. Edith's official title was "Her Majesty's Inspector for Mathematics and Science." She was England's math education's head honcho. And, as we learned when we were back home, Edith's USA publisher was Addison-Wesley, the eventual publisher of Mary's book *Workjobs*.

Edith had invited us to come to a teacher's workshop she would be conducting in Birmingham, England from Tuesday, October 8th through Thursday, October 10th. The workshop was to be for Primary Grade teachers. In England, the Primary Grades included Infant Level for children ages five through seven and Junior Level for children eight through eleven, in essence, elementary school teachers from kindergarten through sixth grade.

We spent Monday, October 7th looking for the conference site and finding a place to stay. We also went to what we thought was to be a 7:30 PM meeting with Edith. We found out when we got there that the meeting was supposed to be at 4:30 PM. Not a great start on our part.

On Tuesday, we reached the workshop's site just fifteen minutes before its start. Edith was glad to see us and made us feel quite welcome. She had been worried because we had not shown up the day before and was concerned that we might not come at all.

The Birmingham Conference
I don't know what I thought when Edith said she was going to conduct a workshop. I had not envisioned a workshop that had three-hundred classroom teachers as its participants. It seemed like all the City of Birmingham's teachers were there. Could one person really give a workshop on the use of manipulative math materials and have all three-hundred teachers actively involved? The answer to my question was, "Yes!"

Edith had invited Mary and me to join the Birmingham teachers as workshop participants. The three-hundred teachers in attendance were clustered in groups of twenty around fifteen separate materials-filled tables, each with its own Edith-trained leader to guide them. Mary's and my table now had twenty-two participants.

Edith provided the over-all introductions of the materials and the instructions for using them. The activities she introduced were carried out at each individual table, and the interactions we participants had with one another was as free-flowing as our groups of twenty permitted. It was like the workshop was designed simply for each group of twenty and not for the three-hundred. Overall, Edith's conference was excellent.

The table leaders Edith had trained in advance also met with Edith at the end of each workshop day to provide feedback on that day's events. Edith met with Mary and me after each day's session, as well, to solicit our feedback. Our feedback was honest but incomplete. We enjoyed the lessons and stated truthfully that we would find the lessons she presented quite useful in our own classrooms.

What was apparent to both Mary and me was that many of our fellow participants did not understand why they should be teaching lessons like the ones Edith was presenting to them. On more than one occasion teachers would say to one another, when our table leader was not present, "Why are we doing this?" They knew they would be teaching these lessons in their own classrooms, not because they believed the lessons were the best way for children to learn mathematics, but because the people in charge said they should. It seemed that the teachers at our table were doing what they were told to do, just like teachers using textbooks and workbooks to teach math were simply doing what the people in charge told them to.

We did not include this information in our feedback because what we were hearing at one twenty-teacher table was not enough for us to judge if the feeling was more general.

Edith as a Friend

Edith was delightful and we had a delightful time visiting with her. She shared her philosophy of teaching with us and was quite interested in hearing our ideas, as well. Edith also liked our Intern Program's philosophy of "What is being taught now isn't working, so try something different." She was quite interested in learning about the "something different" ideas Mary and I had been implementing in our own classrooms.

We got along so well with Edith that she offered to let us use her flat (an individual residence on one floor within a larger building) on the outskirts of London as our home for a week. Edith was about to go on a week's vacation and she told us we could take up residence at her flat while she was away.

The Week Edith Planned for Us

The Birmingham Conference ended on Thursday the 10th. Edith's vacation did not start until Friday the 18th. On her own, without our asking, Edith filled that week with educators for us to meet and schools for us to visit.

On Friday, Edith had Mr. Moon, a local administrator, escort Mary and me on a three school tour in Birmingham. Saturday we spent the day simply being tourists in Birmingham. Sunday we took the train to Nottingham and met up with Dr. and Mrs. Whittaker who were to be our guides for school tours in Nottingham. Monday was filled with visits to schools. Tuesday, more school visits and attending a math class Mrs. Whittaker was giving for local teachers. We left for Sheffield that evening to meet up with Douglas Long. On Wednesday Mr. Long had us visit a school in the morning and attended a secondary school meeting in the afternoon. Thursday, we visited a very well run Infant School in the morning followed by a visit to the Junior School for which Mr. Long had previously been the Head Master.

Thursday at 4:55 PM we boarded the train for London. We reached London at 7:55 PM and rode the London Underground to the London outskirts where Edith lived. We reached Edith's flat at 9:30 PM. Great house! We enjoyed a very nice visit with Edith, settled in and went to bed. Friday morning we joined Edith for homemade scrambled eggs breakfast just before she left for her week's vacation.

Nuffield Mathematics

As I said earlier in this chapter one my two favorite projects from my *Clearinghouse* correspondence was the Nuffield Mathematics Teaching Project in London, headed by Geoffrey Matthews. I had planned to visit the Nuffield Mathematics Project when Mary and I visited London. Edith knew this, so before she left for the week, she arranged for me to meet personally with Dr. Matthews the first Monday of her vacation.

On Monday, Mary and I met with and had a nice long talk with Geoffrey Matthews. He kindly gave me a stack of Nuffield Mathematics materials to add to my collection. He also set up a school visit for us. On Tuesday we visited an Infant School just outside of London. We learned there the same thing we had seen in so many other schools we had visited. The wishes of the leaders are not always carried out by the followers.

After our visit with Dr. Matthews and our visit to the Infant School, we spent the rest of Edith's vacation week, being London tourists. Our favorite event that week, of many favorites, was watching Johnny Cash perform at the London Palladium.

Mary was a country music fan. My favorite music was more rock and roll based. My favorite singers list included Buddy Holly, Ritchie Valens, Chuck Berry, Fats Domino, and Little Richard. However, Johnny Cash was on my list, as well. In addition to liking his music, I felt a personal connection to Johnny. Johnny's nephew Roy Cash was a dorm mate of mine at Naval Officer Candidate School (OCS). Roy even received a royalty check while he was at OCS from "I still Miss Someone" that he had co-written with his Uncle Johnny. Johnny's concert was sold out, of course. Great show!

Edith's Return

Edith returned on Saturday October 27th, the night of the Johnny Cash show. She asked us to stay for another week so we could spend more time visiting with one another. For that second week, Edith stayed with her friend in the flat above us.

From that Saturday until Sunday November 3rd Edith, her upstairs neighbor Kay, Mary and I lived like we were a family. Edith worked during the day, of course, since her vacation was over. So, during the day while she was at work, Mary and I traveled around London and nearby cities doing tourist-like things. However, my daily log for Mary's and my trip has nearly the same entry for every evening that week, either Home-Dinner-Games Bed, or Home-Dinner-Games-TV-Bed. The games were played by me, Mary, Edith and Kay. The dinners were mostly cooked by Mary and Edith together. On our last night with Edith, Mary cooked for everyone and I was the sole dishwasher.

Ayr, Scotland and Leeds, England

Our plan after our very pleasant London stay was to visit Edinburgh, Scotland. Knowing this, Edith planed two more visits for us. The first was in Ayr, Scotland. Our hosts there would be Dr. and Mrs. Riddel. We were the Riddel's house guests from Monday through Thursday. Mrs. Riddel was a classroom teacher. Dr. Riddel was a college professor. We visited both primary schools and Craigie College of Education. A great visit with a very nice family that was fun to be with. We had the pleasure of celebrating Guy Fawkes Day with them on Tuesday. I had never heard of Guy Fawkes Day, but it is now pleasantly etched into my memory.

We spent Friday through Monday in Edinburgh just being tourists. We then traveled to the city of Leeds in England for the second of the visits Edith had arranged for us. Our Leeds hosts were Mr. and Mrs. Hanson.

We visited Mrs. Hanson's Teacher Center and several schools there, as well. Great conversations and very educational school visits.

In addition to the daily journals that Mary and I had been keeping since the first day of our European adventure, we had also been keeping separate journals to record the many things we had been learning from all the educators with whom we had come in contact and all the classrooms we had visited. Our visit to Leeds would be the last entries in our school journals until we returned to the States.

The Gap Between The What and The Why

Mr. Moon, Mr. and Mrs. Whittaker, Mr. Long, Dr. Matthews, Dr. and Mrs. Riddel, Mrs. Hanson – all the great teacher-trainers Edith had arranged for us to visit. What Mary and I observed in all our visits, including Edith's Birmingham workshop, was that there was a gap between what the leaders were saying should be done and what many of the followers were actually doing. While we did not hear the "Why are we doing this?" question from Edith's Birmingham workshop spoken, it's message was being acted out in many of the classes that we visited.

All the classrooms we visited were, at least on the surface, implementing the changes the leaders wanted. However, whether we stopped by a school in the morning or in the afternoon, a math lesson was always in progress in each classroom we visited. It became apparent from talking with the teachers, that many times the lessons that we were seeing were only being taught when visitors were there to observe them. When there were no visitors, the lessons actually being taught were more traditional.

To put it more simply, there was a gap between the what and the why. The leaders were saying what to do because they thought it was a better way. The followers were trying to do it, not because they believed it was a better way, but because they were told to. They knew the what, but had not fully grasped the why. If I had been in their same situation, I too, would have wondered why I needed to abandon the ways I had been taught when I was in school to now teach a different way. The old way had worked fine for me. Why should I change it?

The philosophy of the Intern Program had been "What is being taught now is not working, so try something different." The premise of that statement is that there are children not learning with the methods now being used, so find a better way. The Intern Program's focus was on low achieving inner-city children, but there are children in every classroom who are not learning. If I focus on the fact that the methods used to teach me were successful, then I won't see the need to change how things are taught.

The gap between the what and the why existed because the leaders were presenting what to do because they thought it was a better way with out effectively conveying why this better way was needed. They were emphasizing what to do and assuming why to do it is was self-evident.

At this point in my teaching career, the fact that there was a gap between the what and the why was not my problem. I was not teaching teachers, I was teaching children. Closing the what and why gap was no concern of mine. I did not know then that I was also to become a teacher of teachers. When that happened, closing the what and why gap would be my concern.

On Thursday, November 14th, we set out for our next destination: Huy, Belgium and Lucile Brabant.

Lucile Brabant

During Mary's Junior year in high school, Mary had a "sister." For that school year, Mary's family hosted Lucile Brabant, a foreign exchange student from Belgium and a Junior like Mary. Both girls really enjoyed their year of being sisters. After Lucile returned to Belgium, Lucile and Mary remained in constant contact as pen-pals.

Mary's and my wedding had been a simple affair. My immediate family flew from Northern California to Southern California the day of the wedding. We were joined there by my aunt, uncle and cousins, all of whom lived in Southern California. After the service at Mary's house, we all had a nice meal in her backyard. Mary and I then borrowed one of her parent's two cars and spent a few days driving up the Pacific Coast Highway stopping any place we chose to, for the 350 miles between Mary's home in Sylmar and our new residence in Berkeley.

Although Mary would love to have had Lucile come to our wedding, asking her to come so far for such a quick event was neither reasonable nor practical. However, it was now Lucile's turn to get married. Lucile's wedding was to be held in Huy, Belgium on Saturday, December 21, 1968. Mary and I were, of course, invited. We could have attended Lucile's wedding during our Christmas vacation. However, Mary decided it would be much more fun for us to take the entire year off from teaching and travel around Europe before and after Lucile's wedding.

Lucile had been able to experience America during her year-long visit. Mary had spent her earliest school years in Germany, while her father was stationed there in the army. However, living in Germany as a five or six year-old didn't count as having experienced Europe. Lucile's wedding was Mary's inspiration for wanting to spend a year in Europe, just as Lucile had spent a year in America.

Mary wanted to take this particular year off from teaching because she knew my plan as a teacher was to stay at the same school for so long that the children of the children I had taught would be coming through my classroom. When our time at Cal ended, I would to be applying to teach in East Palo Alto and Mary was planning to join me there. The best time for taking a full year off from teaching was right now, before we began our careers as East Palo Alto teachers.

At 9:35 PM Friday November 15th, we arrived at Huy. Lucile and her brother picked us up at the train station and our visit began. Lucile's father was a dentist. The first floor of his home was his dental office and patient waiting room. The upper two floors were the living spaces where Mary and I were now welcome guests.

The wedding was a little more than a month away. We did not plan to stay in Huy for that whole month. Our plan was to visit for a week or so, continue our European adventure and return again for the wedding. The Brabants invited us to stay with them through Christmas, even though Lucile would be a married woman by then and living with her husband.

The picture above is of Mary, me, Lucile, her father and her mother standing in front of the Brabant's home. Mary is wearing red, of course. I say "of course" because it had become her favorite color. Mary's boyfriend of five years, with whom she broke up to be with me, would not allow her to wear red. He associated "red" with "red light district," so red was not permitted. He had many other rules for her, as well. But all those rules were now long gone.

Germany Side Trip

We spent the time between our initial visit to Huy and our return for the wedding visiting the Scandinavian countries and Germany. Our visit to Germany took us to Hamburg, Berlin, Nuremberg, Frankfurt and St. Goarshausen.

My own family's history is well documented in pictures and 33 millimeter home movies. My Uncle Jim was a Flight Surgeon for the Army Air Force stationed in England during World War II. To keep him constantly updated on the lives of my cousins who were his three children, my grandfather frequently filmed all of us and sent the films to him.

Mary's early life rarely captured on film. While Mary had some recollection of her early years in Germany, she had only a single picture from that time.

The Wedding

We returned to Huy on Friday December 20th, in time to help make place-setting cards for Saturday's wedding banquet. On Saturday, we all dressed up and, with the rest of the wedding party, piled into five taxis for the trip to the Church.

Lucile and Edgard's wedding ceremony took place from 11:15 to 12:00. It was followed by a two hour reception. The reception itself was basically for friends of the families. The reception was then followed by a banquet for the wedding party. By "wedding party" I mean actual family members, the ones who had dressed for the wedding, as Mary and I had.

Mary and I counted as family because Mary and Lucile were "sisters." The banquet started at 2:00 and lasted until 7:30. Neither Mary nor I had ever been to anything like it. The dinner was long and excellent. It was an afternoon and evening filled with great food and very interesting conversations. After dessert, the bride and groom quietly disappeared without saying good-bye and the party continued without them.

Christmas with the Brabants

Since Mary and I had been invited to spend Christmas with the Brabants, we now had the additional pleasure of dining on banquet left-overs for all of our meals on Sunday. While neither Mr. nor Mrs. Brabant spoke English, we had no trouble communicating with one another. In addition, even though Lucile was no longer living there, her brother and sister were still present and they were both fluent in English.

We were back to living like a family as we had been with Edith. We even got to help decorating the family tree on Christmas Eve. When Mary and I placed our gifts for the Brabants under the tree, we found there were gifts for us there, as well. A Christmas more than 5,000 miles away from our home still felt just like we were home for Christmas.

The Last of Our European Adventure

After we left Huy, we continued our European travels. We saved Brussels for our end-of-trip destination because Brussels was where Lucile and Edgard were now living. Neither Lucile nor Mary could have imagined when they were high school that there would come a time when they would both be married and be able to so easily get together as married couples. After a pleasant two-day visit, we said our good-byes to Lucile and Edgard as we boarded the train for Luxembourg and our flight to New York. Our European adventure was now over.

Home Again

In our chats with Edith, I had mentioned that I had been using materials from the Madison Project in Syracuse, New York in my classroom. As it turned out, Bob Davis, the head of the project, had spent time with Edith in London. Edith told us that we should pay Bob and his Madison Project a visit when we returned to the States. She said she would let Bob know we were coming.

On Saturday, February 15th at 2:30 AM, Mary and I departed Luxembourg via Icelandic Airlines for New York. After the mandatory stop in Iceland, we landed in New York at 9:00 AM (3:00 PM Luxembourg time). After a good night's sleep we boarded a Sunday, Greyhound bus for our trip to Syracuse and Bob Davis's Madison Project.

In advance of our European trip, we had purchased a Eurail Pass. A Eurail Pass was a three-month long, travel anywhere, pre-paid train ticket, meant for use by foreign visitors like Mary and me. It was only available for purchase outside of Europe and was meant for use by non-European citizens or non-European residents.

We learned that the Greyhound Bus Company had a similar "See America" one-month travel anywhere ticket for visitors to the States. The ticket was not available for purchase within the USA. However, while Mary and I were in Europe, we purchased Greyhound "see America" tickets for ourselves. We planned to spend our first month back from Europe traveling all across America. Our trip to Syracuse marked the beginning of our planned one-month tour.

Monday morning we met with Bob Davis. We became so engaged in conversation that Bob invited us to keep him company on his drive to Ithaca that afternoon and then sit in on a class he was conducting at Cornell that evening. A great day and night of conversation and the two-way sharing of ideas for teaching. Bob also gave me a whole bunch of Madison Project literature that I did not already have.

Our original plan was to use our Greyhound month to travel as tourists through all the states on the East Coast from Virginia through Georgia and then go from Alabama to Arizona along the Southern States before ending up in California. However, our visit with Bob Davis changed our plans. Our journey now became more teacher-focused

More *Clearinghouse* Adventures

From Ithaca we traveled to Boston, to visit the Elementary Science Study (ESS) Project in near-by Newton. I had learned of ESS through the *Clearinghouse* book. With a single exception, selected ESS units were what I had used for every science lesson in my classroom. I learned of even more science units that I could use from Mary's and my ESS visit, including the Cardboard Carpentry unit that I would use with my future East Palo Alto Special Education students.

From Boston we traveled to Washington D.C. to visit our friend and fellow Intern Betsy, who was now a teacher there. We spent five days in Washington visiting Betsy and her classroom and just being tourists in our Nation's Capital.

Next was the Science Teaching Center at the University of Maryland, in College Park. The Science Teaching Center was the data-gatherer for the *Report of the International Clearinghouse on Science and Mathematics Curricular Developments*. While there, we perused a variety of teaching materials on display from all over the world.

After Maryland, we travelled to Philadelphia for a visit to a Madison Project Demonstration School that Bob Davis had arranged for us. The following day we visited four more schools in Abington. However, what had been true for many of our visits in England and Scotland, was also true here. What we were learning from our school visits was not what the people in charge thought we were learning.

Heading Home - Visiting Relatives on the Way

Sunday, February 16th was the day we began using our See America pass. It was now Sunday, March 2nd. Twenty-two of our thirty-days were already gone. Our original travel plan was no longer possible. At 7:00 AM on Monday, we boarded a Greyhound Bus. Our destination: Las Vegas. The bus ride went so well, with so many rest stops along the way to break up the days and nights, that we decided to stay on the bus for the whole sixty-six hours it took us to reach Las Vegas – which we did at 9:45 PM, Wednesday evening.

We really enjoyed our three-night, two-day stay in Las Vegas and promised ourselves we would be back again when we could afford it. We were not staying in any bed and breakfasts in Las Vegas, and there was not enough left of our $3,000.00 travel fund for us to stay any longer. So, Saturday morning, we took a Greyhound bus to San Bernardino to visit my Aunt and Uncle. Visiting relatives was definitely something we could afford to do. My Cousin Joan and her Baby Jean (born while we were away) were visiting there, as well.

Monday morning we left San Bernardino for the bus ride to Sylmar, Mary's parent's home. On Wednesday, March 13th we boarded a Greyhound bus for the very last leg of what had been our six and a half month journey. How much of our $3,000.00 was left when we reached my parents home in Atherton? Five dollars.

Back Home

We were back home, penniless, but hardly suffering. Before we left, we had moved all of our possessions, both school and personal, into a large storage shed my parents had constructed on a section of the two acre lot on which our Atherton home had been built. Since we were both broke and unemployed, we simply moved into my, until then, vacant bedroom and enjoyed the ultimate bed and breakfast (and lunch and dinner) with a backyard swimming pool available for our use.

Once we settled in, we applied for teaching positions in East Palo Alto for the 1969-1970 school year. Mary was hired as a kindergarten teacher at Ravenswood. I was tentatively hired to teach a Special Education class at Kavanaugh School. The condition placed on my being hired is described in the 1969-1970 – Special Education section of Chapter 9 - The Yearly History of a Change in Plans.

In addition to being hired to teach in the coming school year, we were both hired to fill positions immediately. Mary signed up as a substitute teacher. That meant Mary would be on-call to substitute for any teacher at any grade who called in sick that morning. This was a measure of how far Mary had come from how she felt about her teaching abilities after her very first lesson as an Intern. See the Mary's Disastrous Lesson section of Chapter 5 – The Intern's Years. Mary had gone from saying

then, "I'll never make a teacher! I'm going to quit!" to now feeling comfortable going into any class as its teacher on a moment's notice. Mary always took her guitar with her in case the teacher's plan left for a substitute to do didn't prove workable. Mary never had a day that she ended up not enjoying teaching.

I was hired to be a home-school teacher. Children who were not able to come to school for a length of time for some reason were taught one-on-one at home. I traveled to the homes of the same three students each day. The first was a third grade boy with his broken leg in a full cast. The second was a little girl who had been sexually assaulted by some upper-grade boys in her school. She was completely unaware that what had happened to her was not simply what she was supposed to do with boys. The third was a middle school boy. I was not sure why he was being home-schooled and I never asked.

The Third Time Is The Charm

Mary's book *Workjobs* had already been rejected twice by Addison-Wesley. However, after we returned home, Barbara Beatty, the person who had included suggestions for changes Mary might make to *Workjobs* in her first rejection letter, contacted Mary to let her know there had been a change at Addison-Wesley.

Addison-Wesley had just opened up a new "Innovative Division". Addison-Wesley itself was based in Redding, Massachusetts. This new Innovative Division was located in Addison-Wesley's Menlo Park branch. Menlo Park was the town next to my hometown of Atherton where Mary and I were now staying.

Steward Brewster, the head of this new division, was looking for something unique for his Innovation Division to publish. Barbara had shown Mary's manuscript to Stuart and he was interested in talking to Mary about it. In essence, Mary's *Workjobs* was being submitted to Addison-Wesley for time number-three.

Stuart had Mary come in for a chat. Mary had me come with her. The chat turned out to be quite a bit more informative than Stuart had anticipated. All Stuart knew from Barbara about Mary was that she had taught kindergarten for a year and a half. That was the full extent of her background as a teacher and her only qualification as an author. What Stuart soon learned though, was that both Mary and I had met with and shared our ideas on education with Edith Biggs in London and Bob Davis from the Madison Project in Syracuse. Stuart was completely taken aback when he learned Mary knew both Edith and Bob because both were Addison-Wesley authors under his purview.

After our initial meeting, Stuart contacted both Bob and Edith and asked each for their opinion of Mary. Edith and Bob praised both of us quite highly. Stuart was already giving serious consideration to publishing Mary's book. However, his conversation with Bob Davis in particular had served to give Stuart a marketing strategy. He now had a plan that would allow him to compensate for the fact that Mary was a completely unknown teacher who had only taught kindergarten for a year and a half and who had no following.

In addition to his decision to publish *Workjobs*, Stuart made another key decision. Stuart had his Innovative Division hire a professional designer to ready *Workjobs* for publication. Mary was to assist the designer in the book's preparation. However, Mary strongly disagreed with the entire plan the designer came up with. Mary met with Stuart and explained to him both what was wrong with what the designer was planning and what should be done instead.

Even though Mary was only a kindergarten teacher with absolutely no book-designing experience, Stuart decided to let Mary design *Workjobs* exactly the way she wanted it to be. He did try to get Mary to change the name of the book because he said no one would know what that name meant. I took care of that suggestion for Mary, telling Stuart, "Once the book is out, people will add a new word to their vocabulary - Workjobs."

The Miller Math Connection

It was easy for Stuart to market books written by authors like Edith Biggs and Bob Davis. Both Edith and Bob were known in their fields, with their own followings. Mary, on the other hand, was an unknown second year kindergarten teacher with no following at all. The challenge for Stuart as Mary's publisher was finding a way to make this unknown teacher marketable. Even though *Workjobs* was not a math book, because of Mary's and my connection with Bob Davis, Stuart chose to focus his attention on the math aspect of the book's contents. Stuart even went so far as selecting a math related picture for the book's cover.

The reason for this math focus was the State of California's Mathematics Specialized Teachers Project Mathematics Improvement Program, also known as Miller Math. This program is also mentioned in the Miller Math sub-section of the 1970-1971 - Two Teachers of Teachers section of Chapter 9 - The Yearly History of a Change in Plans.

The two-thousand teachers who would be participating in the Miller Math Program in the Summer of 1971 were from every school district in the State and were hand-picked by their districts to receive the training. Mary's book would not actually be published until 1972. However, Stuart saw an opportunity to get Mary and her *Workjobs*, or at least the math portion of it, known to these two-thousand California teachers in that Summer of 1971. These teacher would become Mary's following.

Miller Math relied heavily on Bob Davis's Madison Project materials. Stuart was aware of this because he was Bob Davis's publisher and had been serving as the liaison between Bob and Leonard Warren, the head of the Miller Math Project. Stuart contacted Leonard and suggested that he consider Mary, a promising new author of math book for teachers, as an instructor to be added to the more than fifty other instructors already chosen to conduct the Program's math workshops.

Mary's personal connection to Bob Davis was crucial to getting Leonard to consider her as an instructor. All but one of the more that fifty current Miller Math instructors were math resource specialist. The one exception was the only classroom teacher serving as an instructor and she had earned her PhD in education. Mary would be the only other classroom teacher serving as an instructor.

Because Stuart had linked Mary to Bob Davis and the Madison Project and because Stuart said Bob both though highly of her, Leonard sent Marilyn Burns (a Miller Math Instructor and a Bob Davis disciple) to visit Mary's classroom. Marilyn liked both Mary and what she saw in Mary's classroom, so Leonard had Mary fly down to San Diego for an interview.

Bob Uses That

In the How We Became Miller Math Instructors sub-section of the Chapter 9 section I mentioned above, I describe how both Mary and I became instructors for the Miller Math Program. Every time Leonard showed Mary any material she would be expected to teach with, Mary would say, "Bob uses that." It became clear to Leonard that if he wanted Mary, he would have to hire Bob, as well. Since Leonard wanted Mary, I was selected as an instructor without an interview and without anyone even bothering to visit my classroom. The reason Mary could keep saying "Bob used that" was because, thanks to Bill Aho, I had already been using Madison Project materials in my class.

Miller Math Level-Two
In the Level-Two sub-section of the 1970-1971 section of Chapter 9, I mention that Leonard assigned me to be an instructor for second-level participants – people who had taken the Miller Math Program the Summer before and were returning for additional training.

Actually, Leonard's assigning me to be a Level-Two instructor made no sense to me. Mary had been assigned to Level-One. Leonard knew that Mary had not used any of the materials she would now be expected to teach. Since he also knew I was familiar with everything, pairing me with Mary at Level-One would have allowed us to work together in planning her lessons. Because I was assigned to Level-Two, my assumption was that Leonard expected Mary's team leader to be her guide. I learned later that Marilyn Burns, who was now Mary's team leader, told Leonard she didn't appreciate having a novice instructor assigned to her group and she was not going to help Mary at all.

As will be repeated again in Chapter 9, it eventually became apparent to me, and later to Mary, why Leonard wanted a person as completely unqualified to teach mathematics as she was to be one of his instructors. Leonard simply had a crush on Mary. He had hired me, sight-unseen, to make sure Mary would join his Miller Math team. He dumped me off to Level-Two to get me out of his way. What he wanted to happen was for Mary to turn to him for support in learning how to conduct her workshop sessions. He would guide Mary's success while I would be left to fail on my own. That is not what happened, though. How Mary went from "Bob uses that" to "We both use that" in that Miller Math Summer is described in detail in the Mary and the Miller Math Experience section of Chapter 11 - A K-6 Math Curriculum And One Big IF.

Leonard's placing me at Level-Two was not the recipe for failure he had hoped. It turned out he had done me an accidental favor, instead.

An Accidental Favor
The knowledge I had gained from Bill Aho and my *Clearinghouse* contacts had definitely provided me with enough ways to teach mathematics to qualify me as an instructor. Miller Math was based in large part on the Madison Project philosophy. By the Summer of 1971, I had already been making use of Madison Project ideas and a whole lot more than that in my own classrooms for three years.

I had never conducted a teacher-training workshop before. However, the many opportunities Edith provided me to observe teachers being trained provided me with all the background I would need to feel quite comfortable instructing at Level-Two. These observations would also end up determining the kind of math instructor I was to become.

I mentioned earlier the gap between the what and the why that Mary and I had observed. Educators like Edith Biggs, Geoffrey Matthews, Bob Davis, and the others we has been privileged to visit were sharing with teachers ways to teach their students more effectively. However, many of the teachers with whom these teaching methods were shared were not using these new teaching strategies with their own students. Their common thought expressed behind the scenes was, "Why are we being asked to do this?" What Mary and I observed repeatedly was that what was being taught to teachers was too often not what was being learned.

I was quite receptive to what was being shared. However, my situation was not typical. The assumption of my Teacher Intern Program was that what had been taught before was not working, so something different was needed. My search for that "something different" is what had lead me to Edith, Bob, Geoffery and the others in the first place. So, of course, I was receptive to the ideas they were sharing. However, if I had not been in the Intern Program, then I, too, would not have seen the need to teach any differently than how I had been taught. The old ways had worked fine for me. Why should I change what was already working?

Before I began my turn as a Miller Math instructor, I had learned that what Mary and I had observed in many of our classroom visits in England, Scotland and New York was also true for a majority of the Miller Math participant. Even many of the participants who were returning for the second-year experience were not actually implementing the teachings of the Miller Math Project in their classrooms.

Why were they back as Level-Two participants when they hadn't fully embraces their Level-One experience? Because participation in the Miller Math experience was not voluntary. Each district in the State made its own decision of who to send. The reward for being selected was two-weeks of extra pay and the hundreds of dollars of manipulative material given to each participant. Neither Mary nor I had even heard of the program's existence from anyone in our own school district. We were not the kind of teachers who ended up being chosen. If it were not for the fact that we were now Miller Math instructors, I doubt if we would ever have known of the program's existence.

I stated earlier that closing the what and why gap had not been a concern of mine. However, now that I was to be a teacher of teachers, dealing with the what and why gap was definitely my concern. And, by placing me at Level-Two, Leonard had done me an accidental favor. If I were a Level-One instructor, I would have had to teach the same Level-One concepts as every other Miller Math instructor. Unlike Level-One, however, there was no formal Level-Two curriculum.

The Intern Program's philosophy was "What is being taught now isn't working, so try something different." Most of my Level-Two participants were not implementing the teachings from their previous summer's workshop in their classrooms, so what had been taught wasn't working. That meant I had tacit permission to try something different. Teaching at the second level gave me the same freedom to create my own curriculum that I had experienced as an Intern teacher.

Receptiveness

In the A Kindergarten Teacher section of Chapter 5 - The Twenty-Two IFs of The Interns' Years, I tell the story of Mary's switch from being a Second-Grade teacher in a team-teaching role to being a Kindergarten teacher with her own classroom. In January of our first year of teaching, the principal of her school offered Mary a kindergarten position that had become open because the teacher had quit. Mary asked our Intern supervisors to let her leave her team-teaching assignment and switch to kindergarten. Her request was denied. Mary asked me if I would talk to our supervisors for her. Mary had chastised me earlier because she said I was too good at manipulating people. So, I asked her if she wanted me to "manipulate" them? She said, "Yes!"

To change someone's behavior, you need to think of his or her needs, and not your own. Keeping their needs in mind is how you make the person receptive to what you have to say. Receptiveness: Willingness to listen to and accept new ideas and suggestions. Mary had approached asking our supervisors to let her switch to teaching kindergarten by focusing on what she needed. Her focus should, instead, have been on the needs of our supervisors.

One of our supervisors needs was, of course, to keep Mary in their team-teaching study. But Mary's team was one of four Intern teams in the study. If she dropped out, the study would still go on. A second need of our supervisors was for there to be school principals willing to accept the program's Interns on their staffs. The Principal at Mary's school had done the Teacher Intern Program a favor by allowing not just one, but two teachers who had absolutely no prior teaching experience to be full-time teachers at his school. Now, however, he found himself without a teacher in the middle of the school year. He had helped the Intern Program. Now, all he was asking for was a little help in return. Our supervisors sympathized with the Principal's need and approved Mary's request to became a Kindergarten teacher.

Teaching Teachers

If I had been hired as at Miller Math instructor right after my second year of teaching, I would have presented my math lessons to my workshop participants in exactly the same way as I presented them to my students

in my sixth grade class. My presentation would have been: "Here's what I'm doing in my classroom, now you can do it in your classrooms, too." That is what the Miller Math instructors had already been doing, presenting the what and not the why.

Teachers were being shown new ways to teach, but not why these new ways were better than the ways they themselves had been taught and were teaching now. The "Why are we doing this?" view that Mary and I first heard expressed at Edith's Birmingham workshop had been overtly or covertly expressed nearly everywhere we went. The fact that most of the Miller Math participants were not using the Miller Math concepts in their classrooms meant that what Mary and I had observed in our travels was present in California, too.

Teaching teachers is not the same as teaching children. When I am teaching the children in my class, the point is the lesson I am teaching. As an example, if I am teaching addition, the point of my lesson is teaching every child to add. However, when I present this same addition lesson to teachers, they already know how to add. So, what they need to know is not how to teach addition, but why is my way of teaching addition is better than the way they are already teaching it?

As I said earlier, to change someone's behavior, you need to think of his or her needs. In this case, however, most of my workshop participants felt their teaching needs were already being met by the traditional curriculum they were already using. The reason so few of them were changing how they taught was because they did not see the need.

Receptiveness at Level-Two

As I mentioned earlier, I was already receptive to what was being shared. I already believed that the more traditional methods of teaching were failing my inner-city students. I had also already seen first-hand, the benefits the Miller Math materials and the other *Clearinghouse* ideas with my own students. The challenge now was to get my workshop participants to see what I had seen and know what I had come to know. Rather than caring about what should be taught, I would focus on why we should be teaching differently. My goal was not to show my participants ways to teach their children. Instead, I wanted to show them how poorly they themselves had been taught. I wanted them to see how they themselves would have benefited if they had been taught a different way. My participants already knew the what. I would focus on the why. I would focus on receptiveness.

Level-Two Lessons

Since Level-Two had no formal curriculum, we Level-Two instructors simply gathered together the afternoon before each day's workshop and

put the title or titles of our planned workshop session(s) for the next day on a matrix that had our names and classroom numbers along the side and the sessions' hours along the top.

Each morning, Level-Two participants viewed the matrix and made their choices. A session that we instructors thought was likely to draw more people than its room would hold would be offered more than once on that same day, or if more popular than anticipated, offered again the next day, as well. Participants made their choices. If a room was full when they arrived, they could either stand in the back of the room and watch or make another choice for that time slot, since a room already full guaranteed that session would be taught again the next day.

First Lesson - Straw Constructions

My very first lesson was greeted with unconcealed skepticism by a few of my fellow Level-Two instructors. Its title was "Straw Constructions." I knew my Straw Constructions session was not something my Level-Two participants would have experienced the year before. The misleading purpose I stated at the beginning of my session was the construction of pyramid kites that participants could take home with them. I held up a straw pyramid to show my participants an example of the small pyramids they would make that would then be covered with tissue on two sides and hooked together in a larger, flyable pyramid kite.

The two requirement before kite construction could begin. First, each person had to make a six-straw pyramid like the one shown. Once made, the pyramid had to stand on its own. Simple enough since the pyramid I had made was already standing on its own. The ones they made would stand as well. Second, each person had to make a straw cube that would also stand on its own. Once the cube was made, construction of the pyramids to be assembled into kites could begin. I told my participants they could work alone or in teams. Straws, string and scissors were available and straw constructions began.

I did not present this lesson as something that I had done with my students. I made no mention of having had my students make straw

kites. I made no mention of my students at all. This lesson was a learning lesson for my participants themselves, as they were soon to find out. If my lesson had really been about building pyramid kites, I would not have added in the "build a cube" requirement. However, what the participants were to find out for themselves was that building a cube that would stand alone was actually quite difficult. Initially, not a single cube built would stand on its own. Every cube collapsed.

Participants tried all kinds of ways to make their cubes stand. Making the cube smaller by cutting the straws in half, connecting more horizontal or vertical straws to the cube's sides for added strength, making a solid straw floor as a base for the cube, and on and on. Eventually it occurred to some students that they needed to add straw diagonals to the opposite corners of each cube's sides. The diagonals would divide each square's sides into two triangle. Triangles were what was needed to make square shapes rigid enough to stand alone.

The Point of It All

I learned about triangles in school. Like everything else I learned in mathematics, of which triangles were a part, what I learned was an abstract set of names and rules. Names for triangles: Isosceles, Equilateral, Scalene, Obtuse, Acute, and Right. Rules, to name a few: The sum of the internal angles of a triangle is equal to 180 degrees. The sum of lengths of two sides is always greater than the third side. The Pythagorean Theorem, which states that the sum of the squares of the two smaller sides in a right triangle equals the square of the longest side.

What I learned, I learned to pass the test that would be given to assess my memory of what I had been taught. Passing tests was the measure of the effectiveness of the lessons I had been taught. The purpose of my triangle pyramid lesson was to teach my participants about triangles, not as abstractions for the passing of some test, but about triangles in real life. What is the most rigid geometric shape? A triangle with all sides equal has the highest resistance to deformation. When properly used in construction, triangles are the most stable and rigid shape.

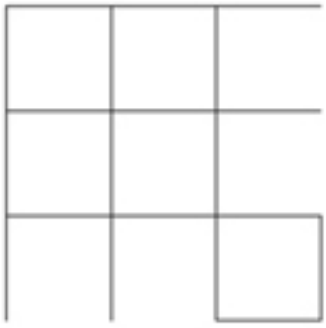
At the end of my session, I talked with my participants about the rigid shape of triangles being essential in construction. I told them of a set of shelves I had made once that taught me the same lesson they had just learned from their straw cubes. I nailed the rectangular bottom, sides and top together and added in the shelves. When I placed a items on a shelf, the shelves collapsed, just like their straw cubes had. What I had not thought to do was add a solid backing to my shelves. Without the backing, the shelves were as unstable as my participants' straw cubes proved to be. Adding the backing gave the shelves the triangular diagonal support they needed to stand on their own.

I said that, just as they had, I learned all about triangles in school. But what I learned in school had turned out to be useless in real life. It was reassuring for me to see that my ignorance about triangles and squares that caused my shelves to collapse was shared by everybody in this room. Just as I had failed to anticipate the problem I encountered when building my shelves, not a single person in this session anticipated that constructing a free-standing straw cube would be such a problem. Now we all knew because we had all experienced it for ourselves.

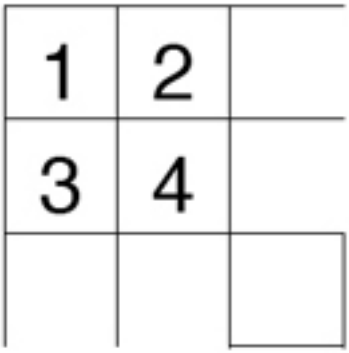
There was no discussion of how this lesson might be used with anybody's students. The point of the lesson was to let my participants experience first-hand the difference between learning abstract mathematical concepts for the passing of some test in school and learning mathematical concepts that are useful in our own lives.

A Lesson Snippet - Find the Numbers that Will Not Work
As much as possible, I aimed my lessons at my participants directly and not their students. My purpose was to teach my participants things they themselves did not know. Below is a snippet from a lesson that I taught soon after Straw Constructions.

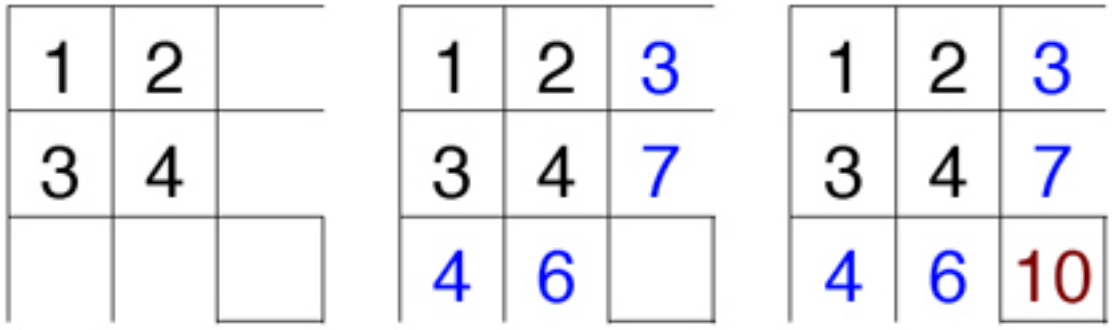
Starting with this set of squares and lines displayed my overhead projector's screen for all of my participants to see on:



I wrote numbers in four of the squares.



I added the numbers across each row and down each column. I then added the sums 3 + 7 and 4 + 6 and wrote the sum they shared in the remaining square.

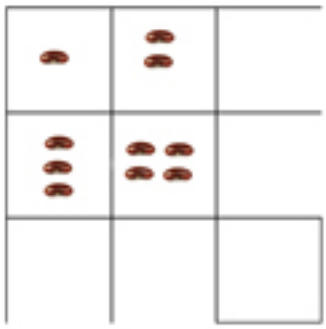


I told my participants that I had intentionally chosen whole numbers between one and ten to put in the first four squares because adding those numbers both across and down, and then adding their row and column sums would always end up with a common total in the lower right-hand box.

Their assignment now was to find the numbers that, when put in the first four boxes, would not end up with a common total in the last box. I also said that anyone in class who had already solved this challenge was to keep the solution or solutions to him or herself for now. I added that all numbers were fair game – fractions, decimals, and even negative numbers, and you can work in teams if you wish.

As my participants began their hunt for solutions, I walked around the classroom looking for just one thing. Were there any participants NOT trying to solve the problem I had posed? I could see that, without exception, everyone was searching for the solution.

After they had worked for ten minutes or so, I told them I would give them a hint. I placed the original blank squares and lines shape on the overhead and added some beans.



Once there were beans in the squares, I asked them to tell me the number of beans that I could put in the four squares so that when I slid all the beans across and counted them, then put the same beans- back in the four squares and slid them down and counted them again, I would get a different number of beans? The answer was obvious to all. There was no number of beans that would change its total depending on which way I slid them. The point to be made: If the answer was so obvious with the beans, then why was it not just as obvious with the numbers?

What I then talked about with my participants was the problem we all shared in how we were taught mathematics in school. Mathematics for us was rules for numbers to be learned. We were taught the rules for how to add, subtract, multiply, and divide numbers in all their many forms – whole numbers, fractions, and decimals. The rules were there for us to memorize and use upon command.

When we were in school, the focus was on the numbers and not what the numbers represented. So, when I said here's a number problem for you to solve, you did what we were all taught to do, which was to apply the rules you had learned by rote to the problem at hand. No thought was given to what numbers represented, because thinking about what numbers meant was not a part of the lessons we had learned in school. The purpose of the Miller Math experience is to let us as teachers learn a different way of teaching math than had been used in teaching all of us. The Miller Math experience is meant to show us ways to let the students we are teaching now see that mathematics is not a set of rules to memorize for some school test. It is a useful tool for helping us make better sense of the world in which we live.

Teaching for Understanding

Miller math session presented great teaching ideas. However, the ideas were taught in isolation by the many math resource teachers on the instructional staff, none of whom were classroom teachers. What I felt was needed was to demonstrate how all these different activities fit together as a math curriculum and not just as a series of activities to be used to keep children occupied on a rainy day.

As I said earlier, I wanted my participants to see how they themselves would have benefited if they had been taught a different way. I decided that rather than lecture my participants on ways to teach their students, I would have my participants actually be my students. I would teach them the same way I taught my own students and then let them decide for themselves if they learned any better my way.

If everyone of the students in my class was learning, then I would not have to change how I taught. Since that was not the case, the decision I

made for the students in my care was to teach for understanding and not for the test. I used the Lesson Snippet above as an example for my participants of the difference between teaching for the test and teaching for understanding. Rather that teach the rules, I use materials like the beans in the Snippet above to allow all of my students, both fast and slow, to learn to understand what numbers represent and then use their understanding to discover the rules of mathematics for themselves.

A partial list of all the many materials that I use in my own class and with my workshop participants: Beans and cups for teaching arithmetic operations in different bases. Ceramic tiles for creating multiplication matrices, also indifferent bases. Unifix Cubes for understanding fractions and their common denominators. Tangram puzzles for an introduction to logical thinking. A Hundreds Chart for pattern searches. Geoboards for creating algebraic formulas and discovering the rules for multiply and dividing fractions. Coordinate Tic-Tac-Toe for learning coordinate graphing. Dice for probability and for creating pages of arithmetic problems and making traditional workbooks and their worksheets obsolete. The list goes on and on. The teaching of every mathematic concept is taught for understanding and not just for the students with the better memories for concepts taught abstractly.

I told my participant that I teach the way I teach in my own classroom because I want every one of my students to be a learner. I also said that if every single child in your class is already learning, then just keep doing what you're doing. If not, then it is time for you to make a change.

The Level-Two and A Classroom Teacher's Model for a Workshop sub-sections of the 1970-1971 section of Chapter 9 - The Yearly History of a Change in Plans describes the classroom model I used for letting my participants see for themselves how I believed children should be taught.

Mary and Receptiveness

How Mary went from "Bob uses that" to "We both use that" in our first Miller Math Summer is described in detail in the Mary and The Miller Math Experience and We Both Use That sections of Chapter 11 - A K-6 Math Curriculum And One Big IF.

I was having reasonably good success at demonstrating to my participants the need for presenting mathematics to their own students the Miller Math way. However, Mary was much better at the why than I was. The ways of teaching mathematics I had been showing Mary in our sessions the evenings before each workshop day were exactly what Mary found she had needed to know to make sense out of mathematics for herself.

Because Mary had been so terrible at math, she was the perfect person for sharing with her participants that the ways she was showing them now were the ways she should have been taught in the first place. Simply put, Mary, who was bad at math herself, was much more relatable as a spokesperson for Miller Math, than either I, who had always been good at math, or all the other workshop instructors who were all math specialists.

When Mary and I began giving our own workshops for the Center for Innovation in Education, at Mary's suggestion we created an opening activity for both our primary and intermediate workshops that would let teachers see at the very beginning how frustrating it could be for children to learn from textbooks and workbooks. We took pages from a first grade workbook and turned them into what we called "The State Math Textbook" to let our workshop participants see and feel for themselves what was wrong with textbooks and workbooks. Receptiveness would be our starting point.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The Ctaite Mathe Teakst Buk was created by Mary and Bob Baratta-Lorton and Kathy Richardson for the Center for Innovation in Education. It was designed for use in the Math Their Way® and Math a Way of Thinking® courses.

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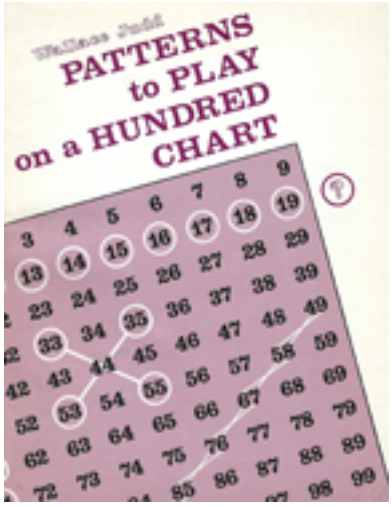
Miller Math Made Me Known

In the Our First Two Books section of Chapter 5 – The Twenty-Two IFs of The Interns' Years, I mentioned telling Mary that for either of us to be able to share our thoughts on curriculum with other teachers, we would have to write books that described what we were doing in our classrooms. Being the authors of books would give us "author credibility." Mary's *Workjobs* would give her credibility. As it turned out, simply being a Miller Math instructor gave me credibility, as well.

In December of 1971 both Mary and I were selected to speak at the first of what turned out to be an endless number of math conferenced across the country. This very first conference was held at the Asilomar Conference Center in Pacific Grove, California. Mary's session was a *Workjobs* workshop. My session was on searching for number patterns.

One of the sessions I had conducted with my Miller Math participants involved having them look at a hundreds chart and see how many different patterns they could find. My Hundreds Chart session was what I presented at Asilomar. Since this was my very first presentation at a math conference and I had no idea of who my attendees might be, I was also not all sure how well my focus on searching for patterns might be received. As it turned out, the entire hour of my session was filled with all the different patterns seen on just that one chart.

One of my participants that day was a teacher named Wally Judd. Mary and I both knew Wally because he had been a fifth grade teacher at Mary's school in East Palo Alto. Wally wrote a book he titled *Patterns to Play on a Hundred Chart* that included the very kind dedication: "This book is dedicated to Bob Baratta-Lorton whose workshop with hundred chart patterns started it all."



Thanks to Miller Math, author credibility was not the only kind of credibility available to me.

A Thirty-Eight IFs Summary

IF I had not made the quarter versus semester units arithmetic mistake, then there would have been no need for me to take that additional three unit class.

IF Mary had not decided to rent a home for us for our first year as a married couple instead of having us continue to live in my studio apartment,

And IF our home had not been so ridiculously close to that class, then I would never have met Bill Aho, or had the chance to learn from him.

IF Bill Aho had ended up missing the entire class instead of showing up for that Friday evening and Saturday, then I would not have learned all the things about math that Bill shared with me.

IF Bill had not introduced me to the Dienes Multi-Base Blocks, then the teaching in different bases, which became a core concept in both Mary's and my math books, would never have occurred to me.

IF I had not learned about and then made extensive use of the *International Clearinghouse on Science and Mathematics* books that Bill introduced me to, then I would not have known to develop the math curriculum for my classroom using teaching materials from the Nuffield Mathematics Project, the Madison Project and all the other programs with which I was corresponding.

IF Mary not decided we should take the entire year off from teaching and travel around Europe, since we would already be going there to attend Lucile's wedding,

And IF I had not asked Bill Aho if I could audit his Spring class, rather than pay for it, because Mary and I were saving for our trip to Europe, then we would never have come to know Edith Biggs and experienced the many benefits knowing Edith brought us.

And IF Edith had not been so accepting of the two of us, then no Birmingham workshop and the extensive knowledge of conducting workshops we gained from it, and no introduction to Geoffery Matthews, or tours of schools in both England and Scotland and discussions with so many British educators.

IF Edith had not known Bob Davis, the head of the Madison Project, and had not sent us to visit Bob with a personal referral, then we would not have enjoyed the extensive visit we had with Bob and the connection to him we made there. On our own, we had not thought of visiting the Madison Project when we returned to the States.

IF Addison-Wesley had not decided to create an Innovative Division,

And IF Barbara Beatty had not contacted Mary to make a third submission of her manuscript to this new Division,

And IF Barbara had not suggested to Stuart Brewster, the head of the Innovative Division, that he consider Mary's book for publication,

And IF Addison-Wesley did not happen to be the publisher for both Edith Biggs and Bob Davis's books and materials,

And IF Stuart Brewster had not been the Addison-Wesley person responsible for both Edith's and Bob's, publications,

And IF Stuart had not been so impressed that Mary and I knew both Bob and Edith, and even more impressed when he asked both Edith and Bob what they thought of us, then Mary's third submission of her book would have met the same fate as submissions one and two.

IF Stuart had not come up with his way of marketing a book by a completely unknown second year kindergarten teacher with no following of her own, by focus his attention on the *Workjobs* activities that were math related,

And IF Mary had not had a personal connection to Bob Davis and the Madison project, that Stuart chose to exploit,

And IF Miller Math had not been relying on Bob Davis and the Madison Project's materials and many of the Project's instructors for its basic curriculum,
And IF Stuart Brewster, as Bob Davis's publisher, did not have a personal connection with Leonard Warren, the head of Miller Math,
And IF Stuart had not seen the following summer's 2,000 Miller Math workshop participants as a target audience for Mary's as yet to be published book, then Stuart would not have thought to suggest to Leonard that he consider Mary as a Miller Math Instructor.
IF Leonard had not decided, as a result of his meeting with Stuart, to send Marilyn Burns to visit Mary's classroom,
And IF Marilyn had not been so impressed with what she saw,
And IF Diane Divoky from the soon to be published *Learning* Magazine has not known Marilyn personally and asked Marilyn to recommend classes for her to visit for the article she was writing,
And IF Diane had not visited Mary's classroom and been so impressed with what Mary was doing that she decided to feature Mary and her book *Workjobs* in the very first article of the very first issue of *Learning* magazine, which would be sent to nearly every elementary school in the country (see the Learning Magazine sub-section of the 1972-1973 section of Chapter 9),
And IF Stuart had not let Mary overrule the professional designer Addison-Wesley had hired to prepare *Workjobs* for publication at every step of the way and create the book as she envisioned it, then *Workjobs* would not have become so quickly known to teachers all across the United States.
Diane's Learning article made teachers across the Country aware of Mary's book, but awareness would not have been enough to make her book a best-seller. Diane's article combined with Mary's design of her book was responsible for the sale of more than 100,000 copies of *Workjobs* before Addison-Wesley had even started advertising it. Stuart told Mary that in the prospective market for *Workjobs*, the sale of 15,000 books rates that book as best-seller.
IF Leonard had not decided to invite Mary to San Diego for an interview,
And IF Mary had not recognized all the materials Leonard showed her and responded to each with "Bob uses that..."
And, IF Leonard had not decided that he wanted to hire Mary as a Miller Math instructor despite knowing that she had never used any of the Miller Math materials she would now be expected to teach other teachers to use,
And IF Leonard had not correctly deduced that Mary would not be willing to become a Miller Math Instructor unless I became one as well, then neither Mary nor I would have become Miller Math Instructors.
IF it had not been that the mathematics curriculum I had created for use in my own classroom, thanks to Bill Aho, was already using all the concepts being taught by Miller Math and more, then I would not

have been in a position to accept an instructor position for a workshop I had never even taken.

IF Mary and I had not learned from Edith Biggs' Birmingham workshop, and all our subsequent school visits in England, Scotland and the USA of the gap between what teachers were taught and what they actually ended up doing in their classrooms,

And IF I had not learned in advance of my first Miller Math workshop that most of the participants were not actually implementing what they had learned at Miller Math in their own classrooms,

And IF it had not been that of the fifty-seven Miller Math instructors, including Mary and me, only three were classroom teachers, the others were math-resource teachers, none of whom spent entire days teaching a variety of subjects to classrooms full of students,

And IF I had not been assigned as a Level-Two instructor, meaning my workshop participants would already have gone through all the Level-One activities, then it would not have occurred to me that the contribution I could make as an instructor would be to show my workshop participants how all the Miller Math activities blended together to make a complete math curriculum for a classroom.

IF Mary had not become a Miller Math instructor, then she would not have chosen to learn from me the math curriculum I had created and was still creating for my fifth and sixth grade students. Her focus would have remained creating more Workjobs activities. As a result of her Miller Math experience, when Mary returned to her first grade class she focused her attention on creating the primary grade version of what I was teaching my upper grade students, including the teaching of arithmetic in different bases and focusing her students' attention of the search for patterns everywhere.

IF Mary and I had not become Miller Math instructors then neither of our math books would have been written, since we wrote both books to serve as curriculum guides for the Miller Math participants.

IF I had not been a Miller Math instructor, then I would not have been invited to speak at math conferences everywhere. Mary would have been invited once her *Workjobs* book was published. My status as a Miller Math instructor was all it took for me to be invited as a speaker, as well.

All the many IFs together are the why and the how our books *Mathematics Their Way* and *Mathematics... a Way of Thinking* came to be written.