

E²Coach in Physics: who takes advantage of personalized feedback, encouragement, and advice?

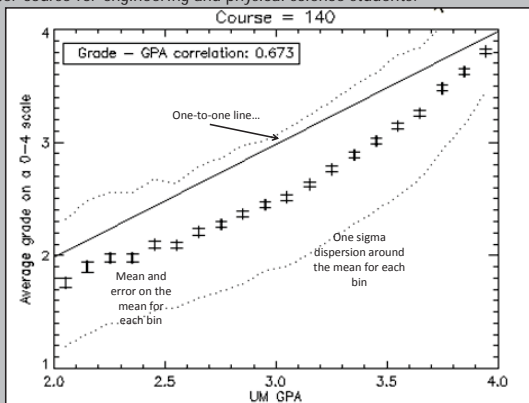
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Who does better-than-expected?

In 2008, we began a learning analytics project aimed at understanding student performance in large introductory physics courses. The 'Better-Than-Expected' (BTE) project gathered information describing the progress of 48,579 UM students through these courses over a period of 14 years. In this dataset we combined detailed information about the student on arrival in the class (including standardized test scores, high school and prior UM GPA, socioeconomic status, gender, etc.) with a full portrait of their progress through the course (including homework grades, classroom participation, exam scores, and final grade).

These data allowed us to quantify the correlation between student preparation, background, and initial performance on course outcomes – to construct predictive models of student success. We find that final grades can be predicted from information about an entering student quite well, with a dispersion of half a letter grade. The simplest predictor is incoming UM GPA.

Example results from the UM "Better than Expected" project for Physics 140, the first semester course for engineering and physical science students.



Mean grades (as points with error on the mean) and one σ dispersion (as lines) as a function of UM GPA at the time the course begins. **These are challenging courses, with mean grades lower than typical GPAs.**

Gathering Advice for E²Coach

Collecting expertise:

- 1. Introductory students:** The Center for Research on Teaching and Learning (CRTL) conducted interviews with 19 previous students who did better- and worse-than-expected
- 2. Advanced undergraduates:** CRTL surveyed 78 Science Learning Center (SLC) physics study group leaders
- 3. Faculty:** Interviewed 9 introductory physics teaching faculty members
- 4. Literature:** Examined inter-disciplinary research including Physics Education, Psychology, Behavior Change Theory, etc.

Programmed logic within the MTS framework

What does E²Coach offer?

Personalized feedback and advice

Performance status updated as the course progresses

Testimonials match the student's identity

Timothy, an engineering student who earned an exemplary grade when he took Physics 140, says: "For me, the first step was attending lectures and discussions, paying attention, and taking the i-clicker questions seriously."

"My family and close friends are most important to me. They are my backbone and support me through everything I try. Second, because I want to become a doctor, I value learning and gaining knowledge. In order to be successful in school and in everyday life it is important that you're well-educated. Finally, I value a sense of humor because it's a big part of who I am today. It's important for me not to take things too seriously despite all of the stresses of school."

Values Affirmation Exercises

...and more...

Implementation in W'12

- Currently being used by **950 students** this semester!
- Available in the life science sequence (Physics 135/235) and the engineering/physical science sequence (Physics 140/240)
- 7 communications delivered throughout the semester
- Survey given at the beginning of the semester; students may opt-out
- Data collected includes:
 - General Information (e.g. name, UM cumulative GPA, college)
 - Future Plans (e.g. concentration, post-graduate plans)
 - Science/Math Background (e.g. high school physics, college math)
 - Plans for this semester (e.g. expected hours of study, Physics Help Room use)
 - Attitudes (e.g. physics is innate, confidence)

E²Coach Status

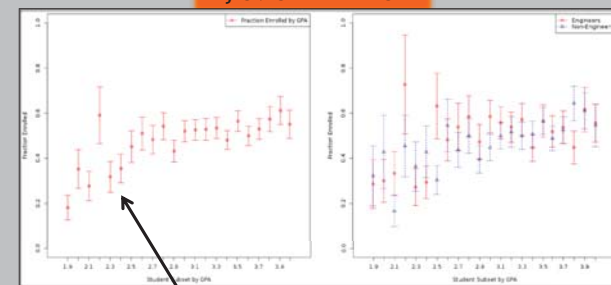
E²Coach Enrollment : by Engineering, by Gender, by Course

		Physics 140		Physics 240		Physics 135		Physics 235		All Courses	
		Enrolled	Total	Enrolled	Total	Enrolled	Total	Enrolled	Total	Enrolled	Total
Engineering	Both Genders	292	511	145	266	2	1	0	0	438	880
	Male	196	359	102	188	1	1	0	0	299	604
	Female	96	152	43	78	1	0	0	0	139	276
Non-Engineering	Both Genders	92	151	43	187	187	174	0	0	406	696
	Male	47	83	23	81	92	82	0	0	217	392
	Female	45	68	20	106	95	92	0	0	189	304
Percent		43.1%	43.4%	43.4%	43.4%	N/A	N/A	N/A	N/A	45.0%	45.0%

More females students have chosen to enroll in E²Coach

More students in first-semester courses have chosen to enroll, especially Physics 135

E²Coach Enrollment : by UM Cumulative GPA



Resource Usage: Gender Differences

- More female engineering students reported that they will frequently attend Office Hours
- More female students reported that will frequently visit the Physics Help Room
- More female students reported that they're interested in SLC study groups, especially among engineering students
- More engineering students reported that they're likely to study with a partner

		Frequently attend Office Hours		Frequently visit the Physics Help Room		SLC Study Groups		Likely to study with a partner	
		Enrolled	Total	Enrolled	Total	Enrolled	Total	Enrolled	Total
Engineering	Both Genders	279	279	266	266	233	233	233	233
	Male	181	181	141	141	187	187	187	187
	Female	97	97	125	125	46	46	46	46
Non-Engineering	Both Genders	114	114	114	114	114	114	114	114
	Male	59	59	59	59	59	59	59	59
	Female	55	55	55	55	55	55	55	55
Percent		43.1%	43.1%	43.1%	43.1%	43.1%	43.1%	43.1%	43.1%

Next Steps

In this initial implementation we required students to opt-in to the system. The data above show that many of the students we most want to reach have not taken advantage of what E²Coach has to offer. We have come to realize that while developing message content is important, so is building a system that engages the students with the material.

We are planning on requiring E²Coach participation for the Fall '12 semester and planning to engage other campus resources. We envision that E²Coach will deliver messages to academic support units such as CSP, WISE, MEPO, MSTEM Advisors, in an effort to provide students with personal support when it is most required.