I teach to a variety of learning styles. A single linear algebra lecture might include visualizing coordinates on a plane, use of matrix and algebraic formalism to express this same concept, sketch proofs of theorems the validity of these formulas, as well as open-ended discussion of where applications might arise.

My teaching style

Every student hears the lecture but it's hard to lecture to each student. It is necessary to include enough variety of material and presentation for every student to get what they need.

(i) **Discrete learning goals**: For each class meeting I set about three learning goals. For example, on the day when we first see integration by parts I try to get the students to learn (1) the basic formula, (2) where it originates, and (3) the basic principle behind choosing u and dv. It's easier to organize the lesson and measure the students' learning success this way.

(ii) **Warm-up exercises**: I have found that putting a couple simple exercises on the board at the beginning of class is useful for the students. The students work alone or in groups for a few minutes, then we go over the solution in detail as a class. I have now used this approach in classes ranging from Applied Matrix Theory to Real Analysis to Introductory Calculus. Every time students have mentioned it as something useful. It also helped some of them feel more comfortable asking questions.

(iii) **Don't overwrite the lecture**: I try not to overstuff my lecture notes, which gives me more room to improvise a bit and interact with the students more. If I notice myself spending too much energy writing detailed lecture notes I check to make sure I've addressed other aspects of the class meeting. (For lengthy proofs it's still helpful to have everything written down.)

(iv) **Humor and fun**: Students with a heavy workload often expect math to be dry, so they respond positively to a random joke or funny picture. A little goes a long way in this direction. When teaching Discrete Math I introduced our section on graph theory using the game Six Degrees of Kevin Bacon. For my upcoming calculus class this fall, I've planned some Jeopardy-style games for exam review.

(v) **Upload notes**: Students love having uploaded lecture notes on the course website. Even when you follow a book fairly closely, like I do when I teach Matrix Theory, they appreciate having notes to compare with their own. I don't typically use Beamer slides but now I try to upload a scanned .pdf of the written notes, or, if I have the time, a TeXed version.

(vi) **Understand the audience**: a classroom of Computer Science majors has different interests, and different objectives, than a classroom of junior and senior Math majors. I find that adding more applications helps make the material seem less arbitrary for the more pragmatically oriented students. Furthermore, I spend time trying to make sure that any cultural references won't be so specific that they are lost on international students. I also try ensure that students with disabilities especially welcome in disclosing them to me and seeking accommodations within the classroom.

Teaching philosophy

I base my teaching on the idea that each student must construct their own internal model of each concept in the course. Some of these can be simple, like vector addition or basic derivative rules; others can be complex, like mathematical modeling and proof-writing. Regardless of their complexity it is necessary that each student fully internalize each concept before they can really use them in any interesting or useful context. For example, a student who has no clear internal picture of matrix multiplication will be unable to master the process of vectorizing a computer program, and will instead find it confusing and arbitrary. An upper-level math major who has not fully internalized the concept of induction will be stymied by the proof of a simple result like Cauchy's theorem in group theory. For each concept I try to motivate it, then state it, then provide many examples and opportunities to practice, and finally I try to evaluate each student's internal model via fair and rigorous exams.

In order to construct such a model each student has to understand the problem that the concept is meant to solve *before* the concept is introduced; otherwise learning it will be sheer memorization. I try to keep the problems "in front" as much as possible, so that the theory and concepts do not seem contrived or useless. Sometimes it's very hard to naturally center the course around problems, and one has to just teach theorems, but it's still useful approach to try to maintain.

There is not a one-size-fits-all approach which will serve to help every student, so I try to keep my classroom style flexible and responsive. When I taught Bridge to Higher Mathematics, I began the course by using a traditional lecture format, but gradually phased in more and more group work as it became clear that my students learned better in groups. Similarly, when I taught Multivariable Calculus, I originally used Beamer slides in order to speed up the process of drawing diagrams. I found that the students were unable to internalize the material on Beamer slides effectively, and stopped using them.

SAMPLE DAILY WORKSHEET

Problem 0

(a) The Product Rule says that

$$\frac{d}{dx}(F \cdot G) = \_\_\_\_\_$$

(b) If $f(t) = te^t$, then is $F(t) = \frac{t^2}{2} \cdot e^t$ an antiderivative for $f(t)$?

(c) If $u = x^2$, what is $u'dx$?

(d) If $u = e^t$, what is $u'dt$?

(e) If $v'dx = 4xdx$, what is v?

(f) If $v'dx = \cos(x)dx$, what is v?

(g) If $v'dt = t^3dt$, what is v?

(h) Integration by parts says that

$$\int uv'dx = \_\_\_\_\_$$

(i) Using integration by parts, we get that $\int xe^x dx =$ _____.

(j) The velocity of a particle is given by $v(t) = te^t$ (meters/sec). How far does it travel from $t = 0$ to $t = 2$ (seconds)?

(k) What does integration by parts look like for definite integrals?

$$\int_a^b uv'dt = \_\_\_\_\_$$

SAMPLE DAILY WORKSHEET

Integration by Parts

$$\int (uv')dt = uv - \int (vu')dt$$

Note: $uv' \neq (uv)'$. Sometimes we write, for example, dv instead of $v'dt = \frac{dv}{dt}dt$.

$$\int u\,dv = uv - \int v\,du.$$

When choosing u and dv, try to make sure

- the derivative of u becomes simple;
- v, which is an antiderivative of v', is easy to calculate.

Problem 1 Calculate $\int f(t)dt$ for each

(a) $f(t) = te^{2t}$ [Hint: we calculated $\int e^{kt}dt$ once.]

(b) $f(t) = t\cos(t)$

(c) $f(t) = t^2\ln(t)$

Student evaluations

BRIDGE TO HIGHER MATHEMATICS - ST LAWRENCE UNIVERSITY - SPRING 2019 Evaluation Statistics

- On a 1-7 point scale (7=highest), average student agreement with "The course was organized effectively" was 6.3 (university average: 6.1)
- On the same scale, agreement with "The instructor was an effective teacher" was 6.4 (university average: 6.2)
- On the same scale, agreement with "I would recommend the this instructor to another student was 6.9 (university average: 6.1)

Student Comments

- "I would definitely recommend this instructor because he is my favorite professor on campus and this is the 4th course I've taken with him."
- "Always willing to hold an appointment on any day at the student's convenience to help them."
- "I forced my friend who hates math to take his class and she did well because of his ability to make any concept seem simple and easy to understand."

MULTIVARIABLE CALCULUS - ST LAWRENCE UNIVERSITY - FALL 2018 Evaluation Statistics

- On a 1-7 point scale, average student agreement with "The course was organized effectively" was 6.9 (university average: 6.0)
- On the same scale, agreement with "The instructor was an effective teacher" was 7.0 (university average: 6.1)
- On the same scale, agreement with "I would recommend the this instructor to another student was 6.9 (university average: 6.0)

Student Comments

- "Dr Crytser is great, he is able to create a comfortable environment in which students can learn effectively."
- "He is very passionate about math, and is very engaging when explaining concepts."
- "He has great assessment and feedback, which is really helpful."

VECTOR CALCULUS - ST LAWRENCE UNIVERSITY - SPRING 2018

Evaluation Statistics

- On a 1-7 point scale, average student agreement with "The course was organized effectively" was 6.8 (university average: 6.0)
- On the same scale, agreement with "The instructor was an effective teacher" was 6.7 (university average: 6.1)
- On the same scale, agreement with "I would recommend the this instructor to another student was 6.7 (university average: 6.1)

Student comments

- "By assigning what might be termed "critical thinking" problems, the computational elements of the class were enhanced greatly."
- "I really enjoyed the practice problems in class and felt comfortable asking questions."
- "Very clear and structured teaching. No curve balls or randomness."

REAL ANALYSIS - ST LAWRENCE UNIVERSITY - FALL 2017

- "Very routinely organized classes and homework. Always have opening small problems to fresh up minds and to review previous works. Slow teaching (in a good way)."
- "Dr. Crytser made in-depth comments on each of our homeworks outlining ways in which we could improve. I found this very helpful for my proofwriting. This was/is a difficult course for me. I think that Dr. Crytser has done an excellent job of teaching the material and making it as accessible as possible."

CALCULUS II - ST LAWRENCE UNIVERSITY - SPRING 2018/2019

Evaluation Statistics

- On a 1-7 point scale, average student agreement with "The course was organized effectively"
  - SPRING 2018: 6.4 (university average: 6.0)
  - SPRING 2019: 6.6 (university average: 6.2)
- On the same scale, agreement with "The instructor was an effective teacher"
  - SPRING 2018: 6.6 (university average: 6.1)
  - SPRING 2019: 6.4 (university average: 6.2)
- On the same scale, agreement with "I would recommend the this instructor to another student"
  - SPRING 2018: 6.5 (university average: 6.1)
  - SPRING 2019: 6.9 (university average: 6.1)

Student comments (Spring 2018)

- "Best mathematics teacher I have ever had."
- "Welcoming voice, passionate about subject."
- "He is what made me decide to be a math major. He is who I aspire to be as an instructor."

Student comments (Spring 2019)

- "Clear, concise, well-practiced, welcoming."
- "It was very helpful how clearly he explains everything."
- "Actually goes out of his way to help you understand."

CALCULUS I - ST LAWRENCE UNIVERSITY - FALL 2017/18

Evaluation Statistics

- On a 1-7 point scale, 7 = highest, average student agreement with "The course was organized effectively"
  - FALL 2017: 6.1 (university average: 5.9)
  - FALL 2018: 6.5 (university average: 6.0)
- On the same scale, agreement with "The instructor was an effective teacher"
  - FALL 2017: 6.5 (university average: 6.0)
  - FALL 2018: 6.5 (university average: 6.1)
- On the same scale, agreement with "I would recommend the this instructor to another student
  - FALL 2017: 6.4 (university average: 6.0)
  - FALL 2018: 5.9 (university average: 5.9)

Student comments (Fall 2017)

- "Brought a sense of humor to math and made the class more relaxed."
- "Devoted to student understanding."
- "Danny showed me that calculus isn't that scary!"
- "He was able to make a seemingly very boring topic easier to learn with his teaching style. He is very approachable."
- "I really liked this Professor and I strongly recommend him to other students."

Student comments (Fall 2018)

- "Very good at answering all students' questions and even checking to make sure everybody understands something before moving on."
- "Very knowledgeable, straightforward, and positive."
- "Makes problems interesting. Makes terrible jokes, but the class laughs anyway."

APPLIED MATRIX THEORY - KANSAS STATE UNIVERSITY - FALL 2014/SPRING 2015)

- "Danny is an amazing professor who knows how to logically structure his course so that it is extremely understandable. He explained subject material very well in one on ones."
- "Dr. Crytser is a good instructor. he is knowledgeable and approachable. His expectations for the course were realistic, and the exams reasonably covered what was expected. This is my favorite math course."
- "Cryster [sic] was a great instructor!"
- "Danny is the best instructor I have had during my time at K-State. He was legitimately enthused with teaching and was always more than willing to help. I would take every math class with him if I had the chance."

MATH 54 - DARTMOUTH COLLEGE - POINT-SET TOPOLOGY - SUMMER 2012

- Excellent man, excellent teacher. Not what I expected from a graduate student. Great experience to be in his class
- "Awesome, inspiring, and great lecturer. I learned so much."
- "The professor was excellent. He was engaging in class and clearly cared about and knew the material. He also worked very hard to guide our thinking - aiming for self discovery - without giving us answers. He was also extremely available and useful outside of class."

MATH 3 - INTRODUCTORY CALCULUS (FALL 2011)

1. "Prof. Crytser explained concepts very thoroughly and patiently. he did not take any short- cuts in proofs, which allowed us to follow each and every step, and ask questions."
2. "Prof. Crytser is an excellent instructor that can convey complex ideas fluidly and clearly. His sense of humor also makes the class funny, interesting, and engaging."
3. "Amazing instructor. Instills confidence in his students throughout the course."
4. "D. Cryts is awesome."