Jeff Anderson's Ungrading FAQs (Frequently Asked Questions)

What are Jeff's grading policies?

Any student who completes this class earns the right and responsibility to assign their own grade. Moreover, I tell my students: "if your are able to finish the work you commit to in our class, I recommend but do not require that you give yourself an A letter grade."

What do students have to do to finish one of Jeff's courses?

To complete our class, my students must create and iteratively improve a customized learning portfolio that shows ample evidence of deep learning. As my students build their portfolios, I ask them to include two types of work.

1. Evidence of Understanding and Expertise in the Mathematical Content of the Course

The first type of work my students include in their learning portfolio is concrete evidence to demonstrates their mastery of the mathematical ideas they study in our class. I provide a series of possible calendars for students in each of my class. When I look for evidence of mastery, I use my five stage model for expertise and look for evidence that my students have created deep understanding of the course content. Moreover, I look for evidence that students are developing an external capture system, like a second brain, so that if students need to remember some special idea they learned in our course, they can go back into their capture system and retrieve their learning quickly.

In order to finish the class, I ask my students to demonstrate deep learning for all the content highlighted in the Beginning Level calendar for that course. Those calendars are posted on each of my course homepages for the target quarter. Towards this goal, I challenge my students to write their own textbook on our course content. In their textbook, I ask students to show me their creative attempts to build deep understanding of core mathematical definitions, theorems, techniques, and ideas that are central to the class.

Over the years I've done this work, I've noticed that many of my students do not know how to learn math at deep levels. This is mostly because the majority my students have been traumatized by years of high-stakes testing and a letter grading system that focuses on exam performance rather than deep intuition. The perverse nature of traditional grading systems robs students of the type of autonomy they need to learn for themselves and instead incentivizes students to maximize their grades independent of the strength of their learning.

To help my students learn how to learn mathematics at the highest levels, I guide them to strive to study each mathematical idea in our course using many different types of thinking. In fact, for each mathematical idea a student captures in their portfolio, I ask them to fill in as much detail as they can afford to create within the time they allocate for studying. I coach my students to use multiple categories of thought to study each mathematical idea in our course and to capture their explorations in their textbook. Below are a list of the types of thinking I ask my students to demonstrate for each idea they study:

- Verbal descriptions
- Abuelita language
- Nerdy language
- Visual representation(s)
- Curiosity and questions
- Interest and intrigue
- Notation and symbolic representation(s)
- Algorithmic descriptions and calculations for pen-and-paper analysis
- Capture systems and organization
- Heuristics and problem solving
- Logical foundations
- Transfer to life and to modeling applications
- Algorithmic descriptions and calculations for digital computation

For more about the theory of learning mathematics that I use to evaluate student's content-specific learning and give corrective feedback, please read my blog post article How to learn mathematics at the deepest and highest levels. When I evaluate student learning during our learning conferences, I look for evidence that students are building mental models for the mathematics that include as many of the above types of thinking as they have the time to create.

In addition to creating and documenting their multidimensional understanding of the core content of each course using multiple categories of thought as highlighted above, I encourage my students to write solutions to any practice problems they find helpful. I work hard to provide answers and, if possible, full solutions to students so that they can check their work at home. I tell my students that one of the best ways to learn is to attempt to solve a problem, fail, look at the solution, and then do an after-action review to improve their approach.

I also welcome students to include any other learning resources they believe will deepen their understanding for the course material. I challenge students to create a rich external memory bank that documents their mastery of the core content of our class. As they create their learning portfolio, I pose the following challenge to my students:

> "Imagine you spend the next three months of this class creating your learning portfolio to document your understanding of the core content of this class. Then, as soon as this class ends, you move onto other subjects in other classes. Ten years from now, you realize that you need the work you did in our class for a professional project you are working on. At that time, you go back to your portfolio and you can easily access everything you produced. In other words, I challenge you to write your work so clearly that you can remember all the glorious details almost instantaneously just by reading your own words. Make this portfolio valuable for yourself so that you can return to your work for years to come. Focus on creating learning skills that you can transfer to the next stage of your education. As you work in this class, think about how you can build your resume. Dedicate energy towards growing your career capital so that you can create a career that you love while doing work that makes you happy. Treat your portfolio as part of your process of growing expertise that you can use in your future to create a life you love."

To help students better understand more about the learning portfolio process, I ask my students to watch my Math 2B Interview with Maria Mihaela video (24 min, 37 sec).

In that video, I interview my previous student Maria Mihaela to highlight how her learning process played out as well as what her portfolio looked like by the end of our time together. One exciting feature of this interview is that Maria highlights her success in continuing to build and use the learning skills she used in my class years after we finished our formal work together.

2. Evidence of Meaningful Transformations to Student's Meta-Learning Processes

The second type of work my students include in their learning portfolio is a collection of meta-learning activities designed to help my students become more sophisticated learners. While in my class, I ask my students to finish a sequence of conquering college learning activities, including each of the following:

- Conquering College Activity 1: Schedule to succeed
- Conquering College Activity 2: Prepare for deep learning
- Conquering College Activity 3: Prepare for flipped learning
- Conquering College Activity 4: Create your dream binder

To learn more about how I launch these activities with my students, please read my first welcome email to students for winter quarter 2024. I sent this email to all my students for that quarter one week before the first day of instruction.

In addition to these conquering college activities, I also ask my students to develop their reading systems. One of the challenges I pose in my class is that I ask my students to finish reading the book *Ultralearning: Accelerate Your Career, Master Hard Skills, and Outsmart the Competition by Scott Young*. That book highlights learning principles students can use to learn deeply and create transferable skills in their education.

I tell my students that this type of reading is dessert while our formal mathematical course work are vegetables. Like anyone who cares deeply about them, I ask each learner to eat their veggies before they enjoy dessert. Still, I set the expectation that all students read that book before our class ends. To help students read this book for no out-of-pocket cost, I coach students to get a library card at their local city or county library. Of the years, I have built a small collection of pictures of my students with their newly activated library cards in hand. This is one of the many ways I help my students deepen their education for as little out-of-pocket cost as possible.

Of course, there are some students who look at the book Ultralearning and indicate that they have no interest in reading that book. I listen carefully to that feedback and empower those learners to make a different choice for their reading. In fact, I provide a list of 40+ books they might consider reading to propel their work in our class and in college. I also encourage them to find books that are not on my list.

I do challenge my students to read nonfiction work on topics directly related to their learning processes, career development, and identity formation using the five learning objectives I pose for my work with them (see the blog article on 40+ books for more details about those learning objectives).

In this effort to encourage my students to read, I care less about the specific book(s) they choose and a lot more about their efforts to design reading systems to propel their learning skills.

One of the fun features of asking students to do my conquering college activities and to read nonfiction books on learning science is that my students demonstrate impressive growth as learners. I routinely have students tell me that they learn to get better grades in all their classes, learn at much deeper levels, have more time for exercise and leisure, feel less stressed, and feel much more productive. Moreover, it is quite common for my students to coach each other and to bring into their daily group work meta-learning conversations. I design these conquering college activities and the reading challenge with this exact type of peer-to-peer mentorship in mind.

I'll end my answer to this question with a note about theory. This approach to teaching and learning is based on my 10 types of 4 categories of learning model. When collecting evidence of student learning and providing feedback for student work, I targe the "Content" and "Meta-Learning" categories from that model and look for evidence of deep work that gets progressively more sophisticated as time passes in each quarter. My main challenge to students is to build learning systems and content expertise that makes them more capable of thriving in their future classes. Then, I ask my students to show me their progress and I provide targeted and timely corrective feedback so that every conversation we have propels students further along in their individual process.

How do students get feedback on their work?

This is a great question. Before I answer this question in full, I think it's worth differentiating between different types of feedback. In my work as a teacher, I identify three types of feedback that students might receive in school. These include each of the following:

- Outcome feedback – Are you doing it wrong?
- Informational feedback – What are you doing wrong?
- Corrective feedback – How can you fix what you're doing wrong?

For more about each type of feedback, please read my blog post entitled The diverse roles that grades play to effect teaching and learning in college STEM classrooms.

I believe that I am most effective as an instructor when I maximize the amount of corrective feedback that my students receive in my classes. Thus, I work to help my students get corrective feedback from three sources:

1. Self-directed corrective feedback.
2. Peer-to-peer corrective feedback
3. Instructor-guided corrective feedback

1. Self-directed corrective feedback

A dehumanizing feature of most modern college classrooms is high brain-to-hands ratios. In most of my classes, I serve between 30 – 40 students. I know some college STEM teachers that lead classes with 200+ students. The idea that, in this type of environment, a single teacher will provide timely corrective feedback to each student is absurd. However, just because we design and maintain public education systems that makes it impossible for a single content expert to give synchronous corrective feedback to all students doesn't negate the reality that students need such feedback to learn. One way I address this challenge is by providing students with enough support to be able to engage in self-directed corrective feedback. Below I highlight some important resources I ask my students complete as we engage in our work together:

- Conquering College Activity 1: Schedule to succeed
- Conquering College Activity 2: Prepare for deep learning
- Conquering College Activity 3: Prepare for flipped learning
- Conquering College Activity 4: Create your dream binder
- How to organize a course binder?
- How to utilize suggested problems?
- *Ultralearning: Master Hard Skills, Outsmart the Competition, and Accelerate Your Career* by Scott Young
- How to solve it by George Pulya

Not every student completes all this work in one academic term. I do expect that each of my students to complete Conquering College Labs 1 – 3 during the first quarter we work together. I also ask that every student in my class to finish reading the book Ultralearning (or to propose some comparable alternative reading if they are not interested in that book).

Once a student finishes all of this work, I support that student in choosing additional reading that might help them improve their deep learning systems. My goal is to help each learner create their own ideas about how they might build their learning skills so that they can become self-directed learners.

In addition to explicitly coaching students on how they can improve their learning systems, I also provide a large collection of content-specific learning resources including free access to course learning materials (both as written textbooks and YouTube videos), problem sets with full solutions, sample quiz questions with answer keys, and applied modeling problems that ask students to engage in real-world problem solving using the course content. In these applied projects, I provide guided tours through the entire modeling process so that students can get a detailed idea of how the modeling process works without needing my individual attention. I also provide open-ended problems that push students past the core modeling activity into new areas of exploration and discovery.

When I give problem sets to my students, I work hard to provide full solutions. One of the best ways for students to learn how to solve problems is to make an earnest attempt at a solution, generate questions that arise as they make progress, and make mistakes while they work. After they've spent some time struggling on the problem, I encourage students to look at a full solution and analyze their work. As they compare the solutions I provide with their own work, I want my students to ask themselves a series of questions including:

1. Can I write a full solution for myself? Do I understand my solution deeply?
2. Can I explain my solution in my own language?
3. What did I do well as I worked to solve this problem? What techniques did I use and how did those work for me?
4. What mistakes, missteps, misunderstandings, or issues came up as I worked on this problem?
5. What was I missing?
6. What can I do differently in the future if I try to solve this type of problem again?

Because I work at a California Community College, I teach students who are first- and second-year STEM majors, most of whom are novice problem solvers. Many of my students have not engaged in years-long training in heuristics. In other words, my students usually have not yet developed specialized knowledge in the art of problem solving.

One of my goals is to help each student become a more sophisticated problem solver. But this takes time. Usually by the second or third quarter I work with a student, I have them deep read the book How to solve it by George Pulya. Once a student has finished that book and spent tens of hours practicing the techniques present therein, I feel a lot more confident challenging them to engage in problem solving without peaking at solutions. However, even in this case, I am very careful NOT to impose strict, instructor-mandated, punitive deadlines on their work. Problem solving is process that takes time and I want to challenge my students to enjoy a strong sense of autonomy in their creative work. I also believe that grit, perseverance, and determination are more important than speed when solving hard problems.

To end this discussion of how I teach students to provide their own corrective feedback, I want to highlight an earlier version of my work in this space. I stopped using timed exams sometime in 2020 and transitioned to more comprehensive learning portfolios at that time. However, starting in 2008 and continuing through 2020, I relied on in-class quizzes and exams to assess student learning and provide feedback. Throughout that time, I was never impressed with the in-class exam process as a tool for inspiring learning. However, between 2016 – 2020 I developed a comprehensive exam correction process that guided students in providing their own corrective feedback on exam problems. Below are two documents I created to guide students through this process:

- My most recent exam corrections packet (.pdf)
- Avoid Common Exam Mistakes (.pdf)

Notice that in this exam correction process, I task students with correcting their own errors, analyzing the mistakes they made, and coming up with their own ideas for new strategies to improve their approaches to learning.

I eventually moved away from in-class exams because I found that my use of this teaching policy inhibited student learning. When I used exams, I sent the message that students only needed to focus on a subset of the material that I put on the exam. Not only did I create a ton of extra teaching work for myself (thinking up new problems, writing exams, making copies, policing student work, writing solution sets, grading, haggling for student points, etc), I also robbed students of agency and autonomy in the learning process. When I used exams, I forced students to work on a course pace that was blind to the individual student's learning needs and lived reality.

My exam correction processes mitigated, but did not eliminate, many of the harms caused by in-class exams. While I am proud of this exam correction process and I encourage this practice for any teacher who is still using in-class exams, I believe we should stop using high-stakes exams in college math classes, I believe I can design much better assessment and feedback processes to encourage students to engage in deep learning every day we work together rather than limiting their creative work to a small number of stressful, in-class timed exams. To do this, I need to empower students to pace themselves and check their own work during their individual learning sessions when they are working by themselves outside of class. The point of all this work is to help students develop the skills they need to correct their own work.

2. Peer-to-peer corrective feedback

Beyond coaching students to engage in self-directed feedback, I also work to help students learn how to give each other feedback. One message I send to students during each of the first four in-class meetings (and throughout the rest of the quarter) is the idea that we will move away from the banking model for education and towards a model based on dialogic peer-to-peer learning. This is one of my goals in asking my students to complete the Class 2 Think-Pair Share Activity : Dialogic Peer-to-Peer Learning.

In the dialogic peer-to-peer learning model, I challenge students to re-imagine their role in our class as that of both teacher and learner. Here are some of the mini-lectures I use during the first few days of class to I encourage students to re-imagine our work:

- When we work together in this class, we are at a severe disadvantage because of the way our society designs and funds our education system. In this class, 40 students are enrolled with a single teacher. Each week, we meet in-class for a total of 250 minutes. Think about that for a minute and do a little math. Let's assume we cultivate the belief that there is only one person in this room who can teach (the instructor) and we do nothing else but engage in individual dialogues between student and teacher. Under these assumptions, our 40-to-1 teacher to student ratio implies that the state of CA and our national government think your learning is worth no more than 250/40 = 6.25 minutes of teacher-student interaction per week.

How effective can we be as a teacher-student team with 6.25 minutes per week? Raise your hand if you think your learning is worth more than 6.25 minutes per week?

I do. I think each of you deserves *at least* 2 hours of individualized feedback, mentorship, and coaching per week. How likely is it that I, as the single "teacher" in this room, can provide each of you with this amount of coaching?

This is the reality that we are up against in this class.

But remember, we are not victims. We are survivor. We can resist and transform this system. Please recognize that there is more than one "teacher" in this room. Recognize that there are 41 teachers in this room (me and the 40 of you). Each of us, both you and me, have the capacity to act as both teachers and learners. In this class, I'm going to challenge and support each of you in playing the role of both a learner and a teacher.

When you attempt to teach each your classmates, to answer each other's questions, and to create group solutions to problems you work on individually, you will push each other to higher levels of mastery.

How many of you have ever had the experience of believing you know how to solve a problem. Then, a friend asks you to teach your solution and asks a few simple questions about your work. As you attempt to articulate your ideas, you learn a ton and address some weaknesses in your understanding that you didn't even know you had. This is one of the benefits of playing the role of a teacher: not only do you help your friends in their learning but you deepen your expertise and understanding of your own work.

- In this class, I want to encourage you to do everything you can to work in groups to solve problems. I want to pose the following challenge: do your best not to look at solutions to problems you're working on or to ask me for help until you've done all of the following:

  1. Worked for at least 20 minutes on the problem by yourself.

  2. Generated specific questions about the problem and what you are struggling with using the 2-minute rule for questions (for more about the 2-minute rule, see Step 9C of this blog post).

  3. Brought your questions to your learning group and worked with your teammates for at least 15 minutes on the problem. If none of your teammates in your individual learning groups know how to solve the problem, then you reach out to at least three other learning groups to ask your question and get guidance.

  If, after you've finished all this work, you are still unable to get an answer to your question, then come ask me your question(s). At this point, I'll provide you with some help.

  My bet is that, as you get better at articulating your questions, you'll be able to address maybe 60 – 70% of your struggles on your own. Then, by using collaborative group work and peer-to-peer dialog, I bet you'll be able to solve up to 95% of the technical issues you're struggling with. For the last 5% of questions you have that you can't find answers to, come ask me those very specific questions and I will help you make progress.

  In this process, you will learn how to distinguish between problems that you and your learning team can solve versus questions that require expert guidance. As you work, I encourage you to remember the following saying: "You do not need to kill a fly with a tank." I believe that you have the capacity to solve the vast majority of questions you generate in this class. I also know that some questions you generate deserve expert guidance. One of our challenges is going to be to help you learn how to distinguish between these types of questions and get timely feedback to meet your needs.

Through this type of coaching and the individual work my students do outside of class, we work together to develop habits of peer instruction during our in-class meeting times. This peer instruction process includes corrective feedback, peer-based question and answer sessions, and lots of collaborative learning. In that sense, the group learning process provides an opportunity for students to give each other 90+ minutes of corrective feedback during each in-class meeting as they deepen their learning and solve problems as a team.

3. Instructor-guided corrective feedback

In addition to self-directed and peer-to-peer corrective feedback, I also provide students with instructor-guided corrective feedback during learning conferences. During our fourth in-class meeting (in the second week of the academic term), my students form learning groups composed of 4 – 5 students. To do this, they complete the following activity:

- Class 4 Think-Pair Share Activity : Get Ready for Peer Learning and Feedback – This activity guides students through the process of forming learning groups, to decide on what work they expect each other to complete outside of class, to draft their ideas about what they want to do during in-class meetings, and to sign up for their in-class learning conferences during which group members present their progress to me and their classmates as part of the feedback process.

Starting in week 3 of the quarter, I work my way through the class and meet with each group for learning conferences. To do this, I partition each 135-class period into an 20-minute introduction followed by three 40-minute meeting blocks. During each 40-minute learning conference block, two or three members of each learning group present their current work. This implies that each learner has about 15 – 20 minutes to present their work and get feedback.
For an example learning conference schedule, please see the documents below:

- Example Learning Group Meeting Schedule
- Example Portfolio Assessment Learning Conference Meeting Schedule

For each portfolio presentation, students show their work and speak about their learning process. I ask them to show me everything they have done in our class including their lesson notes, their attempted problem solutions, any group work they've done, their work on conquering college activities, and to talk about any reading they are doing outside of class. As each student speaks, I look carefully at the work they produced, listen to their words, ask follow-up questions, and try to get a sense of their progress. During this time, other members of the learning group might also interject ideas, questions, comments, or concerns that come up as the student presented.

As each learner is presenting, their learning partner(s) take notes on a shared google document to capture the main points of the conversation for future reference. This makes it easier for us to track action-items and reflect on progress as the quarter progresses. Below I include an example of a Google document from one of my in-class groups from winter quarter 2023. I've used fake names for the students though the actual content in that document was written by previous students during weeks 3 – 5 of that quarter.

- The Mathemagicians Team Notes

After about 8 – 10 minutes of dialog, we work together to come up with some ideas about how that student might deepen their learning. I give follow up reading assignments and concrete suggestions on how each learner might deepen their process. I also ask to see evidence of the changes the student makes in the future based directly on the conversations we have about their portfolio.

In each of these conversations, I work hard to make sure that I give 1 – 3 substantive suggestions on how each student might improve their work, refine their learning, and go deeper into the content. Team members in each learning group might also add their suggestions and be in solidarity with each presenter. During all this time, the learning partner who is taking notes captures the gist of our conversation. Then, to wrap up the meeting, the presenter gives a synopsis of what they learned and what improvements they want to make before their next presentation. At the end of each presentation, I ask each group member who was not presenting to share something remarkable that came up during the conversation so that every team member's voice is part of the dialog. Then we move onto the other presenter for that day.

Assuming regular attendance, this structure means that I meet with each group every other week. Moreover, every student presents their work *at least* once every four weeks. So, say student A and student B form a learning partnership. If student A presents their portfolio during week 3 while student B plays the role of note taker, then during week 5 the roles reverse. In other words, in week 5, student B becomes the presenter and student A becomes the note taker. The Example Learning Group Meeting Schedule document gives a visual representation of how this process works.

We continue this dance throughout the quarter until the final two weeks. If a student misses their conference, I reach out to that student to schedule a one-on-one appointment so that we can connect and make up that work. By about week 9 or 10 in the quarter, many of my students are fully into their own improvement cycles. They are actively changing and improving the way they work without guidance from me as their instructor.

To end the class, I ask each student to show me their completed portfolio during either week 11 or week 12 of the quarter. This represents a comprehensive "final exam" in the class since I am looking for completion of the work they said they would finish. One very fun feature of these final portfolio checks is to see how much progress the students have made in their learning throughout the quarter. Below is an excerpt taken from one of my student's final learning self-evaluation that highlights this reality:

"When Jeff said 'your notes will look completely different by the end of the quarter,' he was not wrong. I did not understand how notes could look really different. Now I do. I understand the importance of notes and how they can help with learning. My notes look completely different. It's like night and day… This course has allowed me to experiment and test which ways of learning work best for me. There was no 'right' way to do an assignment. Everyone could complete a task in their own preferred method. For me, I tested many ways to take notes for this class. I learned that it was important to be able to referred back to your work. I learned many methods to improve my organization and my note-taking me

How do students get Jeff to answer their mathematical questions answered?

As I mentioned above, I challenge my students to find ways to answer their own questions. However, I realize that sometimes students need expert guidance either becase they have discovered very difficult questions that their peers cannot answer alone or because they are looking for clarity that requires years of study to achieve.

In these cases, I will always provide guidance in finding answers to any mathematical question that my students pose to me. Since my goal is to help students learn how to answer their own questions, I sometimes do not answer math questions directly but instead provide pointers to help the student develop their own answer. In this case, I ask for the student to follow up with me and I make an offer for an appointment to do so. This guarantees that if I don't answer the question directly, then students have a chance to get feedback on the answers they developed and ask for further clarification.

To get my guidance on a mathematical question, please do any of the following:

1. Write down your questions in full detail using the 2-minute rule. For more about the 2-minute rule, please read "Step 9C: Capture and track your questions" in the Deep Learning Practice: Create Lecture Note Systems blog post from Conquering College Lab 3: Prepare for Flipped Learning. Mark those questions with a post it note or other marking tool so that you can locate each of your technical questions in less than 5 seconds when you are in-class. Bring those questions to class and ask your group mates for guidance. If you've asked all learners in three different learning groups and no one has an answer, then please ask Jeff about this directly. You're also welcome to post this question on the front white board and make an announcement to the whole class to get guidance.

2. Post any of your questions on any of Jeff's YouTube videos. This technique is most effective when you post your questions on the same video for which your question arises. Also, please do timestamp your question in your comment so that Jeff and click on the timestamp to locate the exact moment in the video that corresponds to your specific question. For some good examples of students who have used this technique in the past, please check out the comment sections in any of the videos below:

   - Theorem: Complete Solutions to homogeneous linear-systems problems
   - The Anatomy of matrix-matrix multiplication
   - Math 1C, Lesson 7.2: Example of Domain and Range