



Teach Others to Learn While You Are Learning to Teach **A Personal Journey in Linking Pedagogy and Technology**

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Abstract: I have found that “teaching others to learn while you are learning to teach” is a good statement of my pedagogy. Teaching began for me in 1983 and is a passion, which happens to overlap with my profession. It is a personal account of this journey that I share in this paper. The narrated experiences are of teaching in India and the United States. My teaching has been greatly enriched by my research in the field of human genetics. It has provided a unique perspective on learning. Some of the questions posed are: Do we have to know whether we can teach before we start to teach? Is learning to teach easy? How does one change one’s style of teaching to cope with modern times when digital media has taken over the lives of the new generation? Can we develop personalized teaching? These are a few questions addressed here which are faced by all who want to teach. Is teaching your passion? That is always the first question that needs to be addressed, because if the answer is yes, then all other things fall into place.

*Life is a pilgrimage
Be joyous during the arduous journey to the
summit
For the arduous journey is the daily
enlightenment and
The summit non-existent.*
—Tara, June 4th, 2006

I have found that “teaching others to learn while you are learning to teach” is a good statement of my pedagogy. What better could life offer as a profession? I enumerate here a personal journey of my teaching and pedagogy and its links with modern technology. Teaching is my passion, and

Dr. Tara Devi S. Ashok has a PhD in Anthropology from India, with a specialization in Human Genetics. Her passion has been teaching and research, which she has carried out in India, Europe and the U.S. for more than two decades. The genetics of mental retardation was the starting point of her research in human genetics followed by study of hemoglobinopathies both at clinical and population levels. In the U.S., she started work on mitochondrial DNA. Tara’s later research experience in Cancer Genetics at the Harvard School of Public Health (1997-2003), Boston, was of great importance not only for understanding the genetic aspects of cancer, but also for human suffering both at the physical and mental levels. Teaching and research are what she does presently at the University of Massachusetts Boston’s Departments of Anthropology and Biology. Having had the opportunity to closely look at health from various angles, she is both an anthropologist and a molecular biologist, above all a keen observer of the mind. She seeks to impart the knowledge that she has gathered over the years in a very simple and direct way, so that all can benefit from her learning.

a large part of my profession. It all began for me in 1983.

Is teaching your passion? That is the first question to ask for anyone wanting to teach. It has to come from deep within, just like a lactating mother wanting to release her nourishment to her child. Similarly, the revelation of the truth within oneself and the joy thereof has to be shared. *Is that your situation?*

The development of the passion in oneself is what propels a teacher to teach across culture, discipline, ethnicity, gender, economic stratifications and borders, in order to reach the common human denominator: unique minds who can be motivated. Sharing is as limitless as it is joyous. This gives a sense of freedom to the self and is thus self-liberating. Is it then loaded with responsibility? Are you ready for the challenge? Challenge, which tells you to first know the truth and then lead others to that truth?

Today, teaching is done in many ways using different forms of technology. I find all those very fascinating and have incorporated many of the different digital media into my teaching format. I have created computer applications in a style that helps me to express my unique and personalized design for sharing information with the students in a colorful, and animated manner. In most of the situations, this is done with a touch of humor too. These applications complement my lectures and help me to use my research material as examples in these designs. All the animations have been created with the help of the Macromedia Director software.

The next question is, "Do we have to know whether we can teach before we start to teach?" No, is my answer, because everyone is capable of teaching. While teaching, you learn many things. That is why my pedagogy is inspired by the motto "teach others to learn while you are learning to teach." Given my disciplinary background, I find biological metaphors sometimes powerful for capturing all that is involved in this process.

The process of developing a teaching strategy is like the development of an embryo, no matter what the stage is of the embryo, it is functional. The heart is beating before the four chambers of the heart are constructed, the nervous system developing, while helping to develop other parts of the body. The germ cells that create the genitals wait in the yolk sac, until the genital ridges are formed, which would be the final destination for these germ cells to reside on after which the sex is determined. But slowly and steadily we function while we build ourselves, unlike a machine that is not switched on until it is completely built.

I find the process of teaching just the same, it grows on us and we go on constructing the parts of teaching while becoming a teacher. Further, present research in biology tells us that we inherit a genome (the genetic component from each of our parents) and an epigenome that makes this genome functional. This epigenome can be influenced by internal and external environmental factors. Similarly, during this phase of becoming a teacher, we are influenced by both our heredity and our environment, and keep changing our teaching style as we respond to the individuals whom we teach.

While I was doing my doctoral thesis on the genetics of mental retardation, I came in close contact with children who were mentally challenged. This brought me to the understanding that everyone does not learn the same way. All of us come with different types of learning capacities, yet all can be taught to bring out the best in themselves. It is very much like the scientists today trying to deliver personalized medicine using the field of pharmacogenomics (i.e., the study of differential drug responses on the basis of individual genetics). This would help physicians prescribe medication suitable to each individual's genetics.

Will we be able to develop the same kind of teaching strategy, namely, "a personalized teaching"? Are we ready for this personalized approach? Today, teaching is a big en-

terprise and done for the masses, many times even over the World Wide Web. So technically all can learn. But, a personalized approach is an ancient approach, which is referred to in India as the Gurukul approach to teaching, like the concept of home schooling in the United States of America. However, in the Gurukul style the students move to the *Guru's* residence and the wife of the *Guru* is like a mother in the house. She serves the students food and takes care of all their requirements and the students have to participate in all the household chores. In this style of education, the students get to observe the *Guru* from close quarters. They are able to see that the *Guru* practices what he preaches. During this period of learning, students have a simple and an austere lifestyle to follow.

I have had the opportunity to teach in two countries namely, India and the U.S. (for more than a decade in each case). Along with this I carried out research work in India, Germany, Netherlands, and the United States. These experiences have greatly enriched my life in more than one way.

What are the few things I learned from this long travel? Firstly, that irrespective of where you come from on the world map, a human is a human with the same underlying desires, potentials and aspirations to be the best in as many ways as possible. Secondly, that every culture has a unique influence on the individual. By birth I am an Indian and have been strongly influenced by my culture, but because of my long travels across different countries, it makes me feel like a world citizen today. Humankind truly appears as one. People of all different cultures are the same, human beings. Thirdly, everyone has the desire to learn, but how we cope with the system which provides higher learning is what tells us about the strength of the desire in a person for learning. The ones with the strong desire are able to fight at every step to be on the learners' mode eternally. My exposure to different cultures and the academic curricula of more

than one university has prepared me in trying to teach anyone, anywhere, of any culture or ethnicity. During a lecture, it is possible to combine different methods of teaching, as the goal is basically to teach the mind of the seeker to learn. Sometimes the mindset has to be modified to assure the seeker that learning is possible by a different method. The fear of examination and the fear of expressing one's opinion in a classroom environment has to be overcome so that learning becomes more comfortable and approachable.

Fourthly, the eye contact with all the students during a lecture has become my strength in making my lectures have an interactive nature. To do this the teacher must have the contents of the lecture well organized. This comes naturally when the teacher is engaged in research in the field of the subject being taught. Teaching helped me to keep the basic concepts very clear in my mind and the ongoing research kept my mind healthy and loaded with examples collected from my personal research work. Therefore, all these years, the subject for the students has been kept real. Last but not the least, a touch of humor and media incorporation into simple applications makes a lecture come alive.

How does one change the style of teaching to cope with modern times when digital media has taken over the lives of the new generation? A teacher has to keep abreast with the latest technologies that keep coming their way to improve the teaching style. Therefore, my lecturing style has changed over time. Earlier, one had to be an orator to lecture, and write on a blackboard with a white chalk with a beautiful handwriting. The blackboard then changed to a white one, with colored pens to write with. Then the days of overheads and slides came in, which has been followed by computer presentations of different types. The PowerPoint software today is the most commonly used application. It is equipped with some tools for creation of animation. However, today there

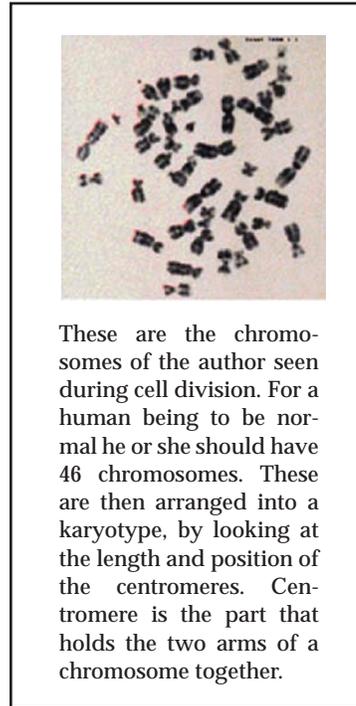
are many applications that provide the full range of tools to allow creation of special animations. In 1997, I learned the Director software program, which helped me to create movies. A main menu page is created and many movies can be linked to it. With the help of the various buttons, the student can navigate through the contents of the software application.

Two examples of the main menu page are illustrated below. One for teaching about DNA (deoxyribonucleic acid) and the other to teach all about biological anthropology. Twenty five movies have been linked to these pages and the movies can be played by pressing on the different buttons on the menu bar.



I could in addition develop games using the Director software for the students to understand some concepts more easily by just playing a simple game.

One example of a game is to arrange the 46 chromosomes in a proper order, based on their size and position of the centromere. This type of arrangement is called a karyo-

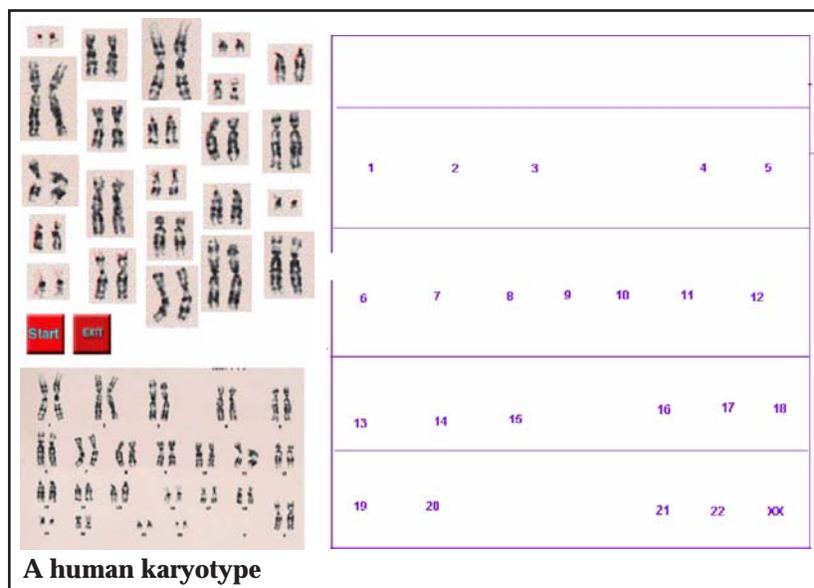


These are the chromosomes of the author seen during cell division. For a human being to be normal he or she should have 46 chromosomes. These are then arranged into a karyotype, by looking at the length and position of the centromeres. Centromere is the part that holds the two arms of a chromosome together.

type and the process karyotyping. It is important for the understanding of chromosomal abnormalities in an individual. It can be useful for pre or postnatal diagnosis.

Looking at the given karyotype a student can drag the pair of chromosomes onto the sheet and place it in the right order by looking at the length and position of the centromeres. The longest chromosome is the first one and the shortest being the last. If the lengths are same then the position of the centromeres are considered. The chromosome with the centromere in the center comes first and the chromosome with the centromere above the center come next in line. The numbers indicated on the sheet help in placing the chromosomes on the right location. Karyotyping helps in the understanding of the number, structure and the pattern of the chromosomes. The number and pattern should be the same for all normal individuals. Any change is indicative of an abnormality.

The use of computers and animation have been very fulfilling for me as a teacher.

A Game to learn **KARYOTYPING**

Creativity could be expressed on a daily basis, be it in the creation of an art piece or creation of music. Further, the use of such technologies made my own understanding of science still better, because it requires a thorough knowledge of the subject matter. This made me to go deeper into the basic concepts in all the subjects that I taught. If we want our students to be motivated, we have to be motivated first, or else how can we show the way to learning? With technology, you can learn as you go along, and change the technology with time; otherwise, we become an outdated teacher who is worth her weight in gold, of course, but who does not live in modern times. If we show the fear of learning then how can we preach that learning is easy?

In addition to using computer applications, I found that to teach subjects like biological anthropology and population genetics I wanted the students to actually go to a field station and carry out genetic studies of real populations. This made the students realize how data is collected and analyzed. Each year this fieldwork became tougher in regard to the approach to the populations

under study. In 1989, I could study the people of South India who even today live in cave dwellings with wild life all around them in a forest preserve with crystal clear river running through. This field trip was documented in the form of a film entitled, *A Visit to the Cave Dwellers of South India—A Genetic Voyage*. I presented this as a case study for my biological anthropology course and for demonstrating research methodologies in anthropology. On such field trips I used to get the taste of the Gurukul style of teaching, as the teacher and the students both live under the same roof, exploring similar thoughts in the same environment.

Today, teaching can be done for students who are unable to travel long distances to a university. A teacher from one location lectures over the satellite connection to students in different locations. This was the opportunity I was given at Roane State Community College (1996), in Oak Ridge, Tennessee—to teach anatomy and physiology in this manner. What one had to learn was that the students on the other end hear you with a little time delay, say half a

minute or so. The television monitors are all connected to allow seeing of the students participating from different locations. Hence, the classroom extended beyond the students sitting right in front of the teacher.

Over these years, I have been able to teach subjects across disciplines, the courses ranging from biological anthropology, biology, human genetics, biochemistry, developmental biology, and developmental models in human evolution, human origins, anthropology of health and illness, population genetics, anatomy, and physiology. This has led me to think truly in a multi-dimensional manner so that I can look at a problem from many angles and understand the biological processes right from a micro or molecular level to the macro level of a complete being. Basically, all the subjects are one in my mind, as all the disciplines contribute equally towards the understanding of the whole.

A few students at the University of Massachusetts Boston have also started to participate in this manner of learning (2003-2008), who have taken many of these courses one after the other, thereby getting the answers to their questions in a holistic way with the help of this interdisciplinary approach.

In India, I taught masters students in the Department of Genetics, Delhi University (1985-1993), who spend two years to complete the masters program. Only five students were registered each year. We had deliberately kept the number low to teach them well. The lecture classes were followed by long hours of laboratory work. Each student received significant personal attention and personal training time in the laboratory. There were no handouts provided and no required textbook as the information had to be collected using many sources. The students pursuing these applied courses were of a high caliber. After they completed the program they went into research and are still doing well in science.

In November of 1993, I arrived at the

U.S., started my research work in the Medical center of Knoxville, Tennessee and within an year started teaching undergraduate students of community colleges. I had moved to the U.S., because of my marriage.

After delivering the first lecture in Knoxville, TN; I realized that I needed to change my way of teaching. These were undergraduate students. I gave out a detailed handout, had a slower lecturing pace, learned to speak English with an American accent. This brought a big smile on the students' faces. They said, "You changed overnight!" I found that fascinating. Thereafter, I have kept improving on my American accent as I find delivering a lecture in the local language is an essential part of teaching. Here, the syllabus for teaching Anatomy and Physiology had been formulated in advance by others faculty members, and I had just to follow it. The number of students in each class was around 35. Using the cadaver to teach Anatomy and Physiology changed my entire perspective on life and teaching in particular.

After spending four years in Tennessee, I moved to Massachusetts and found it to be very different. Tennessee was slow and quiet, whereas Massachusetts was fast paced. Teaching at the University of Massachusetts Boston has also been unique in many ways. I like the ethnic diversity here. The big change came in the number of students that I taught. It ranged from a class having 10 students to a class of 250 students. Hence, in each case I had to develop a different strategy. I prescribed a specific textbook, provided students with detailed handouts and tutoring sessions to make the facts understandable to one and all.

Further, the facts had to be connected to arrive at the truth thereby transforming knowledge into wisdom. This transformation seen in a student is what fills the teacher with great joy and energy that propels the wheels forward for more intensive teaching.

While I was going through the adven-

tures in teaching, I was also involved in carrying out research work in the field of human genetics. I was learning the modern techniques of DNA analysis and seeing the suffering of humans due to genetic disorders. At the same time the computer technology had to be mastered. For me two tracks were going hand in hand, the first one being the unraveling of the knowledge of DNA (deoxyribonucleic acid), and the second, knowledge of computer technology. Both tracks were progressing fast and one day they merged into the fields of Biotechnology and Bioinformatics.

Today, scientific instruments can all be connected directly to a computer, so that results seen in a laboratory can immediately be digitized and projected in a classroom. This allows for teaching to be done in real time in conjunction with the laboratory.

The students in this information age find it very intimidating to assimilate all the information given to them. The teacher's job has become equally difficult. It is here that the digital media comes in handy to explain difficult concepts in a short time as for a student to learn all this at one time is a very big task.

All these years, research and teaching have gone hand in hand, complementing each other at every step of my life. What I look forward to now is teaching over the World Wide Web, where you can practically teach anyone in the world. This is the world that I want to step into. YouTube is a video sharing website where lectures can be upload easily in the form of video clips. Further, I would like to create animations in FLASH software so that they can be uploaded to the web easily. Now, all these technologies help students to have a teacher from any part of the world. It is already a reality.

Today, life has become so fascinating because experiments in science and teaching can be done on a daily basis with the help of cutting edge technologies. But all this information was not available at the

time when I began college. There were no personal computers, and very few laboratories were equipped for carrying out work on DNA technology; but what I graduated with, was the capacity to learn on my own. Therefore, today I teach students to just learn to learn. The travel through the times has been so memorable, and the ascent is still going on.