Hello, I’d like to speak on “Programmer Ergonomics”.

1. Ergonomics, it is not a programming language. It is an applied science concerned with the design and arrangement of things people use, … so that they become safe and efficient. Ergonomics is also known as Human Factors Engineering.
2. You (the student) are currently learning the correct **mental** habits of being a software developer. I feel it would be good for you to learn the correct **physical** habits as well. The correct habits of sitting, typing, and seeing, in particular. It is an uncomfortable truth that promising careers have been cut short by “**R**epetitive **S**tress **I**njuries”. We are talking about avoiding carpal tunnel syndrome, avoiding frequent migraine headaches. We are talking serious.
3. First a disclaimer: I am not a physical therapist, nor a professional ergonomist, nor a medical practitioner. I am offering only some experience from my own career. … One observation is that everybody’s body is different. Thus, I can only speak in generalities.
4. I first became aware of human factors engineering while getting my master’s degree in Operations Research at U.C Berkeley. I also learned a great deal on a two-year programming contract at a major oil company. That company mandated **twice** a year that a professional ergonomist review your work station and your work habits. Managers were **required** to act positively on the findings of those reviews.
5. So, let’s begin … from the ground up. You need to have your feet comfortable, either flat on the ground or at a slight angle using a foot rest of some kind. I mention comfortable, because if you ARE comfortable, you won’t be rigid. Rigidity, I was told, is a prime contributor to repetitive stress injuries. Rigidity also turns out to be unproductive. It actually takes a lot of energy keeping the body rigid. You want that energy to go into problem solving instead.
6. From the feet, we move up to how you sit. Your chair height should be such that your knees are roughly at a 90-degree angle and you have good lower back support. Right now some of you, for your studies, may be using a laptop at a kitchen table, sitting on a bar stool, but if you end up working a great deal at home, it will be worth the investment to have a proper office chair, preferably one that can be adjusted in a number of ways.

Raise hand, point to wrist

1. Having chosen a chair, we can look at the keyboard. You want the keyboard height to be such that you type with elbows at about 90-degrees, with your wrists straight. That “carpal tunnel” you hear about is a tunnel of bones in the wrist which nerves run through. Those nerves can fray if they rub against the side of that tunnel too fast too often. … For the keyboard itself, ideally, a split keyboard that allows you to keep your arms close to your body will also help you keep your wrists straight. Such a keyboard can cost over 4 times that of a standard one, but I personally feel it is worth it.
2. Then … there is moving the mouse. The muscles to use in moving a mouse are **at** **the shoulder**. The mouse should be held with the hand and wrist stationary, elbow at 90 degrees. This is something we can try right now. Everybody now, please try. Hold your arm out as if you had a computer mouse in your hand; elbow at 90 degrees. Now move that imaginary mouse back and forth, side to side, zigging and zagging, by moving your entire arm at the shoulder. For me I actually had to do this exercise a few minutes each day to build up the shoulder muscles. Once those muscles got stronger, it became natural to move the mouse with the whole arm rather than with the wrist. … Also, I found it helpful for my chair NOT to have arm rests that got in the way.

Turn chair, use shoulder, etc.

1. Now that we are sitting, typing, and mouse-moving comfortably, we move up to the head. We want to avoid both eye and neck strain. The usual recommended height for your monitor is that when looking straight ahead, your eyes fall at the line an inch or two from the top of the screen.

Move head, turn to side, etc.

1. Here we should be especially mindful to avoid rigidity. Every so often, look away from the screen; try it, now. There, you moved your neck muscles and moved your eye muscles. That oil company I contracted for thought that taking breaks like this was so important, that they had software on each personal computer to lock the user out a minute or so every hour.
2. One last point I want to make is for you to be aware of your body. I was told that once you begin to feel regular discomfort, you should immediately see a doctor. I was told that if you wait until you feel actual pain you may have waited too long.
3. With that, I’ll close saying that it is possible, and that it pays, to properly address the physical side of software development.

Thank you.