Professional Development and Lifelong Learning

What is meant by “Lifelong Learning”

- Learning on your own (or how to learn on your own)
- Effectively using continuing education to maintain and develop technical currency

Why?

- You have a professional obligation to stay current
- Software development is a (relatively) fast changing profession
- Just like in senior design, new projects often require new skills/techniques
- Many projects require non-CS skills/knowledge (to understand user needs)
- Because you are interested / have a desire to learn more!

A process for learning ... Identify:

1. Reason for learning ... e.g., for project, self interest, etc.
2. Extent of learning ... e.g., what/how far into subject
3. Resources to use ... lots of options today
4. Assessment of learning ... when have you “finished/completed” the learning
5. Process improvement ... reflect on learning process

Exercise 1: With a partner, come up with three different scenarios for the process above
Exercise 2: With a partner, write down resources (sources of information) you have used to “learn on your own”

Not all sources of information are equally “authoritative” ...

• “An authoritative source is a work known to be reliable because its authority or authenticity is widely recognized by experts in the field”

• Implies need to (independently) verify authorship and/or content

• Wikipedia, e.g., is not considered authoritative because you can’t verify authorship and anyone can edit an entry at any time

Exercise 3: For each of your resources in 2, write down how you determined whether it was a “good” source and how effective it has been for your learning

Some additional/typical learning resources for software engineers ...

• Graduate school (Masters, PhD)
• Certificate programs (somewhat controversial)
• MOOCs (e.g., Coursera, OpenCourseWare, EdX, Udacity, Udemy, Kahn Academy, …)
• Seminars/Short Courses (e.g., 1 to 5 day intensives)
• Technical conferences (Google I/O, JavaOne, PyCon, O’Reilly, …)
• Books (tons of technical books)
• Online Tutorials (lost of these as well)
• **Side projects** (usually the best for technical skills ... can show what you’ve done)

Exercise 4: Find at least two MOOC classes relevant to your senior design project

Exercise 5: With a partner, brainstorm at least two interesting “side projects” and the skills you would gain from doing them.
Ten Simple Rules for Lifelong Learning (According to Richard Hamming)

1. Cultivate lifelong learning as a “Style of Thinking” that concentrates on fundamental principles rather than on facts
   - look for principles, fundamentals, and patterns
   - facts are important only in so far as they lead to principles

2. Structure your learning to ride the information tsunami rather than drown in it
   - since Isaac Newton (1463-1727) the total amount of knowledge has doubled about every 17 years
   - and the half-life of technical knowledge has been estimate at 15 years
   - if the amount of knowledge available today is $x$, then in 15 years roughly $2x$, while amount obsolete is about $0.5x$, thus increase from $x$ to $1.5x$
   - need some structure to our learning to not get buried in information

3. Be prepared to compete and interact with a greater and more rapidly increasing number of scientists than at any time in the past
   - e.g., 90% of the scientists who ever lived are alive today

4. Focus on the future but don’t ignore the past
   - prepare for the future when it comes
   - don’t reinvent what has already been done

5. Look for the personal angle
   - helps to know why certain technology or approaches exist, and to remember them

6. Learn from the success of others
   - “there are so many ways of being wrong and so few of being right, studying successes is more efficient, and furthermore, when your turn comes you will know how to succeed rather than how to fail”
   - “vicarious learning from the experiences of others saves making errors yourself”

7. Use trial and error to find the style of learning that suits you
   - Learning how to learn is like learning how to paint – one learns by trying many different approaches that seem to surround the subject

8. No matter how much advise you get and how much talent you possess, it is still you who must do the learning and put in the time

9. Have a vision to give you a general direction
   - be economical and structure your efforts according to the general direction in which you want/need to move
• “having a vision is what tends to separate the leaders from the followers”

10. Make your life count: Struggle for excellence

• “the life of trying to achieve excellence in some area is in itself a worthy goal for your life …”
• “a life without such a goal is not really living but is merely existing”