

# Critical Thinking for Engineers: Programming scenarios, not coding instructions.

*By Hareem Nisar (PhD student, Biomedical Eng.)*

Intended audience: Engineering department / Introductory programming course

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**The Problem:** Programming is the art of solving a problem using a coding language. Though it is taught primarily in engineering and computer science, it is now held equally important in other disciplines as well. Currently, the introductory programming course includes assignments where detailed instructions are given, and students are to follow them to the T. Students implement each instruction line-by-line and a class of 230 students produces an almost identical code. In my opinion, this technique lacks creativity and problem-solving. The future programmers must know how to solve a problem, not just how to code the given instructions.

**The proposed solution:** The pedagogical approach I am proposing is to switch from the traditional instruction-based coding assignments to the scenario-based programming tasks which can help develop creativity and problem-solving skills. Adapting this “scenario-based” technique for in-class, ungraded assessment will also actively engage the students during the lecture and generate interest in the subject. Students derive their own solution to a problem and implement it using the programming techniques learned in the class.

**Added Benefits:** Scenario-based tasks require that students within each team/group brainstorm ideas, which promotes their team-working skills. Students take ownership and pride in their work. An added benefit is that this technique prevents plagiarism in coding assignments, which is currently a challenge in the course. Students eventually leave the lecture hall with a notion of “perceived learning” which in turn induce confidence in students.

Traditional coding task	Proposed programming scenario
Use the print method with \t command to display the following output: 1) Apple 2) Banana 3) Orange	Design a simple menu for a fruit stand using any print commands you learned today

By the end of this scenario-based assignment or in-class activity, students will have achieved:

1. Problem-solving using critical thinking.
2. Implementation of a programming technique.
3. A sense of skilfulness and perceived learning.

The future of teaching holds that students are equipped with problem solving and design skills, as well as be able to work in teams to come up with creative solutions to a given problem. A scenario-based teaching approach will equip the students with the skills and creativity they need to become leaders of tomorrow.