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2024/2025

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**NEW  
FACULTY  
GUIDE TO  
TEACHING AT  
CALTECH**

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Center for Teaching,  
Learning, & Outreach

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## Section 1: Introduction to the CTLO and Caltech

Welcome to Caltech! The Center for Teaching, Learning, & Outreach (CTLO) supports Caltech's multifaceted educational efforts, including undergraduate and graduate courses and curricula, formal and informal teaching and learning, and community partnerships with PreK-12 teachers and students. The CTLO is committed to advancing evidence-based, inclusive practices through our programs and services, and to fostering innovation based on this foundation.

### Vision, Mission, and Values

Caltech's **vision** for educational equity and excellence, in alignment with our institutional mission, includes continuous improvement and active leadership among peer institutions and in higher education. We envision education and research as integrated, informing each other, and contributing to inclusive, diverse, equitable, and accessible opportunities for faculty, instructors, staff, students, and community members to learn and discover throughout their lives and careers.

The **mission** of the Center for Teaching, Learning, and Outreach is to work toward this vision by:

- **Engaging with Caltech educators** at all levels, including those focusing on designing and facilitating graduate and undergraduate courses that address Caltech learning outcomes, public learning opportunities, and preK-12 educational outreach.
- **Developing expertise in educational methods** that promote inclusion, diversity, equity, and accessibility, and are supported by sound evidence, through training for teaching responsibilities and opportunities for professional development.
- **Fostering innovations and uses of instructional technology** that advance Caltech's vision for educational equity and excellence.
- **Building mutual partnerships** among Caltech units and groups working on educational endeavors, and between Caltech and community groups and organizations such as preK-12 schools, districts, and others, to advance shared goals.
- **Consulting on the design, implementation, and assessment** of educational initiatives via service on committees and discussions with Caltech administration, faculty, staff, and students.

The CTLO approaches this work with commitments to the following core **values**:

- **Focus on inclusion, diversity, equity, and accessibility:** The CTLO uses and advances educational practices with demonstrated potential to increase belonging and inclusion among diverse learners, as well as contribute to equitable educational outcomes among students and participants.
- **Commitment to evidence-based practices:** Along with assessing and using data to improve our work, the CTLO employs and shares approaches that are supported by educational research and theory, with prior studies producing strong and/or promising evidence about their effectiveness and guiding their use.
- **Collaborative approach to partnerships:** When working with groups and organizations, both externally in the community and within Caltech, the CTLO strives to design and implement



programs with mutuality, shared benefits, and shared responsibilities suitable to each partner's unique strengths and needs.

- **Encouragement for innovations:** whether new in the field of educational practice, in specific academic disciplines, or in particular contexts, the CTLO encourages and supports innovation because there remains much to learn and discover in teaching, learning, and educational outreach; through innovation, Caltech contributes to such discoveries.

The CTLO hosts a number of events each term related to course design, educational technology, and special topics as they arise. Our staff are available for one-on-one consultations or group training (such as for TAs or divisions).

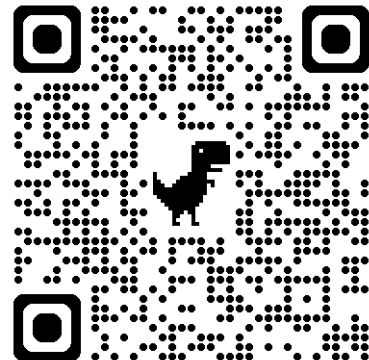
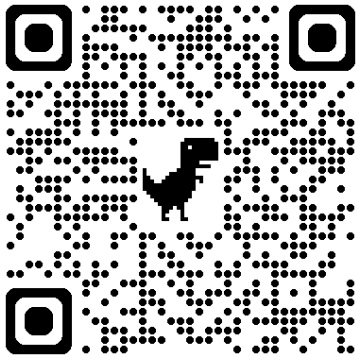
More information can be found in our web resources:

CTLO: [ctlo.caltech.edu](http://ctlo.caltech.edu)

Find information on course design, learning support, outreach opportunities, broader impacts and grant support, and upcoming events

Canvas Learning Management System: [canvas.caltech.edu](http://canvas.caltech.edu)

Learn how to use Canvas to provide material to students in your course, administer homework and exams, and use connected tools like Gradescope.





# Programs and Services

## FACULTY

### FACULTY LEARNING COMMUNITIES

Join other faculty members to discuss challenges and share ideas related to teaching at Caltech. Faculty Learning Communities are open to faculty members of any rank (including teaching faculty, lecturers, and instructors) and aim to provide a supportive conversation about teaching.

### EDUCATIONAL TECHNOLOGY TRAINING

#### Canvas

Learn how to set up your gradebook, create and use rubrics, set up auto-graded quizzes, and more.

#### Poll Everywhere

Learn how to engage students in class with live polling, question and answer sessions, clickable images, and more.

#### Perusall

Learn how to use this tool to encourage students to engage with and reflect on their reading (or videos).

#### Gradescope

Discover tips and tricks to speed up grading of exams, problem sets, and coding assignments.



### CONSULTATIONS

#### WE'RE HERE FOR YOU

**Teaching:** We provide one-on-one or small group consultations on course design, assessment, grading models, inclusive teaching, pedagogical best-practices, and more.

**Outreach:** We help faculty and other members of the Caltech community develop strong educational outreach components for grant proposals with a broader impacts or outreach requirement. Our emphasis is on creating programs that provide both rich experiences for target audiences as well as meaningful professional development and growth for participating Caltech representatives.

### OUTREACH AND COMMUNITY-BASED LEARNING

We offer a multitude of opportunities to connect with Southern California families, K-12 teachers, and students. Programs and initiatives include Science Nights, Visiting Scientists in the Classroom, Sustainable Energy Activity lab, Summer Research Connection, Science Journey presentations, citywide science expos, field trips, lab tours and on-campus events.

### COURSE DESIGN BASICS

This short-course is designed as a series of workshops for you to create a new course from scratch or re-imagine an existing course. Using the Backward Design Model, you will set goals for student learning, align your assessments with those goals, create and plan learning activities to meet those goals, and learn the basics of technology tools and grading models.



# GRADUATE STUDENTS AND POSTDOCS

## HOW LEARNING WORKS

A five-session series highlighting evidence-based principles for smart teaching, grounded in research from education and cognitive & developmental psychology.

## CALTECH PROJECT FOR EFFECTIVE TEACHING (CPET)

CPET is a group of graduate students and postdocs dedicated to improving their teaching skills and helping others to do the same. CPET hosts quarterly seminars, workshops, and discussion groups on topics related to higher education. They also offer two certificate programs in university teaching, to help STEM graduate students and postdocs become knowledgeable and effective future higher education faculty.

## TEACHING STATEMENT WORKSHOPS AND CONSULTATIONS

Interactive sessions on what a teaching statement is, what role it plays in the academic job search, and how to write an effective statement based on personal teaching experiences. Individual teaching statement consultations are also available.

## TRANSFORMING YOUR RESEARCH INTO TEACHING

For post-docs: learn the skills of course design by developing a college-level course based on the area of your research expertise. In this course, you will work with peers across the Institute who are developing courses in similar areas for peer review and inspiration.

## POSTDOC PRE-FACULTY PEDAGOGY PREPARATION PROGRAM (5P)

The 5P Program is designed to help familiarize and prepare post-doctoral scholars for the teaching-related aspects of their role as a future faculty member, whether that is at a large research-focused university, a small teaching-focused college, or anything in-between.

## GRANT WRITING SUPPORT

Individual consultations to help you develop strong educational outreach components for grant proposals with a broader impacts or outreach requirement.

# TEACHING ASSISTANTS

## FIRST-YEAR TA TRAINING

First-year graduate students entering Caltech in the Fall fulfill their TA orientation by participating in First-Year TA Training; this is a required part of graduate orientation week whether planning to serve as a TA at Caltech or not, and includes both specific TA-related sessions and choices relevant to professional development more broadly. All incoming graduate students also complete online modules about teaching-related policies and best-practices.

## SUCCEEDING AS A TA THIS QUARTER

Each term the CTLO offers a workshop to TAs that covers:

- Holding office hours
- Planning Instruction / Rec Sessions
- Facilitating discussion for student learning
- Giving feedback on students work

## CUSTOM WORKSHOPS FOR FACULTY OR OPTIONS



## Teaching at Caltech

### *Excellence in Teaching*

The mission of the California Institute of Technology is to expand human knowledge and benefit society through research integrated with education. We investigate the most challenging, fundamental problems in science and technology in a singularly collegial, interdisciplinary atmosphere, while educating outstanding students to become creative members of society.

With its overriding and unwavering commitment to excellence in all that it does, Caltech strives to be the destination of choice for individuals with the brightest and most creative minds from all backgrounds, experiences, and viewpoints. Our dedication to fostering diversity, equity, and inclusion among our students, faculty, staff, and other constituents is central to fulfilling the Institute's core mission of expanding human knowledge and benefiting society.

Caltech is committed to excellence in teaching through the use of evidence-based, inclusive pedagogies that foster the knowledge, skills, relationships, and values necessary for students to succeed in a rapidly changing world. Caltech embraces an inclusive spirit that values the enrichment diversity brings to students' understanding, leading to greater opportunities to improve the lives of all people. It fosters a convergent spirit, teaching students to see problems and solutions from multiple viewpoints, to move fluidly across disciplines, and to work comfortably in disparate teams. And it cultivates an entrepreneurial spirit, empowering students to innovate and find creative approaches to solving complex problems. Caltech prepares students to navigate ambiguity, to utilize their intellectual curiosity to identify and realize opportunities, and to evolve into visionary leaders who seek impactful and ethical solutions for the local, national, and global challenges of our time.

Caltech defines excellence in teaching in the following manners and practices:

1. Respectful and Professional
  - A. Conveys commitment to learning through demonstrated effort in, and enthusiasm for, the teaching process
  - B. Models and expects respectful and appropriate behavior in all professional interactions
  - C. Develops professionalism in students through high expectations for mindful, ethical, responsible behavior
  - D. Recognizes the power differential between professor and student, and acts with integrity toward students
  - E. Fosters professional identity development through student use of discipline-specific customs and language
2. Challenging and Supportive
  - A. Creates learning objectives and experiences that are challenging but attainable
  - B. Models and fosters critical, analytical, and creative thinking
  - C. Encourages student curiosity, exploration, and self-directed learning
  - D. Cultivates a belief that mistakes and failed experiments further knowledge and understanding
  - E. Fosters a mindset where growth is always possible, and ability is not fixed
  - F. Provides encouragement, positive reinforcement, and support
  - G. Guides students to institute support services according to institute policy



3. Inclusive and Diverse
  - A. Creates an open environment conducive to intellectual risk-taking
  - B. Includes students' strengths, experiences, and identities in the learning process
  - C. Provides materials, cases, or applications that examine diverse experiences, perspectives, or populations
  - D. Applies multiple techniques and strategies to reach all students in a culturally-responsive way
  - E. Follows guidelines of Universal Design for Learning and accessibility best practices
4. Relevant and Engaging
  - A. Uses content that is current, rigorous, and informed by theory, research, evidence, and context
  - B. Uses active learning strategies to promote development of mastery
  - C. Fosters transfer of learning and problem-solving skills to address real-world challenges
  - D. Models and requires use of multiple media and technologies aligned with learning objectives and experiences
  - E. Fosters student participation in academic discussions and fosters peer-to-peer collaboration, knowledge-sharing, and feedback
  - F. Facilitates student engagement in inquiry and research
5. Prepared and Purposeful
  - A. Uses instructional plan aligned with learning objectives that includes assessment of student prior knowledge, instruction followed by application, and shared reflection of what was learned
  - B. Fosters self-regulation to help students to assess their own learning and adjust their strategies
  - C. Manages learning effectively: plans activities, uses routines, and manages time, behavior, and participation
  - D. Utilizes educational technologies (e. g., LMS) to provide students access to course materials, grades, and other feedback
6. Fair and Equitable
  - A. Establishes clear expectations and learning objectives
  - B. Uses formative assessments to evaluate student progress, and summative assessments to evaluate mastery
  - C. Uses transparent assessment processes with clear criteria tied to learning objectives
  - D. Provides specific, regular, and timely feedback tied to performance criteria
  - E. Maintains reasonable course policies that are applied uniformly and fairly
7. Evidence-Based
  - A. Uses results from formative and summative peer and student teaching evaluations to inform teaching practice
  - B. Demonstrates effectiveness of instruction through measures of student mastery of learning objectives
  - C. Pursues continuous improvement of teaching and course design by applying research-based best practices



## The Honor Code

The Honor Code is a long-standing pillar of Caltech culture - in fact, it is a core value of the Institute. It reads:

***"No member of the Caltech Community shall take unfair advantage of any other member of the community."***

The Honor Code allows students the trust and freedom that honesty merits and it is not restricted to transactions of purely academic nature between students and faculty. The Honor Code allows students and faculty an unusual level of trust in one another and affords students uncommon opportunities. For example, exam proctoring is discouraged under current faculty regulations, because faculty simply expect students to follow the Honor Code.

For faculty, the Honor Code provides the freedom to assume students will follow the rules laid out by you on your exams and in your syllabus. This requires, however, very clear rules for collaboration and ongoing conversations with students about WHY you are choosing your assignments and rules. This transparency and dialogue are crucial to building a trust relationship between students and faculty. For the Honor Code to function fully, it is incumbent on faculty to hold regular conversations with their students about how to work and collaborate ethically and why it is important. Some key times and ways to discuss the Honor Code, beyond \*just\* the first day include:

- Discussing the collaboration policy prior to the release of the first homework set and clarifying / asking for questions frequently throughout the term.
- Discussing the ethics of scientific research (and the ramifications of unethical conduct), especially as it applies to your field.
- Discussing the importance of independent efforts in assessment, so you might have a true picture of student understanding of the content.
- Reiterating the importance of the Honor Code prior to midterm and final exams. Providing clear written instruction directly on the exam for what is allowed and what is not allowed.
- Expressing to students your belief in their ability to succeed in your course, giving timely feedback through problems sets, exams, and on other assignments so they are able to improve over time, and being open and available for questions.
- Fostering a sense of community within your course is crucial - all students should feel welcomed and that belong.

### Honor Code Violation Process:

An Honor Code violation involving undergraduate students can be reported by any member of the Caltech Community using the Online Incident form found at the Undergraduate Deans website (<https://deans.caltech.edu/HonorCode>). (Graduate students should be referred to the Graduate Studies Office). This form collects information about the nature of the concern, available evidence, and the course(s) and instructor(s) involved. An initial assessment of the incident is made. The possibility of an "Early Resolution Option" is available for uncontested cases / first offense. This investigation can lead to dismissal or a Full Board Hearing.



A Full Board Hearing must answer three questions:

Has an Honor Code violation occurred? (Conviction OR Dismissal)

- Prior violations are not considered at this point, only an investigation into the evidence.
- All work is confidential and both witnesses and respondents are asked to not discuss the case.

How to nullify the advantage? (Nullification)

- Note that this phase is not punitive. Nullification only.
- Nullification may result in the loss of credit on a single problem or an entire assignment (or course), depending on the violation.

How to protect the community from further violations? (Protection)

- Prior violations are only considered at this point. Possibilities range from a "BOC talk" through leave for one or more terms, or permanently.
- Recommendations are approved by the Dean.

If you have questions about the Honor Code, the process, or *if* you should report a student, feel free to reach out to Maura McDinger, Director of Conduct & Community Standards: [mcdinger@caltech.edu](mailto:mcdinger@caltech.edu).

## Undergraduate Courses and Student Life

Teaching at Caltech can be a unique experience, especially given the small size of the undergraduate population (about 900 total), the focus on STEM, and the somewhat unique residential experience. Here are some useful facts about the undergraduate experience at Caltech:

### The Quarter System:

- The academic year is made up of three 10-week quarters:
  - Fall term: Late September – mid-December
  - Winter term: January to mid-March
  - Spring term: April to mid-June
- Exams occur in ~Week 5 (midterms) and after Week 10 (finals).
- Most exams are take-home.
- Other dates to note:
  - Add Day (Week 3) – last day to add / change classes
  - Drop Day (Week 8) – last day to drop classes

### Vocabulary:

- Lecture – large class section that meets 1-3 times per week, usually led by the faculty course instructor
- Recitation Section – meets once a week to go over questions, homework problems, worksheets, etc. Usually led by TAs.
- Office Hours – informal meeting with students where they can ask questions and discuss the course. Offered by TAs and the course instructor. Typically, the most-attended aspect of undergraduate courses.
- Units – the number of “credits” a course offers. A typical course is 9 units (4-0-5, 4 hours in class, no lab, 5 hours homework per week). Undergrads typically take 45-50 units each quarter – about 5 academic classes plus PE, electives, etc.

The Course Schedule (can be found at <https://registrar.caltech.edu/schedules/>):

**MATHEMATICS** [\[Go to top\]](#)

	Course Offering Section	Units Instructor	Offering Title	Days/ Time	Location	Grade Scheme
Course	Ma 001A 01	4-0-5 Gherman, M	Calculus of One and Several Variables and Linear Algebra	MTWF 10:00 - 10:55	Hameetman Aud CHL	PASS-FAIL
				R 19:30 - 20:55	Hameetman Aud CHL	PASS-FAIL
				MWF 10:00 - 10:55	Lecture Hall Aud CHL	PASS-FAIL
Units	02	Conlon, D		R 09:00 - 09:55	103 DWN BAX	PASS-FAIL
				MWF 10:00 - 10:55	Lecture Hall	PASS-FAIL
	03	Conlon, D		MWF 10:00 - 10:55	Lecture Hall	PASS-FAIL

Lecture time and location      Grading Scheme      Recitation section time and location



## First Year "Core":

All Caltech undergraduates take the "Caltech Core Curriculum", primarily in their first year.

### First Year Mathematics: 27 units

Review of calculus, complex numbers, Taylor polynomials, infinite series, comprehensive presentation of linear algebra, derivatives of vector functions, multiple integrals, line and path integrals, theorems of Green and Stokes.

### First Year Chemistry Lab: 6 units

Laboratory methods and skills

### First Year Humanities: 18 units

Introduction to basic issues in English, history, philosophy, and visual culture.

### First Year Physics: 27 units

Newtonian mechanics, electricity and magnetism, and special relativity with an emphasis on physical insight and problem solving.

### First Year Biology: 9 units

Chosen from a menu of biology courses such as The Great Ideas of Biology, The Biomechanics of Organismal Design, Biology Through the Algorithmic Len, Information Flow in Biology, Construction and Guidance of Biological Defense, and others.

### Introduction to Comp. Sci.: 9 units

Python/Java programming and algorithmic thinking

### First Year Chemistry: 15 units

Physical and electronic structure of atoms, introduction to quantum mechanics, chemical bonding models building up from molecules to extended solids, periodic trends, electrochemistry, descriptions of states of matter, chemical reactivity, properties of complex chemical systems

### Menu Class: 9 units

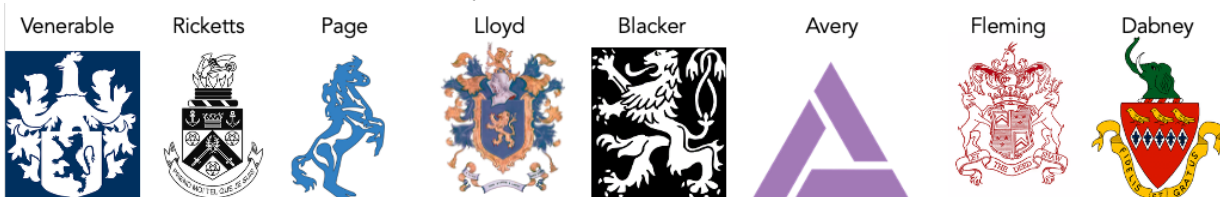
Subjects include Astronomy, Environmental Science and Engineering, Energy Science, Geosciences, Information, and Logic

### Other Requirements (Can be taken later)

Additional introductory lab (6 units), scientific writing (3 units), additional HSS courses (81 units), PE (9 units)

## Student Houses and Athletics:

- Undergraduates live in one of the eight "Houses" or Bechtel Residence
- Houses function somewhat like co-ed fraternities – students are members of the house which has its own government, traditions, parties, etc.



- Members join through a matching process after the conclusion of "Rotation", which happens at the very beginning of fall term.
- 25% of students participate in the athletics program – do not schedule office hours, recitation sections, lectures, reviews, etc. between 4-7pm.

## Resources for Students:

- Peer Academic Coaches – free tutors provided to students upon request (simple website scheduling)
- Hixon Writing Center – writing support for students including research statements, essays, etc.
- Course Ombudspeople – volunteer members of the course who gather input from students and bring course concerns to the instructor or TA and then return that information to the class.
- TAs – an invaluable role in supporting and mentoring students in recitation sections, labs, and research settings.

## Section 2: Planning Documents

The following pages contain planning worksheets and the 2024-2025 Academic Calendar with important dates and Institute holidays.

### Academic Calendar

You can find future academic calendar information at: <https://registrar.caltech.edu/acad-calendar>

To access the most up-to-date resources on Course Design, visit the CTLO website at: <https://ctlo.caltech.edu/universityteaching/course-design>

<b>2024</b>	<b>FALL TERM 2024</b>
September 30	Beginning of instruction - 8:00 am
October 18	Last day for adding courses and removing conditions and incompletes
October 30- November 5	Midterm examination period
November 11	Midterm grades due - 9:00 am
November 20	Last day for dropping courses, exercising pass/fail option, and changing sections
November 21- December 6	Registration for winter term 2024-25
November 28-29	Thanksgiving (Institute holidays)
December 6	Last day of classes
December 7-10	Study period
December 11*-13 *First due date for final examinations	Final examinations, fall term 2024-25
December 13	End of fall term 2024-25
December 14 - January 5	Winter recess
December 18	Instructors' final grade reports due - 9:00 am
<b>2025</b>	<b>WINTER TERM 2025</b>
January 6	Beginning of instruction - 8:00 am
January 20	Martin Luther King Jr. Day (Institute holiday)
January 24	Last day for adding courses and removing conditions and incompletes
February 5-11	Midterm examination period
February 17	President's Day (Institute holiday)
February 18	Midterm grades due - 9:00 am
February 26	Last day for dropping courses, exercising pass/fail option, and changing sections
February 27- March 12	Registration for spring term 2024-25
March 12	Last day of classes
March 13-16	Study period
March 17*-19	Final examinations, winter term 2024-25



*First due date for final examinations	
March 19	End of winter term 2024-25
March 19-30	Spring recess
March 24	Instructors' final grade reports due - 9:00 am
<b>2025</b>	<b>SPRING TERM 2025</b>
March 31	Beginning of instruction - 8:00 am
April 18	Last day for adding courses and removing conditions and incompletes
April 30 - May 6	Midterm examination period
May 12	Midterm grades due - 9:00 am Last day for seniors to remove conditions and incompletes
May 21	Last day for dropping courses, exercising pass/fail option, and changing sections
May 22 - June 6	Registration for fall term 2025-26, and registration for summer research
May 26	Memorial Day (Institute holiday)
May 30	Last day of classes - seniors and graduate students
May 31 - June 3	Study period for seniors and graduate students
June 4* - 6 *First due date for final examinations	Final examinations for seniors and graduate students
June 6	Last day of classes - undergraduates
June 7 - 10	Study period for undergraduates
June 9	Instructors' final grade reports due for seniors and graduate students - 9:00 am
June 11* - 13 *First due date for final examinations	Final examinations for undergraduates
June 13	Commencement - 10:00 am End of third term 2024-25
June 18	Instructors' final grade reports for undergraduates due - 9:00 am





## Course Planning Worksheet

As you think about designing your first (or tenth!) course, it's helpful to start with these guiding questions. Each topic is covered in-depth in Section 3 of this guide.

Questions to Guide Your Course Design:

1. What do you absolutely want students to understand and be able to do by the end of your course? (Learning Outcomes)
2. How will you know students have mastered the learning outcomes? (Assessment)
3. How do students develop mastery of a learning outcome, so they can be successful on the assessment? (Assignments)
4. How do students know whether they've made progress toward mastering a learning outcome? How will they know what to keep doing and what needs to be corrected? (Feedback)
5. How do we get students to be active participants in their own learning? (In-Class Learning)

Learning Outcome	Assessment of the Outcome	Learning Assignments (Homework)	Learning Activities (In-Class)	Lecture Topic (In-Class)
Clear, specific, measurable statements of <b>what students will be able to do.</b>	Evidence that would convince you students have <b>mastered the outcome.</b>	Practice assigned for students to complete on their own, <b>to prepare for an assessment.</b>	Practice assigned in class with you to guide them, <b>to prepare them to complete their HW</b> on their own. *Active learning activities	The content you will teach in class via <b>direct instruction.</b>
1.				
2.				
3.				
4.				
5.				

## Section 3: Preparing for Your Course

### Designing Your Course: Introduction to Backward Design

One of the best ways you can reach your instructional goals is to first, make sure you have clear goals for what you want students to be able to do, and second, to align what you do in the classroom to those goals. This approach, framed by researchers Grant Wiggins and Jay McTighe and labeled "Understanding by Design," reverses the typical course design process and, thus, is often referred to as backwards or reverse design. It starts by prompting instructors to ask a series of questions when they begin thinking about their course.

- **Where do I want my students to end up?** What knowledge or skills should they leave with?
- **How will I know if my students get there?** What evidence will convince me that they have the knowledge and skills I want them to have?
- **What can I do to get them there?** What types of activities and content can I develop to help them build knowledge and skills?

#### *Stage 1: Identify the desired results*

- What are the established goals (in the curriculum, course, or unit)?
- What "big ideas" do we want students to come to understand?
- What essential questions will motivate and inspire students?
- What knowledge and skills need to be acquired for students to be successful?
- What focus questions will guide students to targeted knowledge and skills?

#### *Stage 2: Determine the acceptable evidence*

- What is sufficient and telling evidence of understanding?
- Keeping the goals in mind, what performance tasks should anchor and focus the unit?
- What criteria will be used to assess the work?
- Will the assessment reveal and distinguish those who really understand versus those who only seem to understand?

#### *Stage 3: Plan learning experiences and instruction*

- What instructional strategies and learning activities are needed to achieve the results identified in Stages 1 and reflected in the assessment evidence specified in Stage 2?

## Curriculum Mapping and the Core Curriculum at Caltech

Before you set the goals for your course, it is helpful to understand where your course fits into the larger curriculum of your division and the Institute as a whole.

### Undergraduate Curriculum

Caltech has a Core Curriculum – a series of courses that all undergraduates take, regardless of their intended option. The Core Curriculum is intended to provide foundational knowledge in math, chemistry, physics, and biology that all options can build upon. Furthermore, students are required to take several years of humanities and social sciences courses, so they are able to engage in informed analysis of cultural, political and economic issues. (See the Core Curriculum graphic in Section 1.) If you will be teaching in the core, you will be responsible for helping your students to develop a strong foundation for future courses to build on. If you are teaching courses that come after the core, it might be necessary to check that your students have a strong foundation and to provide resources to them if they need a review.

### Graduate Curriculum

Each option has its own graduate curriculum (rather than one for all graduate students), so it is important to talk with your division about where your course fits into the larger picture. Curriculum mapping can help with this process.

### Overview of Curriculum Mapping

A curriculum map shows where within a curriculum student learning outcomes are taught and assessed. A curriculum map can be used to ensure that alignment exists between the expected learning outcomes and what is taught in a curriculum. When created for an existing curriculum, a curriculum map describes what is actually occurring in a curriculum. When created at the program-level, a curriculum map shows where program learning outcomes are taught and assessed in program courses and experiences.

Curriculum maps serve the following purposes:

1. Help ensure that all program learning outcomes are adequately addressed by the curriculum.
2. Help identify potential structural concerns within the curriculum.
3. Help diagnose where and how to correct structural concerns
4. Help document what topics are addressed and where they are covered.

*Steps to Build a Curriculum Map:*

1. Write program learning outcomes in a separate column in the map template (see example, next page).
2. Place courses and experiences in the rows on the map template.
3. Complete Mapping Stage 1. Place an "X" in a cell to indicate which courses support which program learning outcomes.



4. Complete Mapping Stage 2. Place an I, R, or A in a cell to indicate different developmental levels the student will experience through the curriculum.

- Introduced (I) – The skills associated with the program outcome are presented in the course. You may find this will happen in the lower-level courses in your program. There may be formative assessment (assessment that determines what students know and gives them feedback on how to improve).
- Reinforced (R) – The skills associated with the program outcome are being worked on at a level above the introductory stage and/or the skills are being developed at a deeper level. There may be formative assessment.
- Assessed (A) – Students should have developed a sufficient level of competency in the skills associated with the program outcome to have mastered them. This is where the assessment of the program learning outcome is done (or the artifact for analysis is collected). For example, a large self-directed project, thesis, or comprehensive exam.

Example:

		<i>Program Learning Outcomes</i>		
		Learning Outcome 1	Learning Outcome 2	Learning Outcome 3
<i>Required Courses</i>	Course 1	I	I	R
	Course 2	I	R	I
	Course 3	R		R
	Course 4		A	
	Course 5		R	
	Course 6	A		

Completing a curriculum map with your division can help you identify 1) if learning outcomes are assessed before they are introduced and reinforced; 2) if all learning outcomes are assessed; and 3) if learning outcomes are introduced in the correct order.

## Writing Learning Objectives / Outcomes

Once you know where your course fits in the broader curriculum, you can set your individual course goals. It is important that learning objectives be specific, measurable, and observable behaviors. Learning outcomes should describe what students should be able to know or do as a result of a learning experience. Words to be avoided include: appreciate, believe, know, learn, understand – these are open to many interpretations and are not specific.

Every learning objective should be:

- Taught in the course
- Assessed in the course
- Specific and measurable

Aspirations, which do not satisfy the criteria above, are valuable but distinct from learning objectives. Examples of aspirations include “Appreciate ethics” and “Become lifelong learners”. Aspirations can be included in the course description and help the students to understand the instructor’s broader goals for the course.

### Steps for Writing an Objective

1. Choose the desired level of knowledge or skill that you want your learner to demonstrate. Lower-order skills include retrieval (recognizing, recalling, executing) and comprehension (integrating and symbolizing) of information. Higher-order skills involve analysis (matching, classifying, analyzing errors, generalizing, and specifying) and knowledge utilization (decision-making, problem-solving, experimenting, and investigating). Select a verb from the Marzano’s Taxonomy Verb List that matches the desired skill. Remember, the verb should indicate a specific, measurable, and observable behavior.
2. Assemble your objective. The format of a learning objective is:

Action verb + noun (+ condition + timescale)

Condition and timescale are not always included. For example, the following are well-composed learning objectives:

- Analyze a given data set in Excel.
- Label the bones shown in an x-ray image.
- Describe post-treatment care to a patient during an office visit.
- Given four works of short fiction of contrasting genres, students will be able to match each work with its correct genre.
- Given a case description, students will be able to identify legal and ethical issues and suggest plans of action.

Create an objective for each concept students will be expected to master by the end of the course.

3. Review your objectives to make sure each has an outcome. Double-check that you have not created a list of learning activity descriptions or agenda items (for example, “students will watch a video about XYZ”). Learning outcomes should describe what students should be able to know or do as a result of a learning experience.



## Tips:

When writing learning objectives, ask yourself these questions:

- Does the objective focus on student performance?
- Is this skill taught and assessed in your course?
- What criteria will I use to establish that the objective has been reached?

A typical class meeting often covers 1-3 learning objectives. It is helpful for students to identify those objectives before the class proceeds.

Watch out for these common **mistakes**:

- Listing desired mental states, indicated by the words know, understand, learn, appreciate, value, etc.
- Making a mental state sound like a learning objective by using “camouflage verbs” such as demonstrate and show. For example, “Demonstrate an understanding of interviewing techniques.”
- Listing the steps that are actually included in another learning objective, making them redundant. This is referred to as scaffolding. For example, these five learning objectives:
  - Identify research priorities.
  - Use effective online search strategies.
  - Identify gaps in the research literature.
  - Formulate a good research question.
  - Produce a research proposal ← This is the only learning objective required because the first four are required steps.
- Listing course activities rather than skills obtained in the course. For example:
  - Attend a professional presentation.
  - Complete an online survey.
  - Observe a professional practitioner.
  - Work collaboratively.

Examples of Learning Outcomes:		
Setting (e.g., course):	Physics 1b	Turbulence Course
Target Group:	Students	Students
Marzano’s Level:	Analysis	Analysis
Active Verb:	Estimate	Specify
Content / Skill:	Magnitudes of electromagnetic effects	Statistical and structural features of turbulent flows
Full Outcome:	By the end of <u>Physics 1b</u> , <u>students</u> will be able to <u>estimate</u> the <u>magnitudes of electromagnetic effects</u> arising in common phenomena	By the end of this <u>course on turbulence</u> , <u>students</u> will be able to <u>specify</u> the <u>statistical and structural features of turbulent flows</u> .





## Marzano's Taxonomy of Educational Objectives – Verb List

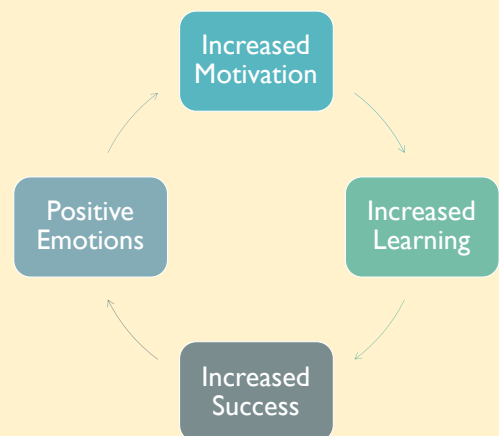
Level of Difficulty	Process	Useful Verbs, Phrases, Definitions
Increasing cognitive level →	<b>1. Retrieval</b>	<b>Recognizing</b> recognize (from a list); select (from a list); identify (from a list); determine (true / false)  <i>The student can determine whether provided information is accurate, inaccurate, or unknown</i>
		<b>Recalling</b> name; list; describe; state; identify who, where or when; describe what  <i>The student can produce information on demand</i>
		<b>Executing</b> use; demonstrate; show; make; draft; complete  <i>The student can perform procedures without significant errors</i>
	<b>2. Comprehension</b>	<b>Integrating</b> describe how or why; describe the key parts of; describe the effects; describe the relationship between; explain ways in which; paraphrase; summarize  <i>The student can identify the critical or essential elements of knowledge</i>
		<b>Symbolizing</b> symbolize; depict; represent; illustrate; draw; show; use models; diagram; chart  <i>The student can depict critical aspects of knowledge in a pictorial or symbolic form</i>
	<b>3. Analysis</b>	<b>Matching</b> categorize; compare & contrast; differentiate; discriminate; distinguish; sort; create an analogy or metaphor  <i>The student can identify similarities and differences in knowledge</i>
		<b>Classifying</b> classify; organize; sort; identify a broader category; identify different types / categories  <i>The student can identify super-ordinate and subordinate categories to which information belongs</i>
		<b>Analyzing Errors</b> identify errors or problems; identify issues or misunderstandings; assess; critique; diagnose; evaluate; edit; revise  <i>The student can identify and explain logical or factual errors in knowledge</i>
		<b>Generalizing</b> what conclusions can be drawn; what inferences can be made; create a principle, generalization, or rule; trace the development of; form conclusions  <i>The student can infer new generalizations from known knowledge</i>

		<b>Specifying</b>	make and defend; predict; judge; deduce; what would have to happen; develop an argument for; under what conditions <i>The student can make and defend predictions about what might happen</i>
<b>4. Knowledge Utilization</b>		<b>Decision-Making</b>	decide; select the best among the following alternatives; which of these is most suitable <i>The student can select among alternatives that initially appear to be equal and defend their choice</i>
		<b>Problem-Solving</b>	solve; how would you overcome; adapt; develop a strategy to; figure out a way to; how will you reach your goal under these conditions <i>The student can accomplish a goal for which obstacles exist</i>
		<b>Experimenting</b>	experiment; generate and test; test the idea that; what would happen if; how would you test that; how would you determine if / how can this be explained; based on the experiment, what can be predicted <i>The student generates and tests a hypothesis by conducting an experiment and collecting data</i>
		<b>Investigating</b>	investigate; research; find out about; take a position on; what are the differing features of; how & why did this happen; what would have happened if <i>The student generates a hypothesis and uses the assertions and opinions of others to test the hypothesis</i>

### Why Communicate Learning Objectives to Students?

Learning objectives provide a roadmap for students, highlighting what information is important and how to assess their own learning.

- Students cannot hit a target they don't know exists.
- Learning and motivation are tightly connected – when students now what they are trying to achieve, have the ability to practice, get feedback, and improve, and have success, they learn more.



## Aligning Your Course to Learning Objectives

How will you know if your students achieve the learning outcomes you've developed for them? The best way to know is to develop assignments and assessments that prompt learners to demonstrate the knowledge and skills that inform your learning outcomes. But before you can assess their knowledge and skills, you need to design activities that help them develop their understanding and abilities. If they haven't had opportunities to develop their knowledge and skill set, they won't be able to succeed in the assignments and assessments you've developed. In short, you need to align your activities, assignments, and assessments to your outcomes.

### Aligning your assignments and assessments

Once you've developed your learning outcomes, reflect on the following questions:

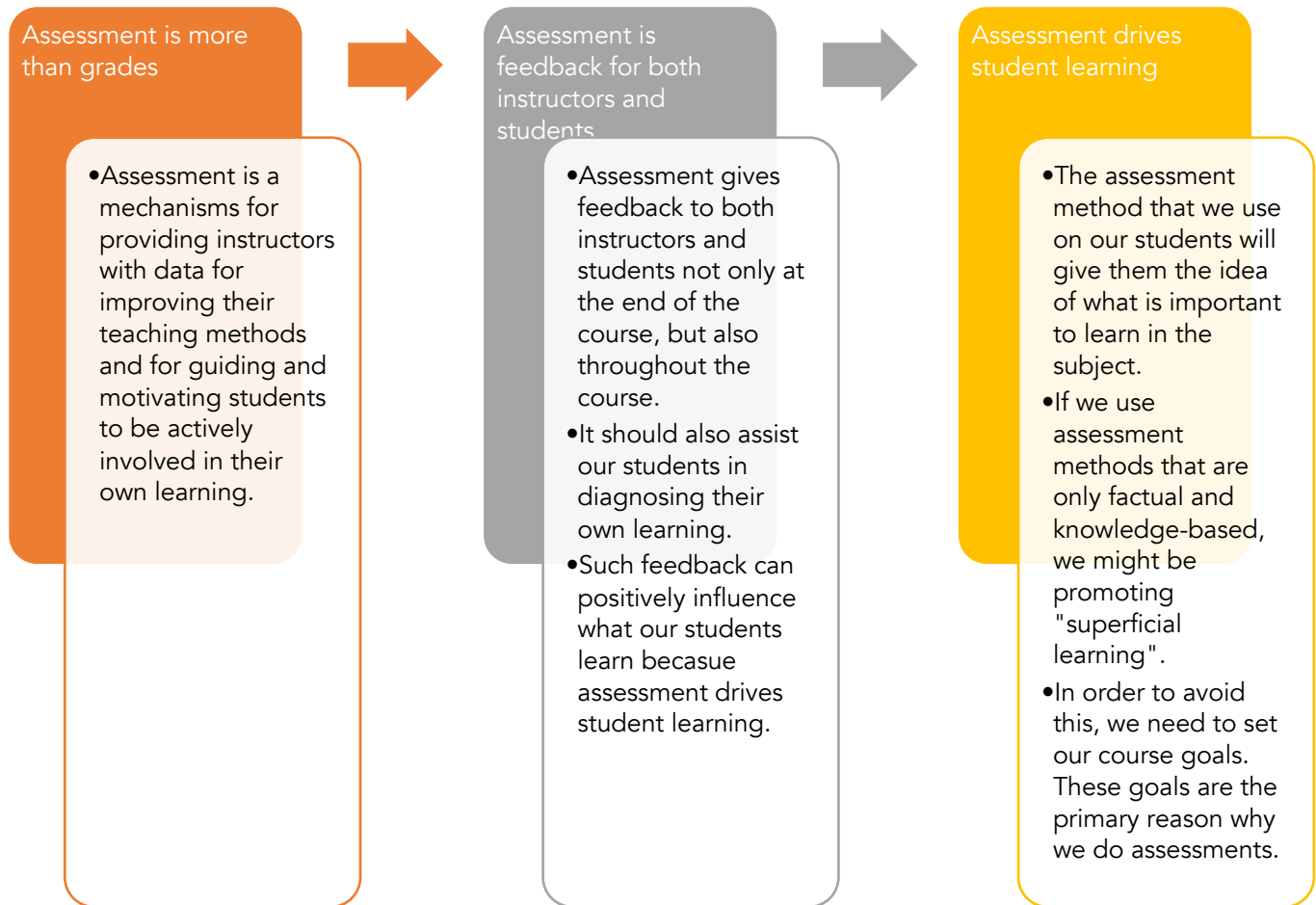
- What type of assignment or assessment would best help me confirm that my students know X or can do Y? Don't be content with inside-the-box thinking. What are options beyond the multiple-choice quiz, midterm/final, or term paper?
- What assessments can I design to check students' understanding during the course? What about at the end of the course?

For each of the learning outcomes developed for your course, what assessment tools will you use to determine if students have learned that material and possess the skill you have taught? (*Read the next several pages for more information about assessment.*)

Assessing Learning Outcomes	
<i>Learning Outcome:</i>	<i>How will I assess this outcome?</i>

## Assessing Student Learning

What is assessment?



There are two fundamental types of assessment:

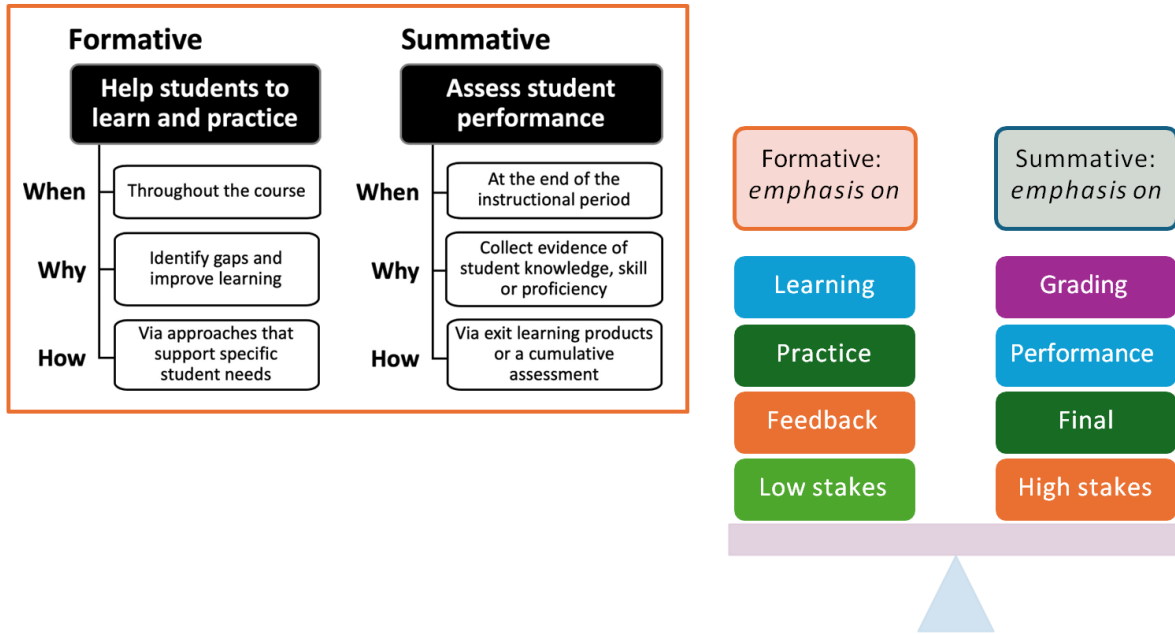
### *Formative Assessment*

- "Assessment (or feedback) which informs students' subsequent learning"
- low-stakes or no stakes (e.g. problem sets, group work, low-value / no value quizzes)
- feedback to you
- feedback to your students

### *Summative Assessment*

- "Assessment (or feedback) which gives a final judgement or evaluation of proficiency, such as grades or scores"
- tend to be higher stakes assessments (e.g. exams, midterms, projects)
- determined by your learning outcomes
- must reflect activities and formative assessments

Learning happens when students are given a chance to practice a skill, get feedback through formative assessment, and improve their performance, which is then measured through summative assessment.



**Assessment best practices:**

- Frequent, low-stakes assessments with immediate feedback so students can improve
- Assessments should be meaningful and purposeful: questions should be authentic
- Assignments should be transparent to student: explain the “why”, the “how”, and the criteria for success, as in a grading rubric
- Course grading should support a “growth” orientation to learning – allow improvement over time



Help students see how to be successful on your assignments and give them opportunities to improve over time.



## Helping Student Develop Mastery – Giving Feedback

When students first start out learning a new concept, we consider them “novices” (while you are likely an “expert”). Novices and experts approach information in uniquely different ways.

### Working with Novice Learners

Novices have a limited network of knowledge.

- They don’t know which information is important, and which information is background.

Novices have weaker retrieval skills.

- Novices don’t have a robust network of knowledge or experience for recalling information.
- A one-time exposure to a concept is not enough to reach mastery.
- Novices need many chances to practice recalling information to reach mastery.

Novices have very limited or incomplete mental models related to the topic at hand.

- With the proper mental models, a person can predict what will most likely happen as the result of an action, which helps in problem-solving.
- Experts are good problem-solvers because they’ve built sophisticated and accurate mental models in their domain.
- A novice must rely on trial and error to solve problems, because they don’t have depth of experience to draw from.

Novices have knowledge without knowing how to use it or how it might be connected to other bits of knowledge. They need experience and practice in order to develop an understanding of when and how to use their knowledge.

*Learning takes place when misconceptions are identified and corrected.*

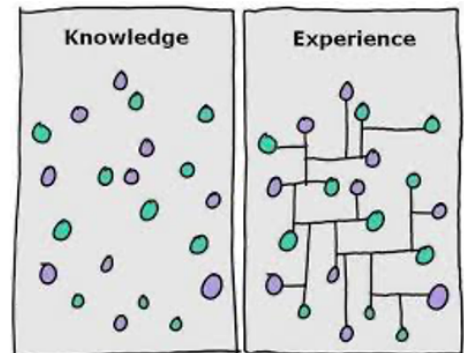
### Providing Effective Feedback

The purpose of feedback is deeper student learning. Students cannot correct misconceptions if they don’t know what they are.

Effective feedback is **wise** and **constructive**:

- Wise:
  - Expresses your belief that students can succeed.
  - Indicates the purpose of feedback is to help them succeed.
- Constructive:
  - Accurate and specific positive and negative feedback.
  - Actionable – clear information about what to improve / change.

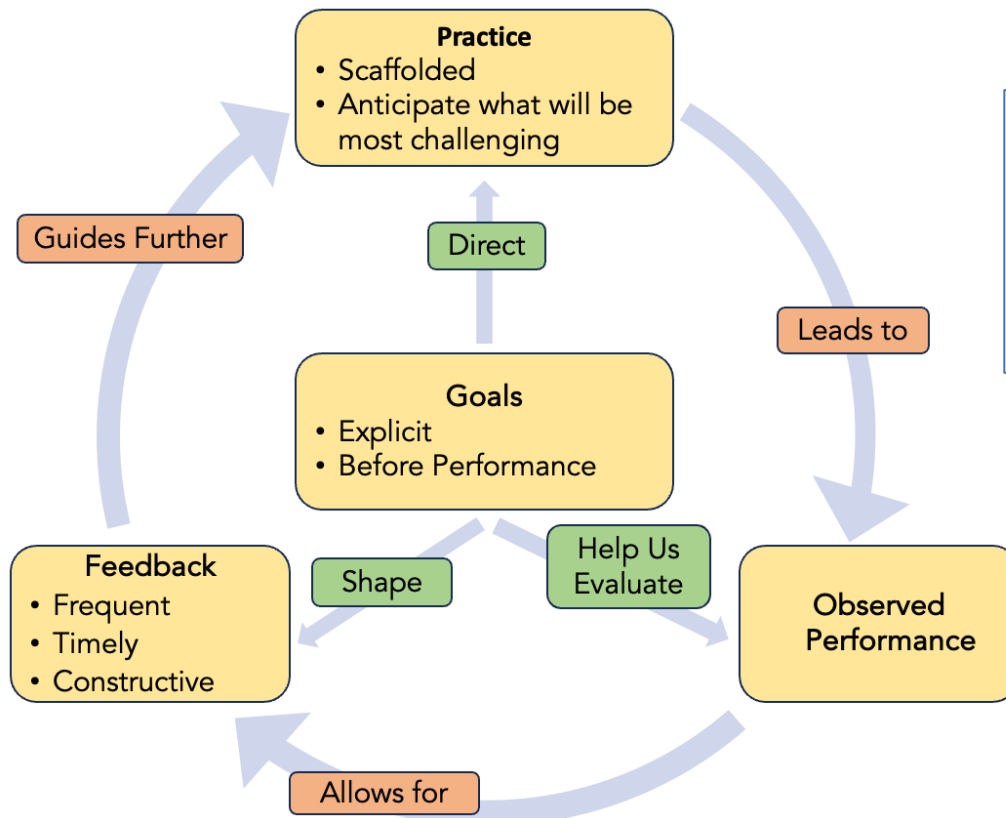
## Knowledge vs. Experience





## Effective, Motivating Feedback:

- The areas for improvement are clear.
- There is an explanation of where/why the error began.
- There are comments for what is correct and why.
- Makes students feel encouraged (growth mindset!).
- Feedback is given in a timely manner, so they can use it on their next assignment.

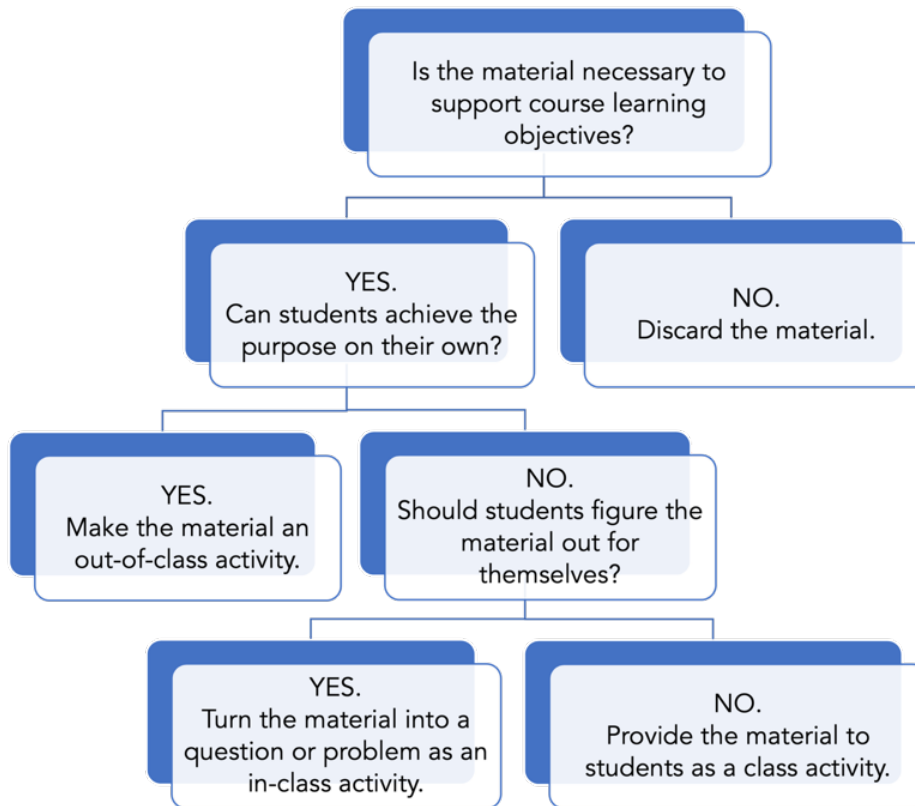


*"It's not teaching that causes learning. Attempts by the learner to perform cause learning, dependent upon the **quality of feedback and opportunities** to use it." --Grant Wiggins*

## Aligning Your Class Activities to Your Outcomes

Learning outcomes are destinations. Our role as instructors is to design the journey toward those destinations. Think of the questions you ask when planning a trip. What's the best way to get to your destination? A train? A car? Walking? Does it make sense to journey solo or in the company of others? In the classroom, you can lead students toward learning outcomes in any number of ways. You might assign readings or videos, lecture on a topic, ask students to engage in active experimentation, explore case studies, practice a skill, write in class, discuss a topic, conduct field work, engage in service learning, or work to solve a problem. How might you combine activities to create an engaging, transformative journey toward your outcomes?

This flowchart can help you decide how to implement your course activities:



## Planning Class Activities – Active Learning

Active learning is an instructional approach in which students actively participate in the learning process, as opposed to sitting quietly and listening. Active learning builds on constructivist learning theory, which posits that people learn by connecting new ideas and experiences to what they already know. Active learning is any educational method in which all students are asked to engage in the learning process while in the classroom, rather than passively receiving information.

There are many ways to incorporate active learning into your teaching. Common strategies include, but are not limited to, question-and-answer sessions, discussion, interactive lecture (in which students respond to or ask questions), quick writing assignments, hands-on activities, and experiential learning. As you think of integrating active learning strategies into your course, consider ways to set clear expectations, design effective evaluation strategies, and provide helpful feedback.

### *Ideas for Using Active Learning*

#### Larger classes

- **In-class poll questions.** Use practice quiz questions to help students check their understanding or open-ended questions to gather ideas or examples from students. Consider having students discuss how they responded with each other before you show the answer, then allow them re-vote after discussion. This is often helpful for trickier concepts; students can sometimes teach each other on the spot!
- **Minute paper.** Have students spend one minute writing about what they know about a topic or what was confusing or difficult for them. Use this feedback to modify your next class session.
- **Think-pair-share.** Have learners think and/or write for a minute about a question. After a minute, have them pair up with a classmate to discuss their answers. Then have the pairs share out to the whole class.
- **End-of-class wrapper/Exit ticket.** In the last few minutes of a class session, have students write one thing they learned and one thing they are still confused about. Use this feedback to modify your next class session.
- **Post-exam reflection.** Have students reflect on how they studied for an exam (this can be multiple-choice from a list of common techniques, or free response), how they felt about their performance, and what they might do differently next time.

#### Smaller classes

- **Student discussion leader.** Have students write discussion questions based on the class reading, then meet in small groups to debate their questions. Group members are roles (leader, timekeeper, note-taker, devil's advocate). The goal is to produce one discussion question to contribute to the whole-class discussion. One could randomly choose two of the day's discussion leaders to facilitate whole-class discussion.
- **Whole-class debate.** Have students choose a side of the room based on their response to some topic that doesn't have a correct/incorrect answer. Ask students to explain why they hold their belief or opinion. Consider writing ideas generated from debate on the board.



- **Jigsaw method.** In this method, each student in a pre-assigned group contributes one specific thing to the group's overall task. They might read a particular part of a chapter or a particular article or research a particular aspect of a topic. The class begins with all students who learned the same material getting together to review the basic facts and check their understanding. Then students get back into their pre-assigned groups in which each member has focused on a different aspect of the topic and they take turns teaching the other members about what they have learned.

### Flipped Classrooms

Traditionally, instructors have used class time to introduce new content via lecture, and then left students to practice and apply that content by themselves in homework exercises. A flipped classroom model "flips" this use of class time.

In a flipped model, instructors typically introduce new content through pre-recorded lectures (using technology such as Zoom) and/or assigned reading. This homework prepares students to come to class ready to engage in activities that promote higher-order thinking, such as analyzing or synthesizing information through discussion, hands-on work, and collaboration – activities which have been shown to increase students' learning and academic performance.

Allowing students to engage new ideas asynchronously has a lot of benefits. Shifting your lecture from an in-person lecture to a (short) video lets students watch (and re-watch) the information at any time, pausing when they need to. This benefits all learners, but is especially helpful for learners who are slow notetakers or for whom English is an additional language. This also frees up in-class time for deeper dives into the content – students are then in a better position to ask questions, work together, and wrestle with complex concepts.

#### ***Why is the flipped model better than traditional lecture?***

Learning is an active, social process that requires talking, thinking, and feedback. Students need practice transferring their skills from one context to another.

#### *Traditional lecture model:*

- Content is delivered (one-way) to students by the professor while the professor is in the room.
- Students apply their learning to problem sets / learning activities outside of class on their own.

#### *Flipped model:*

- Content is delivered to students outside of class, at a pace they choose.
- Students apply their learning to problems / learning activities with the professor in the room to answer questions, guide thinking, and give feedback.

## How to flip your class

### Step 1: Identify the information students will need to learn and to participate in class

Flipping a class begins with your learning outcomes. What key concepts do you want students to be able to know and what skills do you want them to be able to demonstrate as a result of taking your class? Once you have these in mind, determine what information or preparation students will need before coming to class so that they can work on applying the concept or skill while in class.

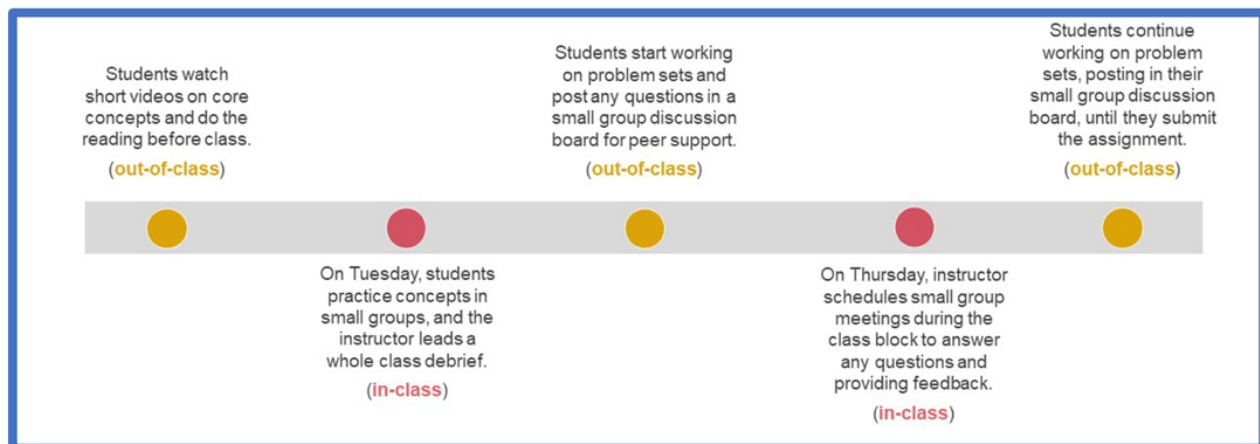
### Step 2: Develop resources and homework assignments that introduce key concepts and prepare students to participate in class

Once you've identified what information students will need before coming to class, determine what resource(s) would best give students this foundational knowledge (e.g., video lectures, assigned readings, animations, diagrams, etc.). Create or find these resources and share them in your course's Canvas site. To ensure that students come to class ready to participate, you might also ask them to complete simple assignments that allow students to check their comprehension (e.g., practice quizzes, short reflections). It is helpful to hold students accountable for their pre-class work through these low-stakes assignments (worth a small percentage of their grade). This provides the students with timely feedback on their understanding and ensures they come to class prepared.

### Step 3: Develop in-class activities that ask students to apply concepts introduced in the homework

Now that you've shifted the introduction of new content to pre-class homework, you can focus your class time on digging deeper and helping students apply concepts. Think about what sorts of activities would help students deepen their understanding of the material. Consider asking students to work together on a problem or set of problems, apply a concept to a scenario, or connect a concept to their own experiences.

#### Sample: Out-of-class vs. in-class content:



## Grading

Practices related to grading—both as an assessment of student performance and as a mechanism through which students receive feedback on their work — vary widely across disciplines, course levels, divisions, institutions and instructors. However, there are several strategies that most instructors agree contribute to successful grading:

- Creating clear grading criteria
- Communicating these criteria to students
- Giving constructive feedback
- Employing time management strategies when grading large amounts of student work

### Establish assessment standards

It is strongly suggested that you explain assessment standards clearly when you introduce the course to your students and probably at several subsequent points during the quarter as well. Most students use grading criteria to determine what they should concentrate on learning in a course. By making your grading policies clear, you can focus students' attention on what is most important for them to learn and retain.

Because grades communicate the relative weight of course goals and assignments and because grades in a course may have great influence on students' future academic work, most students are very sensitive about grades and the criteria on which they are based. Typical questions may include:

- Will this be on the test?
- How much does the quiz count toward the final grade?
- Do you consider attendance and participation?

Determine assessment criteria from the onset, explain these standards clearly to students, and reinforce their application consistently throughout the quarter.

Consistency is also important when it comes to concerns such as accepting late papers and taking more time than allotted for an exam. Attention to these matters in the beginning will save you time and energy later.

### Keeping records

Keep accurate and thorough records of your evaluation of each student's performance throughout the quarter. You should also keep your records for a while after the quarter is over, since students may come back later to question a grade, finish an incomplete or ask you to write a recommendation. Your records will help you to justify and/or reevaluate a student's final grade if necessary.

NOTE: There are a number of tech tools to help you keep accurate records. One such tool is the Canvas Gradebook. Visit the Canvas Resources page ([www.canvas.caltech.edu](http://www.canvas.caltech.edu)) for a comprehensive list of options and assistance.

When students ask you to change a grade, act carefully. Give yourself time for further investigation in order to help you prepare a fair and equitable response. Please also refer to specific information about grade changes at the Registrar's website and on the UASH page.



If a student approaches you to contest a grade it can be helpful to have the student submit their request in writing, which will require the student to reflect on and justify their request. This also provides you with documentation should you be asked to explain your decision at a later point. Finally, document your interactions with disgruntled students as promptly as possible so you have accurate notes for a subsequent discussion.

### Using Canvas to facilitate assessment

The Canvas learning management system is a wonderful tool for creating formative and summative assessments. The "**Quizzes**" function in Canvas allows instructors to create:

- Conventional, **graded quizzes** that reward points based on student responses.
- Ungraded **practice quizzes** that allow students to test their own understanding as they move through course material.
- **Graded surveys** that reward points for completing a questionnaire.
- **Ungraded surveys** that gather students' opinions or other information.

### Alternatives to High-Stakes Testing

In an environment of high-stakes assessments – where a large portion of a student's grade is determined by a single assignment – students often feel anxiety and, when circumstances make them feel desperate to succeed, can lead to academic integrity violations. Here are some alternatives to high-stakes testing and assignments that can accomplish the same goals while creating an environment that reduces student anxiety and stress, emphasizes learning and feedback, and provides an inclusive approach to content mastery.

#### *Frequent, Low-Stakes Assessments*

An alternative to a few high-stakes exams (midterm and final, for example), is to break the content into more frequent, low-stakes assessments like quizzes. Rather than have a single midterm worth 40%, consider giving four quizzes (in Weeks 2, 4, 6, and 8, for example) worth 10% each. More frequent testing encourages students to stay up to date with the material and prevents "cramming" for the midterm (which is not conducive to long-term learning). It also lowers student anxiety since each test is worth significantly less of their overall grade, reducing the chances that a bad day will significantly impact their ability to succeed in the course.

#### *Mix Group and Individual Assignments*

Group quizzes/worksheets provide a good way to get students to solve problems together. Questions that work well for group work like this tend to be conceptual in nature (rather than calculations). Providing one copy of the questions to a group of three students is a good approach to encouraging group discussion and streamlines grading (Gradescope makes group submissions simple and fast). Possible uses include in-class worksheets that directly address student misconceptions, group quizzes the day or week before individual quizzes to help students clarify their understanding, and group post-lab questions.





## Give Students Multiple Ways to Demonstrate Their Understanding

Not everyone takes tests well, despite having deep content knowledge. Consider having short-term projects or creative ways for students to demonstrate their knowledge in addition to exams. These might include creating a poster or infographic, writing a paper, or creating a video. Giving students a range of choices can help them feel motivated and included in the course.

## Create Frequent Immediate-Feedback Assignments

Consider using Canvas quizzes (which can be automatically graded) to test basic knowledge students need to master before class. Giving short quizzes, worth just a few points, with multiple attempts possible, is a great way for students to check their knowledge of the basics. By building in automatic feedback to incorrect answer choices, course instructors can give students instant feedback with little effort after the initial set-up.

## Course Grading Models

Most people are familiar with the traditional percentage / grade cut-off grading model in which students earn a particular total score in order to achieve a certain grade. There are, however, a number of other different types of course grading models:

### Mastery

- Students have several attempts to demonstrate mastery of a concept
- Highest earned grade is retained

### Specifications

- The specific requirements to earn each grade are set forth
- Specifications can be based on breadth or depth of learning

### Contract

- (Closely related to specifications)
- Course requirements are set forth in a mutually-created contract, possibly from a menu of assessment options

*NOTE: It is strongly recommended that you do not grade on a curve (where the number of specific grades is pre-determined). All students should have the opportunity to demonstrate mastery and earn a fair grade.*

Why consider a non-traditional grading model? There can be a number of problems with traditional grading approaches:

- The course grade may not reflect actual student learning. For example, an early low grade on an exam continues to influence the course grade even when the student masters the material later OR partial credit on problems mask students' poor understanding of the material.

- Grades rarely focus on or reward student growth. They tend to demotivate students to go back and learn material they didn't do well on, especially if that material won't be tested again.
- Grades serve primarily as extrinsic motivation and do not develop nor feed into a student's intrinsic motivation.
- They are not student-centered. Traditional grading approaches often focus on easy ways for faculty to judge students rather than a measure of student learning. Learning is expected to happen in a timeframe determined by the instructor rather than by the student – some students need a little longer to master content.
- They can create an adversarial relationship between instructors and students with respect to points earned (or not earned).

There are some questions to ask yourself when choosing a grading model:

- What type of course are you offering and what are your learning objectives? Mastery of new material? Synthesizing concepts into projects?
- Who are your students? Novice learners who need to master fundamentals? Advanced learners applying knowledge?
- What do the letter grades A, B, C, D and F mean to you?
- What about "pass" or "fail"?
- What is the mix of performance versus mastery you hope to have in your course?

**Performance versus mastery:**

Emphasis on Performance	Emphasis on Mastery
Assignments receive little feedback.	Students receive timely, constructive feedback on how to improve.
Few opportunities to practice without "losing points".	Students have opportunities to resubmit work, correct mistakes, or earn additional points.
Few opportunities to correct mistakes.	Students have "lightly graded" ways to practice skills before exams or larger assignments.
Lack of variety in ways to demonstrate mastery – limited to a few assessments.	Students have some sense of control over the process.

Similarly, it's important to decide if you want to emphasize high-stakes assessments or frequent, lower-stakes assessments:

High-Stakes	Low-Stakes
Tests are infrequent and make up a large portion of the course grade.	Lower-point, more frequent assessments (which leads to better long-term retention).
Few opportunities to practice before a major assessment – assignments and exams are in different formats or cover different material.	Quizzes have similar format to larger exams – giving students practice and confidence in answering the types of questions they will see later.
Assignments are unrelated to each other.	Assignments build skills students need to demonstrate in larger assessments.

***Are there course structures and policies that promote learning AND reduce cheating?***

Research indicates there are four features of a learning environment that may pressure individuals to cheat:

- An emphasis on performance over mastery
- High stakes riding on the outcome
- An extrinsic motivation for success
- A low expectation of success

*Practices to increase learning and disincentivize cheating:*

- **Emphasize mastery:** Offer ample opportunities to practice, correct, and retake, with frequent, timely, constructive feedback.
- **Lower the stakes:** More frequent, lower stakes assessments have been shown to increase student learning AND decrease cheating.
- **Build intrinsic motivation:** Give students choices in how they demonstrate their learning – allowing them to tie their learning to their personal lives and values.
- **Build self-efficacy:** Help students see they are capable of success through guided practice, and by telling them they can succeed.

## Putting It All Together: Course Design

<b>Learning Outcome</b> What MUST students know / be able to do by the end of your course?	<b>Assessment</b> Evidence of Mastering Learning Outcome – how could they show you?	<b>Targeted Practice</b> How can you design learning activities for students to practice and receive feedback?	<b>Getting Students Involved: Active Learning</b> What in-class activity can students engage in to “do” the concept?
1.			
2.			
3.			
4.			
5.			
6.			
Repeat for any remaining learning outcomes...			



## TA Roles and Responsibilities

All Caltech teaching assistants (TAs) – whether undergraduate or graduate students – must complete training offered through the CTLO. The training includes not only the important policies related to FERPA, non-discrimination, and accessibility that keep Caltech in compliance with Federal law, but also best practices in how TAs can support students in their class through recitation section, office hours, lab, giving effective feedback, and supporting their development of effective study skills.

Teaching assistants (TAs) at Caltech may serve a variety of roles, ranging from writing & grading problem sets to delivering lectures to setting up and maintaining lab equipment. Due to this variability, it is important to set and communicate your expectations for your TAs before the course begins. In the TA Handbook, we recommend that TAs ask their instructors the following questions to help clarify their responsibilities. We encourage you to think about how you want to utilize TAs in your course.

### 1. Will there be regular TA-professor meetings?

Clear, regular communication is critical for a successful working relationship with your TAs, whether this occurs through in-person meetings or over asynchronous platforms. Make sure that TAs know what you expect at these meetings -- should they be prepared to discuss the previous week, outline their lesson plans for the upcoming week, or simply to check in with you about any concerns or questions they may have? Additionally, you can use regular meeting time to discuss your approach to teaching, receive feedback, and work with your TAs on their own pedagogical goals (developing a guest lecture, learning how to write effective exam questions, etc.).

### 2. Who will be responsible for writing problem sets and exams? For grading them?

If TAs are responsible for writing problem sets and/or exams, ensure that they have access to lecture/reading/lab material with sufficient lead time for them to generate and develop questions based on that material. If TAs are responsible for grading, consider whether they will be using a common rubric/grading scheme you create or if you will require them to develop their own.

### 3. Are the TAs expected to help prepare lecture or lecture notes? To make lecture notes available to the class?

### 4. Are the TAs expected to attend lecture? To take detailed lecture notes?

### 5. Will the TAs be asked to deliver any lectures? If not, will they be allowed to teach a lecture if they wish to?

Many graduate students are interested in gaining experience with teaching, particularly if they are interested in applying for careers in academia. If feasible, consider offering your TAs the opportunity and support to lead a lecture session if they are interested.

### 6. Are the TAs expected to hold office hours? How often?

### 7. In courses with multiple TAs, how will the TA duties be divided?



Will there be a "Head TA" that is designated with additional authority/responsibility? Will TAs divide up submissions and grade some of each problem set/assignment, or alternate who is responsible for doing all of the grading that week?

**8. Will there be any review sessions out-of-class? Who will prepare and facilitate them?**

**9. Who will review requests for extensions on problem sets and exams? Are the TAs allowed to grant extensions? If so, with or without notifying the professor?**

**10. What is the procedure for making changes in grades/points if a mistake has been made on problem sets? Exams?**

**11. Are the TAs expected or allowed to prepare supplementary course materials for students?**

**12. Who will talk to students wishing to add or drop the course, and who will sign the add/drop card?**

**13. In courses with multiple class meeting times, who will review student requests to switch sections?**

In addition, it is helpful to clarify how you'd like your TAs to address you, as students come from a range of educational and cultural backgrounds. Some students come from backgrounds where it was common and expected to address professors by their first name, others come from contexts where the appropriate forms of address would be Professor LastName or Dr. LastName. Specifying your preference gets everyone on the same page.

## Creating Your Syllabus

The syllabus provides the instructor and students with a common reference point that sets the stage for learning throughout the course. Make sure that your students have easy access to the course syllabus by posting a digital copy on the course website and (if applicable) handing out hard copies on the first day of class.

### *Caltech syllabus guidelines and resources*

Many policies and recommended practices at Caltech are enacted at the division or option level, so be sure to connect with your division about expectations regarding syllabi. The institute also general guidelines that you'll want to explore as you build your syllabus.

The CTLO provides a sample Course Syllabus template that you can complete and save as a PDF file or copy and paste directly to your Canvas Syllabus page. Visit:

<https://ctllo.caltech.edu/universityteaching/resources/courses/syllabus-design>

### **Common components included in a syllabus**

The form and content of a syllabus vary widely by discipline, department, course and instructor. However, there are common components that most successful syllabi contain. These components communicate to your students an accurate description of the course including the topics that will be cover, assignments and assessments students will be responsible for, as well as a clear source for policies and expectations.

#### **Course description**

- *Course content:* What is the basic content of the course and what makes it important or interesting? How does the course fit into the context of the discipline?
- *Learning objectives:* What should students be able to do by the end of the course? Objectives are most helpful when they are expressed in terms of knowledge and skills that can be readily identified and assessed. For example, the ability to recognize, differentiate, apply or produce is much more readily identifiable than the ability to appreciate or understand.
- *Characteristics of class meetings:* What types of activities should students be prepared for? Discussion? Lecture? Small groups? Student presentations?
- *Logistics:* What are the instructor's and TAs' names? How can they be contacted? How are course materials obtained? When and where does the class meet?

#### **Course topics and assignments**

- *Schedule of topics and readings:* What will the main topics of the course be and when will they be addressed? What will students need to do to prepare for each class? Most instructors include a weekly or daily schedule of topics they intend to address, along with a list of assigned readings and other course materials.
- *Assignments, projects and exams:* How will students demonstrate their learning? Include learning goals, estimated scope or length, assessment criteria and dates. Instructors typically





include a breakdown, in point values or percentages, of how much each assignment or test contributes to a student's final grade.

## Course policies and values

What values will shape your teaching in the course and what policies will guide you? Policies and values that you might want to communicate through your syllabus include:

- *Inclusiveness*: How can your syllabus help you create an inclusive atmosphere that welcomes all students? Some instructors include statements inviting participation from all students, honoring student diversity and differing points of view, or inviting requests for disability accommodations.
- *Integrity*: What are policies and procedures regarding academic integrity and misconduct in relation to materials and assignment for this course? For example, considering the types of work you are asking students to do, what do you want to communicate about working with data? representing original sources? accountability for contributions to group projects?
- *Responsibility*: What do students need to know about your expectations regarding assignments, attendance, online participation or classroom interactions? Other possibilities include policies regarding late work, make-up exams and preparation for class participation.
- *Expectations for success*: How can students learn most successfully in your course? In your syllabus, you can express confidence that all students are capable of doing well and you can suggest strategies for success. For example, what strategies for learning are particularly important for this material? What resources — such as study centers, web tutorials or writing centers — are available to help students succeed in your course?

## Caltech Sample Syllabus

Visit: <https://ctllo.caltech.edu/universityteaching/resources/courses/syllabus-design> for a Word file.

### Course Code: Course Title

Course Syllabus – Quarter / Year

Department, California Institute of Technology

#### Course Instructor

Name + Pronouns

Contact Information (office, Zoom room, phone number, email address)

Office Hours (*It can be very helpful to include information about what office hours are and how to schedule one-on-one meetings*)

#### Teaching Assistant(s)

Name + Pronouns

Contact Information (office, Zoom room, phone number, email address)

Office Hours

#### Course Description

*Insert course description here as seen in the Caltech Catalog. You may also want to explicitly state the prerequisites.*

#### Course Welcome

*You may choose to use this space to welcome students to your course, set a positive tone for the class, describe why the course is important and interesting beyond the formal course description, and introduce your teaching methods, use of active learning, commitments, and actions toward creating an inclusive and equitable learning environment, and other expectations that you might have. This is also a good place to encourage any and all students to attend office hours – not just if they are struggling.*

#### Learning Outcomes

By the end of this course, students will be able to:

- Learning outcome 1
- Learning outcome 2
- Learning outcome 3
- Learning outcome 4
- Learning outcome 5

*Learning outcomes are key to helping students identify what they are expected to achieve in the course. They should be specific, measurable, and observable behaviors that are taught in the course.*

*For more information visit [CTLO's "Writing Learning Objectives"](#) page.*

#### Required Text

*Required textbooks and where they can be purchased / found / whether they are on reserve at the Caltech library. Also note if older editions are suitable. In a project-based class where students may be required to purchase materials, include information about where financial assistance can be found.*

#### Course Website or Learning Management System

*List the online course resources (Canvas and/or other websites or tools) that your course will use. Give information about how students can access these resources; for those that are integrated into Canvas, there is typically no need for additional instructions. Note that Caltech requests that all courses have,*



at a minimum, a Canvas page published with the syllabus and a link where students can find course content – even if Canvas will not be used for the course.

### Assessment Rubric

Give a percentage breakdown of how you will be assessing your students here (e.g., problems sets 5 \* 5%, final exam 30%, etc.). As much detail as possible will be appreciated by your students! Consider dropping the lowest homework, problem set, attendance or participation grade(s) if many are given throughout the quarter – this can be especially useful for handling student absences.

### Attendance and Participation

Do attendance and/or participation count towards a student's final grade? What are your expectations in terms of students attending and/or participating in lecture? An explanation of why you have this policy can be helpful for students. It is helpful to clearly articulate your policies related to absences related to family emergencies, religious holidays, conferences, job interviews, and other common events.

### Wellness Policy

Some faculty and instructors have chosen to share their wellness policies with their students, which students have very much appreciated. Here, you may want to share that you value and appreciate your students needing to prioritize their health and well-being and how your course has been structured to support that (e.g., this may also include your assessments and policy for dropping the lowest problem set / participation grade). NOTE: The Student Wellness Center and the Dean's Office DO NOT provide notes to students for illness.

Examples of how faculty have conveyed this message include the following:

- I want to clearly state that taking care of your health and well-being should be your number one priority. You cannot learn if you are unwell or under extreme duress.
- The course work should feel challenging in a positive way, but I do not want you to be overwhelmed by your work for this course.
- If you find yourself overwhelmed or encountering other personal challenges during the term, please reach out to me so we can develop a plan for you to pursue success in this course in a healthy way. In addition, I encourage you to utilize Caltech's resources.
- I am available to chat, and you can always attend office hours for a non-academic conversation if necessary. You can also visit the counseling center or talk to a dean if you find you need help beyond the course staff.
- Diversity, inclusion, and belonging are all core values of this course. All participants in this course must be treated with respect by others in accordance with the honor code. If you feel unwelcome or unsafe in any way, no matter how minor, I encourage you to talk to me or one of the Deans.

\*Special thanks to Susanne Hall, Adam Blank and Claire Ralph for sharing their policies, which have been adapted for this template.

You may also want to share when and how students can reach out beyond the instructors to resources such as the Deans and Student Wellness Services along with COVID-19 (and other illness) procedures.

For example:

While COVID-19 remains a concern, all members of the Caltech community, including students and others, are required to [promptly report](#) to the Institute if they have become ill with [COVID-](#)



[like symptoms](#) or have been exposed to someone who has tested positive for COVID-19. Furthermore, any individual, regardless of vaccination status, who is ill or has been exposed to COVID-19 should stay home or return home if they have already reported on-site (including not attending class or other meetings in person), and report their status through the [Caltech COVID-19 Reporting Application](#). Individuals who have reported their status through the COVID-19 Reporting Application will receive personal follow up and guidance from Student Wellness Services on next steps. For additional information on the Institute's COVID-19 preventative health measures and requirements, visit the [Caltech Together](#) website. If you would like to ask about flexibility with coursework for a temporary or minor wellness issue, please contact [*insert course personnel: e.g., instructor, TA, head TA*] directly. The Deans' Office, Student Wellness Services (SWS) and Caltech Accessibility Services for Students (CASS) are available to help you with illness and health conditions that may impact your coursework:

- [Student Wellness Services](#) will assess and treat illnesses and medical conditions and communicate (with student's permission) with the Deans' Office if needed. CASS, part of SWS, can recommend and provide for accommodations needed due to temporary or long-term disabilities. Policies about academic extensions for medical reasons can be found [here](#).
- [The Deans' Office](#) may recommend academic exceptions in cases of significant family or personal emergencies, or moderate to severe illness or medical conditions that make it difficult to keep up with coursework. Please reach out to a dean as soon as possible if you experience these conditions.

#### Students with Documented Disabilities

*You may choose to make a statement here about your intent for the course to be accessible to all students and/or your hope to hear from students as early in the term as possible. At a minimum, please include the following text:*

Students who may need an academic accommodation based on the impact of a disability must initiate the request with Caltech Accessibility Services for Students (CASS). Professional staff will evaluate the request with required documentation, recommend reasonable accommodations, and prepare an Accommodation Letter for faculty dated in the current quarter in which the request is being made. Students should contact CASS as soon as possible, since timely notice is needed to coordinate accommodations. For more information: <https://cass.caltech.edu/>, [cass@caltech.edu](mailto:cass@caltech.edu). If you are having difficulties with access or other challenges in the class you think might be related to a disability, but do not yet have a diagnosis, please feel free to reach out to CASS to learn more about resources.

#### Academic Integrity

*In addition to stating the honor code here, you might choose to articulate what the honor code means for you or your class in particular. Please find a guide for preventing and responding to plagiarism for faculty here: <https://writing.caltech.edu/faculty/plagiarism>*

Caltech's Honor Code: "No member of the Caltech community shall take unfair advantage of any other member of the Caltech community."

Understanding and Avoiding Plagiarism: Plagiarism is the appropriation of another person's ideas,



processes, results, or words without giving appropriate credit, and it violates the honor code in a fundamental way. You can find more information at: <https://writing.caltech.edu/resources/plagiarism>.

All instances of plagiarism or other academic misconduct will be referred to the [Board of Control](#) for undergraduates. For graduate students, contact the [Graduate Office](#).

*The CTLO recommends frequent conversations with students about the Honor Code and its application in your course. All exam rules should be clearly and explicitly stated on the exam and discussed with students in class.*

### Collaboration Policy

*Students will appreciate you being as explicit as possible here, especially in terms of the level of collaboration intended (e.g., allowing discussion of line-by-line solutions, whether students can check their answer when they've completed their solution, or discussion of p-sets in class). Be sure to discuss all aspects of the course (problem sets, in-class assignments, final exams) and online aspects were applicable (e.g., screensharing). Students particularly appreciate the use of checklists or tables in being able to quickly view collaboration policies. Please also explicitly state your policies on the use of AI tools (ChatGPT, CoPilot, etc.) on assignments and in the course generally.*

Example Collaboration Policies:

- Written Guidance
- Full discussion of the problem and solutions is allowed. This includes talking about the concepts relevant to the problem, as well as the details of the solution; or
- Discussion of the problem and how to solve it is allowed. However, intermediate work and the final solution should not be shared; or
- Discussion of the conceptual issues of the problem is allowed, but discussion of the solution is not.
- Checklist-Style Guidance

The following types of collaboration are allowed:

	PS	Quiz	Test
Basic discussion of the problems	Yes	Yes	No
Look at communal materials while writing up solutions	Yes	Yes	No
Look at other's noncommunal work (i.e., writeups)	No	No	No
Turn in a set with more than one name on it	No	No	No

Comments:

*Here are some example collaboration policies for Caltech courses. Special thanks to Ryan Patterson and Doug MacMartin for sharing the following examples:*

#### Example 1

The HW you hand in must be your own and not copied from others or from the blackboard in Recitation. You are encouraged to work on the problems with others and to seek additional



help if you find that useful, but the write-up must be your own. Also, you may not consult any prepared solutions for the problems, whether they are from this year or from previous years, or from Caltech or external sources. As a guideline for the collaboration policy, you should be able to reproduce any solution you hand in without help from anyone else. It is possible to achieve high scores on the HW but still fail the quizzes and the final exam. This indicates poor adherence to the collaboration policy: the object of the HW problems and the collaboration policy is to help you learn the material.

### Example 2

Collaboration on homework assignments is encouraged. You may consult outside reference materials, other students, the TA, or the instructor, but you cannot consult homework solutions from prior years, and you must cite any use of material from outside references. All solutions that are handed in should be written up individually and should reflect your own understanding of the subject matter at the time of writing. Python or MATLAB scripts and plots are considered part of your write-up and should be done individually (you can share ideas, but not code). No collaboration is allowed on the midterm or final exams.

For a complete example checklist, see:

<https://ctllo.caltech.edu/documents/18980/checklistcollaborationpolicy.pdf>

and further Caltech-specific collaboration policy resources are here:

<https://ctllo.caltech.edu/universityteaching/resources/courses>.

### Course Ombuds

*If you participate in the [Course Ombuds](#) program, it's a good idea to explain it in the syllabus and indicate where students can find out who the ombuds are. Email the [Academics and Research Committee](#) (ARC) for more information about this program.*

This course will have 3 or more course ombuds who will be listed in the "Course Ombuds" module in Canvas. I invite you to share concerns about the course directly with me, but you can also share them with the course ombuds. I will meet with the ombuds during weeks 4, 9, and if they reach out to schedule additional meetings.

### My Status as a "Responsible Employee"

*The following text has been provided by the Equity and Title IX Office and is suggested for incorporation into syllabi to articulate your responsibilities as a faculty member:*

As a faculty member, I am required to notify the Institute's Equity and Title IX Office when I become aware of discrimination, sexual harassment, or sex- or gender-based misconduct involving our community members. If one of my students shares such an experience with me, I can help connect them to support resources but will not be able to keep that information confidential as part of fulfilling my responsibility to make sure my students are offered the opportunity to access information and support by the Institute. For more information, you can email [equity@caltech.edu](mailto:equity@caltech.edu), go to [equity.caltech.edu](http://equity.caltech.edu), or review the Institute's [Sex- and Gender-Based Misconduct Policy](#).

If you have experienced such prohibited conduct and want to report it or speak to a confidential resource, consult the [Equity and Title IX Office's webpage on reporting](#) for guidance.



## Course Schedule

Course schedules including lecture topics, associated readings and homework (if appropriate to include in this table for your course) can be clearly laid out in a table format. Include key dates for exams, project milestones, etc.

Week	Date	Lecture Topic	Associated Readings	Homework Due
1				
2				

## Academic Resources for Students

- **Peer Coaching:** The undergraduate dean’s office provides a free peer coaching service to support student in their courses. Find a coach: <https://deans.caltech.edu/AcademicSupport/pac>
- **Writing:** The Hixon Writing Center provides professional writing tutors as well as peer tutors, individual and group writing space, and additional resources; <https://writing.caltech.edu>
- **Registrar & FERPA:** The registrar can answer questions about degree progress, privacy of student records, and course enrollment procedures; <https://registrar.caltech.edu>. The website also lists *Option Representatives* for option-specific advising, policies, and information.
- **Library:** Borrow books, retrieve journal articles, receive guidance about research; <https://library.caltech.edu/>
- **Dean of Undergraduate Students:** Wide-ranging assistance addressing issues (academic and other) for undergraduates; <https://deans.caltech.edu>
- **Dean of Graduate Studies:** Wide-ranging assistance addressing issues (academic and other) for graduate students; <https://gradoffice.caltech.edu>

## Additional Resources for Students

- **Student Wellness Center:** Wide variety of health and wellbeing services; <https://wellness.caltech.edu/>
- **Counseling Services:** Free for all students, regardless of insurance plan; <https://counseling.caltech.edu>
- **Occupational Therapy:** Individual sessions and consultations on building healthy habits and routines, time management, planning and organization, and more. Free for all students; <https://ot.caltech.edu>
- **Center for Inclusion and Diversity:** Resources concerning navigating diversity and inclusion, including staff who can speak with students about challenges of harassment and discrimination; <https://diversity.caltech.edu/>
- **Title IX:** Caltech’s Title IX Coordinator ([titleix@caltech.edu](mailto:titleix@caltech.edu)) works with students on issues related to sexual harassment, sexual misconduct, and sex discrimination; <https://titleix.caltech.edu/>
- **Caltech Accessibility Services for Students:** The Accessibility Services Specialist works with students with temporary medical conditions, or mental, physical or learning disabilities on accommodation requests and services; <https://cass.caltech.edu>
- **Residential Support:** Resident Associates (RAs) and Residential Life Coordinators (RLCs) are





also resources for TAs and students; <https://ore.caltech.edu/residential-experience>

- **Career Advising and Experiential Learning:** Provides resources to help students make career decisions and implement career plans; <https://career.caltech.edu/>



## Section 4: During Your Course

### Inclusive Teaching

#### *Before Teaching*

#### **Examine your own assumptions:**

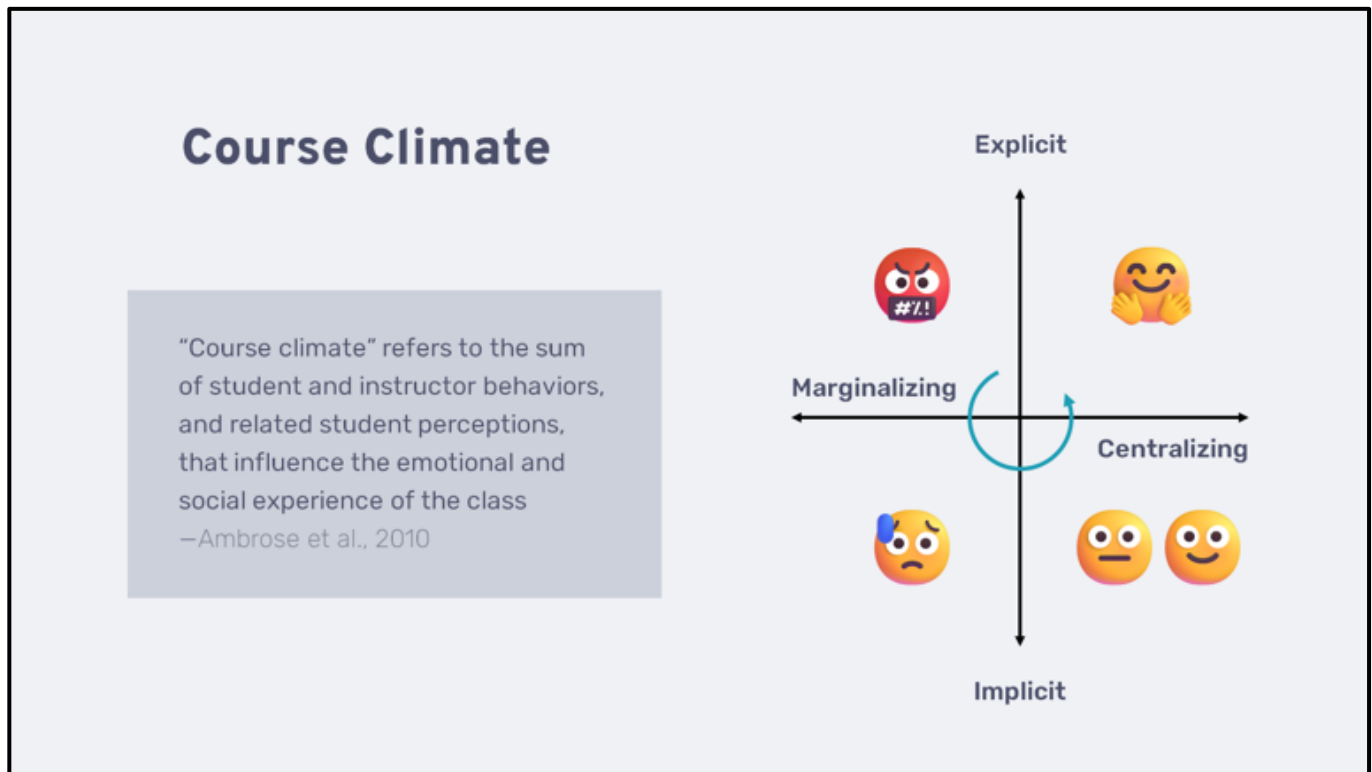
- Make a list of the teaching styles and course structures that you found helpful to your learning in STEM courses. For each one, question how aspects of your background (early exposure, familiarity with university settings, support at home, access to additional resources, life structure allowing full use of resources) might have made that work well for you. Consider how a different experience with any of those factors might change things for your students.
- Examine your own "implicit associations" or stereotypical beliefs about ability and socio-cultural characteristics. Having implicit associations is normal; most people have some associations of which they are unaware, and becoming conscious of them can be helpful.
- Ask trusted colleagues for their perspectives. If nearby colleagues can't answer questions about assumptions and potential bias frankly, you may be able to find remote colleagues within your discipline at disciplinary conferences—especially if there are educational sessions or sessions devoted to diversity within your field.
- Read about various kinds of privilege and reflect on how they may be operating for you.
- Become more knowledgeable about socioeconomic and first-generation effects in colleges and universities; again, reflect on your own background and what may be most familiar or invisible to you.

#### **Establish inclusive class structures:**

- Set "Ground Rules" for interaction in STEM courses, such as:
  - Commit to answering all student questions, either during class or after, and follow through.
  - Provide multiple ways for students to ask questions and interact; make those options clear to everyone at the beginning of the class.
  - Acknowledge there are different ways to express uncertainty, and all are acceptable in the class context. E.g., it's ok to be sure and right, sure and wrong, unsure and right, or unsure and wrong.
- Build inclusive course structures that:
  - Don't assume everyone's life beyond class is the same. For example, unexpected time commitments (extra lab sessions, etc.) may impact some groups of students more than others.
  - Make it normal and routine to make use of academic and other services on campus for this class: e.g., peer tutors, group study opportunities, accessibility services.
- Let students know how you (the professor or TA) can help:
  - Give students concrete examples of when and why students should talk with the professor and/or TA (e.g., at office hours). This can help lower the barrier for those who have prior

conceptions about what college students should or shouldn't do, or what it means to be "successful"; some may believe they have to do it on their own without any help.

- Build feedback into class structures, so you have ways to check on student understanding as well as identify barriers to learning early on, e.g.:
  - Anonymous mid-quarter surveys, which can ask students to reflect on how they are allocating their study/work time in the class, as well as how aspects of the course are supporting their learning. Often, early feedback surveys yield insights that help instructors make small changes, with positive impacts for students.
  - Minute papers (i.e., short prompts at the end of class, which students write on an index card or other paper to hand in before leaving; minute papers can ask students for "the most important thing" learned that day, "one insight" they had in class, and/or "one question or point of confusion" (sometimes referred to as the "muddiest point") from class.
- Plan to use inclusive materials and interaction strategies:
  - Make materials accessible electronically so that students who need to use assistive technologies can do so without extra requests. Using a variety of visual/text-based/aural approaches can help all learners be flexible and learn more deeply.
  - Plan for multiple kinds of input and response—verbal and non-verbal—in class.



# Classroom & Course Climate



## Explicitly Marginalizing

Hostile  
Unwelcoming  
Discriminatory



## Implicitly Marginalizing

Excludes in subtle ways  
Often unintended  
Cues may not be perceived by everyone  
(Micro-aggressions, micro-inequities, stereotype threat, **absence of inclusion attempts**)



## Implicitly Centralizing

Validates multiple perspectives and experiences  
Often unplanned (e.g., in response to situations that arise)



## Explicitly Centralizing

Multiple perspectives are overtly integrated into content  
Inclusive climate is intentionally communicated via syllabus, course policies, structures, etc.

### *During Classes*

#### **Acknowledge students as individuals with varying perspectives:**

- Learn students' and TAs' names, pronunciation, nicknames, and invite (but don't require) students to share their pronouns (e.g., they/them; she/her; he/him; or others) at the beginning of the term. Having students fill out a short information card/survey asking for their preferences in an open-ended way can be a great way to learn about students and allow them to share what they choose.
- Model alternative perspectives and approaches to solving problems. Making room for many forms of difference, including critical thinking and problem solving, can foster a more explicitly inclusive climate.
- Test communication and messages through an "all students" lens: E.g., when trying to reach student(s) you think may be at risk, mentally pre-test your communications by asking "how might \_\_\_ interpret this invitation for extra help (or other communication)?" Insert several different students you know well with diverse backgrounds.
- Adjust communications to the whole class to make sure all would feel included, and not singled out, based on their identity.
- Avoid language that may trigger stereotype threat, i.e., added stress that tends to reduce performance when people feel at risk of confirming a negative stereotype about their social, cultural, or other facet of identity. E.g., performance differences between groups based on gender or other identity, subtle cues about "natural abilities" or "intelligence" that may be stereotypically associated with some groups more than others.

## Fixed Mindset

A learner's belief that their intelligence **is a fixed, immutable trait**

"I'm just not good at this."

"OMG I'll never understand calculus!"

"Their art is so good, they must be naturally talented"

"Gardening isn't for me, I don't have green thumb"

## Growth Mindset

A learner's belief that their intelligence **can expand and develop**

"I'm learning to do this well."

"I'll practice more and do better next time."

"Their art is so good, they must have practiced a lot."

"Gardening is cool, I'm going to try to learn more"

Research has shown that when students have a growth mindset, they are more likely to challenge themselves, believe that they can achieve more, and become stronger, more resilient and creative problem solvers. —Stanford Teaching Commons

**Teachers can have a massive impact on their students' mindsets!**

## Fixed vs. Growth Mindset Attributes

	Fixed Mindset	Growth Mindset
<b>Views on effort</b>	Sees the exertion of effort is a sign of weakness	Sees effort as an integral component of learning
<b>Goals</b>	<i>Performance goals</i> : picks challenges that are easier to meet	<i>Mastery goals</i> : picks increasingly more difficult challenges
<b>Attribution of failure</b>	Internalizes (not enough ability) or externalizes reasons for failure (blames others & situation)	Diagnoses more objectively their own responsibility (not enough effort, preparation, or ineffective strategies) vs. the contribution of external factors (ineffective mentoring, poor course design, etc.)
<b>Strategies</b>	Abandons and withdraws due to feelings of helplessness, or repeats the same failed strategy	Doubles down on effort, tries new things, asks for help
<b>Feedback</b>	Avoids feedback, acts defensively	Seeks feedback proactively

MIT Teaching + Learning Lab

**Focus on practice and improvement, rather than prior privilege:**

- Consider course policies that reward students' current learning, rather than access to exclusive prior educational settings or a family history of university education.

- Consider grading systems that reward improvement over the term rather than immediate perfection.

**Make the content inclusive whenever possible:**

- In cases, problems, and scenarios, vary the pronouns, origin of names, etc., including those of any fictional researchers/scientists represented in the cases.
- When discussing the history of the field, check to see if diverse researchers are represented. While there may be a history of overrepresentation of some and minoritization, marginalization, and exclusion of others, you can make the field's existing diversity more apparent by including researchers' first names and/or photos.
- Avoid language or metaphors with unintended implications about gender, culture, (dis)ability, sexuality, age, etc. For example, choosing a "romance" metaphor for a scientific process that assumes a heterosexual relationship as the norm can feel marginalizing to LGBTQ (lesbian, gay, bisexual, transgender, and questioning/queer) students.

**Address and correct occurrences of microaggressions in class settings, no matter how they arise.**

- These statements or actions that communicate bias, often in subtle ways, may occur outside of people's conscious awareness, so addressing them while preserving everyone's dignity is important.
- Microaggressions may be verbal, e.g.:
  - Expressing surprise at accomplishment or ability to an individual from a marginalized group in the field or in postsecondary education (this reminds them that people may assume they are not as skilled, intelligent, etc.).
  - Asking an individual to speak for or represent an entire group, often a minoritized group or identity--i.e., tokenism (this places an unfair burden on that individual, often not borne by "majority" students in the same setting).
- They may also be nonverbal, e.g.:
  - Not making eye contact with people who have certain characteristics, such as a disability.
- Whether you realize your words or actions may be perceived as microaggressions, or whether you notice them between students, it is best to address them through non-judgmental, direct methods. E.g.:
  - After your own verbal statement: "I'm sorry, what I just said did not accurately represent my beliefs; What I meant was \_\_\_\_\_. I'll do better from now on."
  - After a verbal exchange between students: "In this class/at Caltech it's important that everyone be treated fairly. Let's avoid (asking individuals to represent a larger group; making assumptions about talent/intelligence; comments about \_\_\_\_\_)."
  - If you notice students' peer microaggressions continuing following such interventions, please reach out to the Dean's Office, Title IX office, Center for Inclusion and Diversity, or Center for Teaching, Learning, and Outreach to consult about possible solutions.



## Transparent Teaching

Transparency in learning and teaching (TILT) refers to a teaching style that...

- Clarifies to students the instructor's choices for lesson plans AND
- Specifies how those choices relate to course goals.

TILT moves away from the "what" of teaching to the "why" and the "how" of teaching.

The research demonstrates that when students are exposed to transparent assignments, they gain academic confidence, a sense of belonging and employability skills.

- Students learn more and retain that learning longer when they have an awareness of why they are learning something and have control over how they are learning.
- Giving students more agency in the process of learning increases academic success.
- Transparent teaching methods help students understand how and why they are learning course content in a particular way and how that learning will be useful to solve real world problems.

When students are involved in the learning process and know why they are doing something in a course, it **motivates** them and **increases their confidence** in their learning.

The easiest way to TILT an assignment, course content, or activity is to:

- Explain the purpose of the assignment. What does it teach? Why is it relevant?
- Describe the task in some detail. Provide examples with annotations, if possible.
- Explain the criteria for grading. A rubric is great! Encourage self-assessment and peer assessment.

### **Succinctly share with students:**

- **PURPOSE** – why / what will this help them learn?
- **PROCESS** – what are you asking them to do / for how long / how?
- **PRODUCT** – what is the end result / what will they show or share?





## Universal Design for Learning

Universal Design is a concept that originated in the field of architecture. The idea was to design products and spaces that could be used to the greatest extent possible by anyone, regardless of their age, status, or ability.

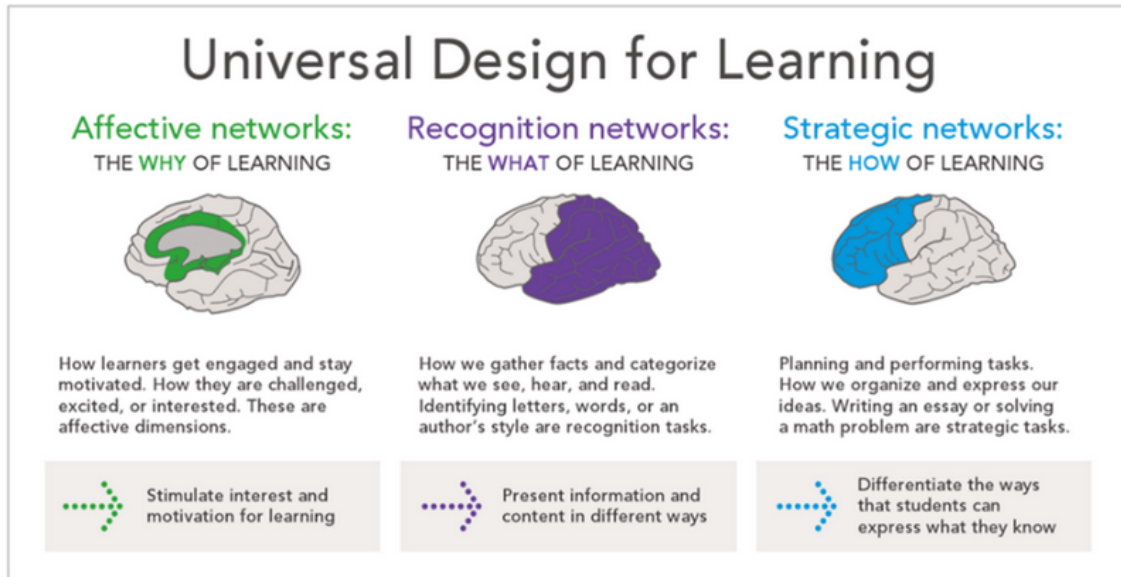


FIG. 4.5. The brain networks ©2013 CAST, INC.

Universal Design for Learning (UDL) applies principles of Universal Design to education. Three primary principles guide UDL. Instructors should provide learners with:

- Multiple means of representation
- Multiple means of engagement
- Multiple means of action and expression

The key word across all those principles is *multiple*. By providing multiple ways to access and engage, UDL increases the likelihood that a more diverse range of learners can succeed. The common red, octagonal stop sign is a great example of the use of multiples to increase access. It conveys information to users through text, color, and shape. Those who can't read, can take cues from the color and shape. Those who are colorblind can take cues from the text and shape. Given the diverse needs humans bring to learning, this use of multiples means that UDL-designed courses are more likely to better serve more people.

### Multiple means of representation

UDL acknowledges that "learners differ in the ways that they perceive and comprehend information that is represented to them" and that "there is not one means of representation that will be optimal for all learners." **Presenting course content and information in multiple formats makes it accessible to a greater number of learners.** Chances are you already do this in your courses. If you assign an article for your learners, you likely also reinforce the article's ideas verbally through a lecture, you explain key terms, you draw diagrams on the board or show images as examples.

Some options to consider:

- **Create assignments in Canvas rather than uploading a PDF or handing out hardcopies in class.** HTML text is readable by a screenreader so those with vision challenges can access the information through the audio version provided by the screenreader.
- **Provide videos with transcripts or closed captions.** Learners with vision challenges can access video content through the transcript text. Hearing-impaired learners can use closed captions to comprehend the audio content in videos.
- **Provide lecture materials in Canvas.** Posting lecture notes and/or slides in Canvas allows all learners the opportunity to benefit from the opportunity to revisit and reflect on your lecture content. While helpful for all learners, this can be especially helpful for those with cognitive and physical disabilities.

## Multiple means of engagement

UDL acknowledges that "learners differ markedly in the ways in which they can be engaged or motivated to learn" and that "there is no one means of engagement that will be optimal for all learners in all contexts." **If information is not engaging, it is inaccessible to learners.** Stimulate learners' interests and motivation for learning in multiple ways. Being flexible and offering learners a degree of choice as to how they engage can help make the content more relevant to them.

Some options to consider:

- **Explain the importance and relevance of your learning outcomes.** Doing so can help build learners' motivation.
- Find ways to **connect the content to learners' lives**, for example through the use of culturally-relevant examples.
- **Acknowledge many forms of participation**, such as contributions to class discussion, online discussion boards, and comments made in writing.
- **Allow learners to self-assess and reflect** on how the content impacts their interests to help them take ownership of the information.
- **Break up larger assignments into smaller, scaffolded assignments** that allow learners to practice and build incrementally toward your learning outcomes.
- **Use a variety of methods for active learning**, such as individual, pair, and small group activities. Learn more about active learning.

## Multiple means of action and expression

UDL acknowledges that "learners differ in the ways that they can navigate a learning environment and express what they know" and that "there is not one means of action and expression that will be optimal for all learners." For example, some learners may be more comfortable and skilled in expressing themselves verbally, but not necessarily in writing. Employing a variety of assessment strategies throughout the course can **empower learners to demonstrate their knowledge in ways that don't disadvantage them.**



Some options to consider:

- **Allow learners to choose** the tool they will use to demonstrate their understanding. For example, if you want to assess whether a learner can think critically about a particular concept, you might offer them a choice to write a paper or record a video to demonstrate their ability.
- **Allow learners to participate in the design of an assignment.**

### Additional Resources

- [SensusAccess](#) is a tool that aims to empower students with disabilities, promote independence and self-sufficiency, and support inclusive education. SensusAccess is integrated with Canvas, providing faculty and students with fully automated document conversion and remediation capabilities right at their fingertips.
- [The Caltech Accessibility Services for Students \(CASS\) office](#)

## Supporting Students Who Miss Coursework Due to Illness

Illness can interfere with student learning, and this page contains information and guidance about how to respond to such challenges. The CTLO can consult with instructors and TAs about course design choices that provide flexibility for students navigating illness. We encourage instructors with specific questions about how to support sick students to reach out to the undergraduate or graduate deans' offices for guidance about individual situations. These offices work closely with students as they navigate illness and other barriers to learning.

### *Caltech Practices and Policies*

- Students who miss required class meetings or need extra time to complete assignments due to illness should communicate their situation directly with instructors. There is no formal "sick excuse" process run by the Deans' Office or Student Wellness Services. Each instructor decides how to work with sick students within the context of their own course and the student's situation. In cases of bereavement, hospitalization, or serious illness, a dean may communicate directly with instructors on behalf of a student. Such communications aim to make sure that instructors are aware a student is dealing with a particularly difficult challenge. You can learn more about how the deans support struggling students on their website ([deans.caltech.edu](http://deans.caltech.edu)).
- Caltech's honor code means that students should tell the truth about their reasons for missing classes and assigned work, and instructors should accept students' communications about absence due to illness as truthful and respond to them in good faith. If an instructor becomes concerned a student is not being truthful, they should share that concern with the Board of Control.
- Accommodations for disability are handled by Caltech Accessibility Services for Students (CASS). Typically, CASS is unable to provide support in cases of short-term illnesses unrelated to an existing disability. However, CASS can provide support and advocacy for students with temporary disabilities or medical conditions, which may include some physical injuries, concussions, some longer-term illnesses (i.e., more than a few weeks), pregnancy, and other medium- or longer-term conditions.
- When a student does not complete course requirements by the end of the term, an instructor may choose to assign a grade of "E" to give a student more time to complete the work. A grade of "I" may be given only in cases of unexpected illness occurring near the end of the term. You may consult the catalog for more details about E and I grades. You can find additional information about I grades under "Medical Incompletes" on the Undergraduate Deans' webpage. Students have the ability to petition UASH for a late drop of a course; these requests are only approved when circumstances beyond a student's control prevented them from dropping the course by the posted deadline.

### *Guidance for Instructors*

- It can be challenging for an instructor to manage requests from sick students. As you work with students, keep in mind most sick students are doing their best to handle a difficult situation of feeling unwell while falling behind in a very demanding academic curriculum. Communicating



to students that you care about both their well-being and their success in your course can help them navigate this difficult situation. One way to do this is to include a wellness policy in your syllabus that expresses your investment in students' well-being, discourages students from attending class when sick, and explains how students should contact you when dealing with illness. See an example on the CTLO syllabus template ([ctlo.caltech.edu](http://ctlo.caltech.edu) and included in this handbook). Also see our guidance for students on this page, which you could borrow for your own course materials.

- Unlimited flexibility can be difficult for students to manage, and due dates are often important for keeping students on track to succeed in a course. When a student misses due dates due to illness, consider working closely with them to create a revised set of due dates that allows the student to catch up and meet the course's learning goals. It's helpful to email this information to a student so there is a written record you can both refer to. This new agreement with the student can be revised if a student continues to navigate challenges.
- Some instructors employ grading plans that allow students to drop a low grade (e.g., dropping the lowest quiz or problem set grade). This helps students mitigate the negative effects of short-term illness with minimal consultation with their instructors.
- Consider what materials you can provide to students who miss class. These may include your own slides/notes, notes taken by a student, or a recording of a class meeting. Offering an opportunity to meet with you outside of normally scheduled office hours may also be helpful.
- It is helpful for instructors to provide specific guidance to TAs about what kinds of communications and questions from students should be referred to the instructor of record for attention. These may include requests for extensions or explanations of missed work.
- If you believe that a student has missed so much coursework that they will be unable to complete the course successfully, consider writing an email expressing that concern to the student and copying their advisor and one of the deans. This helps ensure the student is aware of your concern and that they have support in making decisions about how to respond to it.
- If you become concerned that a student is in acute distress, make a referral to the CARE team (<https://caltechcares.caltech.edu/care-referrals>).
- It is helpful to have some familiarity with Student Wellness Services so you can make sure students are connected to Caltech's resources. You can find more information on their website [wellness.caltech.edu](http://wellness.caltech.edu).

## Section 5: After the Course

### Developing a Reflective Teaching Practice

Self-reflection is the cornerstone of an effective, inclusive teaching practice and plays a key role in helping improve your teaching. Keeping track of what's working (or not working) in the classroom can reveal new ways to engage your students. Reflection also helps identify how your training and lived experiences shape your selection of content and approach to teaching.

#### What is "reflective" teaching?

The American philosopher and educational reformer, John Dewey, considered reflection crucial to learning. As Dewey scholar, Carol Rodgers, notes, Dewey framed reflection as "a systematic, rigorous, disciplined way of thinking" that led to intellectual growth.

Because our students are diverse and there's so much variety in instructional contexts, **good teaching requires instructors to observe, reflect upon, and adapt their teaching practice.** In addition to identifying areas for improvement in your teaching, reflection is also core to an inclusive teaching practice.

#### Reflective practices

There are lots of ways to be thoughtful about your teaching, but here are a few for each point in the quarter.

##### *Before the beginning of the quarter:*

- Reflect on your course goals. What do you want students to be able to do by the time they leave your course?
- Reflect on your own mix of identities. How has privilege or oppression shaped your perspectives?
- Reflect on how your discipline creates knowledge and decides what knowledge is valuable. How has this constrained what and how you teach?

##### *During the quarter:*

- Keep a journal to briefly jot down your observations of student interactions and experiences in the classroom. Note things that are working and things you might want to change.
- Get an outside perspective. Ask a colleague to come observe a class and your interactions with students and/or course materials.
- Conduct a mid-quarter evaluation to gather information on how the course is going. Ask yourself what you can do to relieve the pain points that students identified in the evaluation.

##### *At the end of the quarter:*

- Reflect on your course data. What do your gradebook and course evaluations indicate about what worked well and what didn't work so well? What can you do to improve students' performance?



- Connect with a consultant to brainstorm ways to redesign assignments or improve your teaching practice.
- Dig into the scholarship of teaching and learning to find ideas for how others have improved their teaching practice in a certain area.

## Reflecting on your identities and position

Your teaching emerges from your educational background and training, as well as from your personal history and experience. Reflecting on how who you are and what you have experienced shapes your teaching can help you identify ways to better connect with your students.

### *Positionality and intersectionality*

**Positionality** refers to the social, cultural, and political contexts – including systems of power and oppression – that shape our identities. Our positionalities influence how we approach course design, choose content, teach, and assess student work. Recognizing how your own positionality impacts your teaching can help you create a more inclusive classroom.

On one level, **intersectionality** refers to the ways that the multiple dimensions of our identity intersect to shape our experience. Black feminist scholars have stressed how social systems based on things such as race, class, gender, sexual orientation, and disability combine to create an interlocking system that privileges some and oppresses others.

Reflecting on your own positionality and the intersectional nature of your identity can help you think more intentionally about your content choices, the materials you assign to your students, and even how the different aspects of your students' identities may affect their experience in your class.

### *Empowering students*

The relationships that define learning environments are, unavoidably, imbued with power. As an instructor, you hold a position of authority, and a level of implicit institutional power – you determine the content of your course, create assignments, and grade those assignments. But when **students have agency in their courses, they are more likely to be engaged and invested in their own learning**. Reflecting on the power structures that define your classrooms may help you find ways to recalibrate or redistribute power so that students become more active agents in the creation of disciplinary knowledge, as well as in their own learning.

As you reflect, you might consider adopting one or more of following strategies for empowering your students:

- **Take on the role of a guide.** Rather than aspiring to transmit information through lecture, consider ways to make students active participants and contributors in their learning. Develop student-driven activities and discussions that create constructive, cooperative learning environments that encourage students to learn together.



- **Consider** flipping your classroom. Devote the time you spend with students to interaction and collaboration. Create videos focused on your lecture material that students can watch (and rewatch) as a homework activity.
- **Work with students to articulate community values and expectations.** Consider building community agreements with students. Openly discuss how you will assess students' work and allow students to ask questions and offer their own ideas for grading. A great way to get students involved in thinking about their own assessment is to co-create assessment rubrics.
- **Encourage students to share their own knowledge and expertise.** Ask students to think about what they already know about a course topic and how your course can help them build upon that knowledge. Challenge students to think critically about why and how course material is relevant to their own lives.
- **Practice inclusive course design.** Universal Design for Learning (UDL) principles can help make your teaching more inclusive and offer students more opportunities to engage and express their knowledge.



## Section 6: Policies and Guidance

### Online teaching:

At this time, all courses are expected to meet in person. In the event There is a need to revert to online teaching, resources can be found at [teach.caltech.edu](http://teach.caltech.edu).

### Student privacy:

#### Posting Grades

The public posting of grades either by the student's name, institutional student identification number or social security number, without the student's written permission, is a violation of FERPA. Even with names obscured, numeric student identifiers are considered personally identifiable information and therefore violate FERPA. Instructors can assign students unique numbers or codes that can be used to post grades. However, the order of the posting must not be alphabetic. Using the Canvas gradebook allows students to view their grades securely.

#### Returning Assignments

Leaving personally identifiable, graded papers unattended for students to view is no different from posting grades in the hallway. If these papers contain "personally identifiable" information, then leaving them unattended for anyone to see is a violation of FERPA if the instructor has not obtained the written permission of each student to do so. A possible solution would be either to leave the graded papers (exams, quizzes, and homework) with an assistant or secretary who would ask students for proper identification prior to distributing them or to leave them in a sealed envelope with only the student's name on it. The use of Gradescope and Canvas allow the secure, digital return of graded work.

#### Sending Grades to Students

Instructors can notify students of their final grades via the U.S. Mail if the information is enclosed in an envelope. Notification of grades via a postcard violates a student's privacy. Notification of grades via email is permissible. However, there is no guarantee of confidentiality. Again, Canvas gradebook allows the secure publishing of student course grades.

#### Access to Student Records

Faculty members and TAs are normally considered "school officials." But, the faculty member/TA will have to demonstrate "a legitimate educational interest" in their request to access student records, e.g. advising students, retention study, etc. However, faculty & TAs do not have access to student academic records unless their normal job duties specifically require access.

#### Parents Requesting Information

Such things as progress in a course, deficiencies in a subject area, scores and grades on papers, exams, etc. are all examples of personally identifiable information that make up part of the student's education record. This information is protected under FERPA and the parents **may not** have access unless the student has provided written authorization that specifically identifies what information may be released to the parent(s).



### Crisis Situations/Emergencies

If non-directory information is needed to resolve a crisis or emergency situation, an education institution may release that information if the institution determines that the information is "necessary to protect the health or safety of the student or other individuals." Factors considered in making this assessment are: the severity of the threat to the health or safety of those involved; the need for the information; the time required to deal with the emergency; and the ability of the parties to whom the information is to be given to deal with the emergency.

### Letters of Recommendation

Written permission of the student is required for a letter of recommendation if any information included in the recommendation is part of the "education record" (grades, GPA and other non-directory information).

### Comments/Questions

Please contact the Office of the Registrar (<https://www.registrar.caltech.edu/contact>) with general questions, comments or suggestions.

## Technology Tools

A number of technology tools are available to help you teach your courses. An up-to-date list and more information can be found at [canvas.caltech.edu](https://canvas.caltech.edu).

### Canvas

Canvas is Caltech's learning management system. Courses you are scheduled to teach are automatically generated in Canvas 6-8 weeks before the start of term. Canvas is where students go to find course information such as the syllabus, lecture notes, textbooks, etc. Canvas is also a FERPA-compliant tool that controls access to your course materials – limiting them to students and TAs – and allowing you to share course scores and grades with students in a way that keeps them private. It is the recommendation of the administration that, at a minimum, you post a syllabus and a link to course materials on your Canvas course page. Canvas, however, has a number of powerful tools built in and the CTLO recommends robust usage for students. You can learn more about Canvas at [canvas.caltech.edu](https://canvas.caltech.edu).

### Gradescope

Gradescope is a grading tool integrated with Canvas that allows for consistent and efficient grading of problem sets, exams, quizzes, and code. Most courses use a combination of Gradescope / Canvas to collect and grade student work. You can learn more at [canvas.caltech.edu](https://canvas.caltech.edu) or [gradescope.com](https://gradescope.com).

### Poll Everywhere and Mentimeter

Poll Everywhere ([polleverywhere.com](https://polleverywhere.com)) and Mentimeter ([mentimeter.com](https://mentimeter.com)) are two similar online tools which allow you to quickly survey your students. Both offer free versions with access to basic functions, and you may want to experiment with both to see which one you prefer. In-class polling is a great way to learn what your students know in the moment – consider using it to ask multiple-choice questions, create word clouds, ask "click on the image" questions, or have students give short-answer responses.



## Libraries and Textbooks:

Caltech Library manages both the online textbook store where students can purchase their course materials and the course reserves service where students may access electronic versions of their course materials (via Canvas) and check out physical textbooks. Please let the library know what course materials your students will need, and they will take care of the rest. Information about course reserves (e.g., how to submit textbooks for student purchase, book reserves, and audiovisual reserves) is available at <https://library.caltech.edu/search/reserves>. Please email [coursereserves@library.caltech.edu](mailto:coursereserves@library.caltech.edu) for assistance.

Please submit course material information as early as possible and no later than **three weeks before the start of classes** to ensure your requests are available before the start of the term and to allow students enough time to purchase required textbooks. Requests submitted after this date are welcomed, but the library can't guarantee the online textbook store will stock them.

