Advice to Students

Dear students,

In preparing my advice for you I asked myself "What would Einstein say?" And it occurred to me that Einstein, being an intelligent fellow, would probably start with a joke. Fortunately, I happen to know Einstein's favorite joke. It turns out to be quite relevant. Here goes.

A man is having trouble with his car; it frequently stalls. So he goes to a garage, and asks them to fix it. They replace the transmission and put in new spark plugs. But his car still doesn't run right, so he takes it to another garage. At this second garage, the mechanic pokes around for ten minutes, then pulls a screwdriver out of his belt and tightens a screw. And now the car runs perfectly.

But the man is irate when he gets a bill in the mail for $200. He storms back to the mechanic, and says, "This is outrageous! All you did was tighten a screw, and you ask for $200! I want an itemized bill!" So the mechanic takes out a pad and pencil, and writes down an itemized bill, as follows:

> Labor: turning screw $5
> Knowing which screw to turn: $195

My first piece of advice is to consider very carefully the possibilities for what you can do, before choosing. This principle works on several levels. You should consider many different possibilities for what general sort of work you want to do, before settling into one. And when you have

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finished one project, you should think about many different possibilities for what to do next. And when you encounter a problem, you should consider various possible approaches, before investing heavily in any one.

It's easy to give vague advice, but I will break new ground, and give you an algorithm. Many of you are probably thinking about getting married, and naturally you would like to maximize your chance of finding the best possible mate. I'll give you an algorithm for that.

You have to estimate the number N of suitors that you can expect to deal with over your career in courtship. We'll assume that you evaluate them one at a time, and that once you've broken up with one, then that one is gone forever. Then what you should do is this. Evaluate, but do not accept, each of the first N/e suitors. Here e is a number, the base of natural logarithms, approximately 2.7. Then accept the first subsequent suitor who is better than all the earlier ones. That is how to maximize your chance of getting the best possible mate.

For example, if N is 10, then you should evaluate but reject each of the first 4 suitors, and accept the first one after that who is better than them. In my own case, I estimated $N = 3$. I dutifully broke up with my first serious girlfriend, but the second was better, and I married her. It worked out fine.

Of course the precise assumptions that underlie this particular algorithm might not always be appropriate, but the underlying lesson is much more general. You should put considerable effort into gathering information before choosing what to invest in. The great mathematician Henri Poincaré, when asked how he came up with such good creative ideas, responded, "I generate a lot of ideas, and discard most of them." This is also Nature's trick, in natural selection.

My second piece of advice is to learn about the history of your endeavor. This has many advantages. By reading masterworks you come in contact with great minds, and get to feel how they operate. Often the original works are well expressed, and you can learn valuable lessons about how to express yourself. Most important, you can begin to see yourself and your work as part of a continuing narrative, that started before you entered, and that will continue after you leave. That is a beautiful thing to realize.