The Unorthodox Professor
Surviving and Thriving as a Change Agent in Education
Barbara S. Spector

The book is an autoethnography (self-analysis) of a woman’s career as an educator that spans half a century. Her stories as a visionary change agent in STEM education provide:

- an unorthodox approach to surviving and thriving in academia. By candidly “telling tales out-of-school” about events common in higher education – but not openly talked about – these stories and 149 lessons learned can be a roadmap for both seasoned and early career faculty;
- a guide to sources of joy and satisfaction – career rewards;
- insight to attaining grants from public and private sources to develop programs for diverse learners and for community engagement;
- a federal grant funding program officer’s use of a systemic approach to infuse marine education nationally;
- adventures of an out-of-the-box high school biology teacher as a template for use of the community as a resource for teaching K-12;
- use of program and course development for learners of all ages in formal and informal settings as a mechanism for change.

Social issues emerging during this study that are relevant to the next generation of educators include a woman’s role in society, gender discrimination, and sexual harassment; shifting paradigms, school reform, resistance to change, and educational funding; environmental degradation and climate change.

This book will interest anyone concerned with improving education.
The Unorthodox Professor
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Surviving and Thriving as a Change Agent in Education

Barbara S. Spector

University of South Florida, USA

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To the memory of my parents, Adele and Sam Solomon, who encouraged and supported me to have the courage of my convictions.

To my daughters, Audrey-Lyn Stockton and Stacy Ellen Spector, who have the courage to live by their convictions and work to improve the world.

To my grandchildren and great grandchildren, may they be inspired and able to change the world for the better.
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PROLOGUE

The only constant is change.
(author unknown)

My stories span half a century during which time our society has been engaging in a paradigm shift from a reductionist, mechanistic paradigm to a holistic paradigm (see Figure 1). Paradigm shifts, of necessity, engender conflict as people and organizations attempt change. This paradigm shift underpins all my stories. It is what makes these stories potentially useful to participants in education at all levels.

I love interacting with doctoral students, especially helping them make sense of, and build on their life experiences. One mechanism I use to accomplish this is sharing stories of my professional experiences that relate to events in their lives. Feedback from students indicates that hearing my stories stimulates new interpretations of their own experiences. It helps them learn lessons applicable to their lives and their professions, while illustrating that being open to possibilities provides many ways to succeed in science education K-16. I share my stories with you now with the hope they enable you to avoid skidding on some of the hidden banana peels in academia and to understand how and where to expect rewards (or not) as education institutions engage in a societal paradigm shift.

As I analyzed the data from my stories for this autoethnography, I became aware I was demonstrating a way to blend the roles of change agent and research professor, thus providing an alternate route to entering, surviving, and thriving in higher education. I tell some stories from my high school teaching years that I use with students in preservice science methods courses to help them accept that the strategies I ask them to use do work in public schools.

Our enterprise suffers from amnesia. In science education, we do not learn from either our past successes or failures.
(Paul DeHart Hurd, 1995, personal conversation)

Half a century into my career, I want to preserve the history of the science education enterprise as I understand it from my experience as a paradigm shifter, pioneer, change agent, and leader in it to help mitigate the amnesia. In addition, the history of the science education program at the University of South Florida could prevent unnecessary repetition in the future. Sample social issues threading throughout my stories include, but are not limited to, a woman’s role in society, gender discrimination, sexual harassment; school reform, resistance to change, education funding, school desegregation; organizational hierarchies, cultural border crossings; environmental degradation (especially in the marine domain), and climate change.
My role as a change agent in the shifting paradigm shown below (Figure 1) is the focus of this book.

I incorporate a variety of writing styles in different chapters (e.g. expository, responses to an interviewer, dialog, and first person narrative reflections), and include works, or sections of works, I published previously with permission from the publishing companies. My journey begins with a synopsis of my early life to identify some initial influences on my thinking. Then an overview of my career sequences my professional positions and their locations to orient you to my path as a science teacher, a change agent, a federal funding program officer, and a university professor. The stories thereafter are not entirely in chronological order. Most chapters identify explicit lessons I learned. These lessons provide experienced and early career faculty as well as doctoral students preparing for the professoriate with tips to help a person thrive in academia. Many tips relate to grantsmanship, which played a major role in my life. The recursive nature of what I learned in varied domains is apparent,

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<tr>
<td>There is one objective reality independent of a person that can become known to an individual.</td>
<td>Reality is constructed by individuals within their own minds. There are, therefore, multiple realities.</td>
</tr>
<tr>
<td>Truth corresponds to one objective reality.</td>
<td>Truth is what a group working in a field at a given time agrees to call reality. It is socially constructed.</td>
</tr>
<tr>
<td>The whole is equal to the sum of its parts.</td>
<td>The whole is greater than the sum of its parts.</td>
</tr>
<tr>
<td>Parts are discrete, each having their own identity.</td>
<td>Pieces are altered when they interact to become part of the whole.</td>
</tr>
<tr>
<td>Cause and effect are linear and immediate.</td>
<td>Cause and effect relationships involve multiple factors, are complex, and may be difficult to distinguish.</td>
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<tr>
<td>Hierarchies are the prevailing model organizing information, people, and things.</td>
<td>Networks dominate the organization of information, people, and things.</td>
</tr>
<tr>
<td>One can know the world by analyzing smaller and smaller pieces.</td>
<td>One can know the world by examining the whole.</td>
</tr>
<tr>
<td>Science, using this reductionist approach, is the legitimate way of knowing.</td>
<td>Science, is one of several equally valid ways of knowing.</td>
</tr>
<tr>
<td>Process is product.</td>
<td>The wholeness of the person, the union of the physical, spiritual, intellectual, and emotional aspects of the individual, is acknowledged.</td>
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*Figure 1. Comparison of societal paradigms (from Spector, 1993)*
because I refer back to various episodes more than once to reveal patterns I noticed at different times in my career. These patterns are emergent themes I used to construct the remaining chapters. I anticipate you will find life in academia smoother and less stressful from reading the stories of my professional life and lessons I learned.

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SECTION I
LIFE OVERVIEW

In chapters one through four, I give an overview of events in my life sequenced chronologically. Collectively, they provide a glimpse of the context into which I was born, my personal life, and its influence on my career. While describing my life teaching advanced biology in a high school, I realized I had developed a subconscious pattern I then used throughout my career as a high school teacher, a change agent, a federal funding program officer, and a university professor. That pattern and the most surprising lesson I learned from this autoethnography are discussed in this section. The lesson is that I use an unorthodox approach to being a professor, which may provide others an alternative way of surviving and thriving in academia. I hope you enjoy my journey and the people with whom I worked along the way.
1935 – A world where most women were the homemakers and men were the caretakers, big changes were afoot. Franklin Delano Roosevelt signed into law the Neutrality Acts to limit the U.S.’s future involvement in war. Social security was instituted. Amelia Earhart flew solo across the Pacific. Monopoly was the newest game craze and the Volkswagen Beetle was all the rage in Germany. As couples swayed to the newest jazz style “swing,” troubling events were at the forefront of the news. Even though the worst of the depression was past, depression level unemployment rates hung at twenty percent. Across the ocean war clouds gathered as Germany passed the Nuremberg Laws stripping Jews of their civil rights. Uneasiness was in the air.

At home in a Jewish community in Brooklyn excitement filled the air as first generation Americans Adele and Sam Solomon, recovered from the depression, welcomed their daughter – me – Barbara Solomon Spector into the world. I joined a brother, Arthur, who was six years older than me. My brother faced some challenges growing up. Having been hit by a car when he was three, he suffered a hearing loss and had to wear a hearing aid that looked like a large box strapped around his waist. Unfortunately such devices were pretty ineffective, subsequently he needed extra help. Arthur was also diagnosed with a blood disorder that, thankfully, he outgrew during puberty.

I remember telling my mother, “You don’t love me. You only love Arthur,” because she gave him so much attention. Now I understand why it was necessary. She perceived I was capable of taking care of myself, and I was. I was the classic daddy’s little girl. It was common for me to say good night to my father, who would often be seated in an overstuffed chair in the living room listening to the radio in the muted light of a multicolored globe lamp (which I now have and cherish). I curled up in his lap and gained an extra hour of wake time cuddled there.

I grew up in a large extended family surrounded by grandparents, aunts, uncles, and cousins. Weekly visits to my grandparents were always fun as everyone gathered for Friday evening, Sabbath dinner. Running down the long block ahead of my parents, I would shout back over my shoulder, “They are home!” The sounds of singing floated out into the late afternoon air from the open window of their second story walk up apartment. My aunts and uncles were always playing the piano, the violin, and singing while they gathered. These get-togethers extended to the shore as my maternal grandparents (Anna and Hyman Rosenbloom) moved their butcher shop to Rockaway Beach during the summer months. My grandmother, the neighborhood psychologist, dispensed counseling while dispensing meats in my
CHAPTER 1

grandfather’s butcher shop. Mother and I visited many times and went swimming in the Atlantic Ocean. It was a particular treat when my uncles came home in the evening and took me swimming when the tide was the strongest and the waves the highest. They taught me to use the ropes along the jetties to keep myself from being pulled out to sea.

Biking through the neighborhood with my friends was a frequent event. We often ended up at my grandparents’ home where this scene repeated itself:

“Grandma where’s grandpa?” I question as I hurry into the kitchen dropping my sweater at the door.

Smiling she replies, “Grandpa gay learnen” (went to the synagogue to study the Torah).

I begin digging in my coat pockets looking for spare change to drop in the pushkkees (small metal charity boxes) that line the wall next to the kitchen door. As my hand emerges with only a few pennies, I look disappointed but drop them into the closest container. As I settle in, I hear the door opening behind me.

“Grandpa you’re back!” I exclaim.

“Yes,” he replies, a smile spreading across his bearded face. He hangs his coat on a hook next to the door as he pulls coins from his pocket and drops them into a nearby pushkee.

“Why did you go to the synagogue to study the Torah again?” I question, “You have been reading the same Torah every year for eighty years. Don’t you know it by now?”

Grandpa laughingly replies, “No, there is always something new to learn.”

This scene reveals important aspects of my Judaic cultural heritage that impacted my pedagogical creed: The charity boxes in my grandmother’s kitchen taught me I had responsibility to contribute to solving societal problems. My grandfather’s study of the Torah every day of his adult life taught me the power of social interaction and life’s experiences as perceptual screens for making meaning. He read a daily portion with neighborhood men in the synagogue and participated in vigorous discussion that looked like arguing, as they continuously reinterpreted the Torah and the sages’ commentaries to use the moral lessons for current day living. Valuing of multiple interpretations made by sages past and present is reminiscent of a theoretical base in science. It made me tolerant of ambiguity and accepting of the notion there is no one right answer or right way to resolve a human dilemma. Climbing on my great uncle’s lap as a young child during Hanukkah parties, I was told I would be given a silver dollar if I asked a good question. My family rewarded me in many ways for asking insight-generating questions.

In the Jewish culture, boys were expected to go to Hebrew school in preparation for Bar Mitzvah, an event signifying entrance into manhood. This school, Talmud Torah, took place on weekdays after regular school and Sunday morning. This expectation was often met with resistance from my brother. I suspect it was because his hearing deficit made learning Hebrew difficult. The same was not required of girls, but I begged my parents to let me attend because most of my friends were boys.
While they were studying, I had no one with whom to play. It was in Hebrew school that I developed a fondness for analyzing text. This served me well as it led to my fondness for analyzing everything. It just seemed to come naturally as I navigated the world raising questions in every situation. My process reminds me of the nature of science as I gather and analyze evidence and support my ideas logically.

School and after school activities were a big part of my life. I had a wide variety of interests and my parents supported them all. While in grade school, I took oil painting lessons with a group of neighborhood girls in a local loft. This interest extended into college where, for my elective courses, I took courses in art appreciation, music appreciation, painting, and fashion design. I had classical piano lessons from three years of age until mid-high school. I wanted to play popular music, but my teacher refused, so I quit playing altogether. That was a big mistake!

I took dancing lessons, both ballet and tap, outside of school while I was in grade school. I danced on point (toe shoes) with a high hat and cane in a recital in the Brooklyn Music hall. Eventually I gave it up, because my toes bled every time I danced on point. Learning to dance skate and figure skate at a roller-skating rink two blocks from my house then became my main past time and outlet for liking to move to music. That lasted throughout high school. I was never very good, because my limbs were so gangly. I did compete locally as did most of my peers with whom I interacted. I loved it. The anatomy of my feet became an issue again, because my feet were so long and narrow standard boots never fit well. I had to ask my parents for custom made skating boots. It is strange how it was difficult for me to ask even though I had every reason to expect they would say yes. They did say yes.

When the summer heat hit the city streets, I escaped to eight weeks at sleep-away camp in the Catskill Mountains beginning when I was three. My older brother was in the boys’ camp and my mother spent most of the summer in the camp’s guesthouse with my father coming up on weekends, a common pattern for people who lived in New York City. Four generations of my family, including my eight cousins, spent summers at camp Lokanda. Then several of the family went to camp Chiwanda when the owners of Lokanda ended their partnership and started their own camp. At one point the head counselor in the girls’ camp at Lokanda was my aunt’s mother, and my aunt’s sister was my bunk counselor. When my mother no longer spent the summers at the camp, my parents came to visit every two weeks. Family stories tell of me crying “I want to go home” each time they got ready to leave. Then as soon as they were out of sight I got interested in an activity and was fine. The family tradition continued as I sent my own children to the camp, but I don’t think they particularly appreciated it. I do remember my daughters doing the “I want to go home” routine when I visited and then quickly getting involved in activities when I left. My interest in arts and crafts, horseback riding, swimming, singing around the campfire, and dramatics all had aesthetic appeals that were fostered in camp. The great variety of activities in camp introduced me to many things I later capitalized on as a professional educator.
As I grew older I became a CIT (counselor in training). I was assigned to care for a three-year old named Brenda, whose mother worked in the camp office. This was my first counselor experience. Day camp counselor in Long Beach Long Island where my cousin Bruce was a camper followed it. I also taught at another day camp in Nassau, outside of Albany, New York. This camp was part of a family hotel. I led arts and crafts activities: lanyard making, hammering pictures in copper plates, and carving totem poles. It was here I had my first experience with alcohol. The year before I was supposed to start college, my co-counselors decided I needed to learn how to drink alcohol. I didn’t like the taste of alcoholic beverages, so they decided I could drink vodka screwdrivers masking the alcohol with orange juice. I drank a ten-ounce glass of orange juice with, I don’t know how much, vodka in it. I remember going back to my bunk and lying down and saying, “I feel awful.” All the episode did was convince me that I really did not like to drink alcoholic beverages! The irony is I married into a family where my father-in-law was a closet alcoholic and my ex-husband died an alcoholic. I still do not drink alcohol.

As is with any child, my life was my life. I had no one else’s life to compare to mine. Extended family gatherings centered on community and faith, varied activities, and friends. These were things I just did. I never thought to compare my life to others. Was my family rich or poor? I didn’t know.

I was not cognizant of social class or money when we lived in Brooklyn. I remember wanting some things I thought were outrageously expensive, like a bicycle and custom made boots for roller-skating. My parents never said things were too expensive, nor did they question why I needed them. Yet, I had a hard time convincing myself it was okay for my parents to spend the money on what I wanted. I did not think about whether my parents could afford it. I don’t know why I had to work so hard to convince myself it was okay for them to buy those things for me. When I was in about sixth grade, I looked in the window of the Firestone store a few blocks from where I lived several times and stared at a beautiful two-wheeler with balloon tiers and green, black, and white paint. I wanted that bike, even though I lived on a busy street with trolley tracks in the middle across from a busy post office in the heart of a city. I finally prepared an approach to my parents saying here’s how much it cost, and here’s why I should have it. They said fine.

I knew my father left school after eighth grade, and my mother left during high school. Both of them went to work to help support their families. My father, with his eighth-grade education, was the best problem solver I ever encountered. I asked my father how he dealt with problems when I was an adult. He said, “When I have trouble making a decision, I put it on the shelf and leave it there for three days. When I come back to it, I find the problem has disappeared, or I have a solution.” I started deliberately doing that. It worked!

As a young adult, my father was doing well enough in the garment industry to buy my mother a magnificent three-carat diamond ring for their engagement. (My mother gave it to me before she died. She made me promise to wear it all the time, not just put it in the vault for safekeeping.) Then came the depression. My parents
lost everything. They had to move in with my grandparents to have a place to live.
In the center drawer of my mother’s dresser were vestiges of those years, numerous
scarfs, collars, and cuffs. I used them to play dress-up when I was very young. Mom
told me she had two dresses and used the things in that drawer to change the look of
the dresses so it appeared she had a full wardrobe.

My parents had regained their financial independence by the time I was born. As
a teenager, I often admired my mother’s “diamond pendent.” I recall mother telling
me when she wore it with her affluent friends, people remarked, “What a beautiful
diamond pendent!” When she was with people with little means, everyone assumed
it was a paste imitation made of rhinestones, which in fact it was.

What I know now, that I didn’t know then, was my father had done very well
as a coat and suit manufacturer in New York City’s garment industry. We were
probably the richest people in the OPA rent controlled apartment building in our
neighborhood. When my father bought my mother her first mink coat, my mother
wouldn’t wear it out of the apartment to walk down the long hall into the elevator
and out of the apartment building. She turned it inside out with the fabric lining
showing until she got out of the building and into the car. Apparently, she thought
it was not appropriate to show this sign of affluence in our apartment building. My
father used to get annoyed saying, “I worked hard to earn the money. You should
wear that coat.” I was seven years old when my father made a light aqua dyed, furry
coat for me. It went with the three-tiered pink and blue evening gown Ceil Chapman,
the lead women’s designer of the time, made for me for my brother’s Bar Mitzvah.
After that event, I usually wore the coat to go out with my family when my mother
took her mink coat.

I recall one occasion when I was an adult my father chose to take the family to
an expensive nightclub/restaurant near where my brother lived in Baldwin, Long
Island. My children and niece and nephew were very young, probably around 5 or
6. My niece and nephew each ordered a lobster dinner, the most expensive thing on
the menu. It was obvious they were not going to be able to eat much of it. On the
way home, I asked my father why he permitted the children to order such expensive
things when it was obvious they would not eat a substantial amount of it. My father’s
answer was, “Because I can.” I understood this to be an expression of his financial
accomplishment having recovered from very lean times.

My parents lived within their means and saved. They learned from the depression,
one does not know what tomorrow will bring. I only knew about the depression
story because of the scarfs, collars, and cuffs in my mother’s dresser drawer. I think,
however, I picked up the depression mentality unknowingly from shopping with
my mother, who was especially careful about spending. She also taught me to save
when I was in early elementary school by walking me to the bank with a paper
passbook in hand to deposit a portion of my allowance every week. I felt a sense
of accomplishment each time the bank teller stamped my book with the new entry.
I suspect these things have been in my subconscious all my life. I didn’t remember
them until I began to wonder why I thought the way I did when writing this book.
CHAPTER 1

A little of whatever that was is still functioning today. I can afford to do what I want to do as long as the stock market does not crash. My financial advisor says I can retire and don’t have to worry. Yet, I can’t justify to myself spending money on luxury things for me. I can, however, think nothing of sending checks to my children, grandchildren, and great grandchild. I wonder if that is some sort of investing or saving because it is for the next generation. I realized a month after I wrote this that it is my having been imbued with a sense of Tikkun Olam functioning, meaning Jews have responsibility to take care of each other to repair the world. I have to insure my family will be cared for after I am gone.

The grade school I attended went from kindergarten to eighth grade. By sixth grade, my girlfriends were focusing on attracting boys. They were not being as competitive in athletic events and were curtailing their swimming because they didn’t want their hair to get wet. I found myself in high school having two sets of friends. One set Maxine, lived on Ocean Avenue, a long bike ride away. The other set lived in my neighborhood near me. Both were equally important to me. This did not seem unusual to me, since my parents had affluent friends they played cards and golfed with and my “aunt” Franny and her group who were more cozy and homey.

My high school science teachers impacted my thoughts about science and scientists. The biology chair invited me to work in his office during my free periods when I was a freshman and sophomore. Later, in my junior and senior years, I assisted the female chemistry teacher. The interaction with these teachers influenced my decision to continue as a science major in college.

It was always understood that I would attend college. It seemed that my cousin Phyllis, a year older than my brother, helped pave the way for me. I remember Phyllis’ father talking to my father about how difficult it was going to be for Phyllis to get into college because she was Jewish and female. Many higher education institutions had quotas on the number of Jews they would admit, if they admitted any. It did not matter that she was an A student. Brandeis University was beginning in 1948 as a non-sectarian institution supported by the Jewish community and named for the famous Judge. Phyllis continued her academic career there.

My parents were supportive of my interests and encouraged me to decide what to study in college. While I liked art and dance, I eventually decided to pursue a science degree. I hoped to become a physician someday.

So, off I went to Syracuse University (1953) to pursue a premed degree. Campus life was standard for the time. Women were well supervised 24/7. Coeds lived in all female dormitories or sorority houses under the watchful eye of the housemother who made sure nightly curfews were enforced. The men, however, were free to choose their living quarters and had no curfews. I never thought to question why there was a difference.

At this time, in my culture and most others, women were expected to be stay-at-home mothers, even if they graduated from college. It was this thinking that led my mother to insist I have a fallback plan for my premed degree. Since teaching and
nursing were the two acceptable careers for women, my mother insisted that I get my teaching license. There were not many courses required to get a secondary school science temporary teaching license, so it did not interfere with me being a premed major. The literature in secondary science education was sparse and quantitative, and I did not perceive it to be meaningful. I often used the time in the education classes to write letters home to my parents, for which they were appreciative. In one letter, I apprised them of a package I sent. It contained a pair of knitted slippers I made. Learning to knit was the rage in my sorority. I often knitted during lectures in which note taking was not extensive. My philosophy professor, after looking at many knitting needles flashing throughout the lecture hall said, “Unless you are pregnant, you are not permitted to knit in my classes.” The knitting needles quickly disappeared from view. Being pregnant and unmarried was still highly stigmatized.

I did what most of my peers did: I attended college and my senior year I got married (1956). My husband, as times dictated, said I could have two years to do what I wanted, but after that we had to have children. I continued studying my senior year to earn my bachelor’s degree, which included a temporary teaching license. New York State required a master’s degree within five years to be granted a permanent license.

I was graduating with honors in the premed program, but recruiters interviewing me for medical school were discouraging. They said they did not think I was a good candidate as a newly married woman who would soon have children. Unfortunately, their view reflected that of the times and I did not pursue medical school. It never occurred to me that I could protest this decision. Again, it was just the way things were. Fortuitously my mother’s fallback plan enabled me to become a biology teacher.

Prior to graduation my undergraduate advisor, Dr. Collette, and I were walking towards each other in the wide hallway of Lyman Hall at Syracuse University. I said, “I would like to talk to you. My husband said I can take two years to do whatever I want. Do you think I should get teaching experience or go for my master’s degree?” He never stopped walking. He looked back over his shoulder and said, “Eh, you are a perpetual student. Get your master’s degree.” That was how the decision was made. So I went on to get my master’s degree in combined sciences. Shortly thereafter I took on the role of stay-at-home wife and mother. I continued in that role for about three years wondering what I was supposed to think about every day to keep from being bored.

An opportunity to substitute teach in Nottingham High School (NHS) near my home presented itself, and I jumped at the chance. This turned into a full-time job and eighteen years’ experience, during which time I continued my education and earned my Ph.D. During my time at NHS I grew both professionally and personally. Throughout my teaching days I participated in credit bearing courses at Syracuse University. I did not know who paid the tuition. They were advertised as free to science teachers. I used six credits of science courses every few years to keep my teaching certificate viable. In New York State this was a requirement.
I also became known as an innovator and was recognized for my out-of-the-box thinking while at NHS. Doing what just seemed logical to me, my advanced biology students and I created a course based on free choice and students’ interests and needs. I used this course as my way of staying current in the science needed to understand social issues (e.g., right to die law, extraordinary life prolonging technologies, fluoridation of water, controversial psychiatry issues, aging, etc.). Scientists, engineers, and other professionals (e.g., Law School Dean) from the community came to class to help us learn many ideas I knew little or nothing about. We also traveled out of the school building to the local medical school, laboratories, and eventually to Woods Hole Massachusetts, the land of the Nobel Laureates, to engage first hand with the cream of the scientific world. This course was a wonderful adventure that eventually led to me being offered a fellowship to attend graduate school, which culminated in my doctoral degree.

It was also at NHS, that I was introduced to grants. The school district’s grant writer crafted a proposal for me to submit to the Community Foundation in Syracuse to pay for my high school advanced biology students to travel to the Marine Biological Laboratory in Woods Hole Massachusetts from Syracuse New York to study for ten days. The two years prior to the Community Foundation grant, the students and I had engaged in the usual bake or candy sales, car washes, and general begging for funds from parents and neighborhood businesses to fund our study at Woods Hole.

While my professional life was expanding and flourishing, my marriage was not. After thirteen years of marriage, I divorced. Teaching was now not only my career, but was necessary to put food on the table. Even so, the first thing I did when I got divorced was telephone a Syracuse University medical school professor, Dr. Lilien, who was involved in admissions. I knew him, because several of his seven children had been my students at NHS, and he had done some things with me to enhance what I was teaching in the high school. I told him, “I just got divorced. My husband did not want me to go back to graduate school while we were married. I can go to medical school now!” The professor said, “I can get you entrance into Syracuse medical school and get you a scholarship. What will you do with your children?” I said, “I don’t know, but I will find out.” I called my parents that night. My father said, “I can retire. We can move to Syracuse and take care of the kids while you go to medical school.” I was all set to go medical school when I hung up the phone. The next morning, I woke up and thought, “You cannot put an eight year old and ten year old on the shelf for five years and expect them to be there when you come back.” I called my parents and told them it would not work. Years later I found out my older daughter had heard the conversations with my parents. Both children, therefore, knew that I didn’t go to medical school because of them.

Making the best of my current situation, I broadened my professional activities and found professional associations, especially those targeting teachers, met many of my interests and needs. I became heavily involved with these organizations beginning with the Syracuse Teachers Association (STA) and the Science Teachers Association of New York State (STANYS). This eventually led to my attending a
Earl Smith

Early Life

National Science Teachers Association (NSTA) meeting and an opportunity to get my Ph.D. My daughters were supportive when I told them about the opportunity to go back to graduate school. My older daughter told me when I got this opportunity to go for the academic year, “You have to take it. You’re not going to saddle us with more guilt!” I said, “What do you mean more guilt?” They both said, “We’ve been feeling guilty, because you couldn’t go to medical school because of us. You have to do this. We don’t want more guilt!”

My oldest daughter had arranged her schedule to graduate one year early from high school in order to join Up With People for a year before going to college. It was a patriotic singing group of teenagers traveling throughout the U.S. She said, “I will not join Up With People. I will stay home and take care of the house and my sister while you go to graduate school.” So, it was. I gave her the car keys and the checkbook, and I went to Syracuse University (SU).

(I would like to have gone to medical school. I think I would have been able to make an even more significant contribution to the world if I had gone to medical school, because I wanted to practice, do research, and disseminate it. I do know, however, I made the right decision for my family.)

My daughter drove me to SU campus each day and picked me up when I telephoned her after a full day of graduate classes. The man at the SU campus guardhouse used to tease my daughter when she came to the university: “Did mommy call and ask for a ride home?” That is how it was that I went through that year in graduate school.

At the end of the academic year, I discovered I only needed a few additional credits to earn a Ph.D. I reported to my school district’s superintendent. I think he was the first African American superintendent in New York State and was extremely admired and well liked. He also had a connection to my acquaintance, Dorothy, and her business partner, Dick, with whom I had a long-standing friendship. When I reported to him, I told him I wanted to complete the few remaining courses for a Ph.D. and do a dissertation. I decided to go on with studies for a Ph.D. as a part-time student. People asked me at that time, “What are you going to do with the Ph.D.?” I said, “Nothing. I’m going to go back to my job, because I love my job at Nottingham High School.” I had no idea the future was going to hold an entirely different lifestyle. It was later that I found out there was no job for me at NHS.

As part of my academic year leave agreement, I had to return to the Syracuse City School District. I asked to go back to NHS, one block away from my home. Most of the students I taught at NHS were in the same community, the same country club, and the same environment in which I had spent my adult life after college. There was, however, no longer a teaching job there for me. The principal told me he had hired an African American science teacher after I went on leave. The normal district hiring policy was the last one in would have to be the first one out for me to come back to my position. This was the era of the civil rights movement. The administrators would not move her, because she was African American. Instead, I was assigned to Corcoran High School, some distance across the city. Everything about Corcoran High School was to be a drastic change from NHS.
I began teaching at Corcoran High School and carpooling with some other people from my side of town to go to teach there. That student body did not have the financial or intellectual advantages of the students in NHS. The principal was not interested in innovative programming. There was no advanced biology course. After moving in my thirty-six boxes of science materials and models I had from NHS, I discovered an RFP (request for proposal) designed to enable science teachers to change their way of teaching. Corcoran High School fit the criteria for the target audience. I put together a plan to help the science department take a different approach to teaching. I got all the teachers to agree, although not enthusiastically.

The superintendent knew what I wanted to do in Corcoran High School from previous interactions I had with him. I met with him when I was arranging study trips for students in NHS to Woods Hole, Massachusetts and Andros Island in the Bahamas, as well as when I was granted the study leave to accept the fellowship at SU. He and I had discussed the existence of resistance to changing anything and everything in most of the schools. We had concluded it was probably because schools were places originally designed to pass on the status quo to the next generation in society and not designed to explore what could be. He knew I was always on the cutting edge, always trying to do something different, looking for another way of approaching something. That was not commonly welcomed in these city schools.

After I got the teachers to agree, the principal got involved. He got angry with me and stopped the proposal. He called me into his office and said, "I am the principal. I determine how things get taught, how things get done in this school, not you!" I perceived it had to do with me just coming in new to the school and being female. I said, "Call the superintendent. He will tell you it’s okay for me to do what I’m trying to do." The principal did not know that I knew the superintendent. The principal turned his back to me, picked up the phone, and called the superintendent while I was in his office. I don’t know what the superintendent said to him, but whatever it was, the man’s entire body deflated. He hung up the phone, looked at me with a whipped puppy expression, and said, "All right go ahead with it."

Remember at this time I was taking courses for my Ph.D. and eventually would have to do a dissertation. After a few months of frustration at Corcoran High School, I went to see the superintendent again. I was trying to figure out how I could complete my Ph.D. and still put food on the table. He asked me, "How much sick leave do you have?" I answered, "I did not use my sick leave. I collected it for about fifteen years." He said, "Use your sick leave. Take the time off and do your dissertation." That’s what I did.

Going into my Ph.D. program, I had nothing to compare it to. In retrospect, I realize I had a nontraditional unique experience that I have emulated with my students. I earned my degree in science education from Syracuse University. Traditional students take a prescribed set of courses and then complete a
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In my case, during my academic year at SU I worked closely with Dr. Arthur Blumberg (Art). He became my primary mentor. His areas of expertise were educational administration and organizational development. This was at the time when sensitivity training was popular. I was fascinated by what he did and wanted to learn how to do what he did even though I had no name for it. Art became a member of my dissertation committee. He enabled me to shadow him and get course credit for it instead of taking traditional courses. Dr. Ann Howe, who became my committee chair, signed off on the coursework. I was able to apply my inservice science and science education courses to the degree, which made accumulating credits relatively easy. The third member of my committee was Dr. Marvin Druger. He had a dual appointment in biology and science education. He taught an audio tutorial biology class that was used in 5 high schools scattered across New York State. The idea was to provide tutorials for high school teachers, who would in turn teach college level introductory biology classes to their students. The high school students would then earn college credit from Syracuse University. I studied this program as the focus of my dissertation. From this experience, I thought Ph.D. programs were tailored to individual students and used the expertise of their professors. Boy, was I wrong!

Of course, my program included writing a dissertation. Art Blumberg commented to me, “Completing a research study is an effective way to learn to do research.” I was not enthusiastic, because I had not benefited from existing science education research as a teacher. I responded, “I will never do another research study in my life time. That is not a good enough reason to put in all the time and energy needed.” I was interested in understanding why things were as they were and how they got to be that way. I did not see the quantitative research methods courses I had been taught helping me develop my interest.

Fortunately for me, Art told me Dr. Robert Bogdan (Bob), Professor of Special Education, Cultural Foundations of Education, and Sociology was on the SU campus. He was developing something called qualitative research that revealed the meaning in situations and why things were as they were. Bob’s activism and research led to many reforms in mental health institutions. He was using research to help him be a very effective change agent. I wanted to find out more about what Bob did, because I wanted to be an effective change agent for science education. I asked Bob if I could audit the classes he taught on qualitative research. Now that I am in the professoriate, I understand how generous he was when he agreed to let me sit in his two courses without contributing to his FTE/SCH (student credit hours) count. Ann Howe, my committee chair, also wanted to learn about qualitative research, so she often joined me in Bob’s classes.

We learned about the work of Glaser and Strauss (1967) leading to the discovery of grounded theory. This was exactly the tool I needed to help me understand complex situations in which the total of the things that are known about a phenomenon is beyond what could have been predicted. Their work described a way to systematically gather and analyze data, and let the data direct the next
step of an inquiry. Doing this leads to an emergent theory that enables us to make relevant predictions, explanations, interpretations, and applications in a setting (Spector, 2013).

Reflecting on my career now, I realize all the original ideas and products I developed (from a middle school children’s camp to postdoctoral education opportunities), research I conducted on those products, and the way I interacted with my students involved emergent design. “Bob taught me to ask the ultimate research question: “What is going on here?” This is my best tool as a change agent. It enables me to see things participants immersed in a situation may not see that are key to solving their problems or resolving issues” (Spector, 2013, p. 275).

Dr. Bogdan also emphasized the importance of naivety. He made a point of telling us during class to go into a setting new to us (the researchers) when choosing a setting in which to test our newly developing research skills. It enables a qualitative researcher to do grounded theory research more easily than going into a context with which you are familiar. In a familiar setting there are things you’re likely to take for granted and not even note. Naivety about a setting includes not knowing boundaries that constrain people who live in the setting. I found this to be true not only as a researcher, but also as an activist and creator of unique learning opportunities in advanced biology and in my work later in Washington, DC.

If I had to choose the single most important idea I learned in academia there is no question it would be a statement Bob Bogdan made early in his qualitative research methods course: “People respond to the world as they perceive it, not to some objective reality.” This statement changed my understanding of the world around me, and the way I respond to it. It continues to serve me every day of my life, and I share it with all my students. It seems to have as powerful an impact on them as it did on me.

I decided early on that my dissertation would be a qualitative research study and I was encouraged by my mentors to pursue this idea. In 1973, however, when I began thinking about my dissertation, qualitative research was not accepted in science education. It was first being introduced to the social sciences as a novel and controversial method to learn how humans perceived themselves and their worlds. Bob Bogdan’s book written with Steven Taylor titled, Introduction to Qualitative Research: A Phenomenological Approach to the Social Sciences established a foundation for the field in 1975 and remains a staple for this research method.

Fortuitously, we had a blizzard in Syracuse after I had collected the data for my dissertation study. I was house-bound for three weeks and hand wrote my dissertation. I doubt I would have ever made the concentrated time needed to write it had I not been snow-bound. I brought my scripted document to my mentor early in the spring semester. He took one look and said, “You don’t expect me to read that, do you? Get it typed.” I admit to being a bit miffed, because I had worked hard to write it legibly, but off I went to find a typist. I brought the study to him the second time saying, “I can graduate this semester, right?” He said, “Take the summer off and forget about
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this. Nobody can be awarded a Ph.D. in less than a year.” I had to wait until the next academic year to defend my study and graduate.

My qualitative dissertation was accepted in 1975. The model emerging from my research (Figures 1.1 & 1.2) described how high school biology teachers embraced a change in teaching procedures to become consistent with those necessary in the innovation, Project Advance Biology. An article about my findings was published in 1979 (Druger & Spector, 1979).

![Theoretical Model of Factors Influencing Success of an Innovation](image)

**Figure 1.1. Theoretical model of factors influencing the success of an innovation**

The model in Figure 1.2 incorporates the major factors and connections between factors, which seem to influence the behaviors of teachers as they cope with the demands of the implementation of Project Advanced Biology. One assumption underlying the model is that a successful innovation depends upon the teachers making changes in their behaviors so that their role behavior becomes congruent with the role demands of the innovation. This model posits that the dominant force influencing the teachers’ willingness to change is the degree to which a teacher perceives the potential for derivation of personal satisfaction from responding to the role demands of an innovation.

At the time of initiation of an innovation, a teacher expresses a willingness to change in a manner so as to test behaviors necessary to facilitate the innovation. The readiness to engage in the changes is based upon his/her past experiences in teaching.
To the extent those experiences have been satisfying, the person anticipates future satisfaction and is willing to test new behaviors. Additionally, the past experiences lead to certain perspectives on change, teaching, institutional setting, and the change agent. To the extent a person holds positive perspectives on these issues, he/she is willing to test new behaviors that are congruent with the demands of the innovation, the spiral will continue and the innovation will be successful.

At the National Association for Research in Science Teaching (NARST) meeting in 1982, Dr. Wayne Welch suggested science educators should look into, “…this new research method called qualitative research” during his presidential luncheon address. My dissertation had been accepted seven years before this address. Waiting for the enterprise to catch up!

REFERENCES


CHAPTER 2

CAREER PATH

OVERVIEW

In this chapter I recount my career including high school teaching, Oregon consulting, Sea Grant position, and professorships at Florida International University (FIU) and University of South Florida (USF). The high school anecdotes focus on my use of social issues as the context for teaching science. I did not know I was pioneering something new. For me, what I did was an intuitive response to my students’ needs, the context in which I worked, my own minimal tolerance for repetition, along with my insatiable curiosity and lifelong concerns for the moral and ethical perspectives in society. My deviation from the norm resulted in a teaching/learning environment consistent with the principles of today’s reform and current research on science teaching. You will also find lessons learned embedded among the anecdotes. This may help to guide your thinking as you read these episodes.

I excerpted many of the high school stories (with permission from the editor) from a chapter I was invited to write titled, “Serendipity, A Paradigm Shifter’s Friend in Academia,” in the book titled, Researching and Teaching Social Issues: The Personal Stories and Pedagogical Efforts of Professors of Education (Totten & Pedersen (Eds.), 2006). There are some minor changes in wording and some information added.

HIGH SCHOOL TEACHING

Changing Times

I began teaching after Sputnik was launched in 1957. Science in K-12 schools was designed for the elite learners who would become scientists and engineers to enable the United States to “catch up with the Russians.” Science literacy for all, the current mantra for science education since the late 1980s, did not exist. Classes as a community of learners/practice, teachers as facilitators, generative classrooms, student centered classes, cooperative learning, the nature of science, open-ended inquiry, place or project-based learning, social issues, among other things were not in the science teacher preparation program I had experienced. I was expected to teach in the didactic, reductionist, mechanistic paradigm focusing exclusively on basic biological science concepts. Through a series of unplanned actions, I eventually became a
pioneer leading the use of social issues in the science education reform movement labeled, STS, (Science, Technology, Society Interaction) begun in 1982. It engenders a paradigm shift to a holistic, constructivist, inquiry-practice based paradigm. My early teaching experiences sowed the seeds for me to devote my career to being a change agent forwarding the holistic paradigm. (as reported in the 2013 book Going Back for Our Future: Carrying Forward the Spirit of Pioneers of Science Education).

The Seeds of Change

My use of social issues to teach science emerged during my first attempt to teach eighth grade general science in Blodgett Junior High School in Syracuse as a “student teacher.” I transmitted biological concepts in lecture/demonstration format with some laboratory exercises thrown in, most with known outcomes. I was actually quite good at it. However, “Why do I have to know this?” was the common lament of students. My cooperating teacher’s suggested response was, “to pass the exam at the end of year.” That did nothing to change students’ resistance! Being a novice in the classroom, I did what came naturally, which was to recount stories I knew involving people in difficult decision-making about real life events connected to science information, e.g., Should the father of two young children risk newly evolving cardiac surgery with aid of a crude (by today’s standards) heart-lung machine? I will admit I often had to make creative leaps from the classroom topic to the stories, but they worked to encourage students to pursue the topic at hand. My stories usually came from the newspaper.

In my first full time teaching job at Nottingham High School in tenth grade biology, I intuitively assigned students to summarize one science related article from a newspaper each week and explain its significance. These articles and summaries were posted on the bulletin board, with directions to read what others had posted. I used the articles when there was a lull in class activity or topics. I filled the time by asking individuals to tell the full class about their postings. These articles frequently raised controversy and illustrated a social issue.

It was common for me to abort the discussions that ensued about such issues, because of my perceived need to “cover the curriculum” and perception of these discussions as extras and “off track.” I thought my job was to transmit as much basic science information as possible to the students in class to the exclusion of anything else. I did, however, commonly offer to find answers, with the help of my advanced students, to questions that were left hanging, and I briefly reported the findings.

During my first semester teaching a Regents biology class, I stated, “microelements are important to living things, but the exact role they play is not understood.” A hand shot up from the back row and a student indignantly said, “Yes they do!” I was taken by surprise and felt uneasy. My undergraduate studies as a premed major were less than two years old. I thought about contradicting him, but instead said, “What makes you say that? Do you have evidence I have not heard?” He responded, “My father is currently at the Royal Academy of England reporting his research on the role of
several of these microelements in cells.“ After class, the student stopped to talk with me. He said, “I expected you to contradict me, since you are the teacher, but since you were open enough not to, you are going to be successful teaching in this school.” This was my first clue suggesting I should be looking to the community for expertise to keep me up to date.

**Lesson Learned:** Students can lead to a source of current science a teacher may need to learn.

In school, I functioned in an insulated environment isolated from other teachers. In fact, I often commented I could teach the betting form used for horse racing all year, as long as no parent complained, and students did well on the statewide exam. Early in my teaching career, I discovered I could teach students to succeed in the statewide Regents examination focusing on biology as traditional basic science by spending three weeks at the end of the semester reviewing with students. I had them make and share three-dimensional working models of concepts and concentrated on test-taking skills. Many times I had more students earn perfect scores on that exam than other teachers in the state. After that I was more willing to deviate from the barrage of basic science concepts I taught to include applied science and take excursions into social issues. In my mind, however, this applied science was still labeled a diversion from the basic science I was supposed to be teaching.

While teaching a traditional unit on genetics, I noticed an advertisement for a carousel slide tray on Tay–Sachs disease. It said it contained a new technique for diagnosing the disease and introduced genetic counseling. Although I was not familiar with the information, I bought it anyway. I was rewarded when students enthusiastically engaged in asking questions and lively discussion surrounding this and other genetic diseases. This was my first intentional excursion into explicitly teaching a social issue, but I still felt guilty about the time I used.

**Sex Education**

The syllabus for biology in NHS included teaching all the human systems. As one would expect, students had many questions related to the reproductive system. It did not occur to me to ask anyone if there was a line demarcating what was studying the reproductive system in a student centered classroom and sex education. I saw my job as making biology relevant to the needs of the learner. I did not realize I was breaking new ground and opening myself to significant risk by venturing into what I learned later was designated sex education. I first understood the risk involved when I encountered professors of human sexuality at Syracuse University. The year before I received the fellowship that led to my Ph.D. in science education, I studied informally with Drs. Roger Libby, Sol Gordon, and Mickey Diamond (The latter was from the University Hawaii visiting SU), all world renown for ground breaking work in human sexuality at the time, alias sex education. I had considered if I did not get the fellowship for science education, I would embark on doctoral studies in human sexuality.
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Dichotomy in Teaching

There was a dichotomy in my approach to teaching biology when I was a high school teacher between what I did in my Regents level course, where learners would take a statewide examination, and in my second year advanced biology course, where learners did not have an examination imposed from outside. My first level classes, usually three sections, had thirty to forty students in each section, only ten working microscopes, and fifty dollars a year to spend on supplies and microscope repairs. I did devise a process enabling students to investigate varied things in the laboratory at the same time. They were given from one week to three weeks of uninterrupted classroom time to complete a collection of related investigations in the laboratory at the back of my classroom. That mitigated the materials and equipment problems slightly.

I always needed to improvise, scrounge from the community, and bring things from home with which to teach. This practice of using the community as a resource later became a deliberate strategy I used throughout my career. I share more about that strategy and how it manifested itself in exciting adventures throughout my career in Chapter 4. Even vicarious trips in nature through 16 mm films or other media were hard to arrange. Software (films, film strips, film loops, 35 mm slide sets) had to come from the central office downtown to my school, be ordered months in advance, and sometimes did not arrive on the date requested. I was never able to figure out exactly when students were going to be ready for a particular film. The same was true when videos became available.

My first principal refused to let students even go out into the schoolyard to examine life forms in the grass and the trees. One time I had arranged for students to go to Cornell University, a little less than a two-hour bus ride away, to explore biology laboratories and meet with seven different scientists. The principal called me at 6 o’clock in the morning to tell me the trip, that was set to begin at 8:30 AM that day, was cancelled. I never did find out why. The next principal permitted us to go out on school grounds and reluctantly agreed to trips beyond. By the time I got through all the red tape and logistics for the large group of students (90–120), a trip rarely came to fruition. This was so frustrating! I believed a classroom was a great staging ground, but learning takes place in the rest of the world. In those years, I kept a file folder of notes labeled, “Death of Creativity in a Biology Teacher.” Many of the tactics, such as deliberately assessing your sources of satisfaction, developing relationships with vocal parents, and developing ways to use community resources I developed to lessen my frustration eventually became part of the book I wrote years later titled, Empowering Teachers: Survival and Development (1989). It addressed the social issues involved in teachers’ survival in a school setting.

I do not recall the name of the textbook used in Regents biology, but I do remember telling the students, “The primary function of your textbook is to keep your locker floor dry so it does not rust when the snow from your boots melts.” Fortunately, I had an extensive collection of current print matter in the cabinets in my classroom for students to access.
The district adopted the Biological Sciences Curriculum Study (BSCS) (yellow version) book when it first came out. It was meant to shift classroom emphasis from text based telling to laboratory investigations using ecology as a theme tying facts together. There was no inservice training for it, no new supplies to match the laboratory requirements, and no professional support of any kind. Here was the book, period. Having seen a presentation by some teachers in the pilot test using the materials the way they were intended led to my frustration running high. Unfortunately, the book ended up being used by me and other teachers the same way any other textbook was used, ignoring the pedagogical and inquiry principles in it.

**Lesson Learned:** Inservice professional development is essential to maximize use of materials with new approaches to teaching.

**Duplicating Machine**

I often found it necessary to print a summary of my ideas, diagrams from my college studies, and information from other sources for students to learn, such as professional science journals. This was pre Xerox machine days, so the ditto machine with its magical fluid that smudged purple on your hands was the available copier. It was common for our school machine to be running low on fluid and print faded type. I distributed several pages of less than desirable quality print for students to take home. As a result, I got a telephone call from an irate parent who blamed me for the poor quality of print. He would not accept my explanation that the school did not provide any more fluid. He then identified himself as the school district’s assistant superintendent for operations. I got seriously rattled as this authority figure criticized me. He taught me a useful lesson, but one I find difficult to implement even today. He said, “The squeaky wheel gets the grease! You had better squeak loud and long and get what is needed for that machine. I don’t want to see print like that again.” This episode started me squirreling away school supplies. I eventually acquired seven filing cabinets in my room and filled them with transparencies I made and extra supplies. In fact, when I emptied my garage many years later moving from one university to another, I found a box of blank colored transparency sheets, the type I used in NHS.

**Music**

NHS had a large marching band that successfully competed throughout the state. Every week as students came from band into my fifth period class, they talked excitedly about the activities of the band. This gave me the idea to use music as a vehicle to teach biology. I located recordings with songs describing science phenomena, such as the nature of a salt marsh, characteristics of reptiles, and parodies from medical school anatomy studies. I also encouraged students to make up songs to help them understand and remember biological concepts. A teacher who was proctoring the Biology Regents exam one year brought a student out of the
exam to my room holding him by the back of his collar. She was visibly angry. She perceived the student to be cheating. His defense was, “I was singing the words to the mammal song in order to answer a question on the test about mammals.” The teacher brought the student to me, because she did not believe there was such a thing. All was forgiven and the student went back to complete the exam with the warning to sing future songs in his head, not out loud.

Desegregation

In the late 1960’s when the civil rights movement was dominant in Syracuse, the students in NHS went from being affluent, mostly headed to competitive colleges, to numerous students who were bused from the inner city and did not expect to complete high school for various reasons. My upper middle-class suburban school became an integration battleground so severe that it only stayed open half a day for almost a year. That prevented students from congregating in the cafeteria, where the riots began. There were three public telephones to which students had access outside the cafeteria. (This was before cell phones.) Eventually, we learned the riots were orchestrated by outsiders at all the district’s high schools via the public phones near the cafeterias. An image burned in my memory is that of a shoulder-to-shoulder line of huge state troopers dressed in full battle regalia moving down the hallways to clear them of fighting students.

A scalpel in my lab coat pocket was standard fare for protection “just in case.” “Lock your classroom doors” often came across the public address (PA) system, so trouble makers could not enter after the bell rang. One time a group of rioting African-American students broke passed the lock on the door to my room and forced several of the African-American students, who wanted to stay in class, to leave with them. I was shoved against the wall at knifepoint when I tried to stop the exodus. Another aspect of social issues had become a reality in my classroom, the racial conflict. White flight ensued, the neighborhood changed, and the school had to accommodate to problems similar to those of inner city schools today. With the changed school population, it became even more evident that making biology immediately and locally relevant to learners was my only hope to engage students in learning biology. Addressing the social issues that enveloped us from numerous aspects of science, technology, and society interaction was essential to generate interest, capture their imagination, and motivate students to cooperate, thus increasing their likelihood of success in my class.

Many of the students bussed in were placed in the tenth grade basic biology classes. When I was assigned to teach a section of that course, I was confronted with students’ inability to read even public print media such as Life magazine and Readers Digest, supposedly written at eighth grade reading level. Never having been trained to teach reading, I was stumped. The large colorful pictures in Life magazine articles relating to human biology enabled me to focus students’ attention on a topic while I talked about it, but learners were entirely dependent on me for information. I decided to tape record myself reading the print matter I used with the students and
let them spend part of class time listening to the tapes and following the words on the printed pages, so we could have something to discuss. I did this for all the relevant *Life* magazine articles, the *Reader's Digest* articles, laboratory directions, and some of their textbook materials. It did help, but was certainly not a cure all.

**Lesson Learned:** Teachers of low-level readers must know how to teach reading strategies.

Another response to desegregation by the Syracuse City School District was to create specialized magnet schools within the schools heavily populated by African-American students. Most of the schools were in low socioeconomic areas of the city. My science supervisor encouraged me to accept an invitation from the principal of one of the schools who wanted to create a science magnet program. The primary attraction was the promise I could create anything I wanted in the program that would attract bright white students from around the city to the program. I was not sure I was seriously interested in the potential to leave NHS, but I did go to meet the principal at the school on a Saturday morning. The offer made to me was tempting. I agreed to give it serious thought. The principal walked with me into the parking lot. There was my green Cadillac convertible with its soft top slashed to pieces. I looked at the principal’s grief stricken face and said, “I guess you’ve got your answer.” I stayed at NHS.

**Advanced Biology**

The second level biology course in NHS, which was a popular elective with the intellectually elite, had been taught as Advanced Placement Biology (AP). When the AP teacher retired, the principal offered the class to me. I told him I would like to teach a second level biology course, but I did not want to teach the advanced placement syllabus. The students would have plenty of time to take college biology in college. Instead, I proposed inventing a course addressing things our students would not likely encounter in their college biology course. I could follow my interests and topics in which my students expressed interest without a preset syllabus to follow. What I did in later years was labeled a generative classroom. None of the other biology teachers wanted to teach the AP course either. The principal agreed to let me do what I wanted with the course with the proviso, “…as long as you keep the parents off my back.” This was my license to teach cutting-edge biology and enabled me to stay current in the field. I could take advantage of the fact that three higher education institutions surrounded our school, including Syracuse University (SU). SU had an outstanding medical school, a prominent forestry college, a law school, and a biology department housing many world-renowned researchers. I lived in the university neighborhood; therefore I knew many faculty socially and as the parents of our students. From the student incident reported earlier during my first semester teaching Regents biology, and conversations I had with scientists in social settings, I expected scientists would be agreeable to coming to NHS to tell these outstanding students about their work. This turned out to be true.
Students were delighted to invite their parents and neighbors to speak to our class. I asked some of my acquaintances to speak. We were introduced to the diversity of research being done in our own back yard. Some scientists invited us to their laboratories for a visit. We frequented the cadaver laboratory in the medical school. This led to one of the most embarrassing moments of my career. The laboratory technician lifted a preserved human brain from a refrigerated case and started orally labeling it parts. I heard my voice saying out loud, “Oh my gosh, it looks just like the pictures!” I wanted the floor to swallow me up for making such a ridiculous statement. Two of the students said they were too squeamish to look at the full cadavers inside the preservation room, but they wanted to stay with the group. They stood behind other students with their hands over their faces. As the instructor conducted the tour of body organs, the hiding students peeked through their fingers and around their classmates. By the end of the two hours, they had their faces up close to the cadavers and were as fully engaged pointing and asking questions as the rest of the students. It was funny to watch. There is more about this use of the community scientists in Chapter 4.

Figure 2.1. Advanced biology class examining a cadaver
My first parents' night after I began teaching advanced biology, a man started his conversation with me by saying, “Last year all we ever heard at dinner was how hard our daughter found biology. It was Mrs. Spector this and Mrs. Spector that, none of which were pleasant.” I held my breath and felt queasy. He continued, “Now this semester, all we still hear from her at dinner is Mrs. Spector this and Mrs. Spector that, with glowing statements about now she understands why you insisted she learn what she did last year. She is ecstatic!” With his second sentence I realized he was the parent of an advanced biology student. I breathed a sigh of relief. I asked for his daughter’s name. He replied, “Don’t you know me? I am the school board president and Collene Buzzard’s father.” Looking back on that event now, I see how insulated I was from the way the district was run and the school district’s politics.

Lesson Learned: Make sure teacher education students understand the importance of knowing who runs their school district and how it is run.

More of my adventures with the advanced biology class relate to the use of the community as a resource for teaching and are described in Chapter 4.

DEPARTMENT OF EDUCATION, OREGON CONSULTING

After earning my doctorate in 1975, I was hired by the Department of Education in Oregon to review the many marine education initiatives on the Oregon coast and create a plan to enhance marine education throughout the state. This consulting job of thirty-eight days had a monumental impact on my career direction. In this position, I traveled with the state science supervisor conducting marine education workshops and gathering data from Oregon teachers.

Figure 2.2. Data collecting workshop
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I was also introduced to the National Marine Educators Association (NMEA), because many of the Oregon teachers were attending the NMEA annual conference at Evergreen State University in the state of Washington. Consequently, I went to the NMEA meeting. There I ate the best salmon of my life at my first outdoor salmon bake! I ordered salmon at every restaurant I went to for years. None has ever matched it.

In addition to the Oregon marine educators, I interacted with marine educators from many other states. Sea Grant marine educators had their national annual meeting just before the NMEA conference and played a prominent role during the NMEA conference. I did not know anything about the National Sea Grant College Program before this meeting. I learned the New York State Sea Grant College Program in Albany, New York was submitting a proposal to the National Sea Grant College Program for federal funding. This was to be the first time Sea Grant would entertain including a proposal for marine education from a high school. I submitted a proposal to reinstate my Woods Hole adventure.

Following standard procedure, the National Sea Grant College Program Office sent a multidisciplinary team to New York State to conduct a site visit as part of the process to evaluate the entire New York Sea Grant proposal. The site visit provided the visiting team an opportunity to interview the authors of the varied proposals in the overall New York Sea Grant proposal package. I gave a presentation. Apparently Sea Grant educators with whom I interacted at NMEA told the National Sea Grant College Program Office about our interactions and my advocacy for marine education. As a result of their input and the New York site visit, I was invited to interview for the position of Education Director in the National Sea Grant College Program Office in Washington, D.C., actually located in Rockville, Maryland.

Lesson Learned: Attendance at professional associations can provide leads to a new job.

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CAREER PATH

I had presented at state and national science teachers conferences about my adventures with my advanced biology students at the Marine Biological Laboratory in Woods Hole, Massachusetts and studying blue holes at a dive station on Andros Island in the Bahamas. Further, I had organized a group of teachers from five different high schools in the central New York area surrounding Syracuse and taught them how to organize similar study trips with their students. Thus people with whom I interacted generally assumed I had significant knowledge about marine science. The reality was, however, what little marine science I knew, I learned on the job during those expeditions and while consulting in Oregon.

NATIONAL SEA GRANT COLLEGE PROGRAM

Sea Grant Invitation

About a month after I returned home to Syracuse from Oregon, I received a telephone call from the national office of Sea Grant asking me if I would be interested in an IPA (Intergovernmental Personnel Act) assignment in the national office for a year. I had no idea of what I might be getting into, but I was thrilled with the prospect of more consulting and said yes. I was then invited to the annual national meeting of Sea Grant directors in New England for an interview. I heard that John McMahon, a highly regarded marine education extension agent from Hawaii, was interviewing for the same position.

John was the only person I really knew at that directors’ meeting. He and I had dinner together and talked excitedly about the prospects of this IPA position. We sat in the lounge after dinner continuing our conversation for several hours. I told him I thought he was best suited for the job, because he had been in marine education most of his career and knew so much about the marine domain. He told me he thought I was best suited for the position, because of my knowledge about how to bring about change. This job was to initiate implementation of marine education in all K-12 schools in the United States. We got very strange looks from the Sea Grant directors as they took note of our apparent enjoyment visiting with each other.

In the end, I was offered the job. I told them I would accept it on one condition. It was that John would also be offered the job, and we would share the position. The man who was to be my boss promised he would bring John on a few months after I got settled in the national office. Unfortunately, this never happened. John and I continued to be great friends and worked together on a steady basis, even though he was in Hawaii and I was in the national office in Maryland.

On my first trip to Hawaii Sea Grant, John picked me up at the airport and said, “Do you want to stop to see the chum boats. It is on our way to the hotel.” I replied, “What is a chum boat?” John responded with an incredulous tone in his voice, “You were serious! You really don’t know anything about the marine domain.” My reply, “I have been telling you that all along.” It turned out chum boats were the boats that
collected shrimp by throwing live bait into the water to attract them. They seemed to have lines, nets, and scaffolding going in all directions.

**Context for My Sea Grant Years**

My Sea Grant job came about at a time when there was concern nationally for the condition of all science education throughout the United States. The National Science Foundation had suspended its entire request for proposals in science education in the late 1970s, while funding Norris Harms’ Project Synthesis to conduct a comprehensive study of the condition of science education, including mathematics education, throughout the country. When I arrived on the DC scene in November 1979, Project Synthesis was finalizing its report. That report was published in 1980 and set the wheels in motion for what was to become the longest lived science education reform movement in the history of the U.S. It continues today. I was in the right place at the right time for a change agent!

Project Synthesis recommendations for the changes needed in the science education enterprise set the foundation for the declaration of a crisis in science education. In May, 1982, Dr. Senta Raisin, the grande dame of science education and principal of the National Center for Improving Science Education, worked with the American Association for the Advancement of Science (AAAS) to orchestrate a major media blitz at the AAAS. Scientists and mathematicians decried the condition of the nation’s science education. The media gave the dramatic conference message great nationwide publicity. It was official: The United States had a crisis in science education!

**My Role in Sea Grant**

In my new position as the Program Director for Education in Sea Grant, a federal funding agency, I had decision-making responsibility for the three million dollars Sea Grant had to fund education initiatives. I interacted with leaders of the Project Synthesis teams as they pursued further federal funding to support the implementation of their recommendations. Among the leaders with whom I had the privilege of interacting were Drs. Norris Harms, Paul DeHart Hurd, Joseph Piel, Robert Yager, and Jane Butler Kahle.

In addition to responsibility for dispensing grant dollars, my task was to initiate mechanisms that would infuse marine concepts into K-12 education throughout the nation as a result of a congressional mandate. In order to do this, I had to interact with people across the country in a time when communication was limited by comparison to what it is today. This was before cell phones and the internet with instant global access. Telephones for long distance calls were used sparingly due to the expense. Personal computers were nonexistent. Everything took hours and days to complete. Snail mail was a major communication avenue slowing decision-making. I needed to work with people in various professional and governmental organizations to
build networks, using federal funding wisely in order to keep efforts from becoming redundant. I used a systemic change approach connecting people and organizations and building relationships and networks. I had to make a leap from a teacher with a local perspective to the number one national figure in marine education, almost instantaneously having to develop a national and international perspective.

Needless to say, I learned several things while in this position beginning with the first day on the job. My boss in Sea Grant was in the hospital for the first six weeks I was on the job. There was no one to tell me the parameters of my responsibilities, and I was too naïve to know what the boundaries were. I just did what came naturally. By the time my boss came back to the office, he was delighted with what I had accomplished. He told me to keep doing what I wanted to do. One could say I had fresh eyes looking at the role of a program director for education.

**Lesson Learned:** One does not know existing boundaries in a new context. Subsequently, a person is not limited by accepted boundaries and is apt to suggest solutions to a problem that are more creative than solutions suggested when you know the field.

Part of my job in Sea Grant, as I conceived it, was facilitating workshop meetings in which all the Sea Grant educators participated in developing consensus about policies and actions that should be taken. One day I conducted a workshop for Sea Grant educators that ran from a buffet breakfast through lunch to just before the dinner hour. At the end of the session, I passed out and fell to the floor. When I came to, a workshop participant said, “Of course you are exhausted, you spent the entire day making individual eye contact with each one of the thirty people in the room when you were facilitating the meeting. That in itself is exhausting, to say nothing of working straight through breakfast and lunch.”

**Lesson Learned:** Do not run all day meetings without taking any breaks.

I was invited to do a multi-day workshop on marine education for science supervisors in Puerto Rico. I did not speak Spanish. I did my usual slide presentation about why marine education was important and what their schools might do through an interpreter. The interpreter was someone I had worked with in Sea Grant in other capacities, so I trusted he knew what he was doing. I said several sentences, and the interpreter said one sentence. I said one sentence, and the interpreter said a dozen sentences. It was very disconcerting. I questioned the interpreter after my opening presentation, before we started the first interactive data gathering session. He explained he was not translating word for word. He was taking the ideas I was expressing and conveying them in the way with which this particular audience would identify. This was my first experience with an interpreter. I am still fascinated by the fact that he reconstructed my message tailored to the paradigm in which the audience functioned. I was further surprised by how easily I was able to socialize and party with these people even though I did not speak their language. We dined and danced for hours in the evenings.
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**Lesson Learned:** An interpreter needs to understand your goals before being trusted to speak for you.

I have always been a telephone person and continue to be to this day, despite all our efficient communication tools. This is probably the result of me being thrown into the national scene at Sea Grant when it was a painstakingly slow process to communicate with people across the country.

It still amazes me to realize I have unlimited long distance calling on my phone today. In my early career days, when anyone asked what I thought was the height of luxury I used to say, “Unlimited phone lines and airline tickets for which I do not have to pay.” Well, the first half came into being with the FTS line (government unlimited phone line) and now with cell phones. I was totally enamored with having the FTS line in the national Sea Grant office. It was the government’s phone line that I did not have to pay for each phone call and worry about how many long-distance calls I made. I started calling Sea Grant colleagues on the east coast first thing in the morning and moved to the west coast later in the day. At about 4 o’clock in the afternoon, when many of the office workers on the Sea Grant floor were getting ready to leave, I walked around the office and visited. Then after most everybody left and things got quiet, I continued contacting colleagues on the west coast ending around ten in the evening with my calls to Hawaii. I saw myself serving as a liaison among all the Sea Grant educators.

**Lesson Learned:** Today’s instant communication technologies facilitate being a change agent.

Since one of my responsibilities in Sea Grant was to make decisions about all the education portions of the various state Sea Grant proposals submitted annually, I was part of the team doing on-site visits to each state before the final decisions were made. At one of my early site visits, the team chair person, a very authoritative African American man, asked for my preliminary thoughts on the education section submitted by an Historically Black College (HBC). I said, “It is not worthy of funding,” and explained why. My boss, sitting across this wide thirty-person conference table, slide down in his seat and kicked me under the table. He clearly disapproved of my comment! When we took a dinner break, the chairman deliberately walked over to me, put his arm around my shoulder and said, “Dearie, we have to talk. Let’s sit together.” My boss looked like he was getting indigestion watching us from afar.

The message I understood from the chair was, “Stick to your guns! Most people today would have approved that part of the proposal just because it came from an HBC.” He explained awarding an HBC funds to create learning opportunities not in keeping with high standards only gives those professors and students the impression they are doing well, when they are not. That is lying to them and hurts the students in the long run when they go into the work force.

**Lesson Learned:** Well-educated African Americans want quality education for their progeny, not false approval for their efforts.
My knowledge of qualitative research (QR), organizational development (OD), and techniques to facilitate change served me well. The congressional mandate to infuse marine education in K-12 schools required me to use my new research and change agent skills and combine them with my experiences in art, music, and dance from my youth. Addressing real world social issues involving the ocean required the perspective of every discipline; therefore, marine education could be infused in every discipline taught in K-12 schools. I worked with stakeholders from marine businesses, government agencies, and education institutions across the United States to develop this perfect vehicle for a transdisciplinary approach to education. All the disciplines in this approach are woven together creating a tapestry of the whole, in contrast to interdisciplinary or cross disciplinary in which each discipline is linked to others, but remains identifiably different.

As I developed a national perspective, I learned I had been pioneering a shift from the dominant, reductionist, mechanistic paradigm to a holistic paradigm in science education throughout my career. The latter is currently referred to as the Science/Technology/Society Interaction (STS) reform movement or STEM (science, technology, engineering, and mathematics) reform. Things I started doing early in my teaching career “just because they seemed reasonable,” such as teacher as mediator, student centered inquiry, cooperative learning, Socratic questioning, project-based learning, integration of community resources, and more, now have distinctive labels as part of the literature facilitating the paradigm shift from traditional transmission science teaching to the desired state for teaching described first in Project Synthesis, then in the National Science Education Standards (NSES) (1996), A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (2011), and The Next Generation Science Standards (2013).

**Lesson Learned:** Marine education is the perfect vehicle to facilitate the paradigm shift in learning in every discipline.

**Professional Associations and Government**

During this time, I also learned about the role of professional associations in the governmental policy arena. Being on Capitol Hill, it became obvious leaders of professional associations spoke for the field. I learned legislators made policy and implementation of policy was directed by State Education Agencies and, or, directed by professional association leaders as spokespersons for their fields. Legislators listened and responded to professional association leaders. This is evident in the following anecdote:

My change plan to implement marine education in our nation’s schools K-12 included top down and bottom up approaches. I began with the Council of Chief State School Officers (CCSSO), the professional organization for State Superintendents of Public Instruction and Commissioners of Education. I attended several of their
meetings during three years, made presentations about the importance of marine education, and advocated for them to pass a policy statement and white (position) paper supporting implementation of marine education in their schools K-12. CCSSO policy statements explain why teachers in schools, seemingly often out of nowhere, are told they are required to do something new.

Once that was done, I successfully lobbied individual members to appoint a marine education supervisor or coordinator in each state with whom I could work toward infusing marine education. The CCSSO was especially important, because chief state school officers could appoint a coordinator or supervisor, an individual in each of their state departments of education to engage in activities ensuring marine education was taught K-12.

Also, having the policy statement from the CCSSO opened many doors for me. I used it as my conversation opener for my next step, which was to use my invisible network to identify key people who would invite me to the boards of directors’ meetings of the prominent national education professional associations. At those meetings, I had the opportunity to convince each association to pass a position statement endorsing the infusion of marine education in all K-12 curricula. I also participated toward the same end in state science education association meetings in various states. There is more about the role of professional associations in the education enterprise and in an individual’s career in Chapter 13.

**Lesson Learned:** Policy statements issued by the CCSSO influence what teachers do in their classrooms.

My IPA appointment in Washington, DC. required me to travel extensively. This allowed me to connect and network with the chief state school officers from all the states. The main topic of discussion at the Council of Chief State School Officers annual conference after Mr. Reagan was elected President of the United States was his cutting the size of federal government and its impact on state education agencies. I commented to the elected Oregon State Superintendent of Public Instruction after he said he would have to lay off a substantial number of employees with loss of federal education funds, “I would like to work for you to help do the necessary reorganization of your department. He responded saying, “I agree. I need your skills to do that, but if I did it I would be kicked out of office for bringing a stranger in while I was letting so many of my current people go.”

In another conversation, the Florida Commissioner of Education said, “Florida will be the perfect place for you to be a change agent, because the governor committed to moving Florida from the bottom quartile in education to the top quartile in the nation. Come to Florida. You can have your own learning laboratory.” I thought, “An added bonus would be living near my parents in Florida.” I had not done so since I was eighteen years old.

On the plane ride back from the CCSSO meeting to DC, I sat next to the Colorado Commissioner of Education. We talked about the reduction in education funding to the states. He asked what I was going to do when my IPA assignment was completed.
I said, “Go into educational consulting.” His response was, “You are a lot braver than I am. That is too precarious. I would never do that.” His words rang in my head for the several months before my IPA was over. I finally reconsidered consulting and decided it made more sense to go into higher education and do consulting on the side. I still, however, had Potomac Fever and wanted to stay in DC.

**IPA Ending**

As the national administration continued to change in DC, each time I called a colleague in a federal office I was told the person was gone. I was feeling abandoned and realized I needed to seriously consider the possibility of leaving also. Then my IPA assignment ended unexpectedly. My boss told me he did not want me around anymore because I would not have a sexual relationship with him. I was being sexually harassed in my job throughout my three-year tenure. It was easy for him not to offer reappointment, because IPA’s are temporary one-year assignments not requiring justification for termination. What was I going to do? I wanted to stay in DC. I had no reason to go back to Syracuse.

There was no one left in town with whom I could explore options. There were no higher education positions open in science education anywhere in the country, nor had there been for several years. The Reagan administration was filling positions in government agencies with his political appointees (Schedule C appointments). I inquired about a “Schedule C” political appointment with support from a New York politician. The interviewer was a man with whom I had interacted on and off during the previous three years. He said, “You are a program builder. You would die in this position. Our job is to dismantle the [US] Department of Education.” I had to come up with an alternative. I did not want to go back to high school teaching. Being locked in a school building seven hours a day would be too confining after my three-year introduction to traveling all over the country. I wanted to do something different. My children were in Colorado in college, and my parents lived in Florida.

Feeling frightened, I searched for a professional career guidance workshop. I found one based on *What Color is Your Parachute* (Bolles, 1978). It was very productive in helping me clarify what I liked to do and what I was good at doing. I discovered some things I was good at I really did not want to do, which surprised me. (I used that workshop as a model and wrote a parallel book when I was at FIU. The book was not printed for sale. I reproduced it on a copy machine and used it with inservice teachers in my classes in the gifted program at FIU. It proved to be helpful to them.) I came to realize that although I thought of myself as a biologist, I still had great interest in the arts and social sciences. My experience in Sea Grant integrating everything I had ever learned formally or informally from competition skating, to piano, to woodworking and other crafts, to blurring the lines among the natural and social sciences and technology made it clear I had a more holistic perspective than many of the scientists and science educators with whom I worked. I clearly was not trapped in all or nothing thinking,
or in tiny philosophical boxes. My great satisfaction in the role of change agent is my opportunity to integrate everything I learned to forward the reform movement.

On one of my trips to Florida to visit my parents, I was still weighing my options. My connection with the Florida Commissioner of Education led me to visit with a vice president at Florida Power and Light Company. I told him about my training and desire to work in organizational development (OD). He told me there were few OD departments in Florida industry, because workers were commonly not permanent. People came to Florida to escape shoveling snow. However, they did not stay very long because they discovered being paid in sunshine came with low wages. They could not support their families and meet their financial needs. They left and went back north. Companies, subsequently, did not invest in much organizational development. I wonder if that is still true.

As the end of summer came into view, I accepted a biology teaching position in a private high school near my parents. The first week of teachers’ meetings was enough to convince me I could not teach in a high school again. The principal told the teachers things they were going to have to do as a result of edicts from Washington, DC. One of them related to marine education. I had been involved with the writing of the legislation to which he referred. His interpretation was way off. Agitated by his misinterpretation, I asked to meet with him in his office. I explained the implications of the legislation. He insisted I did not know what I was talking about, even though I was involved with creating the legislation. At that point I realized there was no way I could work for him. I remember leaving his office in a huff and thinking, “I have got to get out of here!” I resigned that day, before classes began.

Where to Now?

Where could I use my change agent skills and knowledge to help move science education in our nation to a new vision? I bought into the vision spelled out in Project Synthesis (Harms, 1980) and what was emerging in Project 2061 at AAAS. Both were consistent with my experience in my advanced biology course and knowledge gained through my Sea Grant travels. It was obvious holistic thinking, a systemic approach, was key to change. The whole is greater than the sum of its parts. This thinking brought me to Florida International University (FIU) and higher education.

ENTERING THE PROFESSORIATE

Beginning at FIU

Florida International University was a relatively new institution not far from where my parents lived. It was perfect for me, a change agent looking for a place to create. I felt comfortable on university campuses interacting with upper administration and scientists. I thought I understood how universities worked, given my experience
with the thirty Sea Grant colleges for three years. (Boy, was I wrong!) I went there to see if I could convince someone to let me create a position for myself. I did not know anything about faculty lines and how they came into being. When I met with the Dean of Education at FIU, I learned he knew many of the same people I knew in Washington, DC. We were talking the same language and became buddies right from the beginning of the interview. He had a position available on soft money to work part time in the gifted program and part time in science education. I had no idea of the significance of a soft money line, that it was a non-tenure earning line, nor would I have cared if I did know. We agreed my task was to do something atypical with inservice teachers to move science teacher education in Florida in a direction consistent with national initiatives. I lived near my parents in Pembroke Pines for four years, a reasonable commute to the two FIU campuses.

When I had visited with my parents in Pembroke Pines months earlier, I went with them to a presentation by a local politician. I stopped and chatted with him at the end of the presentation. I told him I was considering moving to Florida and what I had been doing in DC. He asked, “What would you like to do in Florida?” I told him, “Reform science education.” He told me about the STAR grant availability. It was intended to support innovation in various disciplines. This grant would be a perfect vehicle to make the dramatic changes in science education K-12 called for in Project Synthesis (Harms, 1980). I could advance the goals of Project Synthesis by changing science teacher professional development.

Thus when I accepted the position at FIU, I immediately wrote a proposal and landed a STAR Grant to do a qualitative research study. This study focused on Florida science teachers’ perceived needs regarding their ability to be effective. I started as a new visiting assistant professor in higher education at FIU with a grant. In retrospect, I realize this is unusual in higher education, but was completely normal for me. Having come to FIU from the grant world in DC, and all the faculty with whom I had interacted on college campuses worked on grant funded projects, I took it for granted I was supposed to write grant proposals.

I was awarded a total of three grants my first year in the professoriate that ran simultaneously. My title became Project Director for Research and Development in Science Education. One grant was federally funded from Title III – Special Needs. In it, I committed to extending my research on science teachers’ needs to include quantitative procedures and a national perspective. The product was a document titled, Post Baccalaureate Education for Science Teachers in Florida (Spector, 1984). Here is the abstract describing the document.

A qualitative study was conducted to gather data from members of the educational enterprise and those external to it who influence policy in science education. Initial analysis of the data revealed characteristics of an ideal (desired state) master’s degree and generated a model to guide the selection of science education content for all post baccalaureate teacher training, including doctoral programs and noncredit inservice activities.
A quantitative study followed the qualitative study and confirmed the data and analysis of the qualitative study. Further analysis of the qualitative data yielded a list of competencies which science teachers need to maximize their performance in the multiple roles required of them. Relationships were identified among competencies. These relationships were used in grouping the competencies. Competencies, which could be synthesized into broader general objectives and attained through related learning experiences, were grouped together.

An individualized, diagnostic, prescriptive format was determined to be the ideal delivery mode for the desired state degree program. Selection of learning activities would be based upon an extensive guided self-diagnosis [based on the “Parachute” workshop in DC] and a collaborative prescription procedure with a professor/advisor. Incremental steps to phase the new program into existing university offerings were delineated. The steps would gradually increase the number of options offered to degree candidates. Facilities to house the desired state degree program were described. (FIU, 1984)

This document and its companion document describing detailed goals and objectives equating to thirty graduate credits of study were used by the Florida Department of Education to obtain its share of the Eisenhower funds. These were dollars allocated by the federal government to State Departments of Education that were not released to the states until a state received approval of its plan to support inservice teacher education reforming science and mathematics teaching. I further described syllabi for ten three-credit courses, the way they integrated with each other, and their consistence with the emergent reform movement eventually labeled, Science/Technology/Society (STS).

All this took place a decade before the development and publication of documents, such as the National Science Education Standards (NSES) (NRC, 1996), Benchmarks for Science Literacy (AAAS, 1993), Science for All Americans (AAAS, 1989), and related documents guiding the reform of science education nationally. I influenced and was influenced by my interactions with Dr. James Rutherford (Jim) as he developed Project 2061 at AAAS and its documents that impacted the NSES. Prior to those documents there had been no national standards types of guidebooks for K through 12 science education, nor for science teacher education. In fact, most states did not have state standards. Although, I recall New York had guides for the statewide Regents examinations in various high school disciplines.

Even though I had the institutional blessing via the administrators in the college, my faculty colleagues did not like the idea of changing things. They did not appreciate someone constantly rocking the boat. Resistance to new ideas in the university system was there from day one. My graduate studies had trained me to be a change agent. I knew what I was up against in terms of organizational change, and
the kinds of strategies it took to accomplish organizational change. The resistance was not a surprise. Diagnosing who influences whom and why was key. During my four years at FIU, I pilot tested many of the goals and objectives I had developed, even though I did not have time to pilot test all 10 courses per se.

Science Supervisors

The science supervisors in FIU’s client school districts were wonderful colleagues with whom to work. My relationships with them continued even after I moved away from the area. They provided me with insight and access to students, teachers, administrators, and schools. They supported my change initiatives as consultants to my work, as student learners in my courses, and hired me for specific inservice initiatives in their districts. I reciprocated their support with access I provided for them to national leaders and national initiatives, especially when we went to professional association conferences together. One supervisor, who roomed with me at my first NSTA meeting after moving to Florida was in a doctoral program at another university. After an opening social event, she exclaimed, “Oh my gosh, this is so exciting! You introduced me to all the people I have been reading about!”

I could count on the supervisors to provide their districts’ support whether it was for personnel or matching money whenever I wanted to write a grant to support an innovation, field test an emerging new commercial curriculum, or test an idea. Teachers in the classes I taught also appreciated the opportunity to develop closer relationships with their science supervisors when they participated in my courses. They could obtain an administrative perspective on issues and call on their supervisor’s support to make changes in their schools. It was a win-win situation for everyone involved.

Thinking Skills

One day, the Dean of Education at FIU asked me to present at a meeting about thinking skills being held at a local high school. I said, “I don’t know what thinking skills are.” He responded, “Just go and talk about the things you have been promoting for science education in our college.” I went to the meeting and asked to be the last speaker, hoping to figure out what to say from the other presentations. Four speakers, each from a different discipline, went before me. By the time they finished, I understood why the dean asked me to speak. It appeared to me the so-called thinking skills were the same as teaching science as a way of knowing through systematic inquiry. I borrowed overhead projections from each of the earlier speakers and tied them together to explain what I did for “thinking skills” in science education. It was well received. Prior to that episode I had no idea CORT in California or anyone else was out there promoting thinking skills as a distinct entity from conducting scientific inquiry.
CHAPTER 2

Work Style

I worked in my office at FIU from early morning until midnight and on weekends. At first, I was located on the main Miami campus. I wore a path in the grass between my office in the education building and the science building diagonally across campus. There was a cafeteria on the way, and I could not resist stopping at the Pina Colada juice machine on my way to and fro. Oh! The calories. The dean of arts and sciences, the biology department chair, and several faculty were wonderful supporters. Later my office was on the new FIU branch campus on Biscayne Bay.

The 24/7 work pattern I had developed while at Sea Grant continued throughout most of my higher education career. I had been warned about that intense work pattern becoming permanent by a professor at Syracuse University while I was a doctoral student. Another doctoral student came running by his office while I was there and exclaimed, “I defend my dissertation tomorrow. Then I can finally go back to being a normal human being and not working all the time!” The professor’s comment to me was, “He does not realize the work pattern during these years of doctoral work was behavioral conditioning that will stick with him for life.” I certainly am living evidence of that comment.

Switch to University of South Florida (USF)

I came to know two science educators at the University of South Florida from my activity on the political front for the state of Florida. Both held administrative positions in their college. The primary science educator had been the associate dean of programs for several years and continued doing that to the end of his career. The next science educator was a department chair. During my fourth year at FIU, a hard line (tenure earning) position became available at USF. The two science educator administrators approached me at a Florida Science Teachers Association conference and asked me to apply for that position. They knew of the work I had done studying what inservice teachers perceived they needed and the design of graduate education, including for a new style masters degree in science education consistent with the reform movement. To encourage me to apply for the job, they told me, “Come here, because we need somebody to give life to our graduate programs in science education.” The three science educators at USF were all males. The third science educator at USF, whom I did not know, was very dominant paradigm and would have nothing to do with any kind of reform.

My parents encouraged me to look into this potential position, even though my mother recently had a heart attack. It was a tenure earning line and could give me job security, which was of greater concern to my parents than to me. I was surprised, since Tampa is three and half hours to four hours from Pembroke Pines. My parents were, however, quite insistent that they did not need me to stay in Broward County. I accepted the position and moved to an apartment in Tampa. My father called me three weeks after I settled in Tampa saying, “Aren’t you missing something?”
I responded, “Not that I know of. Why?” He said, “I just did a walk-through with your landlord to close out your rental agreement for your apartment in Broward County. When we opened the cabinet in the kitchen below the sink we found an entire collection of pots and pans.” Obviously, I wasn’t doing much cooking. I never missed all the pots and pans I left behind.

**Life in USF**

I brought two grants with me to continue developing new inservice science teacher education. The third science education professor, and the only one actively teaching courses, was not interested in change. My charge at USF in 1985 was to update the science education graduate programs. At USF, the primary focus of the reform in mathematics education and science education were the same: The paradigm shift. A highly experienced mathematics educator, Dr. E. Ray Phillips and I collaborated to develop the Graduate Program of Excellence for Mathematics and Science Teachers (GpEMSt) (Spector & Phillips, 1989). Program development and testing was supported by Florida Eisenhower funds from the two state grants I brought with me to USF from FIU.

This was the beginning of my thirty plus year career at USF dominated by grants. Seventy-two grants providing about seven million dollars gave me much freedom to function as an agent for change. I was able to make major contributions to science education locally, statewide, and nationally. I traveled extensively, networked nationally and internationally, and contributed to professional science and science education associations.

Navigating the university system with an outsider’s perspective left me much to learn. For example, I was so engrossed in what I was doing I never even took a sabbatical when I was eligible the first time. It was fourteen years before I applied for my first sabbatical! In retrospect, I realize that having come to higher education from being a national figure and part of numerous national and international networks, I approach being a university professor from a different perspective, with different intentions and goals, than most of my colleagues in the university. This has its advantages and disadvantages as you will see throughout the remainder this book about my experiences.

**Lesson Learned:** Take a sabbatical as soon as you are eligible.

**REFERENCES**


