Digital Circuits and Systems (CSD)

What the Best College Students Do[1]

1. People learn best and most deeply when they try to answer questions or solve problems they find interesting, intriguing, important, or beautiful.

2. They can try to answer the question or solve the problems then receive feedback and try again before anyone "grades" them on their efforts.

3. They can work collaboratively with other learners struggling with the same problems.

4. They have lots of opportunities to speculate about possible answers or solutions even before they know much about the subject, and to receive feedback on those speculations.

5. They face repeated challenges to their existing fundamental paradigms.

6. They can get support (emotional, physical, and intellectual) when they need it.

7. They care that their existing paradigms do not work.

8. They believe that they are in control of their own learning, not manipulated.

9. They believe that their work will be considered fairly and honestly.

10. They believe that their work will matter, that it will have significant consequences for themselves and/or their world.

11. They believe that intelligence and abilities are expandable, that if they work hard, they will get better at it.

12. They believe other people have faith in their ability to learn.

13. They believe that they can learn.

14. They have an opportunity to "do the discipline" before they fully "know the discipline (in other words, they have an opportunity to learn by doing and receiving feedback on their efforts).

15. And they have an opportunity to learn inductively moving from specific example and experience to general principles, rather than from the general to the specific.

[1] Adapted from: Bain, K., What the best college students do, Harvard University Press, 2012.

What the best college teachers do[2]

1. Create a Natural Critical Learning Environment (NCLE)

    - Natural – atmosphere in which students can form habits, skills, attitudes and encounter questions.
    - Critical – think critically and reason from evidence; ask probing questions.

    - The best teaching creates a sense that everyone is working together to solve a problem:
        - Listening quietly during a lecture.
        - Working together on a problem in a group.
        - Guidance in helping students to understand the significance of the question, tutorials and self-learning materials.
        - Engages in some higher-order intellectual activity: Get students to do everything except only to listen and remember.
    - Safe, yet challenging condition (try, fail, receive feedback, and try again) – learn by doing and failing.

2. Get the students' attention and keep it in and out of the class.

    - Real-world design problems (creative, semi-structured, open-ended).
    - Use state-of-the-art CAD/EDA technology.

3. Start with the students rather than the discipline.

    - Student-centred (what they do) vs. teacher/discipline centred (how they solve exams).

4. Seek commitments.

    - Student must attend classes and try hard to do the projects before the due date.

5. Help students learn outside of class.

    - Office time, blog, individual feedback on assignments and activities, etc.

6. Engage students in disciplinary thinking.

    - Offer explanations, analogies, tutorials, questions that help them understand fundamental concepts.

7. Create diverse learning experiences.

    - Problems, exercises, individual tests, portfolios, oral presentations, etc.

[2] Adapted from: Bain, K., What the best college teachers do, Harvard University Press, 2004.