



Goncalo Martins

Electrical & Computer Engineering

PBL for 1st Year

Engineering

Curriculum

The Challenge

The main goal of this Project Based Learning (PBL) plan is to increase the quality of work produced by students in the 1st year of the engineering curriculum. For that, it is necessary to reinforce/improve intrinsic motivation, fundamental skills and knowledge that will serve as background to the design experiences occurring in the 3rd and 4th years of the curriculum, as also emphasize the importance of self-directed study.

The Approach

The main difference with previous approaches, relies on the fact that the instructor has a mentor/guide role rather than a traditional lecturing role. The instructor brings awareness on self-directed study, and close interaction with students will aim to boost intrinsic motivation. The fundamental skills and knowledge will be acquired during project execution. The instructor has mentors (students with visible intrinsic motivation) from the sophomore, junior and senior year integrated in class to help freshman getting familiar with college class dynamics and hopefully keep students motivated.

The labs and lectures sections are merged in a homogeneous way. The instructor assigns projects where students need to find a solution based on the knowledge that they have. After experience the challenge (failure) the instructor guides the students through the knowledge that will serve as foundation to the projects. With the knowledge acquired during that period, the students will try again to solve projects later in the quarter.

The grading system is also different. It is a system that eliminates points, promotes intrinsic motivation and true content mastery among students. There are 4 possible scores: E (Exceeds), M (Meets), A (Approaches), or B (Far Below). The ultimate goal is to make the students improve their work, perform self-assessment and master fundamental engineering concepts throughout the freshman year disengaging from grade driven mindset. Mastering engineering concepts sometimes can take years. Students should focus on learning and grade is a just a consequence of students work, it shouldn't be considered the ultimate goal.

How it Went

From the instructor's perspective, overall the class went pretty well. At the end of 20 weeks (2 Quarters), students were able to develop their own projects, integrating different systems and provide professional work and engineering documentation (e.g.: block diagrams, schematics, flow charts). However, some big questions remain to be answer: quality time spent, from students, outside of class to study; phone addiction and dependency; what they "hear" in class is not sufficient; is this model of education sustainable?

At the beginning, engineering labs, especially in the area of electronics, can be very frustrating. Students need to develop good habits in order to minimize failure and "bad experiences". The instructor spent 30h per week just in class with students, guaranteeing that everyone was able to get proper assistance, mainly because he believes that proper guidance at earlier years help reinforcing/improving student's intrinsic motivation.

Advice for Others

Class size is normally 100 students per year. The ECE department divides the students in 5 sections with no more than 20 students per section. Labs are offered 3 times per week per section (2h each) – 6 contact hours per week per section. The instructor believes that this model is sustainable if there is more than one instructor assigned for the class. TA's and Mentors are definitely important but not sufficient to guarantee a certain level of quality.

Be ready to be exposed to unknown projects and questions. To promote intrinsic motivation, students are encouraged to bring their own projects and ideas to class. This means that the instructor is "vulnerable" and might not know right away the answer for a certain project/problem. It is important to be comfortable to say "I don't know, let me find out" and be aware that it might take several tries until getting the right answer.



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