The Sure-Fire Foolproof Guaranteed* Project-Mentoring System

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*No guarantee is made regarding the fitness of this product for treatment of students or classes. Your results may vary. Side effects may include nausea, stress, hair loss, frustration, procrastination, premature aging, and damage to lab equipment. Consult a psychiatrist before committing to mentoring large groups of undergraduates in a 'project' setting.

Here's the problem

- Every student is different.

- Every project is different.

- Every student project is *Different.*

- Highly variable individualized systems do not lend themselves to systematic optimization.

Four Guiding Ideas

- The Kagan Axiom

- The Procrastination Principle

- The Powell Observation

- The Yoda Prediction

The Kagan Axiom

If there are no points, there is no point.

The ideal student is self-directed.

- If you tell one "You should look up Finkelbottom's paper" they will read Finkelbottom's paper and all its references.

- If you say "You should order parts before next Tuesday" they will present you with an invoice on Wednesday.

The real student is in your class.

- "I printed that paper out to read on the bus… it's in my bag here, somewhere… what brand of voltmeter did Finkelbottom use?

- Wednesday: "So… what parts will I need, and where would I order them?"

- *Even the self-directed students occasionally try silly things like taking other classes or sleeping.*

So, small regular assignments, *with points on each.*

- "Your assignment for next week is to have read Finkelbottom and two other relevant papers. Be prepared to answer questions about them."

- "Email me a link to your Digikey cart with parts for everything in this circuit by 4pm Tuesday."

The Procrastination Principle

Everything gets done at the last minute.

So… Make lots of last minutes.

- Engineering-style project timelines are key.

- Weekly milestones.

  - e.g. Week 1: Turn in your draft project timeline.

  - e.g. Week 3: Give a 10-minute talk in class outlining relevant publications from your literature review.

  - e.g. Week 4: Turn in your pre-amplifier circuit diagram.

  - e.g. Week 9: Turn in the first draft of your JAUPLI submission.

(Hey, look, I'm using PER! I'm circling back to previous concepts!)

- All those timeline milestones must have associated points, *or there's no point*.

The Powell Observation

No battle plan survives contact with the enemy.

That timeline? It's wrogn.

- Things break.

- Things don't work.

- Students misunderestimate the difficulty of the project.

- The timeline will need to be adjusted…
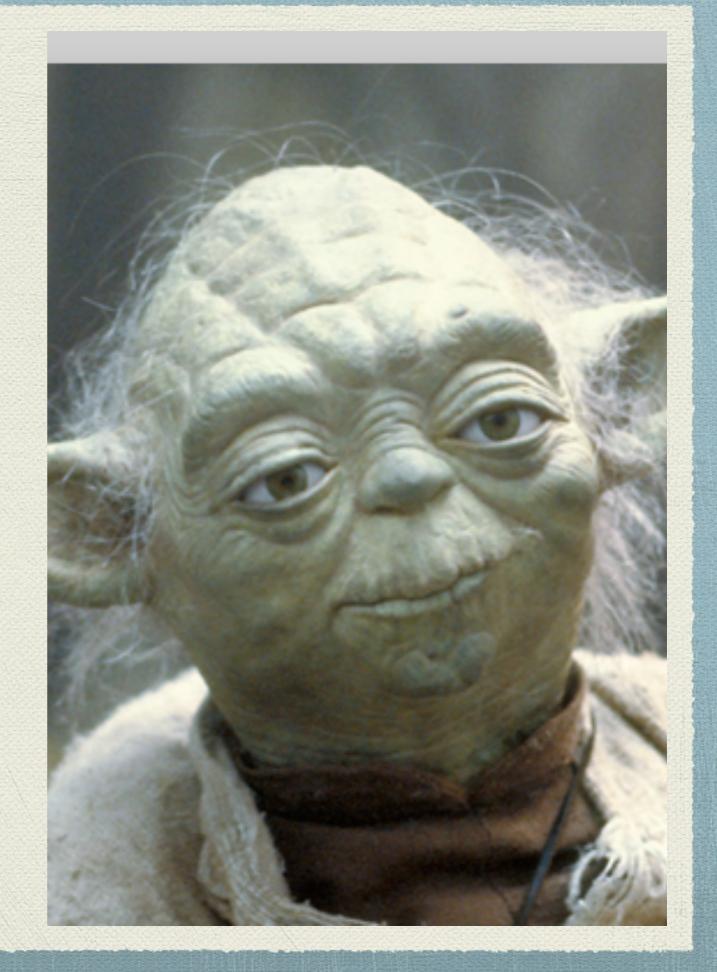
DO NOT retroactively adjust deadlines.

* The Procrastination Principle presents a problem.

* Prevent Procrastination Principle problems by applying the Kagan Axiom.

DO NOT retroactively adjust deadlines.

- If they missed a deadline, they missed those points.

- You generally don't have to do this more than once per semester.

- A reputation for inflexibility regarding deadlines makes your life easier.

- You can continue to make students think you care by being very reasonable regarding *future* deadlines: adjust the timeline in discussion with the students.

The Yoda Prediction

Always in motion the future is.

You need to see the future, but this is not as hard as you would think.

- Keep close enough tabs on students' progress that you can let them make (relatively) harmless mistakes, *and have a solution ready* so they can stay on the timeline.

- This is work, but that's why they pay us the big bucks.

Example:

- Students need a low-noise pre-amplifier, and they design one using a 741 op-amp.

- When they order the parts, quietly add a couple OP27s to the order.

- Let them build it, but make sure the 741 goes in a socket rather than soldered to the board.

- When it doesn't work, it's a HUGE learning opportunity regarding "real" op-amps: and you "just happen" to have some OP27s handy…

Encouraging Words

- "Reply hazy, try again."

Am I doing OK on this talk?

- If I have given you the impression that I have a working system for smoothly running a project-based Advanced Lab course, *I've failed to communicate.*

- Just to be clear: I don't believe there *is* a "Sure-Fire Foolproof Guaranteed Project-Mentoring System": These are tools I use to try to generate *any forward progress at all!*

- Every mentoring situation is still *Different.*

- Advanced Lab still expands to fill all available time.

- But… Careful management lets me spend more of that time on the more interesting parts of the job!

Ideas? Questions? Suggestions?

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