

Preface

My father always told me that I would be a teacher. He didn't mean it in a nice way. My father talked in riddles. As the only child in the house I had plenty of time and opportunity to figure out what he was really saying. This was it: *I am afraid that like me, the best you will be able to do in life is to be a civil service worker.* He was also saying: *if he had realized he was going to be a civil service worker, at least he could have been a teacher, which he might have enjoyed.* He wasn't really talking about me at all.

I never had any intention of being a teacher. I wanted to be a football player. But I could talk better than I could run. I became a professor

because of my excitement about coming up with new ideas.

I have been thinking about teaching for more than fifty years. First I thought about it when my father said that was what I was going to be. Then I thought about as I watched my teachers teach me and no less importantly, watched my father teach me.

My father eventually retired from his civil service job and became a junior high school teacher in Harlem. He loved his new job and, I have to assume, became a good teacher. I say it that way because he was certainly not a good teacher for me, at least not when he thought was trying to teach me.

I remember him trying to teach me algebra and it making no sense to me whatever. I remember him teaching me sports and I mostly think of him as being totally frustrated with my inability to perform as well as he had hoped. (Being a jock was a big thing to my father and I didn't run so well.)

I did fine in algebra without his help and, in fact became, unfortunately, a math major in college. But, as I look back at it, my father was my first and best teacher. Why do I say this?

My father was at his best when he wasn't teaching but when he was just saying what was on his mind and arguing. He often talked about history because he liked history. And when he talked about history and I asked questions, he became a good Socratic teacher. He forced me to think and question in our discussions. The conversations were often very heated but also were a highlight of my intellectual life at that time. My father taught me how to think. For this I am grateful.

As part of my father's conversations about life with me he spent a fair amount of time on his own college experiences. He was sent by his mother to New York City to go live with his aunt in Brooklyn and to go to college. He was fifteen and had, until that time, spent his whole life on a farm/hotel run by his parents in upstate New York. He was unprepared for the city, had no money, missed his family, and had no idea why he wanted to go to college at all. Did I mention that he was fifteen? He had graduated first in his class (a class of sixteen I think) and had skipped a few grades on the way. Suddenly he found himself at New York University, which in those days was located in the Bronx.

This is what he remembered about college in 1923: Apart from the poverty stories, the how hard he had to work to support himself stories, the watching the Yankees from the elevated train and wishing he could go to a game stories, this is what he remembered most: He remembered that teachers lectured, that you had to memorize what they told you and then tell it back to them on a test. He thought this to be an odd state of affairs.

I was thinking about teaching before I got to college and I was thinking about it while I was a professor and I am thinking about it now that I have, for the most part, finished teaching. To make sure I have been thinking about it correctly, I asked former PhD students of mine, (now tenured professors mostly and some industry executives) what they had learned from me while they were spending 4-7 years studying with me. I thought their answers might help me think about teaching in a new way. I sent an e-mail to maybe 20 former students whose e-mail addresses I happened to have and most responded. Here are some pieces of them:

1. I remember quite specifically a homework presentation I made in your class. When I presented it in class, I was a junior in college, and all the other students in that class were grad students. When I was done you smiled at everyone (a rare event) and said, "anyone care to follow that act?" Your clearly heartfelt endorsement of my little research product was a key moment in my coming to trust my own ideas. I just submitted a \$16.7 million proposal to NIH that would create the first all computational genome center. The kind of chutzpah embodied in that proposal is one consequence of my experience with you.

2. The way you assigned me to a project - you sent me to each existing project for two weeks until I hit on a project with a good fit (I was enthusiastic and coherent talking about it). I used this technique when I was assigning people at Accenture.

3. You taught me to teach by telling students stories that are meaningful to you. I think to be a real teacher you have to let yourself be vulnerable. So the students can see that you are a human with feelings and fears and goals. And then being able to say to the students: this is the way I do it; it fits who I am; it helps me be successful; and don't let anyone tell you that you can't do something

4. You taught me that not everyone will like you no matter what you do and no matter how hard you try. I came back from a Deloitte course evaluation, and the deans just hated me. Instead of being upset with me, you assured me that you have to just say what you believe, and some people won't like you, and oh well.

5. You taught me to start by collecting data. I recall watching most of your papers start by collection of data. I recall watching your criticisms of work that was just abstraction on abstraction, with no data at its roots

6. You taught me that often our theories get so complex that it takes a specialist with years of training to understand them. When we get our theories this distant from everyday life and everyday people, it is awkward

explaining what we do when in conversation with our family, friends, the press, and even upper level executives, etc. You taught me to test to see if what you are doing matters and is of interest to the everyday person seeking distraction and some entertainment, but not entirely brain dead, with some curiosity left about life and what others think

7. Nobody really understands their [REDACTED]. thesis until several years after they are finished. You told me this, when you had an insight that I had not had, and I was working much closer to the details. I now take this to be an issue of perspective, and I come across it all the time when I am working with my students. I don't think I understood it at the time you told me, but I trusted it, and I started to see this with my own students, with people I met at conferences and talked to, and with people who came to interview at Georgia Tech. I've repeated it many times. Other faculty now repeat it back to me when some student doesn't realize the implications of what they are proposing.

8. Because there are so many things you could be working on at any time (especially while working on [REDACTED]. research and thesis), do the one you are most excited about at that time. Don't force yourself to do something you think you should do if there are other things on the list that you need to do that you are more excited about.

9. You once told me to imagine that my mother was my audience - if I could explain it to my mother, I could explain it to anyone. Incredibly, this seems to work for every audience out there. So I've passed that tip along to my students and it seems to work for them too.

10. I remember that you used to tell us we need to be excited to get up and go to work in the morning, that that was the most important thing. For some people, it's because of the people you will be with. For some, it is because of the passion about whatever it is. But, in general, I still give people that advice (and it is advice I've also been giving my own kids). You have to love what you are doing.

This is a sample but it reflects what these former students, now all in their forties and fifties, remember about what I taught them. Hadn't they

learned any facts from me? Didn't I teach them some real stuff? Some said in passing that they had learned the actual content of the subjects I taught as well, but that that wasn't as important to them as the things they chose to write about. Why not?

I think that there are two answers to this question and those answers are what this book is really about. My father offered these same answers to me, not explicitly by any means, when I thought about the good and bad of having him as my teacher. When he tried to teach me facts, I learned nothing much. When he engaged my mind, I learned a lot. As a professor I never forgot this lesson. I rarely tried to teach facts, upsetting many a student along the way. I just argued with them, or encouraged them. I never told them much, except maybe some good stories.

So here are the answers:

The first is that

Teaching isn't what outsiders to the profession think it is.

The profession I am referring to here is of course: the teaching profession.

The second is that

Learning isn't what outsiders to the profession think it is.

In this case, the profession I am referring to is not teaching at all.

Let's start with teaching.

A professor friend of mine once asked her class what they thought a professor's biggest fear while teaching a class was. They all agreed it was *not knowing the answer to a question a student might ask*. When she told this story to a group of professors, they all laughed out loud.

Why am I telling this story? Because a student's view of teaching varies greatly from teacher's view. No teacher worries about not knowing the right answer to something a student will ask. You can always fake it (say - *What do you think?* or *Class, can you help here?*) if you think it is important, but answers don't matter very much. Teachers are not supposed to be encyclopedias. They are supposed to be something else. The question is: what?

My student's responses above give a hint. Teachers are supposed to be people who help students find their interests in life, think about how to make decisions, understand how to approach a problem, or otherwise live sensibly. Teachers are never shocked to be asked to provide personal or professional advice to a student having a problem - any problem. Teaching means being available to help if one takes one's job seriously. But then, this important advisory job is confused by lesson plans, and class hours, and lectures, none of which matter very much.

Why do I say that these things don't matter very much? This is the essence of what this book is about - the move from content-based instruction to cognitively-based learning, assisted by good teaching. This means we will have to define this "new" kind of learning (its not really *new* of course, just *new to schools*) and the "new" kind of teaching that is a natural consequence of using this *new learning method*.

Most teachers understand and appreciate that delivering the required material is not their real job, at least it is not the reason they signed on in the first place. The employers of teachers on the other hand, administrators, governments, department heads, and so on, expect certain material to be covered. Exciting students is not on their worry list. This is a big problem for teachers and for students and one that we will address here.

But my more serious concern is our conception of learning, not teaching. Teaching follows one's conception of learning so getting learning right is of prime importance. When I said earlier that outsiders to the learning profession wouldn't get the real point I was being ironic. There is no learning profession. Why not?

In 1989, I moved from Yale to Northwestern to establish a new institute, funded by Andersen Consulting, devoted to issues of changing training and education by the use of new technologies. I needed a name for the institute and came up with *The Institute for the Learning Sciences*. I made up the term "Learning Sciences." There was no such field in academia. Most people thought I meant we were planning to work on how people learned science. The only academic fields that "studied" learning were Psychology, and Education. Psychology, being an experimental field, only allows faculty to work on experiments about learning that provide data in a controlled environment. Education faculty study how schools work and very rarely think about learning outside of the school context or in a way different from the paradigm already extant in schools. I wanted to create a learning profession. In 1989, there certainly didn't seem to be one.

Today this is less true. Cognitive Science, a field I also had a big part in creating, has become more important in the academic world. Training, and e-learning, the first new field to come about as a result of our work at my new Institute (for better or for worse - I am not too fond of most e-learning work) has become more important to think about within the academic context, in part because on line courses are seen as potential revenue producers.

So, while there is still no learning profession *per se*, there is much interest in what learning is about. This book is meant to address the issue of what learning really is, in or out of school, and to answer the question: **how does learning really work?** The questions that follow from the answer to that question are:

1. What kinds of learning situations occur naturally?
2. How can we focus education (and training and e-learning) on those types of situations in a new paradigm?
3. What would teaching look like in this new paradigm?
4. If what we know about how learning works is antithetical to how school works, then what can we do?

Answering these questions is one goal of this book.

Another goal of this book to think seriously about what it means to teach. Typically, we look at teaching in precisely the way that our system forces us to look at it. There are subjects and there are experts and experts talk about their subjects to students who listen to what they have to say. This idea is not only archaic -- it is

wrong. In the history of mankind teaching could never have looked this way.

Teaching always meant apprenticeship until recently. We are set up to be apprentices, to learn by doing with help from a mentor. We have done this since the beginning of time. When learning became academic in nature, when students were expected to become scholars, all this changed -- and it didn't change for the better. Teaching started to mean talking and talking is a terrible way to teach. People aren't really that good at listening after all. Small children don't listen to their parents. They may copy their parents. They can be corrected by their parents. They may be impeded from doing something by their parents. But listen? Not really. We listen in order to be entertained, not in order to learn.

This lack of understanding about what learning really is like, and what teaching must be like in order to be useful, has caused us to set up school in a way that really does not work very well. When students complain about school, when politicians say school isn't working, we understand that there is a problem. But we don't understand what the problem is. We think we can fix the schools by making them more friendly, or safer, or paying teachers better, or having students have more say, but none of this is the case.

We see school as a place to study academics, and to become a scholar, when in, fact very few students actually want to become scholars or study academics. As a society we have gotten caught up in a conception of school from the late 1800's that has failed to change in any significant way, despite the fact that universal education has made the system unstable.

In this book, we will try to understand how learning actually works, and how teaching actually works.