TEACHING PHILOSOPHY: Over the course of a 31 year career, my teaching developed in an embryological fashion. The teaching repertoire grew, changed, and expanded to adapt and embrace new students, environments, technology, and content. Accomplished teachers' attitudes, regarding both the field of science and the profession of teaching, should shine brightly as a twinkling star on a summer's evening. The positive attitude I possess has enthusiasm, innovativeness, curiosity, and wonderment as its integral components. Exemplary teachers understand their roles in transmitting this attitude to students who pass through the classrooms and laboratories of their departments. Teachers are so much more than simply conduits of information. Learning is facilitated by utilizing diverse approaches appealing to an array of learning styles and by asking probing, thought provoking questions. Science curricula should be approached with a "less is more" viewpoint even though an avalanche of pressure from high stakes testing looms overhead. *Depth* of knowledge is much more important than *breadth*. Students must be afforded time to develop deep understandings of major scientific concepts.

All students possess the capacity to learn science and hold the potential to become members of a scientifically literate citizenry. I endeavor to rouse their curiosity and to train and encourage them to ask meaningful questions about observations of their world and events occurring around them. Although individual students respond to different trigger mechanisms, adolescents desire to be valued and need interactive teachers who offer relevant, rigorous, and demanding curricula. Students should be engaged in the *process* of science. It is my desire to challenge them to step beyond their comfort zone and to reach toward their full potential.

Lastly, good teachers routinely practice personal reflection. Reflection is an ongoing, dynamic process which continually seeks, and leads to improved student learning. It is vitally important to reflect upon effective as well as unproductive strategies and goals

INSTRUCTION: The fundamental key to my effective science instruction is the establishment of numerous links to my students' lives – their interests and concerns, their activities, their families and their communities. These links unfurl as a net that captures and connects my students to an exciting and relevant science curriculum. They rouse the student's curiosity. Effective science classes of today bear little resemblance to classes of twenty or thirty years ago. It is no longer acceptable practice to require students to memorize vocabulary definitions listed at the chapter's end. In accord with the National Science Education Standards, students in dynamic science programs such as mine are *actively* engaged in learning and reflect the changing emphasis in science education of today. Inquiry-based activities and student designed projects are used whenever feasible while strongly emphasizing the use of the scientific method and its associated processes and skills. My *Probing Ponds* activity in which students manipulate an environmental factor and determine its resulting impact upon the dissolved oxygen content of water from a local pond is an excellent example of this type of investigation.

Technology is a tremendous tool I routinely employ to reach my students. It allows me to create new innovative approaches that add renewed sparks of interest to ignite waning student interests about traditional curricular topics. Science classes provide perfect settings for an intricate intertwining of technology and student learning that can capture the attention of a tech-savvy generation. Through grants and awards I have equipped my classroom with laptops which are wirelessly connected to the Internet. Students use the Web for independent research, to prepare presentations, and to download assignments I have placed onto my class website.

Mitosis, a form of cell reproduction, is an example of a traditional topic included within the syllabi of most general biology classes as well as the National Science Content Standards. Historically, teachers like me have listed and elaborated on the stages a cell goes through on its

way to the creation of an identical copy of itself. I now, however, incorporate technology and give the topic of mitosis a fresh breath of life and excitement when students explore *Mitosis in Cyberspace*! Within this unit cellular biology becomes visually alive, and students assume the role of teacher while I work as a learning *facilitator*. Computers, the Internet, and computer interfaced microscopes enable learning activities that have previously been impossible. Individual assignments containing project requirements are uploaded onto my class Web site.

Students engage in independent learning as they first conduct Internet research to expand their knowledge bases about the process of mitosis. No trip to the computer lab is necessary. They work at their tables using laptops with Wi-Fi cards. Their assignment is to create vibrant and animated Power Point presentations from their newly gleaned information. Students less proficient in computer use are paired with others who are more accomplished. Through their research out in *cyberspace* students encounter an enormous amount of information on the topic. They read, analyze, and select relevant material they deem to be important enough to share with their peers. This prompts them to develop latent critical thinking skills. The Internet searches lead students to sites containing excellent pictures, diagrams, and animations that help to clarify the concept. A few web sites contain interactive activities which reinforce student learning. I believe these intriguing activities kindle student interest and ownership and engage young minds which are regularly inundated with a plethora of sensory stimuli from multimedia sources. The completed presentations are shared with the class which serves as a form of peer instruction as well as an opportunity to practice public speaking skills. As students prepare themselves to teach others, they more deeply internalize the concepts and are able to retain them much longer.

Although cell images are easily found on the Internet, there is still something intriguing and exciting when a student sees them first hand using a microscope in the laboratory.

Technology, however, is improving the types of microscopes used within secondary science laboratories of today and students digitally capture images of the specimen they view. Then, photos are printed and carefully scrutinized to determine which phase of mitosis was in evidence.

My computer interfaced microscope has been tremendously beneficial instructionally. During post-lab discussions previously captured cell images are quickly opened and reviewed with the class. By connecting the computer with an LCD projector, full screen images are discussed during whole class discussions. There is a colossal difference in the visual impact that full-screen projection of microscopic images has upon the viewing audience. With ease I focus the attention of an entire class upon the cellular structures to be emphasized and discussed.

At the completion of my ***Mitosis in Cyberspace*** unit I formally assess my students' learning. Following with my focus on total technology immersion, students engage in online quizzes. Online quizzes are available from several sites on the Web, and several are free to educators. I created the test and placed it into a test bank to which only my students have access. As quickly as students log in their answers they receive instantaneous feedback on their choices, and the teacher receives the students' grades. This provides an immediate opportunity for me to clarify student misconceptions on the incorrect responses.

One vital component of my teaching, my students' learning, and thus, the science program revolves around the students' preparation of a science fair project. For numerous reasons, I am an advocate of student participation in science fairs at all levels. I initiated the first local science fair at our high school, and since that time it has spread throughout our junior high and upper elementary schools in our district. Since I believe that all students need the opportunity to experience extended individualized scientific explorations, I require all my students to prepare a science fair project. Some projects are simple, while others are much more

complex. A few class periods, spread over a period of several months, are spent on the development and analysis of the projects, but much of the work is done outside of class. Extensive projects such as these hold many values. They require students to develop long term planning and organizational skills. They offer an opportunity to incorporate student research and to explore deeply a topic in which they have a particular interest. This puts them in contact with scientific journals and books they would rarely, if ever, consult for a typical class study. These projects necessitate the implementation of good scientific process skills – experimental design, data acquisition and analysis – processes central to science standards. Visual and oral presentation skills are developed as they communicate their projects and findings to judges and attending community members. The local show affords an opportunity to truly showcase our students and the science department.

Another important benefit of the science fair is that it links local organizations and individuals to our science program. I have collaborated with our parent-teacher organization to purchase data collection probes which allow students to collect improved numerical data rather than observational subjective data. Donations from individuals have allowed the purchase of costly chemicals and supplies. Local businesses supply monetary rewards for the top three winners at both the junior and senior high level, thus the fair serves as a link between our area merchants and our students. Finally, through these long term projects most parents become more closely engaged in their son's or daughter's science learning.

Due to my background, I believe I have been uniquely successful in integrating science with other subjects. My first degree was vocational home economics which provided me an opportunity to link science to nutrition, human development, and the chemistry of textiles. In addition, I am the daughter of an agriculture teacher who instilled within me the appreciation of

the ecological and chemical balances necessary to raise high quality crops and healthy animals. I am from Oklahoma and possess a degree of Native American heritage. This led, in part, to an ambitious study in which my biotechnology class examined sequential differences found in the mitochondrial DNA of members of five Native American tribes who reside in our state. Students analyzed via the Internet the tribal DNA sequences they had collected, isolated, and amplified and then compared them to other worldwide populations to determine the degree of genetic diversity and evolutionary distance. This allowed them to make a *global* comparison of tribal sequences to other sequences. I hoped my students would come to understand that people over the world, though quite diverse, are genetically very similar when viewed at the molecular level.

I believe my teaching practice is unique, but conforms to the Science Teaching Standards in part due to my commitment to continued learning. Each summer is a new professional learning opportunity for me. Since science is an ever changing field, it is vital that effective science teachers be perpetual learners to remain current in their content knowledge. The professional contacts, ideas, and strategies that result from these summer workshops are a boon to my personal teaching repertoire. These activities prevent teacher burnout which claims the careers of many excellent teachers, and they renew my hope and enthusiasm for what is, in my opinion, the best career on the face of this earth. I have spent the past two summers at research facilities which deepened my knowledge base and provided ideas to be incorporated into my curriculum such as an investigation of bacteriophage collected from environmental samples.

My students know how passionate I am about science and how valuable I believe it is to the vitality of our daily lives and to the future success of our planet. I believe that this degree of personal enthusiasm is both unique and contagious to them. If I am successful, many of my students will catch the fever of science, too, and choose careers that lead to improving our world.