

If Only I'd Passed Biochemistry

By Arianne Cohen

Universities have traditionally created foundational or introductory courses that fail out many students. But are such “weed-out” classes dashing the career hopes of many promising students who might be future successes in the corporate world?

Brad Biren was thrilled to snag a ticket to an unstoppable career: admission into a dual law and business degree program. With those credentials, who couldn't make it rain money?

But from the first week of his JD/MBA curriculum in 2009, half of his plan went south. His law classes, he recalls, were filled with boisterous Socratic dialogue, in which professors questioned the students, then students probed the professors, and avid conversations ensued. The MBA classes were, well, different. “The business school was cemented in the idea that what they were teaching should not be questioned,” he

WEED-OUTS, By the Numbers

Academia isn't shy about studying itself, so scholars have gathered together ample data sets to quantify the effects of weed-out classes on students.

25%

Students in weed-out courses who report negative consequences from some aspect of the classes.

29%

Students in those classes who receive Ds or Fs or withdraw.

3

Years it typically takes a school to redesign one of these classes.

1 in 5

Proportion of all weed-out classes that are intro chemistry classes.

7%

Probability that a woman who fails calculus will go on to receive a bachelor's degree in a STEM field.

86%

Probability that a man who fails calculus will go on to receive a bachelor's degree in a STEM field.

says. He participated similarly in both programs, but while his questions were interpreted as curiosity in law classes, he says, "in business classes, they were interpreted as ad hominem attacks against my professors."

Biren describes his mode of thinking as considering different concepts at the same time, and questioning them both. This approach continued to play poorly in his second round of business classes, where the atmosphere grew flat-out uncomfortable. When Biren introduced himself to a new class, the professor replied, "Oh, I've heard about you." He graduated from the law school with honors. The business school? "There was no point in continuing."

A decade later, as a successful attorney practicing in tax and elder law in Des Moines, Iowa, Biren has moved past all this. But many students never do. As long as universities have existed, an innumerable number of career hopes have been derailed by so-called "weed-out" classes, which year after year crush the dreams of promising engineers, marketers, and CEOs. In doing so, these classes also reduce the pool of talent for a corporate world that is facing a serious shortage.

Classes that serve as gatekeepers are so endemic throughout higher education that they're hard for any student to miss. They are typically foundational or introductory classes, often with high enrollments, such as psychology, economics, accounting, physics, chemistry, biology, or world history. Some appear midway through prerequisite course loads, such as organic chemistry for premed students or anatomy and physiology for nursing students. The frequency with which students are tossed off the track differs depending on the institution. At schools that accept most applicants, 50 to 60 percent of students may earn Ds or Fs or even withdraw—known in the field by the acronym "DFWing." At selective schools, DFW rates can be under 10 percent yet a significant proportion of students who pass but struggle in the class decide to shift careers.

Proponents say that this is how the educational world operates, relying on various benchmarks to move the right students forward. But critics say the system weeds out so-called late bloomers and too many other promising students, especially low-income students and students of color who come from underresourced school systems. Weed-outs also tend to amplify problematic gender ratios. "We have admitted these students willingly to our institutions," says Drew Koch, CEO of the John N. Gardner Institute, an organization that improves collegiate teaching and learning and also tracks weed-outs. "The idea that we now need to weed out students to somehow maintain standards and rigor is really no longer relevant, equitable, nor fair."

In earlier eras, weed-out classes were undoubtedly more relevant, when university student bodies consisted of the male offspring of affluent landowners. Long before standardized testing, weed-out classes served the important purpose of removing low performers while maintaining intellectual standards. Critically, a wealthy male student tossed from a law or medical track could still enjoy a bright future.

Fast-forward two hundred years. From the Ivies on down, colleges now are expected to vastly widen the net of opportunities for all, to greatly open up financial aid, and to compete for the most diverse classes possible. Many of the students they admit

arrive with dreams of future lives they've had since childhood, or with eyes dazzled by a host of exciting career paths.

Some enroll in a weed-out course because they're interested in the topic, or because it's a prerequisite for a career track. Almost immediately, though, the stakes balloon: A low grade can induce rippling negative effects, such as threatening federal aid money or forcing families to take more of it. Weed-out courses such as college calculus or writing, which are often among the first that students encounter, can deter them from college altogether. Students from less competitive high schools face a particularly uphill battle in STEM fields, because those fields are

cumulative. This means students often find themselves bombing multiple courses at once. For example, a student struggling in freshman calculus can end up dropping the course to take remedial algebra—a decision that will lengthen their undergraduate career and put a "W" on their transcript—while simultaneously trying to not fail introductory chemistry. Just thinking about it induces anxiety.

Sociology professor Deborah Cohan teaches Introductory Sociology at the University of South Carolina Beaufort. The class is a prerequisite for the school's popular and competitive nursing program, which many students perceive as a lifetime ticket to



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a \$30-to-\$50-per-hour salary and family-friendly schedule in a highly sought-after field. “The students are often under so much familial pressure,” she says. The nursing program has far more applicants than slots, and the students transfer some of that pressure onto professors like Cohan. Grade-grubbing pleas include the typical “This is going to ruin my GPA,” “I’m going to lose my scholarship,” and “I’m going to get kicked off the team.” “Then they add, ‘I’ve wanted to do the nursing program since I was four years old,’” she says. After Cohan posted final grades last semester, one student called her cell phone a half dozen times, emailed and texted, and left three voicemails, hysterically wailing that she was not going to get into the nursing program. “She was coming unhinged.”

The question is whether Introductory Sociology really does weed out students who are unsuited for a career in nursing. Enrollment hovers around 70 students, nearly all studying pre-nursing or checking off a general education requirement. Grades vary widely from semester to semester (a positive sign that the professor is not grading on a curve). This year Cohan had 10 As and “quite a few” Ds and Fs. Those who struggle tend to see the class as a less-than-fair obstacle on an incoherent path toward patient care.

Cohan says she never wanted to be the gatekeeper to a health care profession. She loves sociology. That said, she points out

many excellent reasons why a professional nurse should have a foundation in the understandings of inequality, gender, race, class, and sexuality that arise through sociology. Her class touches, among other things, on domestic violence, childhood hunger, and body image. “All of these are definitely topics that future nurses should be exploring and mastering,” she says, “so that we have medical personnel who are more savvy about human interaction.”

Her argument mirrors the broader argument for liberal arts: if a student on a preprofessional track is exposed only to topics directly related to their profession, their mindset will remain narrow and oblivious to the wide array of ways of thinking about the world. Cohan herself regrets that as an undergrad at the University of Wisconsin-Madison, she myopically “gobbled up every sociology class that I could. I was so driven by my interests. But there’s something lost in that. I think it’s worth it for students to dabble in many disciplines.” And yet it’s often these classes that end up serving as weed-out classes.

Professors like Cohan are placed in an untenable position. But she says that students who get poor grades in sociology often do so because of traits or behaviors that will get in the way of a successful nursing career. “I hate being the person that’s perceived as standing in the way of their dreams, but at the same time, the way they behave in class or interact with me can be very telling.”

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Not surprisingly, there is a strong movement to weed out weed-out classes, and it is coming from within many universities’ own halls. Koch, at the Gardner Institute, blanches at the idea that weed-out classes offer everyone a fair and equal shot. “The reality is that most students weren’t treated equitably and fairly since birth,” he says. “If we turn a blind eye to that, we’re just using our courses to reinforce privilege.” He says that the courses tend to perpetuate themselves under the cover of institutions’ focus on student responsibility: if a student fails, it’s on her. “It actually allows institutions to not have to look at themselves and see why this keeps happening,” he says.

Marissa Thompson, a postdoctoral fellow in education policy at the University of Michigan’s Ford School of Public Policy, has done research tracking weed-outs and found that a low first-year grade in a STEM class commonly discourages students from pursuing the major altogether. She says that there’s a contradiction between colleges’ messaging about diversity and inclusion and the ways that their weed-out classes discourage people from those fields—often along gender, racial, and socioeconomic lines. “If universities are serious about opening up the pipeline, or encouraging more students to consider STEM, they’re not going about it in a way that is necessarily going to accomplish this goal,” she says.

Schools that have addressed the issue tend to offer reduced class sizes as well as special support, such as supplemental classes and tutoring. At Arizona State University, Biology 101 was once a 300-student lecture class, with a withdrawal rate of 20 percent and a failure rate of 25 percent. Then the school hired hundreds of computer scientists and curriculum designers to collaborate with professors to reshape Biology 101 and other lecture courses. Students now work together in small groups and do interactive homework online—including interactive remedial and review learning, as needed—that routes them on their own paths through the material. This is known as adaptive learning. The interactive software aims to provide students with the lessons they need at any given moment, with the baked-in understanding that students with differing backgrounds or diverse cognitive profiles can all succeed, but will likely do so

on different timelines. Some classes allow fast-moving students to finish months early; professors can follow students’ progress day-to-day, and intervene quickly.

In Biology 101, the withdrawal rate dropped to 2 percent and the failure rate to 10 percent. A similar intervention for the school’s introductory algebra class more than doubled the pass rate of students with the lowest placement scores. Thirty other public universities have adopted the same strategy. On any given day, a dozen students in algebra could be working on a dozen different skills. Though this may sound expensive (and it is), proponents say it is cheaper than losing tuition-paying students semester after semester, and it spurs a priceless dividend: interested, talented students do not fall off career tracks en masse.

Companies may be able to learn from this, experts say. College introductory courses have become a well-researched testing ground for whether motivated people succeed when given access to the upskilling and knowledge they need. The evidence suggests that most do succeed, as long as the atmosphere encourages mastery of content. Scant data exists on intern and entry-level employee-training programs, but the same concepts undoubtedly apply. In a time when many firms struggle to find qualified people, experts say it may be worth the effort for companies to hire and train applicants who are many steps behind their peers but still very promising.

The tech industry has long since taken matters into its own hands, out of necessity: for over a half decade, technology has evolved faster than colleges can adapt curricula, leading to a technical skills gap that is expected to cost \$775 billion this year in delays and cancellations. Tech giants are now largely unconcerned about how their employees fared in Comp Sci 101; lots of engineers and developers never took the course at all. Microsoft’s ever-growing Learn program allows workers to snag certifications via free online coursework; the company is now in its second year of a “global skills initiative” partnership with LinkedIn Learning aimed at training 25 million people online, at their own pace, college-credit counts be damned.

Koch says that adaptive-learning curricula alone will not solve the problem. An organizational mind shift is necessary: institutions that help people master content also need to reward that mastery at all levels. Mastery is collaborative among learners and teachers, not competitive. Yet in both academia and the workplace, senior employees are often rewarded based on entirely unrelated metrics, such as P&L or research publications. In Koch’s view, a greater focus on the knowledge and upskilling of underlings is a rare win-win for employers, employees, and students of the future alike. “We get better-prepared doctors, engineers, and bridge-builders,” he says. “We all benefit.”