Inclusive Teaching Strategies

Fostering a Sense of Belonging to Promote Student Success in the STEM Classroom

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1 | Introduction

The paradox… and a possible solution

Our role as **STEM educators** requires expertise in two areas: **STEM** and ***education***. Yet, while we are required to hold advanced graduate degrees earned through years of extensive training in our specific STEM subdisciplines, we typically have no formal training in education. Most of us are faced with doing "on-the-job" training to learn how to be educators. In fact, for many of us, we will begin our journey as educators not even knowing what the words "pedagogy" and "rubric" mean. As such, understandably, we teach as we were taught—lecturing and testing. Only after our first DFW (failure) rates and student evaluations roll in do we then think: wait, something is wrong! Maybe we spend some time moping, or exploring alternative careers, but optimally we will approach education the same way we approach science: in an evidence-based and intentional manner.

Thankfully, the burgeoning field of scholarship of teaching and learning (SoTL) is ripe with papers on pedagogical strategies that have been evaluated in a variety of contexts. The research tells us that our effectiveness as educators hinges on our ability to center our students. We are here to educate our students, so framing our pedagogical modalities around students should be intuitive (*should be…* yet when an educator has never experienced a student-centered classroom as a student, it might not be so obvious). When centering students, it follows that we must understand *who our students are* and consider their diverse backgrounds that contribute to their learning experience. Our students may have different cultural frameworks for learning, accessibility differences, socioeconomic barriers, communication differences, or other attributes that have unjustly contributed to their minoritization and exclusion in STEM classrooms.

In this handbook, we present student-centered, inclusive pedagogies that have been assessed by experts in the field of SoTL and shown to have significant impacts, such as improved student sense of belonging, narrowed equity gaps, and increased retention of students from minoritized groups. We describe common obstacles to implementing each practice and present strategies for overcoming those obstacles. We also include a resources section that provides examples of activities that you can add to your curricula. We hope this will serve as a useful resource for you in your on-the-job educator training and advance your ability to foster a sense of belonging to advance student success in your STEM classroom.

Structural inequities in STEM

There is a wealth of information on the history of structural racism and exclusion in STEM in higher education. STEM has long-standing cultural norms and organizational structures that marginalize, discriminate, and/or harass **minoritized groups**[1] (National Academies of Science, Engineering, and Medicine, 2016; Rainey et al., 2018; McGee, 2020). The structural inequities in STEM include lack of accountability for racism and injustice (Campos et al., 2019), lower salaries for Black, Indigenous and People of Color, and women with similar training (NSF, 2018 Report), persistent underrepresentation of individuals from historically minoritized groups relative to the population (NSF, 2019 Report), biased and discriminatory hiring practices (e.g., 62% of Black employees and 42% of Hispanic employees in STEM report experiencing discrimination in recruitment, hiring, or promotion; Funk and Parker, 2018), and unwelcoming academic cultures that disenfranchise minoritized students and faculty (McGhee, 2020). In a recent study, professors were asked to assess identical CVs of graduate students in which the only difference was the name. Professors ranked CVs with traditional Black or Latine names less favorably than identical CVs with traditionally white or Asian names (with Black and Latina/e women being ranked as "least hire-able"; Eaton et al., 2020). Thus, there is a moral imperative to advance equity, inclusion, and justice in STEM to dismantle the bias, practices, and policies—borne from STEM's racist, exclusionary, colonial roots—because they continue to marginalize and harm people.

Depending on the identities you hold and/or the learning you have engaged in, you may be well-versed in the inequities embedded in our field, or this news may come as a shock. It is not uncommon for individuals with more privileged identities to be unaware or even resistant to the reality that individuals with systematically marginalized identities experience persistent inequities in STEM.

If you are interested in learning more about both the history and current state of systemic oppression and inequities in STEM in higher ed, we can recommend several articles and books on this topic, which are listed below.

- **Asai, D. J. (2020).** Race matters. Cell, 181(4), 754-757.
- **McGee, E. O. (2020).** Interrogating structural racism in STEM higher education. Educational Researcher, 49(9), 633-644.
- **McGee, E. O. (2021).** Black, brown, bruised: How racialized STEM education stifles innovation. Harvard Education Press.

[1] We use the term minoritized group to collectively refer to individuals who have been systemically minoritized and are consequently underrepresented in the majority with respect to identities including, but not limited to, race, ethnicity, national origin, sexual orientation, gender identity, physical ability, neurodiversity, and religious status.

- **National Academies of Sciences, Engineering, and Medicine. (2016).** Barriers and opportunities for 2-year and 4-year STEM degrees: Systemic change to support students' diverse pathways.
- **Perry, T. B., & Zemelman, S. (2022).** Teaching for Racial Equity: Becoming Interrupters. Stenhouse Publishers.
- **Rainey, K., Dancy, M., Mickelson, R., Stearns, E., & Moller, S. (2018).** Race and gender differences in how sense of belonging influences decisions to major in STEM. International journal of STEM education, 5(1), 1-14.
- **Peterson, R. J. (2021).** We need to address ableism in science. Molecular Biology of the Cell, 32(7), 507-510.

Although the resources listed above were all published in the four years prior to writing this handbook, this topic has been studied extensively in recent decades and there is consensus in the field: structural inequities are rampant in STEM disciplines. In this handbook, we don't debate whether STEM has structural inequities; instead, we start from the baseline understanding that we have a major problem with marginalization of historically underrepresented groups in STEM, and that everyone in a position to advance change must act now.

While the problem of structural oppression in STEM is vast and complex, research from the SoTL community clearly shows that as STEM educators *we can affect change* by implementing evidence-based inclusive teaching practices aimed at supporting *all* students.

Why invest time fostering a "sense of belonging?"

STEM disciplines are currently facing a critical imbalance stemming from high rates of attrition of students from systemically minoritized populations. While STEM disciplines have achieved some success in attracting students from historically underrepresented groups, they are currently struggling to retain them. This imbalance not only impacts the ability of students with diverse experiences and backgrounds to persist in STEM, but it also keeps STEM disciplines from expanding their reach and potential (Seymour, 2000).

A wealth of data indicates that focusing on sense of belonging can help us retain diverse students in STEM. **Belonging** refers to a feeling of connectedness to a group that stems from being **accepted, included, and supported.** One study found that students who graduate with STEM degrees report a greater sense of belonging than those who leave STEM, and that students from minoritized groups are less likely to feel like they belong in STEM (Rainey et al., 2018). A subsequent study found that attrition in STEM is largely due to reduced social belonging rather than academic preparedness (Dewsbury and Brame, 2019). This handbook introduces a

variety of inclusive teaching practices, each of which is ***centered on ensuring that all of our students understand that they belong in STEM.***

Strategies to support ALL students

The creation of inclusive environments and teaching activities informed by inclusive and culturally responsive pedagogies play a crucial role in supporting all students to succeed (Kuh et. al, 2011). The inclusive and culturally responsive teaching practices described in this handbook (and listed below) can help STEM educators more holistically and impactfully support all students:

- **Address implicit bias (Chapter 2)** | We all have implicit biases. Identifying our biases enables us to actively counteract them, instead of allowing those biases to impact how we interact with and educate our students.
- **Create inclusive syllabi (Chapter 3)** | Using validating language and setting an inclusive tone in our syllabi can increase sense of belonging at the outset of our courses.
- **Ensure courses are accessible (Chapter 4)** | Ensuring our course materials are accessible and inclusive helps students with different abilities feel supported and, importantly, grants them the equal access to the education that they deserve.
- **Cultivate connection with students (Chapter 5)** | When faculty connect with students, it helps cultivate a classroom environment where students are more comfortable, more engaged, more resilient, and more likely to ask questions and/or participate in classroom discussions.
- **Build Peer-to-Peer Community (Chapter 6)** | Helping students foster connections with each other is a simple way to build community in the classroom.
- **Representation (Chapter 7)** | Ensuring diverse scientists are included in our curriculum—especially those that represent the identities of students in our classrooms—helps students understand that they have a place in STEM.
- **Use growth mindset strategies & activities (Chapter 8)** | Studies on growth mindset have shown that by simply helping students understand that mistakes are a requisite part of learning and by giving them a varied set of tools to engage with course material, faculty can promote resilience, self-compassion, and a greater sense of belonging in students.
- **Incorporate active learning (Chapter 9)** | Active learning more effectively facilitates long-term retention of information and helps maintain student engagement and attention during class.
- **Develop student-centered learning outcomes (Chapter 10)** | Give students clear expectations by creating learning outcomes that are centered on measurable outcomes that directly connect to course activities and assessments.

- **Use inclusive assessment practices (Chapter 11)** | Effective assessment of student learning is paramount to ensure grades are reflective of student learning. Inclusive forms of assessment help mitigate test modalities contributing to grades that do not reflect student learning.
- **Assess yourself (Chapter 12)** | It is important that we evaluate our own performance so that we can grow as educators and ensure our practices are not impeding our students' ability to succeed. Assessing equity gaps in our classroom and learning about student perceptions of our course are two critical metrics that can help us learn what we are doing right versus what changes we should consider.

Obstacles & Opportunities

While we would love to say that we can't think of a single reason why NOT to make all the changes outlined in this handbook, of course we know the number one reason on most of our reader's minds: *time*. We are tasked with teaching heavy course loads, running research programs, writing grant proposals, publishing in peer-reviewed journals, advising students, serving on committees, and serving our communities. We also have lives beyond the classroom. We get it. Two of the authors are STEM faculty with active research programs who are also parents of small children. Understanding what it is like to be a too-busy STEM faculty member is why we wanted to create a resource that will make adding inclusive practices to your classroom achievable, even for the busiest of our colleagues.

Another challenge specific to STEM is that our courses are often incredibly content-dense, and the material must be delivered to prepare students for future coursework or standardized entrance exams for graduate programs. We have certainly found that some teaching strategies introduced in professional learning communities are unrealistic for us to implement because there is simply no space in the curriculum, which is often already stripped down to the minimum content acceptable for the course. We kept this in mind as we wrote this handbook and were dedicated to presenting strategies that can be implemented without removing any content from your course. ***It turns out that there are very small changes you can make that will have enormous impacts for your students.*** (Some strategies are as simple as adjusting the language you use with your students.) We also provide ideas for educators who *do* have the ability to make more significant adjustments to their curricula.

As you read, keep in mind that course redesign does not have to happen all at once. We present you with a wide variety of options. Maybe you only have time to implement one change per semester. Before you know it, it will be three years down the road, and you will have

implemented six changes. We are all constantly making changes to our own courses as we learn more about cultural competency, equity, and inclusion.

Reflection activities | Identity/privilege wheels

Below are two examples of identity wheels, which are visual tools that can help you identify and consider our social identities and their connection to your power and privilege. Privilege gives advantages, favors, and benefits to members of dominant groups at the expense of members of minoritized and underrepresented groups. In the United States, privilege is granted to people who have membership in one or more of these social identity groups: White people, able-bodied people, heterosexuals, males, Christians, middle or owning class people, among others (Leaven 2003)

These privileges are not, as is often thought, the result of that individual's hard work and effort, but rather the simple fact that they were born into a privileged group. Before we move on, take a moment to explore your own social identities and reflect on how the various facets of your identity are associated with privilege/power or marginalization and how they may have affected your pedagogical approach. To read more, here are some resources:

https://psychology.umbc.edu/wp-content/uploads/sites/57/2016/10/White-Privilege_McIntosh-1989.pdf

https://www.vanderbilt.edu/oacs/wp-content/uploads/sites/140/Understanding-Privilege-and-Oppression-Handout.doc

Reflection Activity | Watch this video: Instructor Identity : https://youtu.be/c1nWLImHYlw and reflect: What identities do you possess that are associated with power and privilege? What identities do you possess that are associated with marginalization? In what ways do you think your identity aligns or contrasts with that of your students? How might they impact the way you teach your students?

Reflection Activity | What is the story of your experience in your field? How do you think your social identities or experiences in academia inform your teaching practices?

Meet the Authors

We are a group of faculty invested in the success of our students at Sacramento State. We came together to participate in the National Science Foundation (NSF) Inclusive STEM Teaching Project representing Sacramento State. We completed the asynchronous modules offered in the training and participated in a facilitator training in the Spring of 2022.

Dr. Eliza Morris is an assistant professor in the Department of Physics and Astronomy. She earned her PhD in applied physics from Harvard University in the area of soft condensed matter physics and her Bachelor of Science degree in physics from Sacramento State. While at Harvard University, she began work in pedagogical development at the Derek Bok Center for Teaching and Learning. As a postdoctoral fellow at UC Davis, Eliza expanded her research further into biophysics, an area she works in today with students in her squishy physics lab at Sac State. In addition to her research in biophysics and soft condensed matter physics, Eliza is an active researcher in the area of physics education research, for which she was recently awarded an NSF DHR:IUSE grant. Eliza's work also focuses on improving representation and providing space for minoritized groups both in STEM and across other disciplines, which was recognized by her receiving the College of NSM 2022-23 Outstanding Faculty Award for University Service. Eliza brings a decade of experience in inclusive teaching training, at Harvard, UC Davis, and now at Sac State, but first and foremost she is a practitioner and is always eager to apply research-based teaching practices in her classroom.

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Meet the Editor

Dr. Mikkel Herholdt Jensen is an associate professor in the Department of Physics and Astronomy. He earned his PhD in physics from Boston University In 2013 studying the dynamics and mechanics of biopolymers and biological cells using biophysical tools and his Bachelor of Science in physics and mathematics from the University of Southern Denmark, Odense, in 2005. He has taught physics, biophysics, and biomedicine at the university level for nearly two decades, working as an undergraduate teaching assistant at the University of Southern Denmark for six semesters and a graduate teaching assistant at Boston University for an additional seven semesters. During his graduate program, he also taught middle and high school physics and general science for one year as an NSF-funded GK-12 teaching fellow at Boston Latin Academy. He joined Sac State In 2015 after a two-year postdoctoral fellowship at Harvard University. His teaching was recognized with the Teaching Fellow of The Year Award at Boston University in 2008 and, more recently, with the College of NSM 2020-21 Outstanding Faculty Award for Teaching. Mikkel's current research focuses on biophysics, soft condensed matter, and the interplay between the physical and physiological properties of living matter, and involves students from across physics, chemistry, and biology.

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2 | Addressing Implicit Bias

"...The process of making these connections is called bias. It can happen unintentionally. It can happen unconsciously. It can happen effortlessly. And it can happen in a matter of milliseconds. These associations can take hold of us no matter our values, no matter our conscious beliefs, no matter what kind of person we wish to be in the world." -Jennifer L. Eberhardt, Biased: Uncovering the Hidden Prejudice That Shapes What We See, Think, and Do

There is a large body of academic literature in cognitive and social psychology that reveals the impact of implicit or unconscious bias in education, hiring practices, the criminal justice system, health care, housing, neighborhood dynamics, and more (Stats et al., 2017). Implicit bias refers to unconscious stereotypes and attitudes we hold that affect our perceptions, decision-making, and reactions. These biases are shaped and informed by the society we live in as well as by the circumstances of our particular lives.

Implicit biases occur without our conscious knowledge (Dore et al., 2014, Steele, 2010). We often hold biases favoring people that are similar to us, as well as negative biases against people that are different/unfamiliar to us. But because bias is not just about familiarity and is also shaped by societal stereotypes, we can absolutely hold negative biases against people that look/act similar to ourselves, especially if we possess any minoritized identities.

The Harvard University *Implicit Association Test* (IAT) is a free online test developed in 1998 with the purpose of measuring implicit bias across the population. The IAT assesses bias in the form of implicit associations in the categories of gender, race/ethnicity, color, religion, appearance, and sexuality. After millions of assessments, the IAT has revealed strong associations between:

- Female–family vs. male–career;
- Male–science vs. female–liberal arts;
- Asian American people–foreign vs. white American people–American;
- Black people-violence vs. white people-nonviolence;
- Textured hair–less professional vs. straight hair–more professional.

Notably, these associations have occurred across *all groups* who have participated in the IAT. Unfortunately, the question is not whether or not we have implicit biases, the question is what

specific implicit biases do we have, and how do we effectively counter them.

If unchecked, the implicit biases we hold will affect our behavior toward students. Studies have shown that implicit bias by educators impacts how we relate to our students, can diminish their sense of belonging, and can hinder their ability to succeed in our courses (Dasgupta et al., 2014, Stats et al., 2017).

One important implication of implicit bias is *stereotype threat*, which refers to when an individual feels at risk of confirming a negative stereotype about a group with which they identify. For example, a student experiencing stereotype threat might be anxious that performing poorly on a test will confirm people's negative beliefs about the intelligence of people of their race/ethnicity/gender or other forms of identity (Steele, 2010). The effects of stereotype threat are especially evident in the classroom but can also follow an individual into the workplace and throughout the rest of their lives. When students are worried about stereotype threat or are uncertain of whether they belong in the classroom or in an academic field, they are vigilant about whether they feel welcome or not. This hypervigilance creates additional stresses, discourages them from engaging authentically with their peers and the learning community, and takes a toll on their ability to perform successfully (Beasley et al., 2012, Cheryan et al., 2009).

Because none of us are immune from holding implicit biases, it is critical that we all audit our own implicit bias and take measures to work against any implicit biases we hold to ensure all of our students feel valued and supported by us. When students are made to feel valued and included in the community through interactions with instructors, class materials, and culturally relevant curriculum, they are more likely to fully participate in class activities, build relationships with their peers, and be more open to feedback—these circumstances make students more likely to persevere in the STEM classroom (Beasley et al., 2012, Cheryan et al., 2009).

Reflection Activity | Use the Harvard IATs (https://implicit.harvard.edu/implicit/takeatest.html) to interrogate implicit biases you may possess. After taking 3 or 4 of the Harvard IATs, were you surprised about any of the results? Why or why not?

(Note: Some people report noticing that they were "good at taking the test," by way of meaning that they noticed themselves working the algorithm to get the results they wanted...but their noticing that they were working the system was enough to uncover their implicit bias.)

Reflection Activity |
Watch: Implicit Bias - https://youtu.be/BMtG5NBNjTI
In what ways might unconscious bias impact your teaching practice? (e.g. messages about the field that you might share with students, grading practices, etc).

Obstacles & Opportunities

It is uncomfortable to realize you hold biases. This work is hard. But it is mission critical. Remember that ALL of us hold implicit biases—our brains are hard-wired to make quick associations to help us navigate the world around us. Unfortunately, we live in a society with rampant stereotypes, which our brain encodes even if we are consciously opposed to the encoded association. Holding implicit bias does not make you a bad person—it just makes you a person. Working against implicit bias is an ongoing, lifelong process. The bright side is once you get past resisting the idea that you hold implicit bias, you can get to the very rewarding and important work of challenging your bias. This doesn't necessarily mean you will undo your bias and eventually be a bias-free person, but it does mean you'll be able to make a conscious effort to ensure your bias does not affect your behavior toward your students.

Strategies to address implicit bias

- Audit your implicit bias. There are several ways to audit your implicit bias. One way to start is by taking the **Implicit Association Test (IAT)**, which measures attitudes, beliefs and associations we have with individuals in different categories. This test is a free tool that allows us to measure our biases that exist at the unconscious level.
- Scrutinize your biases/assumptions surrounding STEM pedagogies. As you construct your syllabus—while you are considering choices surrounding your pedagogy, including assignments, exam formats, grading systems, etc.—consider if you have taken a diverse student body into consideration.
- Ask your students for feedback. Use a mid-semester and end-of-semester anonymous survey to solicit feedback from your students to learn if they perceived any bias from you. You may want to first explain that the survey is anonymous and is only being used as a tool for you to improve your teaching practices. You may then want to define implicit bias and explain that you want to learn if you hold implicit biases that affected their experience in your class. Next, ask specific questions, like: (1) Do you feel like I treated you or any of your classmates differently based on any of the identities that you/they hold? (2) Do you feel like any of my course materials are/were biased? (3) Do you feel like my teaching practices could be more inclusive? (4) Do you have any suggestions or ideas you would like to share with me?
    - ***Resource available:***
        - ***Resource 1. Example Student Survey | page 83***
- Perspective taking. Consider the diverse experiences and backgrounds of your students

and try to understand a concept or situation from their point of view.

- Individuation. How can you connect with each individual in a way that helps you feel connected to them as a person instead of a false stereotype you may hold about them?
- Stereotype replacement. This refers to recognizing any responses you've had to students that are based on stereotypes and replacing those with a non-stereotypical response.
- Counter stereotype imaging. In the event of stereotyped attitudes you may hold, think about counter-stereotypic examples to make positive examples salient and accessible.
- Increase opportunities for contact. Seek and create opportunities to connect with and engage in positive interactions with out-group members.
- Commit to regular audits of your implicit bias. Even with the available tools to assess our biases, reflecting on them and changing our behaviors towards our students or approaches to how we teach is a challenging endeavor. Auditing our implicit biases and consciously acting to counter those biases should be an ongoing regular practice.

Resources at a Glance

- ***Resource 1. Example Student Survey | page 83***

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3 | Inclusive Syllabi

An inviting syllabus that uses validating language to describe an inclusive learning space where all students will be valued and supported can set the tone for your class before the semester even begins.

Building sense of belonging with an inclusive syllabus

Educators often regard syllabi as contracts between themselves and their students. After all, many of us use the syllabus to communicate institutional and instructional policies. But the syllabus is also an expression of our personal teaching philosophy and pedagogy; it is an illustration of the learning tools, communication strategies, and curriculum that will help students to learn and achieve our course outcomes. As such, the syllabus is "an artifact of practice" because it captures how educators see the course, what we expect students will be able to accomplish, and what we will do to advance student learning to help students achieve our learning outcomes. The syllabus is also the first impression students have of us as instructors and of the class they are about to take.

According to Ken Bain, author of *What the Best College Teachers Do*, "The syllabus is the optimal moment for faculty to set a tone that promotes deeper learning, enthusiasm, and intrinsic motivation."

Consider reviewing your syllabus to reflect on the language you use to communicate with students, as well as to reflect on the assumptions, values and beliefs you hold about teaching your students. *Try to view your syllabus through the lens of an incoming student who has no experience with you or your course.* Does the language feel supportive and validating? Or does it feel authoritative and punitive?

Examples of unsupportive/exclusive/harsh tone	Supportive/inclusive/validating alternatives
"You're on your own" statements: "If you miss a class, it is your responsibility to get notes from a classmate." "If you need extra help in the class, you can make an appointment on your own at the tutoring center."	**"I'm here to help" statements:** "If you miss a class, I can… help you navigate getting notes from a classmate… provide you with a recording of the lecture, etc." "If you need extra help in the class, I would be happy to meet during my student hours."
Suggesting some of them will not be able to hack it in your course: "This class is not for everyone." "Half or more of you will fail." "If you have not done well in the prerequisites, you are unlikely to succeed."	**Encourage students to embrace the challenge with growth mindset language:** "I am here to help each and every one of you be successful in this course." "The rumors are true—this course is challenging. But that's what makes learning this material so rewarding. I will help you learn different ways to engage with the course content and we'll take it one step at a time!"
Implying students are not trustworthy or invested in their learning: "If you choose to miss class…" "If you are late to class more than twice…."	**Make the assumption that your students are trustworthy and invested in their learning:** "I understand that life happens. If you have to miss a class for any reason or are late, please let me know so we can make sure you get the material you missed."

**Adapted from ESCALA, Culturally Responsive Teaching in STEM for HSIs.*

The Center for Teaching and Learning at Amherst College provides a holistic framework to survey your syllabus to make it inclusive. The framework invites you to review your syllabus learning objectives, content, frame, tone, format, teaching and learning activities, and assessment from four interconnected perspectives:

1. **Learner Centered Syllabus:** Centers practice and active learning strategies. You allow students to take ownership of their learning. You trust that your students have the willingness and ability to learn the knowledge, skills, and habits needed to be successful in the course.
2. **The Transparent Syllabus**: Transparent teaching makes explicit the often-tacit ways of

thinking and doing that we expect of our students. Transparent instruction tells students what they are being asked to do and how they will be evaluated on their performance.

3. **Universal Design of Learning (UDL) Syllabus**: Learning is accomplished through different approaches of instruction including multiple means of engagement, multiple means of action and expression and multiple means of representation.
4. **Inclusive Syllabus**: An inclusive syllabus is not only learner centered, transparent and includes UDL elements, *it also communicates that all students are capable of success and are valued members of the learning community that the teacher co-creates*. Inclusive teachers make pedagogical decisions about learning activities that will support the success of all students and make explicit the "hidden curriculum" of higher education. "Hidden curriculum" refers to the norms, practices, and information that are often presupposed by those who work in higher education, but which students who are first generation college students or who are from different cultures and backgrounds may find unfamiliar.

Towards an equity-minded syllabus

In addition to using inclusive language in your syllabus, consider using your syllabus to reflect on how to teach critically about diversity, equity, and inclusion in your STEM discipline. It is in our hands to attract more diverse and historically minoritized students into our discipline by proactively sharing and discussing the current lack of representation and diversity in STEM disciplines and to find ways to make positive changes by ensuring all of our students feel valued and supported in STEM moving forward. This helps reveal the past, present, and potential future contributions and active participation of minoritized students in STEM disciplines.

In their syllabus review guide, the Center for Urban Education describes ways to ensure your syllabus is inclusive by focusing on the following equity-minded practices:

- Demystify college policies and practices (i.e., the "hidden curriculum").
- Welcome students and establish a classroom culture in which all students feel valued and supported.
- Use validating language that demonstrate your belief in your students' ability to succeed in your course.
- Establish your partnership with students by describing how you will work *together* to ensure their success.
- Represent a broad range of diverse scientists in your course materials (see Chapter 7 for ideas on increasing representation in your course).
- Deconstruct the presentation of whiteness in STEM as the norm by promoting awareness and by challenging students to examine their assumptions and beliefs.

Please review to the Center for Urban Education's syllabus review guide for suggestions on how to accomplish each equity-minded practice listed above.

Reflection Activity | Count the number of sections in your syllabus that demonstrate and do not demonstrate equity-minded practices. Which of the practices for equity-minded syllabi are present? Which are absent? Were you surprised at the balance of validating/invalidating language? What steps will you take to make your syllabus is more inclusive and equity-minded?

Obstacles & Opportunities

Some might worry that using a validating tone could be interpreted by students as a permissive tone, which could leave them open to being taken advantage of. But we can be inclusive and

supportive while setting limits and expectations in our classrooms. Limits don't mean "unsupportive"—on the contrary, clear limits and expectations provide students with guidelines that help them understand how to navigate our courses. An inclusive tone means setting limits without using language suggesting you expect students to try to break rules/not show up/not extend effort, and it also means coupling limits/expectations with descriptions of how we intend to support our learners' success.

A concern of many instructors when crafting the rules of a syllabus is academic honesty and integrity. You may have found that no matter what you do, there have always been a handful of students who find ways to cheat. (As an aside, studies have found that students who cheat are often not doing so with devious intent; students typically cheat because they feel unprepared and incapable, for a whole battery of potential reasons.) Although this can present an obstacle, we consider that creating harsh or inflexible policies and using punitive language directed at the few students who may try to "take advantage" of a situation is not worth the consequence of alienating many more students in the course because they want to learn and are simultaneously struggling to feel like they belong.

Strategies for Creating an Inclusive Syllabus

- When writing your syllabus use a warm, approachable tone.
  - ***Suggestion:***
    - ***If you are unsure how your tone might be perceived by others, ask a few colleagues (or, better yet, ask a few students) to review your syllabus and give you feedback specifically about tone.***
- Add a brief welcome statement to the beginning of the syllabus to introduce yourself and share your enthusiasm about the course and/or being their instructor.
  - ***Suggestion:***
    - ***If your syllabus is electronic, consider embedding a welcome video.***
  - ***Resource available:***
    - ***Resource 1. Example Welcome Statement | page 85***
- Include a diversity, equity, and inclusion statement.
  - ***Resource available:***
    - ***Resource 2. Example DEI Statement | page 85***
- Share your pronouns and invite students to share their pronouns (be sure to let them know sharing is optional).
- Feature accessibility. Describe your dedication to ensuring your course is accessible and the ways in which you will strive to accommodate students with different needs.

- ➢ ***Suggestion:***
  - ***Review Tulane's Accessible Syllabus Project: https://www.accessiblesyllabus.com/***

- ❖ Consider making your deadline policies more flexible. Deadline policies often have more to do with classroom management than course learning outcomes. Consider building flexibility and options for students into these policies.
  - ➢ ***Suggestion:***
    - ***Use deadline grace periods. There are many versions of deadline grace periods, including (1) giving students a set number of days they can be late with assignments over the course of the semester; they can apply the days to a single assignment or multiple assignments; or (2) embedding automatic grace periods into all assignments (e.g., give all assignments a three-day grace period following the due date).***
- ❖ Consider making your grading policies more flexible. Keep in mind that grades are intended to reflect learner comprehension of course content. Reflect on how you can build flexibility into grading policies, while still ensuring the grade a student earns is reflective of their learning.
  - ➢ ***Suggestions:***
    - ***Allow a later exam grade to replace an earlier exam grade (e.g., a higher score on a cumulative final exam could replace a lower score on an earlier exam).***
    - ***Co-construct a grading contract with your students by deciding together how to weight different assignments/activities.***
    - ***Offer different grading tracks (e.g., Track A = all assignments, activities, and summative assessments are counted; Track B = only summative assessments are counted).***
    - ***Use mastery based grading, which is centered on mastery of specific content instead of points and partial credit (click here to learn more).***
- ❖ Emphasize the positive, not the punitive. Use bold, underlining, and italics to put emphasis on positive and/or encouraging statements rather than using these features to emphasize negative or punitive statements.
- ❖ Audit your re-designed syllabus using inclusive syllabus surveys.
  - ➢ ***Resource available:***

- *Resource 3. Syllabus Survey | page 86*

Resources at a Glance

- *Resource 1. Example Welcome Statement | page 85*
- *Resource 2. Example DEI Statement | page 85*

- *Resource 3. Syllabus Survey | page 86*

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4 | Accessibility & Inclusion

"Accessible design is, at its heart, just 'good' design: effective, highly usable visuals and interfaces to communicate with an audience. What is added is an awareness of certain limitations or needs of specific audience members."
-Princeton University, Design Accessibility

Universal Design for Learning

Universal design ensures that a product is usable by all people, without need for adaptation. For example, an automatic sliding door will open for anyone approaching it, whether they have the ability to open a door. That person may be pushing a stroller, carrying some furniture, or have a physical challenge with opening the door; in any of those cases, the result is the same: the door opens.

When embodying universal design for learning (UDL) principles, curriculum will minimize barriers and maximize learning for all students, leveraging their strengths, needs, and interests. UDL curriculum:

- Aims to make learning accessible to all, regardless of ability,
- Recognizes that there is variability among learners,
- Works for (and benefits) everyone,
- Is proactive rather than reactive, and
- Is integrated in course planning from the beginning.

UDL curriculum will ideally provide students with a variety of entry points to engage in their learning in a variety of mediums. For example, there may be reading, videos, and worksheets, all of which would engage with students at different starting points for a specific element students are learning in the class. It will also provide the students with a variety of options for them to demonstrate their learning. For example, students could be given the option of either a final exam or a final paper. Finally, UDL recognizes that students are motivated to learn for different reasons and will provide multiple options for comprehension. Recognizing that some students thrive in highly contextualized settings, instructors can offer group work to better motivate these students.

Obstacles & Opportunities

One of the primary barriers to UDL implementation is time—or lack thereof! Developing additional materials to provide alternative modes of engagement, creating additional assessment options, and modifying existing materials to incorporate UDL principles can seem like too large of a hurdle. However, UDL implementation should save you time in the long run! Most often, instructors who have redesigned with UDL in mind have found that it often results in fewer learner questions, saving time in the end.

There are also communities within the CSU system that have worked to build material and best practices, so you won't be starting from scratch: https://ati.calstate.edu/community/training.

Reflection Activity | What concerns/hesitancies do you have about applying UDL principles in your classes? How might you address those concerns?

Strategies for Adding UDL Elements to Classes

- Represent your course materials to students in a variety of different formats.
  - ***Suggestions:***
    - ***A lecture that is typically written on a board can instead be written on a tablet and shared with students.***
    - ***Readings assigned to students can be supplemented with multimedia. Many textbook companies now review YouTube options and can offer topical suggestions or provide their own video selections.***
- Provide opportunities for students to demonstrate their understanding of your course material in different ways.
  - ***Suggestions:***
    - ***Check your course assessments. Make sure your students are not always demonstrating their learning in the same format.***
    - ***Provide opportunities for your students to give verbal or creative responses in addition to more traditional written assignments.***
- Engage students and capture their interest and attention through a variety of methods.
  - ***Suggestions:***
    - ***Make the content relevant! Connect to real-life data and issues that are important to your students.***
    - ***Have students work in teams to consider what they will need to know in the future in their fields and brainstorm their own questions.***
- Sac State has a substantial amount of resources for working on UDL in your classes. There are also numerous other websites from Centers for Teaching and Learning at other institutions.
  - ***Resources available:***
    - ***Resource 1. Canvas Course—Universal Design for Learning | page 89***

Reflection Activity | In what way are your students showing you what they have learned? For example, is it always through writing? Does it always involve equations? What is one thing they could demonstrate verbally or creatively? What might this look like for your courses?

Resources at a Glance

- *Resource 1. Canvas Course—Universal Design for Learning | page 89*

References

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5 | Cultivating Connection

When faculty connect with students, it helps cultivate a classroom environment where students are more comfortable, more engaged, more resilient, and more likely to participate.

Instructor Connection

A large-scale factor analysis aimed at delineating effective pedagogies found that *two* factors (or roles) of instructors most contributed to effective instruction in higher education settings: their instructional role *and their personal role* (Abrami, d'Apollina, and Rosenfield, 1997). The instructional role refers to knowledge, preparation, and clarity. The personal role refers to *concern for students, availability, respectfulness, and willingness to answer questions and foster interaction.*

A number of studies have investigated how building rapport with students affects their learning (Meyers, 2009; Umbach & Wawrzynski, 2005; Witt, Wheeless, and Allen, 2004). Collectively, these studies have found the benefits of instructor connection with students include:

- Increased student engagement with course content and enhanced learning,
- Greater student comfort with expressing their thoughts,
- Increased feeling by students that they are valued by the professor,
- Increased willingness by students to be intellectually challenged by the instructor,
- Creation of a mutually beneficial and productive learning environment, and
- Better understanding of students on the part of the professor.

Obstacles & Opportunities

Most of the strategies listed below do not require a large time commitment and are simple to incorporate into your curriculum. But there are non-curricular challenges associated with connecting with students that are important to consider.

Some strategies for fostering student connection involve being vulnerable and/or decentering yourself in the classroom, both of which can run counter to the academic hierarchy many of us

have experienced and grown accustomed to. Consequently, one common hesitancy reported by faculty is that a focus on interpersonal relationships at the college level might be perceived as "soft" or superfluous. But numerous studies—including those referenced above—clearly show that students thrive in classrooms in which the instructors take on a personal role. So, if the job of the instructor is to be an effective educator, these studies provide a strong argument that building connections with students is instrumental, not superfluous.

Other hesitancies are related to instructor identity. Unfortunately, studies have demonstrated time and again that a majority of students question the competence of faculty of color and female faculty more often than they do of white male faculty. For faculty who hold these identities, focusing on developing connections with students can be fraught with challenges because of the different standards to which they are held. Depending on the student body, it may feel appropriate to lean into being vulnerable in order to use vulnerability as a pathway to connection. In other cases, it may feel more appropriate to focus on building rapport with your students using strategies that do not lean into vulnerability (e.g., disseminating an introductory questionnaire, learning student names, encouraging attendance at office hours, etc.). Although sometimes a powerful tool, cultivating connection does not necessitate making yourself vulnerable. Considering the impact your teaching practices have on *your* mental health is an essential consideration.

Reflection Activity | What concerns/hesitancies do you have about cultivating connections with students? How might you address those concerns?

Strategies for Connecting with Students

- On the first day of class, share some information about yourself, including your background, preferred pronouns (what does this mean?), research interests, hobbies, and why you enjoy teaching.
- Discuss your dedication to inclusion and explain why you value diverse thinking.
- During the first week of class, distribute a questionnaire to learn about your students. Questions can include their preferred name (and phonetic pronunciation), if they wish to share preferred pronouns (it is important that this be optional), how many units they are taking, if they are working, their career goals, what they are most looking forward to and most concerned about related to your course, their communication preferences, any circumstances they wish to share with you, and information about hobbies, family, pets, their favorite inspirational quote or advice, etc. *The goal is to let your students know you care about who they are and about their experience in your course.*
  - ***Resources available:***
    - ***Resource 1. Student Questionnaire Question Bank | page 90***
    - ***Resource 2. Example Questionnaire | page 91***
- Learn students' names and their proper pronunciations. Using students' preferred names when you interact with them is a sign of respect and helps them to feel seen by you. Names are a part of our identities and often carry cultural, familial, and historical connections. Communicate your intention in learning their names. Keep in mind that students' preferred names may not always match what is on your course roster.
  - ***Suggestions:***
    - ***Consider asking students to submit a photo of themselves with their introductory questionnaire to help you put names to faces.***
    - ***Consider asking students to use name tents to display on their desks during***

class until you have their names down. (This has the added benefit of helping students learn each other's names.)

- Make efforts to create a welcoming atmosphere—say hello to students at the doorway as they enter your classroom, incorporate humor, include icebreakers, and co-construct classroom etiquette with your students.
- Be sure to step away from the podium and move around the classroom.
- If you are able to—and it does not interfere with the instructor using your classroom before or after your class—arrive early and stay a bit later to chat with students and address their questions.
- Explain the purpose of office hours and actively encourage students to meet with you during your office hours.
  - ***Suggestion:***
    - ***Consider calling office hours "student hours" or "student drop-in hours" to ensure students know that time is reserved for them.***
- Share stories about yourself, challenges you have faced, and how you have learned from your own perceived failures. Define and discuss the importance of resilience.
- Conduct mid-semester surveys to learn about your students' experiences in your classroom. Ask for their ideas & feedback. Unlike the university student evaluations administered at the end of the semester, your mid-semester survey is an opportunity for you to ask your students specific questions and to potentially make changes during the semester. Even if you do not have time to make changes based on student feedback during the semester, asking them about their experience and for their ideas for improvement sends the important message that you value their thoughts.
  - ***Resource available:***
    - ***Resource 3. Mid-semester Survey Instructions & Question Bank | page 91***
- Connect with empathy and support. Emphasize the importance of seeking support and community. Share university resources and programs dedicated to academic support, wellness support, and community building. Some resources can be highlighted on your syllabus and reiterated during class. The following downloadable list of student resources can be linked to your course Canvas page or distributed as a handout during class. Finally, if you feel comfortable doing so, share personal experiences when you have sought support for specific challenges that you have faced.
  - ***Resource available:***
    - ***Resource 4. List of Student Resources at Sacramento State | page 93***

Reflection Activity | What strategies do you currently use to cultivate connection with your students? What new strategies will you try?

Resources at a Glance

References

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6 | Building Peer-to-Peer Community

Positive peer connections increase student attendance, classroom participation, and overall sense of belonging in academic environments.

Peer-to-Peer Connection

Multiple studies have found that peer-to-peer connection significantly improves student mental health and sense of belonging. For example, a large study conducted in 2018 (Lane et al., 2018) found that peer-to-peer connection increased student confidence and happiness, helped them face challenges, supported their learning, and motivated them to do well academically.

One of the lead authors in the study, Minnie Teng, summarized some of their findings as follows:

> *"When students have friends in a class, they feel more connected with the bigger group of classmates. One student described the sense of care his classmates and friends gave him: 'If you have the support network, you can really weather whatever storm may come your way.' (Science student). Another student talked about the academic benefits of having this support network, saying 'the more connection you have, the stronger you feel that you're part of the group and that's a reassurance … you feel like you have something to fall back on when your grades aren't that high and when … you don't know something that you're supposed to know.' (Science student)."*

Obstacles & Opportunities

One obstacle to building a peer-to-peer community is student hesitancy. A common way to build peer connections is through the use of group projects. However, some students prefer to work independently because they find it less distracting. Other students may have sensory or behavioral differences that cause them to struggle with peer interactions. Student hesitancy may also result from an imbalance in effort. For example, a peer review activity may fall flat if peers put appreciably different levels of thoughtfulness into their feedback. There is also the dreaded "free-rider phenomenon," where one group member knowingly makes no meaningful contribution to the group effort.

There are a number of approaches to overcoming these challenges. First, discuss the common obstacles with your students, then share the reasons why you are having them work together despite those challenges. For example, tell your students you understand some people may not be enthusiastic about peer-to-peer and/or group activities, then follow up with a discussion about why collaboration is an important skill for them to develop. While students may remain unexcited about group work, at least they will be more likely to understand its inherent value and why you are asking them to engage in the activity. Second, consider asking students to assess the individual efforts of group members. This can be accomplished by providing students with an evaluation activity in which they are asked to describe and/or rank the effort of their group members, including themselves (be sure to let students know from the outset that this is the plan). The completed evaluations can be anonymized and returned to all group members in advance of the project due date, so that group members have an opportunity to make necessary adjustments to their effort. If you choose to assign peer-review activities, consider assessing the quality of the peer-reviews to ensure students take the peer-review component seriously. When assessing the process of group/peer engagement, it is critical to determine how the assessments will impact project/assignment grades and that students are given a clear rubric.

- ***Resource available:***
  - ***Resource 1. Peer Evaluation Activity | page 94***

Another obstacle is finding time to embed activities that foster peer relationships into your curriculum. Fortunately, some of the strategies listed below take very little time. In particular, icebreaker activities, think-pair-share activities, and helping coordinate student study groups are very quick and relatively easy to implement (these also largely avoid the pitfalls associated with large group projects discussed above).

Reflection Activity | What challenges have you faced or are you concerned about regarding peer-to-peer/group activities? Given the benefit of fostering peer connection, can you think of solutions to address your concerns?

Strategies for Fostering Peer-to-Peer Connection

- Icebreaker activities. Icebreakers can be accomplished during class or online by creating discussion prompts in which students share and reply to each other.
  - ***Resource available:***
    - ***Resource 2. Icebreaker Activity | page 96***
- Think-pair-share activities. After posing questions during class, ask students to think about the question on their own for a minute or two, then have them share their thoughts with a peer, then ask the pairs to share their thoughts with the whole class.
- Group activities. Assign students into groups and have them work together on questions, discussion prompts, or projects.
- Group formative or summative assessments. Assign students into groups and have them work together on formative or summative assessments, like group quizzes or exams. For grading, one possibility is to have students submit their individual quiz/exam in addition to the group exam and then average the two scores. (To avoid a situation in which the group score brings a student's individual score down, consider giving a student their individual score in the event that the group score is lower.)
- Peer-review activities. Have students review each other's work and provide feedback.
- Provide assistance in coordinating student study groups. Some students need help coordinating study groups. Use the "Discussion" feature of Canvas to create a space for students to organize study groups.

Reflection Activity | To cultivate peer-to-peer connection in your classroom, (a) what activities do you already use to accomplish this, and (b) what new activities will you implement?

Resources at a Glance

- ***Resource 1. Peer Evaluation Activity | page 94***
- ***Resource 2. Icebreaker Activity | 96***

References

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7 | Representation

Including diverse scientists in your curriculum helps all students broaden their perceptions of scientists and supports students from historically minoritized groups in developing a STEM identity and sense of belonging.

STEM Identity is Connected to Representation

STEM identity has been shown to powerfully influence students' sense of belonging, academic success, and career goals. The development of STEM identity for students from systemically minoritized groups is often diminished by the lack of representation in STEM curricula, as described below in an excerpt from Sheffield et al., 2021:

> "*In introductory science courses, instructors and textbooks often present students to the 'greats'—the scientists who developed the unifying theories and concepts for that particular subject. There is an easily identifiable common thread that links most of these 'greats' (e.g., Charles Darwin, Alfred Russel Wallace, Nicholas Steno, and Alfred Wegener) together: they are white American and European men, generally depicted late in their career. By including only aged, white men in our textbooks and lectures, we continue to reinforce the dominant, but incorrect, narrative that has existed for centuries—that white men have been the predominant contributors to new scientific knowledge. Throughout history, this select group of scientists has dictated who has been able to serve in scientific leadership capacities (e.g., the exclusion of women from scientific academies), and has decided whose contributions are considered significant (e.g., the historical exclusion of Indigenous researchers from authorship in scientific articles). In not questioning this narrative, we contribute to the history that has actively ignored or prevented the advances of scientists with marginalized identities (e.g., Black, Indigenous, and People of Color (BIPOC), people with disabilities, lesbian, gay, bisexual, transgender, queer, and genderqueer (LGBTQ+) people, women, people with multiple marginalized identities). Our acquiescence perpetuates a specific history that treats scientists with marginalized identities' contributions to scientific ideas and developments as unusual or uncommon, which is not the case.*"

Fortunately, there are evidence-based interventions that have been shown to significantly impact STEM identity development by students with historically minoritized identities. In

particular, *exposing students to diverse scientists in the classroom* can positively impact STEM identity formation and can potentially undo ingrained stereotypes held by most students regarding who "belongs" in STEM (Johnson et al., 2012; Sheffield et al., 2021; Singer et al., 2020).

Obstacles & Opportunities

Because there is a lack of diverse scientists in STEM textbooks and because we may not have been formally educated about the contributions of diverse scientists in our field, we must seek out the information on our own. This means dedicating time to expanding our knowledge of contributions by people who have been historically excluded. Luckily, there are a number of resources available—including those listed in the Strategies section below—that can significantly simplify the task of expanding (and, in many cases, correcting) our knowledge of notable contributions by people from diverse backgrounds.

In addition to including diverse scientists in your curriculum, going one step further to *correct history* by sharing specific stories of individuals who have been excluded sends powerful messages to your students. These actions demonstrate that (1) you are dedicated to inclusion, and (2) colonial influences (i.e., Westernized white forms of knowledge that have historically excluded contributions of women and people of color) in academia have shaped the historical record. Vaccine history is an example of colonial influences on education that, given the COVID pandemic, has relevance for all of us. In textbooks, a British man named Edward Jenner is regarded as the pioneer of vaccines and creator of the first smallpox vaccine. But the concept of variolation—immunizing an individual using pustular matter from a person infected with smallpox—actually arose in Africa and Asia hundreds of years before Jenner. An enslaved man from Western Africa named Onesimus brought the concept of variolation to the United States decades before Jenner began working on smallpox. Jenner made very important advancements, but they would've been impossible without the hundreds of years' worth of efforts that preceded him. Simply sharing this short story pays homage to all the individuals who contributed to vaccine development, corrects the historical record, and asserts your recognition of the marginalization and exclusion of non-Western individuals throughout history.

Reflection Activity | How has the lack of diversity in STEM textbooks impacted your mindset regarding belonging in your field?

Strategies for Improving Representation in your Curriculum

- Audit your existing curriculum to identify gaps in representation.
- Embed images and information about diverse scientists throughout your curriculum. Consider featuring a "scientist spotlight"/ "scientist of the week" (as in Sheffield et al., 2021) to feature scientists from a variety of backgrounds.
  - ***Resources available:***
    - ***Resource 1. Scientist Spotlights Initiative \| page 97***
    - ***Resource 2. The Atlas of Black Scholarship \| page 97***
- Invite guest speakers from diverse backgrounds to give lightning talks (in person or via Zoom).
- Create assignments involving reading the work of diverse scientists.

Reflection Activity | Audit your existing curriculum. Where are there gaps in representation? How do you plan to improve representation in your classroom?

Resources at a Glance

- ***Resource 1. Scientist Spotlights Initiative | page 97***
- ***Resource 2. The Atlas of Black Scholarship | page 97***

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8 | Growth Mindset Strategies & Activities

Studies on growth mindset have shown that by simply helping students understand that mistakes are a requisite part of learning and by giving them tools to work through their mistakes, faculty can promote resilience, self-compassion, and a greater sense of belonging in students.

Introduction to Growth Mindset

"Growth mindset" is the understanding that we can develop skills through effort, persistence, and the adaptation of our learning strategies. "Fixed mindset" refers to the notion that intelligence is a static, unchangeable phenomenon. Studies centered on brain function and neuroplasticity have repeatedly supported the growth mindset theory by demonstrating that ***intelligence is NOT fixed.***

The idea of a growth vs. fixed mindset was originally introduced by Dr. Carol Dweck in 1999, and research since has demonstrated that mindset is linked to factors such as academic performance, goal setting, and resilience. For example, data indicates that students who appreciate a growth mindset are more resilient in the face of challenges and understand that they can improve their intelligence through hard work *and* by trying new approaches to learning. In contrast, students who believe in a fixed mindset often resist learning and trying to improve and feel embarrassed when they do not understand course content.

Integration of growth mindset into college curriculum can positively impact equity and inclusion. Canning and colleagues (2019) provide evidence from a study with 150 STEM faculty and their 15,000 students that instructors who embrace the fixed mindset have larger equity gaps and inspire less motivation than those who prescribe to a growth mindset. The good news is that faculty can help students develop a growth mindset through the language and activities we employ in the classroom.

Behavioral studies show that students' knowledge of growth mindset matters. In one foundational study by Carol Dweck, Kail Trzesniewski, and Lisa Blackwell, students were separated into two groups. One group was told intelligence is fixed and the other group was told that intelligence is malleable and dependent on effort and a willingness to adapt learning strategies. After observing and assessing the two groups, researchers found the growth mindset

group consistently demonstrated higher motivation toward curricular challenges and ultimately scored significantly better on assessments than the fixed mindset group. Thus, one effective strategy is to simply share this behavioral data supporting growth mindset after defining growth vs. fixed mindset for your students.

Obstacles & Opportunities

It is critical that faculty not simply equate effort with success. Effort is critical, but *the type of effort matters*. If students believe that sheer effort is all they need to succeed in learning, they may put all of their effort into ineffective strategies and fail to reach their learning goals. Faculty should couple the notion of increased effort with *information about different types of effort*. Educators can use this as an opportunity to discuss different learning strategies with students, and to help them appreciate the importance of trying a new strategy when another does not work for them.

Reflection Activity | How much time do you dedicate to discussing different learning strategies with your students? Some faculty have a tendency to focus on strategies that work for themselves. Do you think you fall into that category, or have you shared a variety of learning strategies?

Strategies for Implementing Growth Mindset

- Define & discuss growth mindset vs. fixed mindset with your students.
- Remind students that subject matter expertise is not inherent, and that they are here for those skills to be developed.
- Emphasize the value of attempting different learning strategies.
  - ***Suggestion:***
    - ***Encourage students to participate in the Commit to Study Program, which helps students identify both their strengths and areas with capacity for growth. Commit to Study also introduces students to a wide variety of learning strategies: https://www.csus.edu/college/natural-sciences-mathematics/center-science-math-success/commit-study.html***
- Encourage the use of the word "yet." When students discuss not understanding a concept, remind them that they do not understand it...*yet*.
- Describe mistakes and overcoming obstacles as important parts of the learning process and as opportunities to foster resilience.
- Share instances in which you or other accomplished scientists have learned from mistakes or overcome obstacles.
- Include goal setting activities. Help students learn how to set achievable goals and to create plans to work toward their goals. This activity can help students connect their effort to their outcomes.
  - ***Suggestion:***
    - ***Use this activity to introduce students to different learning strategies.***
  - ***Resource available:***
    - ***Resource 1. DAPPS Goal Setting & Time Management Activity | page 98***
- Implement time management activities. Goal setting is a part of time management and the DAPPS goal setting activity listed above has an embedded time management component.

But time management skills are so critical to academic success that faculty should consider embedding multiple time management activities into their course to emphasize to students the importance of organization and prioritization of their time.

- ***Suggestion:***
  - ***One simple activity is to provide students with editable calendars (available on sites like https://www.calendarpedia.com/) and suggest that they use the calendars to schedule their studying and coursework activities. Consider posting an example of how you would use the calendar to schedule your own time if you were a student in your course.***

- Present post-exam debugging activities. Following exams, help students identify what learning strategies worked vs. did not work for them. One simple activity is providing students with a self-reflective questionnaire that asks questions related to their effort in advance of the exam. Let students know that in order to change their outcome for the next exam, it is important that they change their approach. The questionnaire can pose questions that give students tangible ideas for how to change their learning strategies.
  - ***Resource available:***
    - ***Resource 2. Post-Exam Debugging Activity | page 100***
- Second chance activities. Second chance activities involve giving students a path to recovery after a failure. Exam corrections are one form of a second chance activity that allows students to address and correct mistakes on an exam to recover a portion of the points. Not only does this provide students with a path to recovery, but it also reinforces important concepts from the course. (*This concept is also discussed in chapter 11 on Inclusive Student Assessment Practices.*)

Reflection Activity | What growth mindset strategies have you tried? What new approaches will you attempt? What hesitancies do you have about trying these approaches?

Resources at a Glance

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9 | Effective Approaches for Active Learning

"Deep learning challenges students to confront knowledge gaps and misconceptions, asks them to get comfortable in uncomfortable situations like using their knowledge in unfamiliar contexts or addressing old problems with new knowledge."-Louis Deslaurier, Director of Science Teaching and Learning, Harvard University

Active Learning Cycles

Active learning strategies, such as peer instruction (Crouch & Mazur, 2001), studio-style classes (Beichner et al., 2007), and cooperative group learning (Brewe et al., 2010), have been shown to improve student learning and retention in STEM courses (e.g., Freeman et al., 2014; Lund & Stains, 2015). These strategies have much in common. They typically involve a great deal of peer-peer interaction and place a high degree of importance on the student, allowing those participating in the class to drive their learning process. At the heart of most of these strategies is the active learning cycle, which can be applied generally to any classroom to increase student engagement. At its most basic level the active learning cycle has three key elements:

- Student driven inquiry and *concept exploration*.
- Expansion of knowledge through *concept invention*.
- Application of knowledge through *practice*.

Entwined within all three elements and throughout the cycle are student skills, which will be developed throughout the process. The specific skills developed should be relevant to your students and their future workplace goals, but could include skills such as teamwork, information processing, critical thinking, or written communication.

One essential skill that should always be included is self-assessment, which refers to the student's ability to evaluate their own understanding, determine where they are in their learning process, and identify what gaps may be present. It is important to stress that assessment is a learned skill, and those from privileged backgrounds often have a leg up, having seen family members participate in this metacognitive process (firsthand, through stories, or advice). Effort to develop metacognitive skills will help to ensure that your active learning environment is effective and equitable.

Obstacles & Opportunities

Before students can develop metacognitive skills, they have to feel comfortable being wrong. How many of us as undergraduates were unwilling to raise our hands unless we absolutely knew the correct answer because we didn't want to look foolish? When classrooms are set up to embrace incomplete or incorrect assumptions within a format involving concept exploration, suddenly being wrong is not only okay, but almost expected. After all, if you already knew the answer, why are you there learning?!

Reflection Activity | When did you not speak up in class because you weren't sure if you were right? Was this a common occurrence? Were there certain teachers with whom you were more or less willing to risk being wrong? Why?

Another major obstacle to implementing more active learning in your classroom could be student feedback. Oftentimes students can be resistant to reductions in lecturing to make room for active learning elements. This may result in students complaining that "they are having to

teach themselves." The good news is that these comments are in the minority. A major study investigating the effect of switching to active learning indicated that far more instructors saw higher scores in their student evaluations rather than decreases. Furthermore, negative comments decrease as more and more instructors implement active learning in their classrooms (Henderson et al., 2018).

Strategies for Implementing Active Learning

- Capture and maintain your students' attention by gaining their interest. Students are more likely to participate in a meaningful way when the material is meaningful to them. One excellent way to start off a new area of learning is by sharing a thought-provoking question and asking the students to engage in a Think-Pair-Share activity. In these activities, students are first given time to reflect on the question alone. Next, the students are asked to partner with a fellow student to discuss the question further. Finally, that team will report back to the class.
  - ***Resources available:***
    - ***Resource 1. Example Think-Pair-Share Activity | page 102***
- Student attention spans (like ours) are on the order of 8-10 minutes. When we reorganize our class time to have microlectures, lasting no longer than 10 minutes we will see increases in student attention and engagement. Microlectures should cover only one concept or skill and provide the opportunity for reflection, individually or together with peers. These can be either in person or online. Some considerations for online microlectures are covered in "7 Things you should know about microlectures" (Educause, 2012).
  - ***Suggestions:***
    - ***Consider the one learning objective (LO) you want to focus on for your microlecture.***
    - ***After determining the LO that will be the focus of your microlecture, consider what information should be included to give the students what they need to begin expanding their knowledge in that area.***
- Build activities that will give substantial opportunity for students to actively practice applying the key concepts developed through the microlecture.
- Replace some lectures with worksheets that will guide students through the entire active learning cycle from inquiry, to concept invention, to application. Some excellent examples can be found in Process Oriented Guided Inquiry Learning (POGIL) material. The POGIL organization has been working in secondary education for over a decade, but has more

recently begun expanding into post-secondary education.

- Replace some lectures with team quizzing activities.
  - ***Suggestion:***
    - ***There are several platforms capable of hosting such activities, many are available through textbook publishers, for example Pearson offers their Learning Catalytics platform free with eText purchases. Others are available for low (TopHat) or no cost (some features of Kahoot!).***
    - ***Treat the quiz as a diagnostic and use the data to determine which areas could benefit from additional discussion.***
- Replace some lectures with team competitions.
  - ***Resource available:***
    - ***Resource 2. In class debate model: Organ Debates | page 102***
- Replace all lectures with a variety of the above worksheets and activities and fully "flip" your classroom.
- If you have a large number of students and are worried about fully flipping your classroom, consider adding in some Peer Leaders. These are students currently participating in the class, who will help lead a small segment of the course.
  - ***Resource available:***
    - ***Resource 3. Setting up Peer Leaders in the Classroom: IPLP | page 105***
- Incorporate peer-review into your activities and assignments. Next time you give a quiz or exam, you can continue the learning by having students review or even peer grade each other's work. This can be done with simple swaps, or with team reviews.

Reflection Activity | What active learning strategies do you currently use? What new strategies will you try? How will you ensure that all students feel supported and encouraged to participate in active learning strategies?

Resources at a Glance

- *Resource 1. Example Think-Pair-Share Activity | page 102*
- *Resource 2. In class debate model: Organ Debates | page 102*
- *Resource 3. Setting up Peer Leaders in the Classroom: IPLP | page 105*

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10 | Student-Centered Learning Outcomes

"Learning outcomes are the cornerstones of course design and assessment, and help students focus on what is important. Learning outcomes can also be considered an inclusive teaching practice as they can help clarify expectations for all students."-Student Learning Assessment, University of Wisconsin-Madison

Learning Outcomes

Whether you call them Student Learning Outcomes (SLOs) or Course Learning Outcomes (CLOs), starting from these is probably one of the most important things you can do when designing an inclusive classroom. SLOs will provide your students with an understanding of what they should be able to do to be successful in your course. They will help them in their process of developing their metacognitive abilities and self-regulate their learning. Perhaps most importantly, they will allow your students to take ownership of their learning process. The benefits extend to yourself, as faculty, as well. SLOs can help guide your course design, highlighting essential course content, helpful activities, and necessary assessments. They can also help in aligning your course assessment with your department's learning goals, as well as our university's Learning Outcomes.

Learning Outcomes are:

- Action focused.
- Observable and measurable.
- Connected to large take-aways/big picture.

Learning outcomes will serve as a framework for equitable and transparent assessment in your course. They will help ensure your students have the information they need to make progress and be successful throughout the semester. By starting with the creation of LOs you will make belonging and inclusion explicit in your course design and integral to your class.

Obstacles & Opportunities

One of the most common pitfalls in generating SLOs is to sit down with a textbook (or an

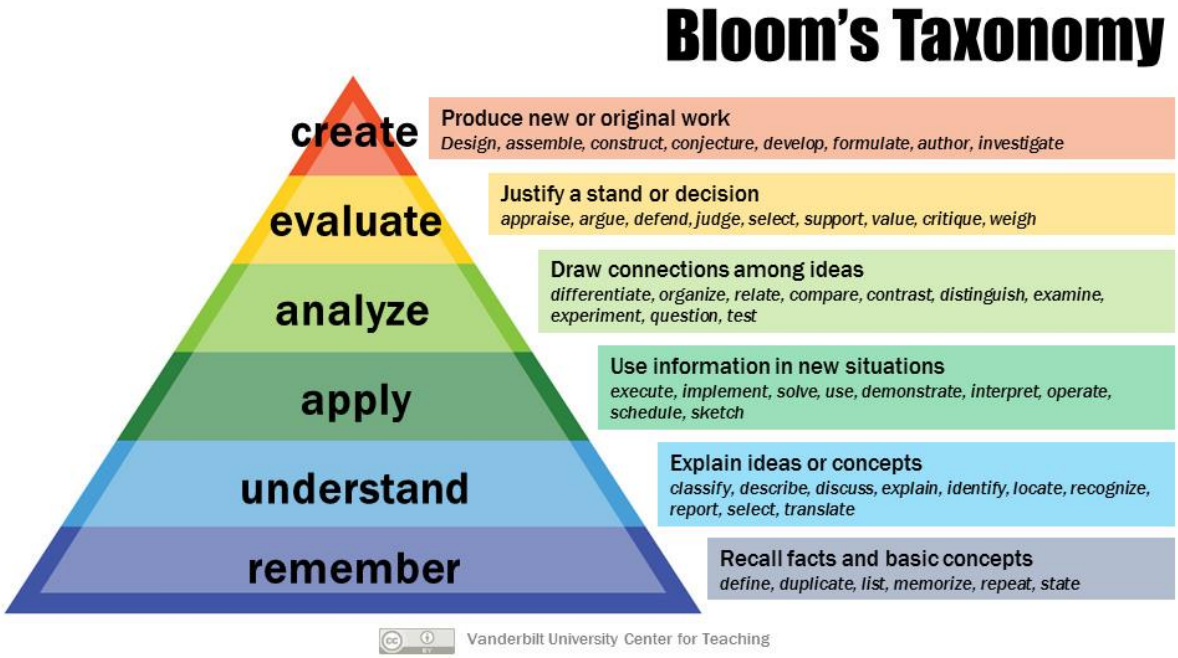
existing course structure) and list out the topics. Some courses should be structured by those big picture topics, but that is not always the case. Instead, consider what high level take-away knowledge and what key skills you want students to gain as a result of participating in your class. Before we start creating SLOs for one of your courses, let's take a quick look at one of our university's General Education LOs. Within these we will look for the key elements of a LO. Select and read through either B-1 or B-2.

- ***Area B-1. Physical Science:***
  Drawing upon one or more of the physical sciences, students will be able to:
  - ***Explain and apply core ideas and models concerning physical systems and mechanisms, citing critical observations, underlying assumptions and limitations.***
  - ***Describe how scientists create explanations of natural phenomena based on the systematic collection of empirical evidence subjected to rigorous testing and/or experimentation.***
  - ***Access and evaluate scientific information, including interpreting tables, graphs and equations.***
  - ***Recognize evidence-based conclusions and form reasoned opinions about science-related matters of personal, public and ethical concern.***
- ***Area B-2. Life Forms:***
  Drawing upon one or more of the life sciences, students will be able to:
  - ***Explain and apply core ideas and models concerning living systems and life forms, citing critical observations, underlying assumptions and limitations.***
  - ***Describe how scientists create explanations of natural phenomena based on the systematic collection of empirical evidence subjected to rigorous testing and/or experimentation.***
  - ***Access and evaluate scientific information, including interpreting tables, graphs and equations.***
  - ***Recognize evidence-based conclusions and form reasoned opinions about science-related matters of personal, public and ethical concern.***

Reflection Activity | After having selected B-1 or B-2, read through the four LOs. Identify and circle the *action verbs* that emphasize what the student will demonstrate to meet these LOs. For each of the four LOs, determine a type of assignment where you could assess that LO. This could be a real assignment in a class you teach, something you know of from a class you do not teach, or an imaginary assignment in a class that doesn't even exist.

Learning exists at multiple levels. Students must be able to *remember* concepts before they can understand them and, similarly, they must be able to understand before they can *apply*. In order for students to *evaluate*, it is helpful for them to have first had the opportunity to *analyze* a process. Finally, to successfully *create*, students will need to be comfortable with *evaluation*. That does not mean that we need to assess students at each level for every LO we have in mind. Instead, you will want to carefully consider at what level your students are starting in your

course, for example, are they freshman in one of their first major courses, or is this a capstone course for seniors? That level, as well as the progression of your course throughout the semester, will guide your choice of action verbs. This hierarchy of action verbs is summarized in Bloom's Taxonomy.



Reflection Activity | Consider where on the Bloom's Taxonomy each of the B-1 or B-2 LO falls. Are there any problems you can see with the existing university LOs? What changes would you make to these LOs if you wanted to adapt one of them for use in your class?

Strategies for Developing Learning Outcomes

- Develop strong Course Learning Objectives (CLOs) that align closely with your department Program Learning Objectives (PLOs). These will provide a strong foundation for inclusive course development in general and are key to inclusive assessment, regardless of the specific strategy employed.
  - ***Resource available:***
    - ***Resource 1. Developing SMART Learning Outcomes | page 107***
- Align assignments to your CLOs by creating a course evidence map.
  - ***Suggestion:***
    - ***Consider each CLO you have developed and find the assignment you currently have that matches that CLO. If you have more than one assignment for a particular CLO, fantastic! That means you can map the progression of that CLO development throughout the course.***
    - ***Make a table that maps out which specific assignments you will use to assess each CLO over the span of the semester.***
- Rubrics provide transparency to your students by highlighting exactly what must be done to meet the CLOs or to exceed them. They will allow you to easily check to see if your CLOs are being met and, when CLOs and PLOs are aligned, your department can also easily check to see if the PLOs are being met.
  - ***Resources available:***
    - ***http://www.introductiontorubrics.com/overview.html***
    - ***Resource 2. 16 AACU Value Rubrics | page 109***

Resources at a Glance

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11 | Inclusive Student Assessment Practices

When assessments are designed with diverse learners in mind, we are able to more accurately evaluate student learning, and provide necessary feedback toward advancing learning outcomes.

Vocabulary

There are two general categories of assessment:

1. **Formative assessments** occur *during the learning process* and typically involve various forms of low stakes or ungraded activities that allow educators to provide ample feedback so students can understand where and how they can improve.
2. **Summative assessments** occur at an *endpoint of the learning process* and are typically a high-stakes exam, project, or writing assignment used by the educator to provide an evaluation of student concept knowledge.

Inclusive Assessments

Perhaps the biggest challenge regarding inclusion and assessment is that *no single summative assessment modality accurately reflects the learning of all students.* One contributing factor is the inherent challenges of communication—study after study has shown that people often misinterpret another person's intended message. This means that any time we administer an exam, there are likely students who miss questions simply because they interpreted our questions differently than we intended. In addition, studies have shown that students with stress bias (students with significant stressors at home) are more likely to have severe test anxiety that negatively impacts their exam performance, ultimately causing a disconnect between the student's actual concept knowledge versus the grade they received on a summative assessment (Heisell et al., 2021). Thus, we are faced with a situation of needing to ascribe grades to students while reconciling the fact that many traditional summative assessments return grades that are often inaccurate and biased toward students who happen to have a similar communication style as the professor and/or with less stressors in their lives.

The take home message: When an overall course grade is primarily based on scores from high-

stakes summative assessments, there will almost certainly be students in the course with a firm grasp of the course content who do not earn grades reflective of their knowledge.

To work toward a more inclusive approach to assessment, some best practices to consider are: (1) incorporating more low-stakes or ungraded formative assessments into your curricula, (2) providing students with ample opportunities to practice the types of problems for which they will be formally evaluated on summative assessments, (3) providing students with opportunities to demonstrate learning in varied ways (written, oral, drawings, videos, etc.), and (4) creating a "*path to recovery*" to allow second chance points (more details below).

There are also different approaches to summative assessment to consider. For example, you could administer a "*Public Exam*," which is a format that involves giving students some version of the exam questions in advance and enlisting them as exam editors. This method has been found to reduce test anxiety and increase the amount of time students spend critically engaging with course content in advance of an exam. If you have a small enough class, you could consider giving students one-on-one oral assessments.

Giving students a *path to recovery* is critical. Bad days happen. If we have a course in which one bad day can mean a student's poor grade is not recoverable, that is not equitable, inclusive, or realistic. For example, we have had students who have been to our office hours enough that we knew they had a firm grasp on the course content. These same students have failed our exams. After reaching out to ask what happened, we find that our students have experienced a variety of hardships. In one case, it turned out a student was struggling with homelessness and a traumatic event involving extreme violence and a family member. In other cases, students have lost close family members, been preparing for possible deportation, or even not eaten for over a day. All of these students obviously deserve another chance. But how many students have faced similar challenges that we are unaware of? A *path to recovery* can include measures like dropping a student's lowest exam score (perhaps based on specific criteria, like showing improvement on a subsequent exam) or allowing students to make exam corrections (which can include a metacognitive component to help students reflect and grow) to earn back some missed points. Importantly, these practices can also help foster a growth mindset, as discussed in chapter 8.

A broader discussion of assessments in terms of the purpose and validity of grading in higher education has led to grading system alternatives, like *mastery grading* and *specification grading*. While the two strategies have some differences, they both operate by assigning points (often all-or-none) based on whether the specifications or criteria of the assignment were met. They usually allow students to repeat and improve upon their work, and have been shown to increase motivation and enhance the quality of student work. To learn more, Linda B. Nilson published a description of both grading systems in *Inside Higher Ed* (2016).

Reflection Activity | What types of formative assessment do you do? Do you feel students are provided with enough feedback to improve before summative assessments?

Reflection Activity | What concerns do you have about your summative assessments when it comes to inclusion and equity? What types of content in your course absolutely require a summative assessment? What alternatives to traditional exams could you use for those summative assessments?

Obstacles & Opportunities

Adjusting our approach to assessment can be one of the most impactful equity-related changes we can implement in our courses. But it can take a great deal of time to re-envision and re-develop assessments. Although creating the assessments and providing feedback both take quite a bit of effort, there are some formative assessments for which the feedback can be built-in making them less time intensive (e.g., Kahoot! quizzes and Canvas-based quizzes). There are also alternative approaches to traditional exams that do not present much of a time burden, like the Public Exam. It's also important to keep in mind that course re-designs are typically iterative processes that don't have to happen all at once. For example, you could start by implementing just one or two Kahoot! quizzes and converting just one exam to the Public Exam format. Then survey your students to find out how the activities impacted them and how you might improve upon them next time. This approach would allow you to start small and use student feedback to improve and expand each semester.

Strategies for Implementing Inclusive Assessment Practices

- Increase your use of formative assessments. Formative assessments, which are used to monitor student learning and provide feedback during the learning process, can be used by both students and educators to make changes. Formative assessments can also play a role in the assessment of CLOs, as discussed in the previous chapter. For example, if you have a CLO with multiple assessments in your course evidence map, it is likely some of those earlier assessments were in fact formative, and if they weren't, you can probably change them up a bit to allow for feedback and growth.
  - ***Suggestion:***
    - ***Kahoot! quizzes are an easy and fun way to do formative assessment in the classroom. You can have students participate individually or as groups. Let your students know about the quizzes in advance to give them time to prepare. You can create guidelines like each team must earn 70% or the group/individual will need to write a short essay on the subject. Or the top three groups/individuals will earn a point of extra credit. Visit: https://create.kahoot.it/***
- Administer low-stakes quizzes that can be taken twice. If you post quizzes on Canvas, you can enable multiple re-takes and set the grading to count the highest score. You can also create automatic feedback if an incorrect answer is submitted. For in-class quizzes,

consider incorporating multiple rounds where students first work through a quiz independently and then repeat the same quiz together with a team.

- Use the Public Exam format. The Public Exam allows students to view a draft version of an exam, and even contribute to improving it, in advance of its administration. The draft version is ideally shared with students at least a week before the actual exam and it can be formatted in a variety of ways. The draft can include more questions than will end up on the exam—without informing students which questions will be selected for the exam—or it may have only a subset of the questions that will end up on the exam. The provided questions can be formatted in a variety of ways. The full text of a particularly challenging question may be fully shared, while a multiple-choice question may be shared without any answer options (or vice versa). Or a graph may be provided without an associated question. This format gives students time to critically engage with content, ask clarifying questions, as well as identify mistakes or language in the questions that they find confusing. This approach has been shown to reduce anxiety, promote deep learning, and eliminate barriers for students who may need more time to read and digest the instructions or question prompts on a test. To learn more about Public Exams and the benefits they have for students and faculty, see this Course Hero Report by Dr. Ben Wiggins (University of Washington): https://tinyurl.com/y5wkzfb3
- Incorporate oral assessments into your summative assessment toolkit. Oral assessments can take on many forms, but usually appear in the format of in-class or recorded presentations. Alternatively, some faculty use them as one-on-one assessments that replace written quizzes and exams. The format will depend on the size of the course and the content under evaluation.
- Give students the opportunity to do exam corrections to earn back a portion of the missed points. After exams are handed back, let your students correct their work. Not only does this provide students with a path to recovery in terms of their grade, but exam corrections also allow students to continue building their skills and knowledge when they are tasked with explaining why they got a question incorrect and/or what the correct answer is and why. Ask other metacognitive questions that ask students to explain how they prepared for the exam, if there are things they could improve upon, and how they plan to improve their preparation for the next exam. By allowing for corrections with metacognitive self-reflection, you will ensure your students come away with a better understanding of the material and perhaps also improved self-accountability and agency.
- Allow students to drop their lowest exam score. This option can come with qualifiers; for example, students will be allowed to drop their lowest exam score, provided that the subsequent exam score is at least x% higher and exam corrections are submitted.

- ***Resources available:***
  - ***Resource 1. Public Exam Example | page 178***
  - ***Resource 2. Exam Corrections Assignment Example | page 180***

Reflection Activity | What types of inclusive assessments do you plan to try?

Resources at a Glance

- ***Resource 1. Public Exam Example | page 178***
- ***Resource 2. Exam Corrections Assignment Example | page 180***

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12 | Self-Assessment: Equity Gaps & Student Perception

Self-assessment is a critical exercise that allows us to evaluate our effectiveness as educators, to engage in self-reflection, and to continue to grow in our profession.

Self-Assessment

The scientific method posits that a conclusion must be based on experimental measurements and observations. Self-assessment is a tool that allows us to measure our performance in the classroom so that we can draw evidence-based conclusions about our effectiveness and enact changes when needed. While it can be uncomfortable to potentially learn that we are not as effective as we'd hoped in the implementation of our teaching practices, we cannot grow into more effective educators unless we receive that constructive feedback.

While there are several different forms of self-assessment, we recommend including the following two types of measurements:

1. *Evaluate equity gaps* across multiple student demographics.
2. *Evaluate student perceptions* using surveys (e.g., a student sense of belonging survey).

Evaluating Equity Gaps

Measuring equity gaps allows us to determine if there are educational disparities across race/ethnicity, socioeconomic status, first-generation status, sex, and other demographic traits and intersectionalities. As of writing this handbook, Sacramento State is working to create data dashboards that will allow us to examine the equity gaps in our classrooms without having to calculate the equity index (a score used to indicate equity gaps) of our classrooms on our own. Because these updated dashboards are not yet available, we will describe how to calculate your own disaggregated equity index to reveal potential equity gaps.

As described by ESCALA Educational Services, an equity index is a ratio calculated to show the differences in grade distributions for any subgroup compared to your whole class. Calculating the equity index will provide you with data on your teaching effectiveness with different student subgroups. When there is a disparity in the performance of a subgroup compared to the whole

class, this disparity is referred to as an equity gap. Below is an example data set provided by ESCALA Educational Services and their list of steps involved in calculating the equity index.

EQUITY INDEX = (Ratio of student subgroup achieving grade)/(Ratio of ALL students achieving grade)

STEP 1: Collect student demographic data corresponding to grades. When determining student demographics, it is important that we never make assumptions about our students' demographics. Demographic data can be acquired by submitting a data request from Sacramento State's Institutional Research, Effectiveness and Planning data center: https://www.csus.edu/president/institutional-research-effectiveness-planning/data-center.html

Alternatively, you can use a survey to ask your students to directly provide you with demographic data. If you choose this route, we suggest explaining to your students that you are using the data in an effort to improve your instructional practices and not for research. (Using such data for research would require Institutional Review Board (IRB) approval.) Be sure to let students know that providing you with demographic information is optional and has no bearing on their grade.

Once you have the data, list demographic categories and the number of students within each category that achieved each letter grade (A, B, C, D, and F), Withdrawals (W), or Incompletes (I), as in the example table below.

Grade	White	Black	Latine	Pacific Islander	Asian	Indige-nous	Women	Men	All
A	5	3	1	0	4	0	8	5	**13**
B	6	2	3	0	2	1	12	2	**14**
C	8	1	16	1	5	0	21	10	**31**
D	1	2	3	0	0	0	0	6	**6**
F	1	1	1	0	1	0	1	3	**4**
W	3	2	8	1	1	0	9	6	**15**
I	0	0	0	0	0	0	0	0	**0**
Total	**24**	**11**	**32**	**2**	**13**	**1**	**51**	**32**	**83**

STEP 2: Calculate ratios of all students achieving each grade. To do so, use the data from your new demographic spreadsheet and divide the number of all students who achieved each grade by the total number of students in the class.

Grade	Calculation *(# students achieving grade/total students)*	Ratio of ALL students achieving this grade
A	13/83 =	0.157
B	14/83 =	0.169
C	31/83 =	0.373
D	6/83 =	0.072
F	4/83 =	0.048
W	15/83 =	0.181
I	0/83 =	0

STEP 3: Calculate this same ratio for each subgroup of interest. The calculation is the same, but focused on a specific student subgroup rather than all students. For our example below, we used the Latine subgroup. This process should be repeated for each subgroup. Although time intensive, disagreggating student subgroups is the only way to determine if there are subgroup-specific equity gaps. Some student subgroups are small enough that equity gaps can be easily masked if those subgroups are aggregated into single data points with larger subgroups (e.g., calculating an equity index for all minortized groups combined as a single data point).

Grade	Calculation *(# Latine students achieving grade/total Latine students)*	Ratio of Latine students achieving this grade
A	1/32 =	0.031
B	3/32 =	0.094
C	16/32 =	0.5
D	3/32 =	0.094
F	1/32 =	0.031
W	8/32 =	0.250
I	0/32 =	0

STEP 4: Use the ratios determined above to calculate the equity index.

Grade	Ratio of Latine students	Ratio of ALL students	Equity Index Calculation *(Ratio of Latine students/Ratio of ALL students)*	Equity Index
A	0.031	0.157	0.031/0.157 =	**0.20**
B	0.094	0.169	0.094/0.169 =	**0.56**
C	0.5	0.373	0.5/0.373 =	**1.34**
D	0.094	0.072	0.094/0.072 =	**1.31**
F	0.031	0.048	0.031/0.048 =	**0.65**
W	0.250	0.181	0.250/0.181 =	**1.38**
I	0	0	N/A	**N/A**

STEP 5: Interpret the data.

EQUITY INDEX	INTERPRETATION
~ 1	The subgroup is performing similarly to the larger group *(Note: a score +/- 0.02 is regarded as similar, though this interpretation is also dependent on your sample size)*
< 1	The subgroup is underrepresented
> 1	The subgroup is overrepresented

In our example data set, the Latine student subgroup is underrepresented in the A, B, and F grade categories (highlighted in orange) and overrepresented in the C, D, and W categories (highlighted in purple). Latine students are not failing the course at a disproportionate rate, though they are withdrawing disproportionately and not achieving the higher grades of A and B at proportional rates.

Evaluating Student Perceptions

Evaluating student perceptions using surveys can help educators understand how their students feel about their classroom environment and can help to illuminate challenges we might not otherwise be aware of. In addition, while it is obviously critical that we help our students be successful in learning and achieving passing grades to ensure we retain students in STEM, we hope this handbook has impressed upon you that it is also critical that we foster a sense of belonging. It is quite possible for a student to earn passing grades, but to still leave their STEM major because they do not feel like they belong—especially if they are given the message that they won't cut it in STEM fields if their GPAs drop below the high 3's (a message perpetuated in some majors). If we only assess grades and equity gaps, we would be ignoring a subset of students who are doing well and could be successful in STEM, but are struggling to feel like they belong. For this reason, we recommend administering a student perception survey focused on the students' sense of belonging.

Developing survey questions can be daunting. One option is to use a "validated survey," which means the survey questions and their interpretation by students taking the survey have been confirmed through focus groups or interviews in a certain population. Such surveys have often been used in previous peer-reviewed literature and are well-established survey instruments. You can also select specific questions from different validated surveys or just use the surveys as inspiration to create your own survey. We provide both a validated sense of belonging survey, as well as different websites where you can explore different student perception surveys.

- ***Resources available:***
  - ***Resource 1. Example Sense of Belonging Survey | page 182***
  - ***Resource 2. Resources for More Student Perception Surveys | page 184***

Reflection Activity | What types of self-assessment do you currently perform?

Obstacles & Opportunities

Currently, at Sac State we do not have access to course-specific demographic information until courses are finished. That means that if we are relying on demographic data from the institution (instead of directly from students) we cannot assess equity indexes during the semester. While determining equity indices after the semester can still help us understand if our implementation of inclusive teaching practices reduced equity gaps in our classroom, it means we could potentially be faced with the frustrating realization that we had an equity gap in our classroom

and no longer have the ability to enact change for that specific group of students. This is why administering sense of belonging surveys is so critical—these surveys provide real-time information about how your students feel in your classroom.

Another challenge to evaluating equity index relates to sample size—if you have small class sizes, you may need to combine multiple sections to assess potential equity gaps. This practice presents other issues if you implement different teaching practices in different sections or the courses you are combining are different (e.g., an undergraduate lab course and a graduate lecture course). Caveats aside, the practice of calculating your equity indices can potentially provide you with powerful data points used to reflect upon and inform your teaching practices.

Strategies for Self-Assessment

- Make calculating the equity index of different student subgroups in your classrooms a regular practice. Calculate the equity indices of courses you previously taught and for all future courses.
- Administer a sense of belonging survey to students at the start, middle, and end of the semester. Assessing students' sense of belonging at the beginning and mid-points of the semester can allow you time to make necessary adjustments. Assessing students' sense of belonging at the end of the semester will help you understand if the interventions you used were effective.

Reflection Activity | What types of self-assessment will you perform in the future? At what points during the semester will you perform the assessment(s)?

Resources at a Glance

References

ESCALA Educational Services; http://www.escalaeducation.com/

Knekta, E., Chatzikyriakidou, K., & McCartney, M. (2020). Evaluation of a questionnaire measuring university students' sense of belonging to and involvement in a biology department. CBE—Life Sciences Education, 19(3), ar27; https://doi.org/10.1187/cbe.19-09-0166

13 | Further Reading

Each section of this handbook includes corresponding references. Below are additional papers and books centered on diversity, equity, and inclusion in education.

Books

Grading for Equity by Joe Feldman

Grit by Angela Duckworth

Culturally Responsive Teaching & The Brain by Zaretta Hammond

Minding the Obligation Gap in Community College and Beyond by Jeremiah Sims, Jennifer Taylor-Mendoza, Jeramy Wallace, and Tabitha Conaway

Mindset - Updated Edition: Changing the Way you Think to Fulfill Your Potential by Carol Dweck

Teach Student How to Learn: Strategies You Can Incorporate in Any Course to Improve Student Metacognition, Study Skills and Motivation by Stephanie McGuire

Successful STEM Mentoring Initiatives for Underrepresented Students by Becky Wai-Ling Packard

Ungrading by Susan Blum

Papers

Dewsbury Bryan and Cynthia J. Brame. (2019). Inclusive Teaching. CBE- Life Sciences Education. 19:fe2, 1-5, Summer 2019

Editorials, N. (2018). Science benefits from diversity. Nature, 558(10.1038). doi: 10.1038/d41586-018-05326-3. PMID: 31076730.

Estrada, M., Burnett, M., Campbell, A. G., Campbell, P. B., Denetclaw, W. F., Gutiérrez, C. G., ... & Zavala, M. (2016). Improving underrepresented minority student persistence in STEM. CBE—Life

Sciences Education, 15(3), es5.
doi: 10.1187/cbe.16-01-0038. PMID: 27543633; PMCID: PMC5008901.

Keller, A. S., Davidesco, I., & Tanner, K. D. (2020). Attention matters: How orchestrating attention may relate to classroom learning. CBE—Life Sciences Education, 19(3), fe5.
doi: 10.1187/cbe.20-05-0106. PMID: 32870089; PMCID: PMC8711818.

Riegle-Crumb, C., King, B., & Irizarry, Y. (2019). Does STEM stand out? Examining racial/ethnic gaps in persistence across postsecondary fields. Educational Researcher, 48(3), 133-144.
doi: 10.3102/0013189X19831006

Schinske, J. N., Perkins, H., Snyder, A., & Wyer, M. (2016). Scientist spotlight homework assignments shift students' stereotypes of scientists and enhance science identity in a diverse introductory science class. CBE—Life Sciences Education, 15(3), ar47.
doi: 10.1187/cbe.16-01-0002. PMID: 27587856; PMCID: PMC5008894.

Wood, S., Henning, J. A., Chen, L., McKibben, T., Smith, M. L., Weber, M., ... & Ballen, C. J. (2020). A scientist like me: demographic analysis of biology textbooks reveals both progress and long-term lags. Proceedings of the Royal Society B, 287(1929), 20200877.
doi: 10.1098/rspb.2020.0877

14 | Resources

This section includes equity-centered activities and assignments that you can add to your curriculum.

Section 2 | Addressing Implicit Bias

Resource 1. Example Student Survey

Tips | Using Qualtrics can help ensure anonymity. Administering during class time will maximize participation.

Implicit Bias Survey | This is an anonymous survey—I will have no way of knowing what your specific responses to the survey questions were. The purpose of this survey is to help me understand your experience in my classroom and to ensure I do not possess implicit (or explicit) biases that have negatively affected your experience in my course.

Implicit bias refers to unconscious attitudes and stereotypes that affect the way people feel and respond to situations and people based on factors including (but not limited to) race/ethnicity, gender, LGBTQIA+ status, socioeconomic status, ability/disability, neurodivergence, religious identity, etc. Studies have shown that all people hold implicit biases and are a result of the way our brain processes the world around us. These implicit biases—which can be positive or negative—are shaped by both the society in which we live, as well as by our particular lives. It is critical that we all explore our implicit biases to ensure they do not negatively impact those around us, which is my intention with this survey. Please be as honest as possible when answering the following questions. If you are uncomfortable participating, it is also absolutely fine for you to not complete the survey.

1) Do you feel like I treated you or any of your classmates differently based on any of the identities that you/they hold?
    - Leichert Scale: Not Sure—Never—Once or Twice—Rarely—Sometimes—Often
    - Insert optional comment box
2) Do you feel like any of my course materials are/were biased?
    - Leichert Scale: Not Sure—No—Somewhat—Yes

- Insert optional comment box

3) Do you feel like my teaching practices could be more inclusive?
    - Leichert Scale: Not Sure—No—Somewhat—Yes
    - Insert optional comment box
4) Do you have any suggestions or ideas that you would like to share with me?
    - Insert optional comment box

Section 3 | Inclusive Syllabi

Resource 1. Example Welcome Statement

Welcome Message | Welcome to BIO 121! I LOVE molecular cell biology and I LOVE teaching. I am so excited to serve as your professor and will do all that I can to help you learn this material...whether or not you share my affection for cells and molecules :)

** As for how to refer to me, feel free to use Kim, Professor Mulligan, Dr. Mulligan, or just "Dr. M" for short. Whatever you are most comfortable with!*

*** Sharing your pronouns is totally optional, but I am happy to learn yours and will also gladly honor your request to address you by an alternative name than what is listed on the course roster. Please let me know on your "student info assignment" (or during student hours or by email) so that I can make appropriate changes to my records.*

Resource 2. Example DEI Statement

In an ideal world, science would be objective. Unfortunately, much of science is subjective and was historically built on a small subset of privileged voices. I acknowledge that there may be both overt and covert biases in the course material due to the lens with which it was written, even though the material is primarily of a scientific nature.

It is my goal that students from all backgrounds and perspectives be well-served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength, and benefit. It is my intent to present materials and activities that are respectful of diversity: gender identity, sexuality, disability, age, socioeconomic status, ethnicity, race, nationality, religion, and culture.

Integrating a diverse set of experiences and voices is important for a more comprehensive understanding of science. If you have suggestions to improve the inclusivity of this course, please share your ideas and/or thoughts with me. I would welcome a discussion, but I will also provide anonymous mechanisms for feedback.

Resource 3. Syllabus Survey

Modified from the Amherst College Syllabus Survey. *Note: the original Amherst College survey asks that you go a step further by reflecting if each consideration is learner-centered, transparent, UDL-adherent, and inclusive.*

LEARNING OBJECTIVES & CONTENT

___ Learning goals are evident

___ Learning goals are articulated in ways that are clearly achievable

___ Learning objectives address and integrate diverse and inclusive knowledge, skills, or attitudes

___ Describes how learning goals may appeal to a wide range of student interests

___ Provides a vision or goal statement for the course

___ Provides rationale for course design decisions

___ Clearly states knowledge and skills that are presupposed rather than taught in the class

FRAME, TONE, & FORMAT

___ Tone is positive, friendly, respectful, inviting

___ Fosters positive motivation, describes value of course, and promotes content as a vehicle for learning

___ Communicates high expectations and projects confidence of student success

___ Syllabus is well organized, easy to navigate, and helps students succeed in the course

___ Meets accessibility guidelines (digital format, uses headers and alt-text for images, accessible colors and font size)

___ Provides contact information for student support services on campus (with hyperlinks)

___ Provides information about how to contact you/establish meetings with you

___ Describes course materials that are available in a range of formats (digital, hard-copy, auditory)

___ Invites students to provide pronouns and names

___ Communicates openness to students with multiple perspectives, talents, and identities.

___ Provides information about how you (as the instructor) want to be addressed by students

___ Course description appeals to students with a variety of perspectives and interests.

___ Course materials are authored by people from diverse backgrounds and with multiple perspectives

TEACHING & LEARNING ACTIVITIES

___ Course schedule is clearly articulated with assignments and due dates

___ Classroom activities, assessments, and course goals are aligned

___ Learning activities are likely to actively engage students

___ Describes the teaching approaches that you will employ (e.g., lecture, team-based learning, role-play, debate, community engaged learning)

___ Indicates points of flexibility in the course design, goals, and/or assignments

___ Provides a timeline of course activities grouped by topic

___ Provides a norms statement for classroom dynamics and behaviors (e.g., cell phone/laptop use, communication standards, academic integrity)

Consider co-constructing a code of classroom conduct with your students on the first day of instruction

___ Provides a list of required readings and course materials

___ Clearly articulates expectations for attendance as well as missed or late work.

___ Includes learning activities that promote cooperative learning.

ASSESSMENTS

___ Goals and assessments are clearly aligned

___ Major assessments are clearly defined

___ Indication of frequent formative assessment with means for immediate feedback

___ Assessments are paced and scaffolded

___ Grading standards (including policy on grade adjustments) are included, aligned with objectives, and separate from assessment criteria

___ Offers students a variety of ways to show what they know

Section 4 | Accessibility & Inclusion

Resource 1. Canvas Course—Universal Design for Learning

Universal Design For Learning Canvas Course, CSU Sacramento:
https://csus.instructure.com/courses/78158

Section 5 | Cultivating Connection

Resource 1. Student Questionnaire Question Bank

Instructions | Begin by providing instructions to students. For example, "In order to help me get to know you and tailor my instruction towards your personal and professional interests, please fill out this questionnaire. All questions are voluntary; you can answer as few or as many as you'd like. Your answers will be kept confidential."

Question Bank | Below are some ideas for questions you could include on your questionnaire.

- Contact information (your name as it appears on the course roster & preferred email):
- If you have a preferred name (nickname) or pronouns (he/his; she/her/hers; they/their/theirs) you'd like to share, please do:
- What is your major/concentration?
- How many units are you taking this semester?
- Are you working? (Yes/No)
- If you answered yes, how many hours/week & what do you do?
- What is your ultimate career goal and why? (It's ok if you have no idea!)
- What is your biggest concern regarding this semester or this class?
- Do you have any circumstances you would like me to be aware of? (Some examples: intense workload and or course load, disability, taking care of a loved one/child, cultural/religious observances, or any other circumstances you would like to share.)
- Is there anything else I did not ask about that you would like to share?
- Do you have any questions for me?
- What are your personal and career goals for your college education? In other words, what are you hoping to get from the time, money, and energy you are putting into your education?
- After looking through the syllabus, which course topics or learning outcomes are most relevant to your personal and/or career goals, and why?
- Are there any topics that do not seem relevant or of interest to you?
- Are you involved in any extracurricular activities, and/or do you have any hobbies?
- What do you do for fun?
- How would your best friend describe you?

Resource 2. Example Questionnaire

This questionnaire can be copied & pasted directly into Canvas as an Assignment or Ungraded Survey.

Assignment Details

One of my priorities as an educator is to learn about my students—the purpose of this assignment is to start that process with you. Below are ten questions. Please feel free to share as much or as little information as you are comfortable with. I will appreciate whatever you choose to share.

Your responses will be for my eyes only. I always respect student confidentiality—the only exceptions being situations for which I am a mandated reporter, which include instances of sexual and physical abuse (in those situations, your safety becomes my absolute priority).

Submission Details

Simply copy/paste the following questions in the text entry box and write your responses.

1. If you have a preferred name (nickname) or pronouns (he/his; she/her/hers; they/their/theirs) you'd like to share, please do:
2. Major/Concentration:
3. Estimated graduation date:
4. How many units are you taking this semester?
5. Are you working? (Yes/No)
6. If you answered yes, how many hours/week & what do you do?
7. What is your ultimate career goal and why? (It's ok if you have no idea!)
8. What is your biggest concern in regard to this semester or this class?
9. Do you have any circumstances you would like me to be aware of? (Some examples: intense workload and or course load, disability, taking care of a loved one/child, cultural/religious observances, or any other circumstances you would like to share.)
10. Is there anything else I did not ask about that you would like to share?

Resource 3. Mid-semester Survey Instructions & Question Bank

Mid-semester surveys give you the opportunity to learn important information about your

students' experience in your course, to give you the opportunity to make changes to improve their experience, and to potentially make your students feel more enfranchised in their learning experience in your classroom.

Administering the Survey | You can either set aside 15-20 minutes during a class period to ask students to complete the surveys or you can make this a voluntary at-home activity. When you introduce the mid-semester survey, let students know that you value their responses because they will help you to understand their perspectives on the course and your approach to teaching. Encourage students to be open, honest, and specific as possible. We recommend making this assignment anonymous to maximize openness.

Follow-Up | After you have a chance to review student responses, be sure to address them during class. Mention any themes that arose and any changes you are making because of their feedback. You can also use the responses as an opportunity to address complaints by reiterating learning objectives and to focus on your rationale for learning centered teaching practices. For example, if some students are unhappy about having to work in groups, that does not mean you need to drop your group work activities. Instead, you can discuss the rationale for group work and learning outcomes. You can also ask if they have suggestions for improving the experience rather than outright eliminating it.

Share your Intentions | Give your students instructions that highlight the purpose of your mid-semester survey. "*The purpose of this mid-semester survey is for me to learn about your experience in my course. Your answers will provide me with valuable feedback that will help me to be a more effective educator—whether that means adjusting the pace of the course, connecting you with important resources, or adapting the way I run my student hours. Please take your time and think through your comments to be as specific as possible so that I can best determine what steps to take to make my teaching more effective for you. This assignment is anonymous.*"

Question Bank | Choose as few or as many of the following questions for your mid-semester survey. You can also add course-specific questions to personalize the survey.

- What aspects of my teaching or the structure of this course has been most helpful to you?
- What aspects of my teaching or the structure of this course has been least helpful to you? What advice would you give me to help improve your learning in this course?
- Is the pace of this course too fast/too slow/about right?
- About how many hours per week do you spend studying for this course outside of class?
- What steps could you take to improve your own learning in this course?
- Are you experiencing barriers that are impacting your ability to be successful in this course?

- Is there anything that I or the university can do to help you overcome those barriers?
- Do you feel comfortable speaking in this class? If not, is there something I could do to help you feel more comfortable?
- Have you attended my student hours/office hours? If not, is there something I could do to help you attend? (e.g., make an individual appointment outside of regular student hours, hold virtual student hours on Zoom, etc.)
- What would you like to see more of between now and the end of the semester?
- How much of the reading that has been assigned so far have you completed? 100% 90% 80% 70%, 60%, 50%, less than 50%
- What is your strategy when you have a question about content that you are struggling to figure out on your own? (e.g., Do you come to my student hours? Do you ask a peer? Do you ask a PAL?)
- Do you have comments/suggestions about the class not covered in the above questions?

Resource 4. List of Student Resources at Sacramento State

Click on the following link for a downloadable PDF & Numbers file formats of campus resources that you can share with your students. Simply download & post to your course Canvas site or distribute as a handout in class.

Student Resources Downloads

Section 6 | Building Peer-to-Peer Community

Resource 1. Peer Evaluation Activity

Anonymous peer evaluations task students with providing important feedback to their peers about their perceived contributions and with reflecting on their contributions. The evaluations can provide instructors with important information about group dynamics and promote individual accountability of group members.

Administering the evaluation activity | Provide students with a copy of the evaluation questions at the outset of the group activity so that students understand how they will be evaluated by their peers. Have students complete the form for their peers and themselves at the midpoint of the group activity (to give students an opportunity to change course, if needed), and at the end of the activity. Anonymize the evaluations by either deleting the evaluator names or not asking for their names and then distribute to the evaluatees.

Example evaluation activity | From Chang Y, Brickman P. When Group Work Doesn't Work: Insights from Students. CBE Life Sci Educ. 2018 Sep;17(3):ar42. doi: 10.1187/cbe.17-09-0199. PMID: 30183565; PMCID: PMC6234829.

Instructions

Please rate each of your team members on their contributions to the performance of your group. Their rating should be based on all the work done as a team. You may use non-integer values (i.e. 2.5). To receive all of the points your group earned for their group problem grade, a student's average score from all of their peers must be 3 or higher. Ratings of 1 and 4 should be reserved for very special cases. If you give a rating of 4 or less than 2 for any category, you must explain why in your comments.

Rate each team member based on the following scale:

- 1 = Unacceptable performance, I would fire this person
- 2 = Improvement needed
- 3 = Good, met or exceeded all expectations
- 4 = Outstanding, a rare individual

Name of group member being evaluated: _____

1. Preparation: Was this person reliably prepared for working on the group work? _____
2. Preparation: Could you count on this person to perform their part of the in-class group work?_____
3. Participation: Did this team member contribute their fair share of the work and actively participate in group assignments and tests?_____
4. Participation: Did this person always seem to be working in your group meetings? Did you always see them in class?_____
5. Collaboration: Did this person try their best to help the group function effectively?_____
6. Attitude: Did this person have a positive attitude that helped the group function? Were they pleasant to work with?_____
7. Performance: Did this group member add substantially to the score on the group assignments and tests?_____
8. Performance: Did this group member bring special skills to the task?_____
9. Attitude: Did this person have a positive attitude that helped the group function? Were they pleasant to work with? _____
10. Performance: Did this group member add substantially to the score on the group assignments and tests? _____
11. Performance: Did this group member bring special skills to the task? _____

Comments:

Resource 2. Icebreaker Activity

Icebreakers are quick activities intended to help students learn about each other, build classroom cohesiveness, and foster a positive environment. Icebreakers can even help to mitigate start-of-the-semester anxiety.

Administering the icebreaker | Post 3-4 icebreaker questions on your course Canvas page in the "Discussion" section. The icebreaker activity should be posted at the beginning of your course as an introductory activity.

Icebreaker question bank

- What is your favorite motivational quote?
- Finish the following sentence: You can tell a lot about a person by….
- What's the best piece of advice you've ever been given?
- What is your dream job?
- What would the title of your autobiography be?
- What is one unexpected thing about you that not many people know?
- If you could have any animal for a pet, what would it be and why?
- Who is your favorite historical figure?
- What is your favorite location on campus to study?
- What is your favorite part of campus?
- If you could eat one thing for the rest of your life, what would it be?
- What is your favorite hobby?
- If you could listen to one song for the rest of your life, what would it be?
- What is your dream vacation destination?

Section 7 | Representation

Resource 1. Scientist Spotlights Initiative

The *Scientist Spotlights Initiative* provides curricular supplements to help faculty integrate stories about the contributions of scientists representing diverse communities. Primarily developed by college faculty and students of diverse identities, the initiative provides suggestions for implementing Scientist Spotlights activities, with a focus on promoting reflection and metacognition as students engage with course content.

Click here to learn more: https://scientistspotlights.org

Resource 2. The Atlas of Black Scholarship

The *Atlas of Black Scholarship* provides a list of Black biologists, chemists, and physicians in the form of a reference manual. The Atlas enables simple access to biographies and contributions of Black scientists, categorized into their respective fields, in an effort to help educators integrate Black scientists' work into their curriculum. Click here to learn more: https://qubeshub.org/publications/2022/1

Section 8 | Growth Mindset Strategies & Activities

Resource 1. DAPPS Goal Setting & Time Management Activity

The following DAPPS goal setting and time management activity can be quickly modified to include your course-specific activities. This activity should be presented to students 2-3 weeks in advance of an exam (or other summative assessment) to provide them with enough time to work toward their goal. A calendar, as shown in the image at the bottom, should also be provided to students along with the following assignment details and instructions.

Assignment Details

DAPPS is an acronym used to describe effective goal setting:

- DATED—*When*? In this case, the "when" will be your exam date.
- ACHIEVABLE—*Be realistic.* Make sure the goal you set is challenging, but also realistic for you.
- PERSONAL—*About you.* You are setting this goal for yourself, not for or in response to anyone else.
- POSITIVE—*What you want to do, as opposed to don't want to do.* (i.e., "I want to earn 80%" rather than "I don't want to fail.")
- SPECIFIC—*Measurable.* Instead of "I want to pass," try "I want to earn 75%."

Instructions

1. Attached is a calendar for now until the next exam. **Complete the schedule** by writing out your study plan. Below are suggested activities for adding to your schedule.

- Pre-viewing lecture slides for specific lectures
- Pre-viewing review questions
- Completing review questions for specific lectures
- Completing learning modules
- Completing quizzes
- Completing homework assignments (drawing & quiz writing)
- Completing the practice exam
- Reviewing power points
- Reviewing review questions for specific lectures
- Reviewing textbook reading assignments
- Reviewing quizzes

- Reviewing practice exam
- Visiting office hours
- Attending a study group

2. **Write down your goal for the next exam** (i.e., what grade you hope to earn). Use the DAPPS strategy, as described above, to develop your goal.

3. **Be sure to match your study plan to your goal!** Re-adjust your study plan if you think you need to do more to achieve your goal.

Example Calendar Handout | Created using PowerPoint

Page 1:

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
(2/28)	(3/1) **Quiz 3 Due 11:59pm**	3/2)	(3/3)	(3/4)	(3/5)	(3/6)
(3/7) **Drawing Assignment Due**	(3/8) **Quiz 4 Due 11:59pm**	(3/9) **Quiz Writing Assignment Due**	(3/10)	(3/11)	(3/12)	(3/13)

Page 2:

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
(3/14)	(3/15)	(3/16) **EXAM 2** **GOAL _____%**	(3/17)	(3/18)	(3/19)	(3/20)

Resource 2. Post-Exam Debugging Activity

The following debugging assignment can be quickly tailored to reflect your course specific activities/assessments. Distribute during class and explain the purpose of the activity, or simply post on your course Canvas site.

Assignment Details

This activity is intended to help you identify changes you can make to improve your study strategies, learning outcomes, and exam performance. If you are unsatisfied with your exam grade or feel lost in this class, use these questions as a guide to help you figure out what strategies you might adjust in your approach to this class—all of your "No's" are things you can change! Try incorporating some or all of those strategies from here on out.

Instructions

Please circle yes or no to the following questions. Your responses are for your eyes only.

- I always attend lecture. Yes No
- I always take notes during lecture. Yes No
- I review my notes the night after lecture, or at some point within the same week. Yes No
- I rewrite my notes to make sure they are legible, organized, and as a way to review the material. Yes No
- I study the PowerPoint slides by paraphrasing content in my own words. Yes No
- I complete ***all*** of the review questions. Yes No
- I keep up with the review questions and complete them weekly. Yes No
- I take 15—20 minutes to preview lecture slides and review questions ***before*** coming to lecture. Yes No
- I try to answer review questions ***before*** coming to lecture. Yes No
- I reviewed the online quizzes before the exam. Yes No
- I take notes when I am reading the textbook and I study those notes. Yes No
- I reviewed the practice exam and studied questions I did not understand. Yes No
- I asked questions on all answers I was unsure about (from review questions, lecture material, practice exams, and quizzes). Yes No
- I attended student hours (office hours) to discuss review questions or other content. Yes No
- I study 6-9 hours for this class alone *every week* (the equation for upper division science classes is 2-3 hours of outside study time per week per unit). Yes No

- Before the exam, I tried answering all review questions and practice exam questions without looking at my notes as a way to figure out what concepts I didn't fully understand. Yes No
- I am getting [free] private tutoring at PARC. Yes No

There are always things you can do to improve your learning! When it comes to succeeding in the classroom <u>perseverance (grit) matters!</u> Oftentimes having perseverance means re-doubling your efforts and approaching learning in a new way.

Section 9 | Effective Approaches for Active Learning

Resource 1. Example Think-Pair-Share Activity

Assignment Details

The following Think-Pair-Share activity is meant to capture student interest as you are introducing a new topic. The specific question should be something captivating that is related to that topic.

Instructions

1. At the start of a new topic, post or otherwise distribute a question related to an aspect of that topic that is likely to prompt discussion. Make sure each student has had some time to **think** and really consider their position before moving onto step #2.
2. **Pair** students and ask them to discuss the question with their partner. Where do they agree? Where do they disagree? Have them work together to produce a response to the question.
3. There is some debate about what exactly the **share** element in a think-pair-share should look like. The critical element of this is that the instructor gets a glimpse into the thought process behind the student answers.

Resource 2. In class debate model: Organ Debates

The following is an example of a debate format used in teaching physiology. It is especially aimed at teaching the subject matter to non-majors, and is an example of how to engage students through different modalities of learning and assessment. The debates are developed by Jennifer Lundmark, California State University, Sacramento; lundmark@csus.edu

Abstract

Facilitating the learning of physiology by non-majors who lack foundational coursework in biology and chemistry presents unique pedagogical challenges. By instead focusing upon the strengths of this group of learners (team skills, interest in applied physiology), a new mechanism for conveying the primary interconnection and synergism of the body's organ systems was developed: The Great Organ Systems Debates. After learning sequentially about the primary organ systems, the Debates are a culminating, integrative experience, where students "debate" the relative importance of their system in different situations. Used and refined over several

years, it is an engaging, interactive and effective learning tool that could be adapted to almost any level of instruction.

Introduction

As an instructor who normally teaches physiology courses for majors in the biomedical sciences, taking on an introductory course for non-majors presented new challenges in terms of pedagogy and student motivation. I felt the need to devise an intrinsically appealing mechanism (beyond the extrinsic motivation of the comprehensive final exam) that would encourage students to appreciate the complex interdependence of organ systems after learning about their basic roles individually. Lower division Anatomy & Physiology (two semester sequence) on our campus primarily serves students in Kinesiology and Health Science. This exercise is the culminating event of the second semester, and includes content from the first course. The general point of the Debates is for teams to *argue their system's merits* within a given scenario. To optimize participation, the Debates evolved to include multiple, graded components, the most impactful of which (in terms of course points) is an individual paper. Small point allotments serve as the initial enticement for progressing through the debate rounds, but students are soon caught up in the fun competition of this end-of-semester event, and, as several students have expressed, "work harder than I ever planned" to see their team succeed.

Basic methodology

Teams**:** Students (within the laboratory setting) are randomly divided into six teams: Cardiovascular, Respiratory, Renal, Digestive, Endocrine, and Nervous systems. They learn their team identity two weeks before the debates begin, and have one, 3-hour lab period devoted to debate preparation. Remaining preparation occurs primarily outside of class; no one has yet indicated that there is too much out-of-class work with this assignment.

Scenarios**:** Six scenarios are identified at the time the teams are assigned. As mentioned, the goal is for a team to convincingly argue why *their system* is most critical for survival/success within a given scenario. While the scenarios shift with each semester, I try to include both short and prolonged athletic endeavors, a situation with blood loss, and challenges with food, water, or the environment. Teams do not know their opponent/scenario until 15-20 minutes before each debate, so they must prepare for everything.

Tasks: There are four point-earning stages to the Debate, divided as follows:

1) Debate Preparation (group; 1 page). Teams summarize resources and techniques used for preparation and describe their best/favorite strategy for each scenario.

2) Organ Synthesis Paper (individual; 1500-2000 words). With the greatest point total, this provides an overview of the assigned system, focusing on its homeostatic role. The paper must include mechanistic details about how the system accomplishes its tasks (e.g., *how* the renal system maintains blood volume), as well as a brief overview of how each other system interacts with the author's system. Writing and language must be at a level that could be understood by an average high school student, with unique explanations, analogies, and arguments. I tell them I want to see their personality emerge from their writing, and for them to use language that is typical for them. This helps to remove the reliance upon jargon, distinguishes authentic writing, and makes it more fun for the students.

3) Team Flair (a few points). Students become unreservedly invested in their organ system. Creative costuming, mottos, music, and even snacks are used to make systems memorable to the judges, and creates a fun and engaging atmosphere.

4) Debate Performance. After one practice round, teams must win to stay in play, with a minor number of points awarded for progression. Debate structure: Team 1 opening argument, Team 2 rebuttal, Team 1 closing argument. After a brief pause, Team 2 opens (same scenario), then Team 1 rebuts, and Team 2 closes. Within their opening statement, the first team has an opportunity to make the scenario their own, including details that they feel may help them (e.g. they were normally hydrated when the scenario began). Teams are coached to use mechanistic arguments, to focus on the merits of their own system, and to demonstrate polite sportsmanship in all situations. To successfully "debate", they must explain the physiological mechanisms by which their system is helping to maintain homeostasis (accessing glycogen stores, adjusting blood pressure), keep the subject safe or help them in some other way (listening for the sound of water, calling for help), or provide other benefits (using deep breathing to calm the mind). During rebuttal, opponents use the strengths of their own system to argue against the opening (e.g. the cardiovascular system may have cited the usefulness of angiotensin II in maintaining MAP; the digestive system may rebut by noting that angiotensinogen, the precursor for angiotensin II, is produced by the liver). The schedule takes up roughly two weeks of laboratory and the last lecture day. All non-debating students, as well as faculty/TA's, judge the performances using a common scorecard (Fig 1). After Round 1, four teams advance to the championship round of the next week (top-scoring second place team joins the other victors), with the other two teams progressing to a consolation round. Thus, all teams remain engaged both weeks. During the finale in lecture (where guest judges have included other faculty, alumni and even the University President), non-debating students have an individual assignment related to the debate to keep them involved, and winning teams make the lab's Wall of Fame photo display (most frequent victors: Renal & Digestion).

Outcomes and evidence of effectiveness

Student attitudes towards this exercise have been uniformly positive, with frequent comments about how much they learned both debating and listening to other teams. The most common request related to the debates (as obtained from anonymous evaluations) is that they'd like them to run the entire semester.

The most impressive outcome, in my opinion, is student performance on the comprehensive final. Due to university scheduling, the final for this class is always Monday morning, the first day of exam week. Our last class period (the Debate Finale) is the Friday beforehand. Yet, without exception, these classes have performed very well on the final, even when earlier exam performances were lackluster. Students in Fall, 2018 semester earned an average of 60.34% on the first exam; two months later, their performance on the comprehensive final averaged 84.4%. While that semester's scores had the most dramatic swing, all classes have trended in this direction. While all exams are approximately 50% free response, the final exam includes a number of complex application questions, for which this group is clearly prepared. Even though this exercise takes a fair amount of time, I believe the student performance outcomes and positive student feedback makes it a tool worth keeping.

Resource 3. Setting up Peer Leaders in the Classroom: IPLP

Active learning with in-class peer leaders: The Integrated Peer Leadership Program

Active learning has been recognized as a key strategy to improve student learning, mitigate high failure rates, and reduce achievement gaps in science, technology, engineering, and math (STEM) courses. Likewise, involving students as peer leaders in or outside the classroom conveys proven benefits for both the students in the class and the students acting as peer leaders.

Even so, implementing active learning and a peer leadership program can often come with a cost, either financially or in the form of instructor time. Active learning instruction is often associated with smaller class sizes, and this may not be a feasible option at many institutions. Likewise, many peer instruction models can cost thousands of dollars per section to run each semester, and procuring such funding Is a key challenge of implementing sustainable peer-led instruction.

Here, we present one option we have developed to implement a structured, no-cost peer leadership model in an introductory college physics classroom. The model transforms a

traditional lecture classroom into a student-centered class without any additional cost or time requirement. Over four semesters of implementation, we found that the model improved student learning gains on formative assessments, reduced the rate at which students received a failing grade, and drastically reduced achievement gaps in the class.

There are many approaches to engage students through active learning, and the implementation does not have to be "all or nothing;" rather, the gradual incorporation of active learning elements can both have an impact and be a more realistic approach for a busy instructor looking to redesign parts of a course. We hope that this piece of reading will inspire you to use active learning and peer leadership in your classes and encourage you to try out pieces of the model and keep what works for you and your students!

Link to the article: https://journals.aps.org/prper/pdf/10.1103/PhysRevPhysEducRes.17.023104

Section 10 | Student-Centered Learning Outcomes

Resource 1. Developing SMART Learning Outcomes

Learning outcomes (LOs) communicate to students what they will know or be able to do by the end of your class. There are many ways to craft LOs and each department, and each class, will have unique needs that may make other methods more or less useful. There are dozens of excellent recommendations online at various Centers for Teaching and Learning throughout the world. The recommendations we are providing are one method to help get you started, but keep in mind that your LOs can always be revised to meet your needs and your students' needs.

So let's get started!

1. Brainstorm the big-picture pieces you want your students to take away at the end of your class. Try to start with around 3-7 pieces, these could be knowledge (content), abilities (skills), or values (affective). The fraction of LOs in each category will depend on the course. For example, a lab class is likely to have more skill based LOs than a non-lab class.
2. Select action verbs to describe what specifically students will be doing to meet your LO.

Descriptions of Bloom's level with sample action verbs:

Bloom's Level	Description (from Krathwohl, 2002)	Sample Action Verbs
Remembering (lowest-order)	Students can retrieve relevant information from their long-term memory	list, define, describe, recall, label, match, observe, identify, reproduce
Understanding	Students can determine the meaning of instructional messages, including oral, written and graphic communication	explain, describe, interpret, paraphrase, classify, restate, summarize, express, generalize, recognize

Applying	Students can carry out our use a procedure in a given situation	apply, choose, predict, use, illustrate, demonstrate, hypothesize, modify, interpret, develop
Analyzing	Students can break material into its constituent parts and detect how the parts relate to one another and to an overall structure or purpose	contrast, distinguish, test, differentiate, categorize, compare, analyze, research, examine, criticize, experiment, map, separate
Evaluating	Students can make a judgment based on criteria and standards	evaluate, judge, predict, argue, persuade, convince, grade, recommend, rank, select
Creating (highest-order)	Students can put elements together to form a novel, coherent whole or make an original product	develop, create, design, construct, synthesize, compose, conjecture, formulate, imagine, invent

1. Using your content/skill/affective element and your selected action verb create a short statement (try to stay under 400 characters) that captures the outcome your student can expect to meet by the end of your class.
2. Complete your full set of course learning outcomes (CLOs).

Now that you have your set of LOs, take a minute to review your LOs to see if they meet the SMART criteria. That is, are they Specific, Measurable, Aligned, Realistic, and Timebound? To answer this, ask yourself the following questions:

- Is the outcome specific?
- Is the outcome measurable or observable?
- Is the outcome aligned with the broader outcomes of the course/program?
- Is the outcome realistic and achievable for students?

- Is the outcome time bound, that is, does it identify a clear timeframe for achievement (for example, the end of the class)?

After reviewing your LOs, revisit and revise as necessary.

Resource 2. 16 AACU Value Rubrics

For additional information on each rubric, contact value@aacu.org

The VALUE rubrics were developed by teams of faculty experts representing colleges and universities across the United States through a process that examined many existing campus rubrics and related documents for each learning outcome and incorporated additional feedback from faculty. The rubrics articulate fundamental criteria for each learning outcome, with performance descriptors demonstrating progressively more sophisticated levels of attainment. The rubrics are intended for institutional-level use in evaluating and discussing student learning, not for grading. The core expectations articulated in all of the VALUE rubrics can and should be translated into the language of individual campuses, disciplines, and even courses. The utility of the VALUE rubrics is to position learning at all undergraduate levels within a basic framework of expectations such that evidence of learning can by shared nationally through a common dialog and understanding of student success.

1. Civic Engagement VALUE Rubric

Definition

Civic engagement is "working to make a difference in the civic life of our communities and developing the combination of knowledge, skills, values and motivation to make that difference. It means promoting the quality of life in a community, through both political and non-political processes." (Excerpted from *Civic Responsibility and Higher Education*, edited by Thomas Ehrlich, published by Oryx Press, 2000, Preface, page vi.) In addition, civic engagement encompasses actions wherein individuals participate in activities of personal and public concern that are both individually life enriching and socially beneficial to the community.

Framing Language

Preparing graduates for their public lives as citizens, members of communities, and professionals in society has historically been a responsibility of higher education. Yet the outcome of a civic-minded graduate is a complex concept. Civic learning outcomes are framed by personal identity and commitments, disciplinary frameworks and traditions, pre-professional norms and practice, and the mission and values of colleges and universities. This rubric is designed to make the civic learning outcomes more explicit. Civic engagement can take many forms, from individual volunteerism to organizational involvement to electoral participation. For students this could include community-based learning through service-learning classes, community-based research, or service within the community. Multiple types of work samples or collections of work may be utilized to assess this, such as:

- The student creates and manages a service program that engages others (such as youth or members of a neighborhood) in learning about and taking action on an issue they care about. In the process, the student also teaches and models processes that engage others in deliberative democracy, in having a voice, participating in democratic processes, and taking specific actions to affect an issue.
- The student researches, organizes, and carries out a deliberative democracy forum on a particular issue, one that includes multiple perspectives on that issue and how best to make positive change through various courses of public action. As a result, other students, faculty, and community members are engaged to take action on an issue.
- The student works on and takes a leadership role in a complex campaign to bring about tangible changes in the public's awareness or education on a particular issue, or even a change in public policy. Through this process, the student demonstrates multiple types of civic action and skills.
- The student integrates their academic work with community engagement, producing a

tangible product (piece of legislation or policy, a business, building or civic infrastructure, water quality or scientific assessment, needs survey, research paper, service program, or organization) that has engaged community constituents and responded to community needs and assets through the process. In addition, the nature of this work lends itself to opening up the review process to include community constituents that may be a part of the work, such as teammates, colleagues, community/agency members, and those served or collaborating in the process.

Glossary

(The definitions that follow were developed to clarify terms and concepts used in this rubric only.)

- Civic identity: When one sees her or himself as an active participant in society with a strong commitment and responsibility to work with others towards public purposes.
- Service-learning class: A course-based educational experience in which students participate in an organized service activity and reflect on the experience in such a way as to gain further understanding of course content, a broader appreciation of the discipline, and an enhanced sense of personal values and civic responsibility.
- Communication skills: Listening, deliberation, negotiation, consensus building, and productive use of conflict.
- Civic life: The public life of the citizen concerned with the affairs of the community and nation as contrasted with private or personal life, which is devoted to the pursuit of private and personal interests.
- Politics: A process by which a group of people, whose opinions or interests might be divergent, reach collective decisions that are generally regarded as binding on the group and enforced as common policy. Political life enables people to accomplish goals they could not realize as individuals. Politics necessarily arises whenever groups of people live together, since they must always reach collective decisions of one kind or another.
- Government: "The formal institutions of a society with the authority to make and implement binding decisions about such matters as the distribution of resources, allocation of benefits and burdens, and the management of conflicts." (Retrieved from the Center for Civic Engagement Web site, May 5, 2009.)
- Civic/community contexts: Organizations, movements, campaigns, a place or locus where people and/or living creatures inhabit, which may be defined by a locality (school, national park, non-profit organization, town, state, nation) or defined by shared identity (i.e., African-Americans, North Carolinians, Americans, the Republican or Democratic Party, refugees, etc.). In addition, contexts for civic engagement may be defined by a variety of approaches intended to benefit a person, group, or community, including community service or volunteer work, academic work.

Definition

Civic engagement is "working to make a difference in the civic life of our communities and developing the combination of knowledge, skills, values, and motivation to make that difference. It means promoting the quality of life in a community, through both political and non-political processes." (Excerpted from *Civic Responsibility and Higher Education*, edited by Thomas Ehrlich, published by Oryx Press, 2000, Preface, page vi.) In addition, civic engagement encompasses actions wherein individuals participate in activities of personal and public concern that are both individually life enriching and socially beneficial to the community. *Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.*

	Capstone 4	**Milestones** 3	2	**Benchmark** 1
Diversity of Communities and Cultures	Demonstrates evidence of adjustment in own attitudes and beliefs because of working within and learning from diversity of communities and cultures. Promotes others' engagement with diversity.	Reflects on how own attitudes and beliefs are different from those of other cultures and communities. Exhibits curiosity about what can be learned from diversity of communities and cultures.	Has awareness that own attitudes and beliefs are different from those of other cultures and communities. Exhibits little curiosity about what can be learned from diversity of communities and cultures.	Expresses attitudes and beliefs as an individual, from a one-sided view. Is indifferent or resistant to what can be learned from diversity of communities and cultures.
Analysis of Knowledge	Connects and extends knowledge (facts, theories, etc.) from one's own academic study/field/discipline to civic engagement and to one's own participation in civic life, politics, and	Analyzes knowledge (facts, theories, etc.) from one's own academic study/field/discipline making relevant connections to civic engagement and to one's own participation in civic	Begins to connect knowledge (facts, theories, etc.) from one's own academic study/field/discipline to civic engagement and to tone's own participation in civic life, politics, and	Begins to identify knowledge (facts, theories, etc.) from one's own academic study/field/discipline that is relevant to civic engagement and to one's own participation in civic life, politics, and

	government.	life, politics, and government.	government.	government.
Civic Identity and Commitment	Provides evidence of experience in civic-engagement activities and describes what she/he has learned about her or himself as it relates to a reinforced and clarified sense of civic identity and continued commitment to public action.	Provides evidence of experience in civic-engagement activities and describes what she/he has learned about her or himself as it relates to a growing sense of civic identity and commitment.	Evidence suggests involvement in civic-engagement activities is generated from expectations or course requirements rather than from a sense of civic identity.	Provides little evidence of her/his experience in civic-engagement activities and does not connect experiences to civic identity.
Civic Communication	Tailors communication strategies to effectively express, listen, and adapt to others to establish relationships to further civic action	Effectively communicates in civic context, showing ability to do all of the following: express, listen, and adapt ideas and messages based on others' perspectives.	Communicates in civic context, showing ability to do more than one of the following: express, listen, and adapt ideas and messages based on others' perspectives.	Communicates in civic context, showing ability to do one of the following: express, listen, and adapt ideas and messages based on others' perspectives.
Civic Action and Reflection	Demonstrates independent experience and *shows initiative in team leadership* of complex or multiple civic engagement activities, accompanied by	Demonstrates independent experience and *team leadership of* civic action, with reflective insights or analysis about the aims and accomplishments of	Has clearly *participated* in civically focused actions and begins to reflect or describe how these actions may benefit individual(s) or	Has *experimented* with some civic activities but shows little internalized understanding of their aims or effects and little commitment to future action.

	reflective insights or analysis about the aims and accomplishments of one's actions.	one's actions.	communities.	
Civic Contexts / Structures	Demonstrates ability and commitment to *collaboratively work across and within* community contexts and structures to *achieve a civic aim.*	Demonstrates ability and commitment to work actively *within* community contexts and structures to *achieve a civic aim.*	Demonstrates experience identifying intentional ways to *participate in* civic contexts and structures.	Experiments with civic contexts and structures, *tries out a few to see what fits.*

2. Creative Thinking VALUE Rubric

Definition

Creative thinking is both the capacity to combine or synthesize existing ideas, images, or expertise in original ways and the experience of thinking, reacting, and working in an imaginative way characterized by a high degree of innovation, divergent thinking, and risk taking.

Framing Language

Creative thinking, as it is fostered within higher education, must be distinguished from less focused types of creativity such as, for example, the creativity exhibited by a small child's drawing, which stems not from an understanding of connections, but from an ignorance of boundaries. Creative thinking in higher education can only be expressed productively within a particular domain. The student must have a strong foundation in the strategies and skills of the domain in order to make connections and synthesize. While demonstrating solid knowledge of the domain's parameters, the creative thinker, at the highest levels of performance, pushes beyond those boundaries in new, unique, or atypical recombinations, uncovering or critically perceiving new syntheses and using or recognizing creative risk-taking to achieve a solution.

The Creative Thinking VALUE Rubric is intended to help faculty assess creative thinking in a broad range of transdisciplinary or interdisciplinary work samples or collections of work. The rubric is made up of a set of attributes that are common to creative thinking across disciplines. Examples of work samples or collections of work that could be assessed for creative thinking may include research papers, lab reports, musical compositions, a mathematical equation that solves a problem, a prototype design, a reflective piece about the final product of an assignment, or other academic works. The work samples or collections of work may be completed by an individual student or a group of students.

Glossary

The definitions that follow were developed to clarify terms and concepts used in this rubric only.

- Exemplar: A model or pattern to be copied or imitated.
- Domain: Field of study or activity and a sphere of knowledge and influence.

Definition

Creative thinking is both the capacity to combine or synthesize existing ideas, images, or expertise in original ways and the experience of thinking, reacting, and working in an

imaginative way characterized by a high degree of innovation, divergent thinking, and risk taking.

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone 4	**Milestone** 3	**Milestone** 2	**Benchmark** 1
Acquiring Competencies *This step refers to acquiring strategies and skills within a particular domain.*	Reflect: Evaluates creative process and product using domain-appropriate criteria.	Create: Creates an entirely new object, solution or idea that is appropriate to the domain.	Adapt: Successfully adapts an appropriate exemplar to his/her own specifications.	Model: Successfully reproduces an appropriate exemplar.
Taking Risks *May include personal risk (fear of embarrassment or rejection) or risk of failure in successfully completing assignment, i.e. going beyond original parameters of assignment, introducing new materials and forms, tackling controversial topics, advocating unpopular ideas or solutions.*	Actively seeks out and follows through on untested and potentially risky directions or approaches to the assignment in the final product.	Incorporates new directions or approaches to the assignment in the final product.	Considers new directions or approaches without going beyond the guidelines of the assignment.	Stays strictly within the guidelines of the assignment.
Solving Problems	Not only develops a logical, consistent plan to solve problem, but recognizes	Having selected from among alternatives, develops a logical, consistent plan to solve the problem.	Considers and rejects less acceptable approaches to solving problem.	Only a single approach is considered and is used to solve the problem.

	consequences of solution and can articulate reason for choosing solution.			
Embracing Contradictions	Integrates alternate, divergent, or contradictory perspectives or ideas fully.	Incorporates alternate, divergent, or contradictory perspectives or ideas in a exploratory way.	Includes (recognizes the value of) alternate, divergent, or contradictory perspectives or ideas in a small way.	Acknowledges (mentions in passing) alternate, divergent, or contradictory perspectives or ideas.
Innovative Thinking *Novelty or uniqueness (of idea, claim, question, form, etc.)*	Extends a novel or unique idea, question, format, or product to create new knowledge or knowledge that crosses boundaries.	Creates a novel or unique idea, question, format, or product.	Experiments with creating a novel or unique idea, question, format, or product.	Reformulates a collection of available ideas.
Connecting, Synthesizing, Transforming	Transforms ideas or solutions into entirely new forms.	Synthesizes ideas or solutions into a coherent whole.	Connects ideas or solutions in novel ways.	Recognizes existing connections among ideas or solutions.

3. Critical Thinking VALUE Rubric

Definition

Critical thinking is a habit of mind characterized by the comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating an opinion or conclusion.

Framing Language

This rubric is designed to be transdisciplinary, reflecting the recognition that success in all disciplines requires habits of inquiry and analysis that share common attributes. Further, research suggests that successful critical thinkers from all disciplines increasingly need to be able to apply those habits in various and changing situations encountered in all walks of life.

This rubric is designed for use with many different types of assignments and the suggestions here are not an exhaustive list of possibilities. Critical thinking can be demonstrated in assignments that require students to complete analyses of text, data, or issues. Assignments that cut across presentation mode might be especially useful in some fields. If insight into the process components of critical thinking (e.g., how information sources were evaluated regardless of whether they were included in the product) is important, assignments focused on student reflection might be especially illuminating.

Glossary

The definitions that follow were developed to clarify terms and concepts used in this rubric only.

- Ambiguity: Information that may be interpreted in more than one way.
- Assumptions: Ideas, conditions, or beliefs (often implicit or unstated) that are "taken for granted or accepted as true without proof." (quoted from www.dictionary.reference.com/browse/assumptions)
- Context: The historical, ethical. political, cultural, environmental, or circumstantial settings or conditions that influence and complicate the consideration of any issues, ideas, artifacts, and events.
- Literal meaning: Interpretation of information exactly as stated. For example, "she was green with envy" would be interpreted to mean that her skin was green.
- Metaphor: Information that is (intended to be) interpreted in a non-literal way. For example, "she was green with envy" is intended to convey an intensity of emotion, not a skin color.

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not

meet benchmark (cell one) level performance.

	Capstone 4	**Milestone** 3	**Milestone** 2	**Benchmark** 1
Explanation of issues	Issue/problem to be considered critically is stated clearly and described comprehensively, delivering all relevant information necessary for full understanding.	Issue/problem to be considered critically is stated, described, and clarified so that understanding is not seriously impeded by omissions.	Issue/problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries undetermined, and/or backgrounds unknown.	Issue/problem to be considered critically is stated without clarification or description.
Evidence *Selecting and using information to investigate a point of view or conclusion*	Information is taken from source(s) with enough interpretation / evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned thoroughly.	Information is taken from source(s) with enough interpretation / evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are subject to questioning.	Information is taken from source(s) with some interpretation / evaluation, but not enough to develop a coherent analysis or synthesis. Viewpoints of experts are taken as mostly fact, with little questioning.	Information is taken from source(s) without any interpretation / evaluation. Viewpoints of experts are taken as fact, without question.
Influence of context and assumptions	Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position.	Identifies own and others' assumptions and several relevant contexts when presenting a position.	Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa).	Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position.

Student's position (perspective, thesis/hypothesis)	Specific position (perspective, thesis/hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/hypothesis) are acknowledged. Others' points of view are synthesized within position (perspective, thesis/hypothesis).	Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others' points of view are acknowledged within position (perspective, thesis/hypothesis).	Specific position (perspective, thesis/hypothesis) acknowledges different sides of an issue.	Specific position (perspective, thesis/hypothesis) is stated, but is simplistic and obvious.
Conclusions and related outcomes (implications and consequences)	Conclusions and related outcomes (consequences and implications) are logical and reflect student's informed evaluation and ability to place evidence and perspectives discussed in priority order.	Conclusion is logically tied to a range of information, including opposing viewpoints; related outcomes (consequences and implications) are identified clearly.	Conclusion is logically tied to information (because information is chosen to fit the desired conclusion); some related outcomes (consequences and implications) are identified clearly.	Conclusion is inconsistently tied to some of the information discussed; related outcomes (consequences and implications) are oversimplified.

4. Ethical Reasoning VALUE Rubric

Definition

Ethical Reasoning is reasoning about right and wrong human conduct. It requires students to be able to assess their own ethical values and the social context of problems, recognize ethical issues in a variety of settings, think about how different ethical perspectives might be applied to ethical dilemmas and consider the ramifications of alternative actions. Students' ethical self identity evolves as they practice ethical decision-making skills and learn how to describe and analyze positions on ethical issues.

Framing Language

This rubric is intended to help faculty evaluate work samples and collections of work that demonstrate student learning about ethics. Although the goal of a liberal education should be to help students turn what they've learned in the classroom into action, pragmatically it would be difficult, if not impossible, to judge whether or not students would act ethically when faced with real ethical situations. What can be evaluated using a rubric is whether students have the intellectual tools to make ethical choices.

The rubric focuses on five elements: Ethical Self Awareness, Ethical Issue Recognition, Understanding Different Ethical Perspectives/Concepts, Application of Ethical Principles, and Evaluation of Different Ethical Perspectives/Concepts. Students' Ethical Self Identity evolves as they practice ethical decision-making skills and learn how to describe and analyze positions on ethical issues. Presumably, they will choose ethical actions when faced with ethical issues.

Glossary

The definitions that follow were developed to clarify terms and concepts used in this rubric only.

- Core Beliefs: Those fundamental principles that consciously or unconsciously influence one's ethical conduct and ethical thinking. Even when unacknowledged, core beliefs shape one's responses. Core beliefs can reflect one's environment, religion, culture or training. A person may or may not choose to act on their core beliefs.
- Ethical Perspectives/concepts: The different theoretical means through which ethical issues are analyzed, such as ethical theories (e.g., utilitarian, natural law, virtue) or ethical concepts (e.g., rights, justice, duty).
- Complex, multi-layered (gray) context: The sub-parts or situational conditions of a scenario that bring two or more ethical dilemmas (issues) into the mix/problem/context/for student's identification.

- Cross-relationships among the issues: Obvious or subtle connections between/among the sub-parts or situational conditions of the issues present in a scenario (e.g., relationship of production of corn as part of climate change issue).

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone 4	**Milestone** 3	**Milestone** 2	**Benchmark** 1
Ethical Self-Awareness	Student discusses in detail / analyzes both core beliefs and the origins of the core beliefs and discussion has greater depth and clarity.	Student discusses in detail / analyzes both core beliefs and the origins of the core beliefs.	Student states both core beliefs and the origins of the core beliefs.	Student states either their core beliefs or articulates the origins of the core beliefs but not both.
Understanding Different Ethical Perspectives/Concepts	Student names the theory or theories, can present the gist of said theory or theories, and accurately explains the details of the theory or theories used.	Student can name the major theory or theories she/he uses, can present the gist of said theory or theories, and attempts to explain the details of the theory or theories used, but has some inaccuracies.	Student can name the major theory she/he uses, and is only able to present the gist of the named theory.	Student only names the major theory she/he uses.
Ethical Issue Recognition	Student can recognize ethical issues when presented in a complex, multilayered (gray) context AND can recognize cross-relationships among the issues.	Student can recognize ethical issues when issues are presented in a complex, multilayered (gray) context OR can grasp cross-relationships among the issues.	Student can recognize basic and obvious ethical issues and grasp (incompletely) the complexities or interrelationships among the issues.	Student can recognize basic and obvious ethical issues but fails to grasp complexity or interrelationships.

Application of Ethical Perspectives/Concepts	Student can independently apply ethical perspectives/concepts to an ethical question, accurately, and is able to consider full implications of the application.	Student can independently apply ethical perspectives/concepts to an ethical question, accurately, but does not consider the specific implications of the application.	Student can apply ethical perspectives/concepts to an ethical question, independently (to a new example) and the application is inaccurate.	Student can apply ethical perspectives/concepts to an ethical question with support (using examples, in a class, in a group, or a fixed-choice setting) but is unable to apply ethical perspectives/concepts independently (to a new example.).
Evaluation of Different Ethical Perspectives/Concepts	Student states a position and can state the objections to, assumptions and implications of and can reasonably defend against the objections to, assumptions and implications of different ethical perspectives/concepts, and the student's defense is adequate and effective.	Student states a position and can state the objections to, assumptions and implications of, and respond to the objections to, assumptions and implications of different ethical perspectives/concepts, but the student's response is inadequate.	Student states a position and can state the objections to, assumptions and implications of different ethical perspectives/concepts but does not respond to them (and ultimately objections, assumptions, and implications are compartmentalized by student and do not affect student's position.)	Student states a position but cannot state the objections to and assumptions and limitations of the different perspectives/concepts.

5. Global Learning VALUE Rubric

Definition

Global learning is a critical analysis of and an engagement with complex, interdependent global systems and legacies (such as natural, physical, social, cultural, economic, and political) and their implications for people's lives and the earth's sustainability. Through global learning, students should 1) become informed, open-minded, and responsible people who are attentive to diversity across the spectrum of differences, 2) seek to understand how their actions affect both local and global communities, and 3) address the world's most pressing and enduring issues collaboratively and equitably.

Framing Language

Effective and transformative global learning offers students meaningful opportunities to analyze and explore complex global challenges, collaborate respectfully with diverse others, apply learning to take responsible action in contemporary global contexts, and evaluate the goals, methods, and consequences of that action. Global learning should enhance students' sense of identity, community, ethics, and perspective-taking. Global learning is based on the principle that the world is a collection of interdependent yet inequitable systems and that higher education has a vital role in expanding knowledge of human and natural systems, privilege and stratification, and sustainability and development to foster individuals' ability to advance equity and justice at home and abroad. Global learning cannot be achieved in a single course or a single experience but is acquired cumulatively across students' entire college career through an institution's curricular and co-curricular programming. As this rubric is designed to assess global learning on a programmatic level across time, the benchmarks (levels 1-4) may not be directly applicable to a singular experience, course, or assignment. Depending on the context, there may be development within one level rather than growth from level to level.

We encourage users of the Global Learning Rubric to also consult three other closely related VALUE Rubrics: Civic Engagement, Intercultural Knowledge and Competence, and Ethical Reasoning.

Glossary

The definitions that follow were developed to clarify terms and concepts used in this rubric only.

- **Global Self-Awareness**: in the context of global learning, the continuum through which students develop a mature, integrated identity with a systemic understanding of the interrelationships among the self, local and global communities, and the natural and

physical world.

- **Perspective Taking:** the ability to engage and learn from perspectives and experiences different from one's own and to understand how one's place in the world both informs and limits one's knowledge. The goal is to develop the capacity to understand the interrelationships between multiple perspectives, such as personal, social, cultural, disciplinary, environmental, local, and global.
- **Cultural Diversity:** the ability to recognize the origins and influences of one's own cultural heritage along with its limitations in providing all that one needs to know in the world. This includes the curiosity to learn respectfully about the cultural diversity of other people and on an individual level to traverse cultural boundaries to bridge differences and collaboratively reach common goals. On a systems level, the important skill of comparatively analyzing how cultures can be marked and assigned a place within power structures that determine hierarchies, inequalities, and opportunities and which can vary over time and place. This can include, but is not limited to, understanding race, ethnicity, gender, nationhood, religion, and class.
- **Personal and Social Responsibility:** the ability to recognize one's responsibilities to society--locally, nationally, and globally--and to develop a perspective on ethical and power relations both across the globe and within individual societies. This requires developing competence in ethical and moral reasoning and action.
- **Global Systems**: the complex and overlapping worldwide systems, including natural systems (those systems associated with the natural world including biological, chemical, and physical sciences) and human systems (those systems developed by humans such as cultural, economic, political, and built), which operate in observable patterns and often are affected by or are the result of human design or disruption. These systems influence how life is lived and what options are open to whom. Students need to understand how these systems 1) are influenced and/or constructed, 2) operate with differential consequences, 3) affect the human and natural world, and 4) can be altered.
- **Knowledge Application:** in the context of global learning, the application of an integrated and systemic understanding of the interrelationships between contemporary and past challenges facing cultures, societies, and the natural world (i.e., contexts) on the local and global levels. An ability to apply knowledge and skills gained through higher learning to real-life problem-solving both alone and with others.

Definition

Global learning is a critical analysis of and an engagement with complex, interdependent global systems and legacies (such as natural, physical, social, cultural, economic, and political) and their implications for people's lives and the earth's sustainability. Through global learning, students

should 1) become informed, open-minded, and responsible people who are attentive to diversity across the spectrum of differences, 2) seek to understand how their actions affect both local and global communities, and 3) address the world's most pressing and enduring issues collaboratively and equitably.

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone 4	Milestones 2	 3	Benchmark 1
Global Self-Awareness	Effectively addresses significant issues in the natural and human world based on articulating one's identity in a global context.	Evaluates the global impact of one's own and others' specific local actions on the natural and human world.	Analyzes ways that human actions influence the natural and human world.	Identifies some connections between an individual's personal decision-making and certain local and global issues.
Perspective Taking	Evaluates and applies diverse perspectives to complex subjects within natural and human systems in the face of multiple and even conflicting positions (i.e. cultural, disciplinary, and ethical.)	Synthesizes other perspectives (such as cultural, disciplinary, and ethical) when investigating subjects within natural and human systems.	Identifies and explains multiple perspectives (such as cultural, disciplinary, and ethical) when exploring subjects within natural and human systems.	Identifies multiple perspectives while maintaining a value preference for own positioning (such as cultural, disciplinary, and ethical).
Cultural Diversity	Adapts and applies a deep understanding of multiple worldviews, experiences, and power structures while initiating meaningful interaction with other cultures to address significant global problems.	Analyzes substantial connections between the worldviews, power structures, and experiences of multiple cultures historically or in contemporary contexts, incorporating respectful interactions with other cultures.	Explains and connects two or more cultures historically or in contemporary contexts with some acknowledgement of power structures, demonstrating respectful interaction with varied cultures and worldviews.	Describes the experiences of others historically or in contemporary contexts primarily through one cultural perspective, demonstrating some openness to varied cultures and worldviews.

Personal and Social Responsibility	Takes informed and responsible action to address ethical, social, and environmental challenges in global systems and evaluates the local and broader consequences of individual and collective interventions.	Analyzes the ethical, social, and environmental consequences of global systems and identifies a range of actions informed by one's sense of personal and civic responsibility.	Explains the ethical, social, and environmental consequences of local and national decisions on global systems.	Identifies basic ethical dimensions of some local or national decisions that have global impact.
Understanding Global Systems	Uses deep knowledge of the historic and contemporary role and differential effects of human organizations and actions on global systems to develop and advocate for informed, appropriate action to solve complex problems in the human and natural worlds.	Analyzes major elements of global systems, including their historic and contemporary interconnections and the differential effects of human organizations and actions, to pose elementary solutions to complex problems in the human and natural worlds.	Examines the historical and contemporary roles, interconnections, and differential effects of human organizations and actions on global systems within the human and the natural worlds.	Identifies the basic role of some global and local institutions, ideas, and processes in the human and natural worlds.
Applying Knowledge to Contemporary Global Contexts	Applies knowledge and skills to implement sophisticated, appropriate, and workable solutions to address complex global problems using interdisciplinary perspectives independently or with others.	Plans and evaluates more complex solutions to global challenges that are appropriate to their contexts using multiple disciplinary perspectives (such as cultural, historical, and scientific).	Formulates practical yet elementary solutions to global challenges that use at least two disciplinary perspectives (such as cultural, historical, and scientific).	Defines global challenges in basic ways, including a limited number of perspectives and solutions.

6. Information Literacy VALUE Rubric

Definition

The ability to know when there is a need for information, to be able to identify, locate, evaluate, and effectively and responsibly use and share that information for the problem at hand. - Adopted from the National Forum on Information Literacy

Framing Language

This rubric is recommended for use evaluating a collection of work, rather than a single work sample in order to fully gauge students' information skills. Ideally, a collection of work would contain a wide variety of different types of work and might include: research papers, editorials, speeches, grant proposals, marketing or business plans, PowerPoint presentations, posters, literature reviews, position papers, and argument critiques to name a few. In addition, a description of the assignments with the instructions that initiated the student work would be vital in providing the complete context for the work. Although a student's final work must stand on its own, evidence of a student's research and information gathering processes, such as a research journal/diary, could provide further demonstration of a student's information proficiency and for some criteria on this rubric would be required.

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone 4	**Milestone** 3	**Milestone** 2	**Benchmark** 1
Determine the Extent of Information Needed	Effectively defines the scope of the research question or thesis. Effectively determines key concepts. Types of information (sources) selected directly relate to concepts or answer research question.	Defines the scope of the research question or thesis completely. Can determine key concepts. Types of information (sources) selected relate to concepts or answer research question.	Defines the scope of the research question or thesis incompletely (parts are missing, remains too broad or too narrow, etc.). Can determine key concepts. Types of information (sources) selected partially relate to concepts or	Has difficulty defining the scope of the research question or thesis. Has difficulty determining key concepts. Types of information (sources) selected do not relate to concepts or answer research question.

			answer research question.	
Access the Needed Information	Accesses information using effective, well-designed search strategies and most appropriate information sources.	Accesses information using variety of search strategies and some relevant information sources. Demonstrates ability to refine search.	Accesses information using simple search strategies, retrieves information from limited and similar sources.	Accesses information randomly, retrieves information that lacks relevance and quality.
Evaluate Information and its Sources Critically*	Chooses a variety of information sources appropriate to the scope and discipline of the research question. Selects sources after considering the importance (to the researched topic) of the multiple criteria used (such as relevance to the research question, currency, authority, audience, and bias or point of view.)	Chooses a variety of information sources appropriate to the scope and discipline of the research question. Selects sources using multiple criteria (such as relevance to the research question, currency, and authority.)	Chooses a variety of information sources. Selects sources using basic criteria (such as relevance to the research question and currency.)	Chooses a few information sources. Selects sources using limited criteria (such as relevance to the research question.)
Use Information Effectively to Accomplish a Specific Purpose	Communicates, organizes and synthesizes information from sources to fully achieve a specific purpose, with clarity and depth	Communicates, organizes and synthesizes information from sources. Intended purpose is achieved.	Communicates and organizes information from sources. The information is not yet synthesized, so the intended purpose is not fully achieved.	Communicates information from sources. The information is fragmented and/or used inappropriately (misquoted, taken out of context, or

				incorrectly paraphrased, etc.), so the intended purpose is not achieved.
Access and Use Information Ethically and Legally	Students use correctly all of the following information use strategies (use of citations and references; choice of paraphrasing, summary, or quoting; using information in ways that are true to original context; distinguishing between common knowledge and ideas requiring attribution) and demonstrate a full understanding of the ethical and legal restrictions on the use of published, confidential, and/or proprietary information.	Students use correctly three of the following information use strategies (use of citations and references; choice of paraphrasing, summary, or quoting; using information in ways that are true to original context; distinguishing between common knowledge and ideas requiring attribution) and demonstrates a full understanding of the ethical and legal restrictions on the use of published, confidential, and/or proprietary information.	Students use correctly two of the following information use strategies (use of citations and references; choice of paraphrasing, summary, or quoting; using information in ways that are true to original context; distinguishing between common knowledge and ideas requiring attribution) and demonstrates a full understanding of the ethical and legal restrictions on the use of published, confidential, and/or proprietary information.	Students use correctly one of the following information use strategies (use of citations and references; choice of paraphrasing, summary, or quoting; using information in ways that are true to original context; distinguishing between common knowledge and ideas requiring attribution) and demonstrates a full understanding of the ethical and legal restrictions on the use of published, confidential, and/or proprietary information.

*Corrected Dimension 3: Evaluate Information and its Sources Critically in July 2013.

7. Inquiry and Analysis VALUE Rubric

Definition

Inquiry is a systematic process of exploring issues, objects or works through the collection and analysis of evidence that results in informed conclusions or judgments. Analysis is the process of breaking complex topics or issues into parts to gain a better understanding of them.

Framing Language

This rubric is designed for use in a wide variety of disciplines. Since the terminology and process of inquiry are discipline-specific, an effort has been made to use broad language which reflects multiple approaches and assignments while addressing the fundamental elements of sound inquiry and analysis (including topic selection, existing, knowledge, design, analysis, etc.) The rubric language assumes that the inquiry and analysis process carried out by the student is appropriate for the discipline required. For example, if analysis using statistical methods is appropriate for the discipline then a student would be expected to use an appropriate statistical methodology for that analysis. If a student does not use a discipline-appropriate process for any criterion, that work should receive a performance rating of "1" or "0" for that criterion.

In addition, this rubric addresses the products of analysis and inquiry, not the processes themselves. The complexity of inquiry and analysis tasks is determined in part by how much information or guidance is provided to a student and how much the student constructs. The more the student constructs, the more complex the inquiry process. For this reason, while the rubric can be used if the assignments or purposes for work are unknown, it will work most effectively when those are known. Finally, faculty are encouraged to adapt the essence and language of each rubric criterion to the disciplinary or interdisciplinary context to which it is applied.

Glossary

The definitions that follow were developed to clarify terms and concepts used in this rubric only.

- Conclusions: A synthesis of key findings drawn from research/evidence.
- Limitations: Critique of the process or evidence.
- Implications: How inquiry results apply to a larger context or the real world.

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone 4	**Milestone** 3	**Milestone** 2	**Benchmark** 1
Topic selection	Identifies a creative, focused, and manageable topic that addresses potentially significant yet previously less-explored aspects of the topic.	Identifies a focused and manageable/doable topic that appropriately addresses relevant aspects of the topic.	Identifies a topic that while manageable/doable, is too narrowly focused and leaves out relevant aspects of the topic.	Identifies a topic that is far too general and wide-ranging as to be manageable and doable.
Existing Knowledge, Research, and/or Views	Synthesizes in-depth information from relevant sources representing various points of view/approaches.	Presents in-depth information from relevant sources representing various points of view/approaches.	Presents information from relevant sources representing limited points of view/approaches.	Presents information from irrelevant sources representing limited points of view/approaches.
Design Process	All elements of the methodology or theoretical framework are skillfully developed. Appropriate methodology or theoretical frameworks may be synthesized from across disciplines or from relevant subdisciplines.	Critical elements of the methodology or theoretical framework are appropriately developed, however, more subtle elements are ignored or unaccounted for.	Critical elements of the methodology or theoretical framework are missing, incorrectly developed, or unfocused.	Inquiry design demonstrates a misunderstanding of the methodology or theoretical framework.
Analysis	Organizes and synthesizes evidence to reveal insightful patterns, differences,	Organizes evidence to reveal important patterns, differences, or similarities related	Organizes evidence, but the organization is not effective in revealing important	Lists evidence, but it is not organized and/or is unrelated

	or similarities related to focus.	to focus.	patterns, differences, or similarities.	to focus.
Conclusions	States a conclusion that is a logical extrapolation from the inquiry findings.	States a conclusion focused solely on the inquiry findings. The conclusion arises specifically from and responds specifically to the inquiry findings.	States a general conclusion that, because it is so general, also applies beyond the scope of the inquiry findings.	States an ambiguous, illogical, or unsupportable conclusion from inquiry findings.
Limitations and Implications	Insightfully discusses in detail relevant and supported limitations and implications.	Discusses relevant and supported limitations and implications.	Presents relevant and supported limitations and implications.	Presents limitations and implications, but they are possibly irrelevant and unsupported.

8. Integrative Learning VALUE Rubric

Definition

Integrative learning is an understanding and a disposition that a student builds across the curriculum and co-curriculum, from making simple connections among ideas and experiences to synthesizing and transferring learning to new, complex situations within and beyond the campus.

Framing Language

Fostering students' abilities to integrate learning—across courses, over time, and between campus and community life—is one of the most important goals and challenges for higher education. Initially, students connect previous learning to new classroom learning. Later, significant knowledge within individual disciplines serves as the foundation, but integrative learning goes beyond academic boundaries. Indeed, integrative experiences often occur as learners address real-world problems, unscripted and sufficiently broad, to require multiple areas of knowledge and multiple modes of inquiry, offering multiple solutions and benefiting from multiple perspectives. Integrative learning also involves internal changes in the learner. These internal changes, which indicate growth as a confident, lifelong learner, include the ability to adapt one's intellectual skills, to contribute in a wide variety of situations, and to understand and develop individual purpose, values and ethics. Developing students' capacities for integrative learning is central to personal success, social responsibility, and civic engagement in today's global society. Students face a rapidly changing and increasingly connected world where integrative learning becomes not just a benefit...but a necessity.

Because integrative learning is about making connections, this learning may not be as evident in traditional academic artifacts such as research papers and academic projects unless the student, for example, is prompted to draw implications for practice. These connections often surface, however, in reflective work, self assessment, or creative endeavors of all kinds. Integrative assignments foster learning between courses or by connecting courses to experientially-based work. Work samples or collections of work that include such artifacts give evidence of integrative learning. Faculty are encouraged to look for evidence that the student connects the learning gained in classroom study to learning gained in real life situations that are related to other learning experiences, extra-curricular activities, or work. Through integrative learning, students pull together their entire experience inside and outside of the formal classroom; thus, artificial barriers between formal study and informal or tacit learning become permeable. Integrative learning, whatever the context or source, builds upon connecting both theory and practice toward a deepened understanding.

Assignments to foster such connections and understanding could include, for example, composition papers that focus on topics from biology, economics, or history; mathematics assignments that apply mathematical tools to important issues and require written analysis to explain the implications and limitations of the mathematical treatment, or art history presentations that demonstrate aesthetic connections between selected paintings and novels. In this regard, some majors (e.g., interdisciplinary majors or problem-based field studies) seem to inherently evoke characteristics of integrative learning and result in work samples or collections of work that significantly demonstrate this outcome. However, fields of study that require accumulation of extensive and high-consensus content knowledge (such as accounting, engineering, or chemistry) also involve the kinds of complex and integrative constructions (e.g., ethical dilemmas and social consciousness) that seem to be highlighted so extensively in self reflection in arts and humanities, but they may be embedded in individual performances and less evident. The key in the development of such work samples or collections of work will be in designing structures that include artifacts and reflective writing or feedback that support students' examination of their learning and give evidence that, as graduates, they will extend their integrative abilities into the challenges of personal, professional, and civic life.

Glossary

The definitions that follow were developed to clarify terms and concepts used in this rubric only.

- Academic knowledge: Disciplinary learning; learning from academic study, texts, etc.
- Content: The information conveyed in the work samples or collections of work.
- Contexts: Actual or simulated situations in which a student demonstrates learning outcomes. New and challenging contexts encourage students to stretch beyond their current frames of reference.
- Co-curriculum: A parallel component of the academic curriculum that is in addition to formal classroom (student government, community service, residence hall activities, student organizations, etc.).
- Experience: Learning that takes place in a setting outside of the formal classroom, such as workplace, service learning site, internship site or another.
- Form: The external frameworks in which information and evidence are presented, ranging from choices for particular work sample or collection of works (such as a research paper, PowerPoint, video recording, etc.) to choices in make-up of the e-portfolio.
- Performance: A dynamic and sustained act that brings together knowing and doing (creating a painting, solving an experimental design problem, developing a public relations strategy for a business, etc.); performance makes learning observable.
- Reflection: A meta-cognitive act of examining a performance in order to explore its

significance and consequences.

- Self-Assessment: Describing, interpreting, and judging a performance based on stated or implied expectations followed by planning for further learning.

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone 4	**Milestone** 3	**Milestone** 2	**Benchmark** 1
Connections to Experience *Connects relevant experience and academic knowledge*	Meaningfully **synthesizes** connections among experiences outside of the formal classroom (including life experiences and academic experiences such as internships and travel abroad) to **deepen understanding** of fields of study and to broaden own points of view.	Effectively **selects and develops** examples of life experiences, drawn from a variety of contexts (e.g., family life, artistic participation, civic involvement, work experience), to **illuminate** concepts/theories/frameworks of fields of study.	**Compares** life experiences and academic knowledge to infer differences, as well as similarities, and **acknowledge perspectives** other than own.	**Identifies** connections between life experiences and those academic texts and ideas **perceived as similar and related** to own interests.
Connections to Discipline *Sees (makes) connections across disciplines, perspectives*	Independently creates wholes out of multiple parts (synthesizes) or draws conclusions by combining examples, facts, or theories from more than one field of study or perspective.	Independently connects examples, facts, or theories from more than one field of study or perspective.	When prompted, connects examples, facts, or theories from more than one field of study or perspective.	When prompted, presents examples, facts, or theories from more than one field of study or perspective.
Transfer *Adapts and applies skills, abilities, theories, or methodologies gained in one situation to*	Adapts and applies, independently, skills, abilities, theories, or methodologies gained in one situation to new situations **to solve difficult problems or**	Adapts and applies skills, abilities, theories, or methodologies gained in one situation to new situations **to solve problems or**	Uses skills, abilities, theories, or methodologies gained in one situation in a new situation **to contribute to understanding of**	Uses, in a basic way, skills, abilities, theories, or methodologies gained in one situation **in a new situation.**

new situations	**explore complex issues in original ways.**	**explore issues.**	**problems or issues.**	
Integrated Communication	Fulfills the assignment(s) by choosing a format, language, or graph (or other visual representation) **in ways that enhance meaning**, making clear the interdependence of language and meaning, thought, and expression.	Fulfills the assignment(s) by choosing a format, language, or graph (or other visual representation) **to explicitly connect content and form**, demonstrating awareness of purpose and audience.	Fulfills the assignment(s) by choosing a format, language, or graph (or other visual representation) that **connects in a basic way** what is being communicated (content) with how it is said (form).	Fulfills the assignment(s) (i.e. to produce an essay, a poster, a video, a PowerPoint presentation, etc.) **in an appropriate form**.
Reflection and Self-Assessment *Demonstrates a developing sense of self as a learner, building on prior experiences to respond to new and challenging contexts (may be evident in self-assessment, reflective, or creative work)*	Envisions a future self (and possibly makes plans that build on past experiences that have occurred across multiple and diverse contexts).	Evaluates changes in own learning over time, recognizing complex contextual factors (e.g., works with ambiguity and risk, deals with frustration, considers ethical frameworks).	Articulates strengths and challenges (within specific performances or events) to increase effectiveness in different contexts (through increased self-awareness).	Describes own performances with general descriptors of success and failure.

9. Intercultural Knowledge and Competence VALUE Rubric

Definition

Intercultural Knowledge and Competence is "a set of cognitive, affective, and behavioral skills and characteristics that support effective and appropriate interaction in a variety of cultural contexts." (Bennett, J. M. 2008. Transformative training: Designing programs for culture learning. In *Contemporary leadership and intercultural competence: Understanding and utilizing cultural diversity to build successful organizations*, ed. M. A. Moodian, 95-110. Thousand Oaks, CA: Sage.)

Framing Language

The call to integrate intercultural knowledge and competence into the heart of education is an imperative born of seeing ourselves as members of a world community, knowing that we share the future with others. Beyond mere exposure to culturally different others, the campus community requires the capacity to: meaningfully engage those others, place social justice in historical and political context, and put culture at the core of transformative learning. The intercultural knowledge and competence rubric suggests a systematic way to measure our capacity to identify our own cultural patterns, compare and contrast them with others, and adapt empathically and flexibly to unfamiliar ways of being.

The levels of this rubric are informed in part by M. Bennett's Developmental Model of Intercultural Sensitivity (Bennett, M.J. 1993. Towards ethnorelativism: A developmental model of intercultural sensitity. In *Education for the intercultural experience*, ed. R. M. Paige, 22-71. Yarmouth, ME: Intercultural Press). In addition, the criteria in this rubric are informed in part by D.K. Deardorff's intercultural framework which is the first research-based consensus model of intercultural competence (Deardorff, D.K. 2006. The identification and assessment of intercultural competence as a student outcome of internationalization. *Journal of Studies in International Education* 10(3): 241-266). It is also important to understand that intercultural knowledge and competence is more complex than what is reflected in this rubric. This rubric identifies six of the key components of intercultural knowledge and competence, but there are other components as identified in the Deardorff model and in other research.

Glossary

The definitions that follow were developed to clarify terms and concepts used in this rubric only.

- Culture: All knowledge and values shared by a group.
- Cultural rules and biases: Boundaries within which an individual operates in order to feel a

sense of belonging to a society or group, based on the values shared by that society or group.

- Empathy: "Empathy is the imaginary participation in another person's experience, including emotional and intellectual dimensions, by imagining his or her perspective (not by assuming the person's position)". Bennett, J. 1998. Transition shock: Putting culture shock in perspective. In *Basic concepts of intercultural communication*, ed. M. Bennett, 215-224. Yarmouth, ME: Intercultural Press.
- Intercultural experience: The experience of an interaction with an individual or groups of people whose culture is different from your own.
- Intercultural/cultural differences: The differences in rules, behaviors, communication and biases, based on cultural values that are different from one's own culture.
- Suspends judgment in valuing their interactions with culturally different others: Postpones assessment or evaluation (positive or negative) of interactions with people culturally different from one self. Disconnecting from the process of automatic judgment and taking time to reflect on possibly multiple meanings.
- Worldview: Worldview is the cognitive and affective lens through which people construe their experiences and make sense of the world around them.

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone 4	**Milestone** 3	**Milestone** 2	**Benchmark** 1
Knowledge *Cultural self-awareness*	Articulates insights into own cultural rules and biases (e.g. seeking complexity; aware of how her/his experiences have shaped these rules, and how to recognize and respond to cultural biases, resulting in a shift in self-description.)	Recognizes new perspectives about own cultural rules and biases (e.g. not looking for sameness; comfortable with the complexities that new perspectives offer.)	Identifies own cultural rules and biases (e.g. with a strong preference for those rules shared with own cultural group and seeks the same in others.)	Shows minimal awareness of own cultural rules and biases (even those shared with own cultural group(s)) (e.g. uncomfortable with identifying possible cultural differences with others.)

Knowledge *Knowledge of cultural worldview frameworks*	Demonstrates sophisticated understanding of the complexity of elements important to members of another culture in relation to its history, values, politics, communication styles, economy, or beliefs and practices.	Demonstrates adequate understanding of the complexity of elements important to members of another culture in relation to its history, values, politics, communication styles, economy, or beliefs and practices.	Demonstrates partial understanding of the complexity of elements important to members of another culture in relation to its history, values, politics, communication styles, economy, or beliefs and practices.	Demonstrates surface understanding of the complexity of elements important to members of another culture in relation to its history, values, politics, communication styles, economy, or beliefs and practices.
Skills *Empathy*	Interprets intercultural experience from the perspectives of own and more than one worldview and demonstrates ability to act in a supportive manner that recognizes the feelings of another cultural group.	Recognizes intellectual and emotional dimensions of more than one worldview and sometimes uses more than one worldview in interactions.	Identifies components of other cultural perspectives but responds in all situations with own worldview.	Views the experience of others but does so through own cultural worldview.
Skills *Verbal and nonverbal communication*	Articulates a complex understanding of cultural differences in verbal and nonverbal communication (e.g., demonstrates understanding of the degree to which people use physical contact while communicating in different cultures or	Recognizes and participates in cultural differences in verbal and nonverbal communication and begins to negotiate a shared understanding based on those differences.	Identifies some cultural differences in verbal and nonverbal communication and is aware that misunderstandings can occur based on those differences but is still unable to negotiate a shared understanding.	Has a minimal level of understanding of cultural differences in verbal and nonverbal communication; is unable to negotiate a shared understanding.

	use direct/indirect and explicit/implicit meanings) and is able to skillfully negotiate a shared understanding based on those differences.			
Attitudes *Curiosity*	Asks complex questions about other cultures, seeks out and articulates answers to these questions that reflect multiple cultural perspectives.	Asks deeper questions about other cultures and seeks out answers to these questions.	Asks simple or surface questions about other cultures.	States minimal interest in learning more about other cultures.
Attitudes *Openness*	Initiates and develops interactions with culturally different others. Suspends judgment in valuing her/his interactions with culturally different others.	Begins to initiate and develop interactions with culturally different others. Begins to suspend judgment in valuing her/his interactions with culturally different others.	Expresses openness to most, if not all, interactions with culturally different others. Has difficulty suspending any judgment in her/his interactions with culturally different others, and is aware of own judgment and expresses a willingness to change.	Receptive to interacting with culturally different others. Has difficulty suspending any judgment in her/his interactions with culturally different others, but is unaware of own judgment.

10. Foundations and Skills for Lifelong Learning VALUE Rubric

Definition

Lifelong learning is “all purposeful learning activity, undertaken on an ongoing basis with the aim of improving knowledge, skills and competence”. An endeavor of higher education is to prepare students to be this type of learner by developing specific dispositions and skills described in this rubric while in school. (From The European Commission. 2000. Commission staff working paper: A memorandum on lifelong learning. https://arhiv.acs.si/dokumenti/Memorandum_on_Lifelong_Learning.pdf)

Framing Language

This rubric is designed to assess the skills and dispositions involved in lifelong learning, which are curiosity, transfer, independence, initiative, and reflection. Assignments that encourage students to reflect on how they incorporated their lifelong learning skills into their work samples or collections of work by applying above skills and dispositions will provide the means for assessing those criteria. Work samples or collections of work tell what is known or can be done by students, while reflections tell what students think or feel or perceive. Reflection provides the evaluator with a much better understanding of who students are because through reflection students share how they feel about or make sense of their learning experiences. Reflection allows analysis and interpretation of the work samples or collections of work for the reader. Reflection also allows exploration of alternatives, the consideration of future plans, and provides evidence related to students' growth and development. Perhaps the best fit for this rubric are those assignments that prompt the integration of experience beyond the classroom.

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone 4	**Milestone** 3	**Milestone** 2	**Benchmark** 1
Curiosity	Explores a topic in depth, yielding a rich awareness and/or little-known information indicating intense interest in the	Explores a topic in depth, yielding insight and/or information indicating interest in the subject.	Explores a topic with some evidence of depth, providing occasional insight and/or information indicating mild interest in the	Explores a topic at a surface level, providing little insight and/or information beyond the very basic facts indicating low

	subject.		subject.	interest in the subject.
Initiative	Completes required work, generates and pursues opportunities to expand knowledge, skills, and abilities.	Completes required work, identifies and pursues opportunities to expand knowledge, skills, and abilities.	Completes required work and identifies opportunities to expand knowledge, skills, and abilities.	Completes required work.
Independence	Educational interests and pursuits exist and flourish outside classroom requirements. Knowledge and/or experiences are pursued independently.	Beyond classroom requirements, pursues substantial, additional knowledge and/or actively pursues independent educational experiences.	Beyond classroom requirements, pursues additional knowledge and/or shows interest in pursuing independent educational experiences.	Begins to look beyond classroom requirements, showing interest in pursuing knowledge independently.
Transfer	Makes explicit references to previous learning and applies in an innovative (new and creative) way that knowledge and those skills to demonstrate comprehension and performance in novel situations.	Makes references to previous learning and shows evidence of applying that knowledge and those skills to demonstrate comprehension and performance in novel situations.	Makes references to previous learning and attempts to apply that knowledge and those skills to demonstrate comprehension and performance in novel situations.	Makes vague references to previous learning but does not apply knowledge and skills to demonstrate comprehension and performance in novel situations.

Reflection	Reviews prior learning (past experiences inside and outside of the classroom) in depth to reveal significantly changed perspectives about educational and life experiences, which provide foundation for expanded knowledge, growth, and maturity over time.	Reviews prior learning (past experiences inside and outside of the classroom) in depth, revealing fully clarified meanings or indicating broader perspectives about educational or life events.	Reviews prior learning (past experiences inside and outside of the classroom) with some depth, revealing slightly clarified meanings or indicating a somewhat broader perspectives about educational or life events.	Reviews prior learning (past experiences inside and outside of the classroom) at a surface level, without revealing clarified meaning or indicating a broader perspective about educational or life events.

11. Oral Communication VALUE Rubric

The type of oral communication most likely to be included in a collection of student work is an oral presentation and therefore is the focus for the application of this rubric.

Definition

Oral communication is a prepared, purposeful presentation designed to increase knowledge, to foster understanding, or to promote change in the listeners' attitudes, values, beliefs, or behaviors.

Framing Language

Oral communication takes many forms. This rubric is specifically designed to evaluate oral presentations of a single speaker at a time and is best applied to live or video-recorded presentations. For panel presentations or group presentations, it is recommended that each speaker be evaluated separately. This rubric best applies to presentations of sufficient length such that a central message is conveyed, supported by one or more forms of supporting materials and includes a purposeful organization. An oral answer to a single question not designed to be structured into a presentation does not readily apply to this rubric.

Glossary

The definitions that follow were developed to clarify terms and concepts used in this rubric only.

- Central message: The main point/thesis/"bottom line"/"take-away" of a presentation. A clear central message is easy to identify; a compelling central message is also vivid and memorable.
- Delivery techniques: Posture, gestures, eye contact, and use of the voice. Delivery techniques enhance the effectiveness of the presentation when the speaker stands and moves with authority, looks more often at the audience than at his/her speaking materials/notes, uses the voice expressively, and uses few vocal fillers ("um," "uh," "like," "you know," etc.).
- Language: Vocabulary, terminology, and sentence structure. Language that supports the effectiveness of a presentation is appropriate to the topic and audience, grammatical, clear, and free from bias. Language that enhances the effectiveness of a presentation is also vivid, imaginative, and expressive.
- Organization: The grouping and sequencing of ideas and supporting material in a presentation. An organizational pattern that supports the effectiveness of a presentation typically includes an introduction, one or more identifiable sections in the body of the

speech, and a conclusion. An organizational pattern that enhances the effectiveness of the presentation reflects a purposeful choice among possible alternatives, such as a chronological pattern, a problem-solution pattern, an analysis-of-parts pattern, etc., that makes the content of the presentation easier to follow and more likely to accomplish its purpose.

- Supporting material: Explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities, and other kinds of information or analysis that supports the principal ideas of the presentation. Supporting material is generally credible when it is relevant and derived from reliable and appropriate sources. Supporting material is highly credible when it is also vivid and varied across the types listed above (e.g., a mix of examples, statistics, and references to authorities). Supporting material may also serve the purpose of establishing the speaker's credibility. For example, in presenting a creative work such as a dramatic reading of Shakespeare, supporting evidence may not advance the ideas of Shakespeare, but rather serve to establish the speaker as a credible Shakespearean actor.

Definition

Oral communication is a prepared, purposeful presentation designed to increase knowledge, to foster understanding, or to promote change in the listeners' attitudes, values, beliefs, or behaviors.

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone 4	**Milestone** 3	**Milestone** 2	**Benchmark** 1
Organization	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable and is skillful and makes the content of the	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable within the presentation.	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is intermittently observable within the presentation.	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is not observable within the presentation.

	presentation cohesive.			
Language	Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience.	Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience.	Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience.	Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience.

Delivery	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears uncomfortable.
Supporting Material	A variety of types of supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that significantly supports the presentation or establishes the presenter's credibility/authority on the topic.	Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that generally supports the presentation or establishes the presenter's credibility/authority on the topic.	Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that partially supports the presentation or establishes the presenter's credibility/authority on the topic.	Insufficient supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to information or analysis that minimally supports the presentation or establishes the presenter's credibility/authority on the topic.
Central Message	Central message is compelling (precisely stated, appropriately repeated, memorable, and strongly supported.)	Central message is clear and consistent with the supporting material.	Central message is basically understandable but is not often repeated and is not memorable.	Central message can be deduced, but is not explicitly stated in the presentation.

12. Problem Solving VALUE Rubric

Definition

Problem solving is the process of designing, evaluating and implementing a strategy to answer an open-ended question or achieve a desired goal.

Framing Language

Problem-solving covers a wide range of activities that may vary significantly across disciplines. Activities that encompass problem-solving by students may involve problems that range from well-defined to ambiguous in a simulated or laboratory context, or in real-world settings. This rubric distills the common elements of most problem-solving contexts and is designed to function across all disciplines. It is broad-based enough to allow for individual differences among learners, yet is concise and descriptive in its scope to determine how well students have maximized their respective abilities to practice thinking through problems in order to reach solutions.

This rubric is designed to measure the quality of a **process**, rather than the quality of an **end-product**. As a result, work samples or collections of work will need to include some evidence of the individual's thinking about a problem-solving task (e.g., reflections on the process from problem to proposed solution; steps in a problem-based learning assignment; record of think-aloud protocol while solving a problem). The final product of an assignment that required problem resolution is insufficient without insight into the student's problem-solving process. Because the focus is on institutional level assessment, scoring team projects, such as those developed in capstone courses, may be appropriate as well.

Glossary

The definitions that follow were developed to clarify terms and concepts used in this rubric only.

- Contextual Factors: Constraints (such as limits on cost), resources, attitudes (such as biases) and desired additional knowledge which affect how the problem can be best solved in the real world or simulated setting.
- Critique: Involves analysis and synthesis of a full range of perspectives.
- Feasible: Workable, in consideration of time-frame, functionality, available resources, necessary buy-in, and limits of the assignment or task.
- "Off the shelf" solution: A simplistic option that is familiar from everyday experience but not tailored to the problem at hand (e.g. holding a bake sale to "save" an underfunded public library).

- Solution: An appropriate response to a challenge or a problem.
- Strategy: A plan of action or an approach designed to arrive at a solution. For example, if the problem is a river that needs to be crossed, there could be a construction-oriented, cooperative (build a bridge with your community) approach and a personally oriented, physical (swim across alone) approach. An approach that partially applies would be a personal, physical approach for someone who doesn't know how to swim.
- Support: Specific rationale, evidence, etc. for solution or selection of solution.

Definition

Problem solving is the process of designing, evaluating, and implementing a strategy to answer an open-ended question or achieve a desired goal.

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone 4	**Milestone** 3	**Milestone** 2	**Benchmark** 1
Define Problem	Demonstrates the ability to construct a clear and insightful problem statement with evidence of all relevant contextual factors.	Demonstrates the ability to construct a problem statement with evidence of most relevant contextual factors, and problem statement is adequately detailed.	Begins to demonstrate the ability to construct a problem statement with evidence of most relevant contextual factors, but problem statement is superficial.	Demonstrates a limited ability in identifying a problem statement or related contextual factors.
Identify Strategies	Identifies multiple approaches for solving the problem that apply within a specific context.	Identifies multiple approaches for solving the problem, only some of which apply within a specific context.	Identifies only a single approach for solving the problem that does apply within a specific context.	Identifies one or more approaches for solving the problem that do not apply within a specific context.

Propose Solutions/Hypotheses	Proposes one or more solutions/hypotheses that indicates a deep comprehension of the problem. Solution/hypotheses are sensitive to contextual factors as well as all of the following: ethical, logical, and cultural dimensions of the problem.	Proposes one or more solutions/hypotheses that indicates comprehension of the problem. Solutions/hypotheses are sensitive to contextual factors as well as the one of the following: ethical, logical, or cultural dimensions of the problem.	Proposes one solution/hypothesis that is "off the shelf" rather than individually designed to address the specific contextual factors of the problem.	Proposes a solution/hypothesis that is difficult to evaluate because it is vague or only indirectly addresses the problem statement.
Evaluate Potential Solutions	Evaluation of solutions is deep and elegant (for example, contains thorough and insightful explanation) and includes, deeply and thoroughly, all of the following: considers history of problem, reviews logic/reasoning, examines feasibility of solution, and weighs impacts of solution.	Evaluation of solutions is adequate (for example, contains thorough explanation) and includes the following: considers history of problem, reviews logic/reasoning, examines feasibility of solution, and weighs impacts of solution.	Evaluation of solutions is brief (for example, explanation lacks depth) and includes the following: considers history of problem, reviews logic/reasoning, examines feasibility of solution, and weighs impacts of solution.	Evaluation of solutions is superficial (for example, contains cursory, surface level explanation) and includes the following: considers history of problem, reviews logic/reasoning, examines feasibility of solution, and weighs impacts of solution.
Implement Solution	Implements the solution in a manner that addresses thoroughly and deeply multiple contextual factors of the problem.	Implements the solution in a manner that addresses multiple contextual factors of the problem in a surface manner.	Implements the solution in a manner that addresses the problem statement but ignores relevant contextual factors.	Implements the solution in a manner that does not directly address the problem statement.
Evaluate Outcomes	Reviews results relative to the problem defined with	Reviews results relative to the problem defined with	Reviews results in terms of the problem defined with little, if	Reviews results superficially in terms of the problem

	thorough, specific considerations of need for further work.	some consideration of need for further work.	any, consideration of need for further work.	defined with no consideration of need for further work

13. Quantitative Literacy VALUE Rubric

Definition

Quantitative Literacy (QL)—also known as Numeracy or Quantitative Reasoning (QR)—is a "habit of mind," competency, and comfort in working with numerical data. Individuals with strong QL skills possess the ability to reason and solve quantitative problems from a wide array of authentic contexts and everyday life situations. They understand and can create sophisticated arguments supported by quantitative evidence and they can clearly communicate those arguments in a variety of formats (using words, tables, graphs, mathematical equations, etc., as appropriate).

Quantitative Literacy Across the Disciplines

Current trends in general education reform demonstrate that faculty are recognizing the steadily growing importance of Quantitative Literacy (QL) in an increasingly quantitative and data-dense world. AAC&U's recent survey showed that concerns about QL skills are shared by employers, who recognize that many of today's students will need a wide range of high-level quantitative skills to complete their work responsibilities. Virtually all of today's students, regardless of career choice, will need basic QL skills such as the ability to draw information from charts, graphs, and geometric figures, and the ability to accurately complete straightforward estimations and calculations.

Preliminary efforts to find student work products which demonstrate QL skills proved a challenge in this rubric creation process. It's possible to find pages of mathematical problems, but what those problem sets don't demonstrate is whether the student was able to think about and understand the meaning of her work. It's possible to find research papers that include quantitative information, but those papers often don't provide evidence that allows the evaluator to see how much of the thinking was done by the original source (often carefully cited in the paper) and how much was done by the student herself, or whether conclusions drawn from analysis of the source material are even accurate.

Given widespread agreement about the importance of QL, it becomes incumbent on faculty to develop new kinds of assignments which give students substantive, contextualized experience in using such skills as analyzing quantitative information, representing quantitative information in appropriate forms, completing calculations to answer meaningful questions, making judgments based on quantitative data and communicating the results of that work for various purposes and audiences. As students gain experience with those skills, faculty must develop assignments that require students to create work products which reveal their thought processes and demonstrate

the range of their QL skills.

This rubric provides for faculty a definition for QL and a rubric describing four levels of QL achievement which might be observed in work products within work samples or collections of work. Members of AAC&U's rubric development team for QL hope that these materials will aid in the assessment of QL—but, equally important, we hope that they will help institutions and individuals in the effort to more thoroughly embed QL across the curriculum of colleges and universities.

Framing Language

This rubric has been designed for the evaluation of work that addresses quantitative literacy (QL) in a substantive way. QL is not just computation, not just the citing of someone else's data. QL is a habit of mind, a way of thinking about the world that relies on data and on the mathematical analysis of data to make connections and draw conclusions. Teaching QL requires us to design assignments that address authentic, data-based problems. Such assignments may call for the traditional written paper, but we can imagine other alternatives: a video of a PowerPoint presentation, perhaps, or a well-designed series of web pages. In any case, a successful demonstration of QL will place the mathematical work in the context of a full and robust discussion of the underlying issues addressed by the assignment.

Finally, QL skills can be applied to a wide array of problems of varying difficulty, confounding the use of this rubric. For example, the same student might demonstrate high levels of QL achievement when working on a simplistic problem and low levels of QL achievement when working on a very complex problem. Thus, to accurately assess a student's QL achievement it may be necessary to measure QL achievement within the context of problem complexity, much as is done in diving competitions where two scores are given, one for the difficulty of the dive, and the other for the skill in accomplishing the dive. In this context, that would mean giving one score for the complexity of the problem and another score for the QL achievement in solving the problem.

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone 4	**Milestone** 3	**Milestone** 2	**Benchmark** 1
Interpretation *Ability to explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words)*	Provides accurate explanations of information presented in mathematical forms. Makes appropriate inferences based on that information. *For example, accurately explains the trend data shown in a graph and makes reasonable predictions regarding what the data suggest about future events.*	Provides accurate explanations of information presented in mathematical forms. *For instance, accurately explains the trend data shown in a graph.*	Provides somewhat accurate explanations of information presented in mathematical forms, but occasionally makes minor errors related to computations or units. *For instance, accurately explains trend data shown in a graph, but may miscalculate the slope of the trend line.*	Attempts to explain information presented in mathematical forms, but draws incorrect conclusions about what the information means. *For example, attempts to explain the trend data shown in a graph, but will frequently misinterpret the nature of that trend, perhaps by confusing positive and negative trends.*
Representation *Ability to convert relevant information into various mathematical forms (e.g., equations, graphs, diagrams, tables, words)*	Skillfully converts relevant information into an insightful mathematical portrayal in a way that contributes to a further or deeper understanding.	Competently converts relevant information into an appropriate and desired mathematical portrayal.	Completes conversion of information but resulting mathematical portrayal is only partially appropriate or accurate.	Completes conversion of information but resulting mathematical portrayal is inappropriate or inaccurate.
Calculation	Calculations attempted are essentially all successful and sufficiently comprehensive to	Calculations attempted are essentially all successful and sufficiently comprehensive to	Calculations attempted are either unsuccessful or represent only a portion of the calculations required	Calculations are attempted but are both unsuccessful and are not comprehensive.

	solve the problem. Calculations are also presented elegantly (clearly, concisely, etc.)	solve the problem.	to comprehensively solve the problem.	
Application / Analysis *Ability to make judgments and draw appropriate conclusions based on the quantitative analysis of data, while recognizing the limits of this analysis*	Uses the quantitative analysis of data as the basis for deep and thoughtful judgments, drawing insightful, carefully qualified conclusions from this work.	Uses the quantitative analysis of data as the basis for competent judgments, drawing reasonable and appropriately qualified conclusions from this work.	Uses the quantitative analysis of data as the basis for workmanlike (without inspiration or nuance, ordinary) judgments, drawing plausible conclusions from this work.	Uses the quantitative analysis of data as the basis for tentative, basic judgments, although is hesitant or uncertain about drawing conclusions from this work.
Assumptions *Ability to make and evaluate important assumptions in estimation, modeling, and data analysis*	Explicitly describes assumptions and provides compelling rationale for why each assumption is appropriate. Shows awareness that confidence in final conclusions is limited by the accuracy of the assumptions.	Explicitly describes assumptions and provides compelling rationale for why assumptions are appropriate.	Explicitly describes assumptions.	Attempts to describe assumptions.
Communication *Expressing quantitative evidence in support of the argument or purpose of the work (in terms of what evidence is used and how it is formatted, presented,*	Uses quantitative information in connection with the argument or purpose of the work, presents it in an effective format, and explicates it with consistently high	Uses quantitative information in connection with the argument or purpose of the work, though data may be presented in a less than completely effective format or some parts of the	Uses quantitative information, but does not effectively connect it to the argument or purpose of the work.	Presents an argument for which quantitative evidence is pertinent, but does not provide adequate explicit numerical support. (May use quasi-quantitative words such as "many," "few,"

and contextualized)	quality.	explication may be uneven.		"increasing," "small," and the like in place of actual quantities.)

14. Reading VALUE Rubric

Definition

Reading is "the process of simultaneously extracting and constructing meaning through interaction and involvement with written language" (Snow et al., 2002). (From www.rand.org/pubs/research_briefs/RB8024/index1.html)

Framing Language

To paraphrase Phaedrus, texts do not explain, nor answer questions about, themselves. They must be located, approached, decoded, comprehended, analyzed, interpreted, and discussed, especially complex academic texts used in college and university classrooms for purposes of learning. Historically, college professors have not considered the teaching of reading necessary other than as a "basic skill" in which students may require "remediation." They have assumed that students come with the ability to read and have placed responsibility for its absence on teachers in elementary and secondary schools.

This absence of reading instruction in higher education must, can, and will change, and this rubric marks a direction for this change. Why the change? Even the strongest, most experienced readers making the transition from high school to college have not learned what they need to know and do to make sense of texts in the context of professional and academic scholarship--to say nothing about readers who are either not as strong or as experienced. Also, readers mature and develop their repertoire of reading performances naturally during the undergraduate years and beyond as a consequence of meeting textual challenges. This rubric provides some initial steps toward finding ways to measure undergraduate students' progress along the continuum. Our intention in creating this rubric is to support and promote the teaching of undergraduates as readers to take on increasingly higher levels of concerns with texts and to read as one of “those who comprehend.”

Readers, as they move beyond their undergraduate experiences, should be motivated to approach texts and respond to them with a reflective level of curiosity and the ability to apply aspects of the texts they approach to a variety of aspects in their lives. This rubric provides the framework for evaluating both students' developing relationship to texts and their relative success with the range of texts their coursework introduces them to. It is likely that users of this rubric will detect that the cell boundaries are permeable, and the criteria of the rubric are, to a degree, interrelated.

Glossary

The definitions that follow were developed to clarify terms and concepts used in this rubric only.

- Analysis: The process of recognizing and using features of a text to build a more advanced understanding of the meaning of a text. (Might include evaluation of genre, language, tone, stated purpose, explicit or implicit logic (including flaws of reasoning), and historical context as they contribute to the meaning of a text.
- Comprehension: The extent to which a reader "gets" the text, both literally and figuratively. Accomplished and sophisticated readers will have moved from being able to "get" the meaning that the language of the text provides to being able to "get" the implications of the text, the questions it raises, and the counterarguments one might suggest in response to it. A helpful and accessible discussion of 'comprehension' is found in Chapter 2 of the RAND report, Reading for Understanding: www.rand.org/pubs/monograph_reports/MR1465/MR1465.ch2.pdf.
- Epistemological lens: The knowledge framework a reader develops in a specific discipline as s/he moves through an academic major (e.g., essays, textbook chapters, literary works, journal articles, lab reports, grant proposals, lectures, blogs, webpages, or literature reviews, for example). The depth and breadth of this knowledge provides the foundation for independent and self-regulated responses to the range of texts in any discipline or field that students will encounter.
- Genre: A particular kind of "text" defined by a set of disciplinary conventions or agreements learned through participation in academic discourse. Genre governs what texts can be about, how they are structured, what to expect from them, what can be done with them, how to use them
- Interpretation: Determining or construing the meaning of a text or part of a text in a particular way based on textual and contextual information.
- Interpretive Strategies: Purposeful approaches from different perspectives, which include, for example, asking clarifying questions, building knowledge of the context in which a text was written, visualizing and considering counterfactuals (asking questions that challenge the assumptions or claims of the text, e.g., What might our country be like if the Civil War had not happened? How would Hamlet be different if Hamlet had simply killed the King?).
- Multiple Perspectives: Consideration of how text-based meanings might differ depending on point of view.
- Parts: Titles, headings, meaning of vocabulary from context, structure of the text, important ideas and relationships among those ideas.
- Relationship to text: The set of expectations and intentions a reader brings to a particular text or set of texts.
- Searches intentionally for relationships: An active and highly-aware quality of thinking

closely related to inquiry and research.

- Takes texts apart: Discerns the level of importance or abstraction of textual elements and sees big and small pieces as parts of the whole meaning (compare to Analysis above).
- Metacognition: This is not a word that appears explicitly anywhere in the rubric, but it is implicit in a number of the descriptors, and is certainly a term that we find frequently in discussions of successful and rich learning.. Metacognition, (a term typically attributed to the cognitive psychologist J.H. Flavell) applied to reading refers to the awareness, deliberateness, and reflexivity defining the activities and strategies that readers must control in order to work their ways effectively through different sorts of texts, from lab reports to sonnets, from math texts to historical narratives, or from grant applications to graphic novels, for example. Metacognition refers here as well to an accomplished reader's ability to consider the ethos reflected in any such text; to know that one is present and should be considered in any use of, or response to a text.

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone 4	**Milestone** 3	**Milestone** 2	**Benchmark** 1
Comprehension	Recognizes possible implications of the text for contexts, perspectives, or issues beyond the assigned task within the classroom or beyond the author's explicit message (e.g., might recognize broader issues at play, or might pose challenges to the author's message and presentation).	Uses the text, general background knowledge, and/or specific knowledge of the author's context to draw more complex inferences about the author's message and attitude.	Evaluates how textual features (e.g., sentence and paragraph structure or tone) contribute to the author's message; draws basic inferences about context and purpose of text.	Apprehends vocabulary appropriately to paraphrase or summarize the information the text communicates.

Genres	Uses ability to identify texts within and across genres, monitoring and adjusting reading strategies and expectations based on generic nuances of particular texts.	Articulates distinctions among genres and their characteristic conventions.	Reflects on reading experiences across a variety of genres, reading both with and against the grain experimentally and intentionally.	Applies tacit genre knowledge to a variety of classroom reading assignments in productive, if unreflective, ways.

Relationship to Text *Making meanings with texts in their contexts*	Evaluates texts for scholarly significance and relevance within and across the various disciplines, evaluating them according to their contributions and consequences.	Uses texts in the context of scholarship to develop a foundation of disciplinary knowledge and to raise and explore important questions.	Engages texts with the intention and expectation of building topical and world knowledge.	Approaches texts in the context of assignments with the intention and expectation of finding right answers and learning facts and concepts to display for credit.
Analysis *Interacting with texts in parts and as wholes*	Evaluates strategies for relating ideas, text structure, or other textual features in order to build knowledge or insight within and across texts and disciplines.	Identifies relations among ideas, text structure, or other textual features, to evaluate how they support an advanced understanding of the text as a whole.	Recognizes relations among parts or aspects of a text, such as effective or ineffective arguments or literary features, in considering how these contribute to a basic understanding of the text as a whole.	Identifies aspects of a text (e.g., content, structure, or relations among ideas) as needed to respond to questions posed in assigned tasks.
Interpretation *Making sense with texts as blueprints for meaning*	Provides evidence not only that s/he can read by using an appropriate epistemological lens but that s/he can also engage in reading as part of a continuing dialogue within and beyond a discipline or a community of readers.	Articulates an understanding of the multiple ways of reading and the range of interpretive strategies particular to one's discipline(s) or in a given community of readers.	Demonstrates that s/he can read purposefully, choosing among interpretive strategies depending on the purpose of the reading.	Can identify purpose(s) for reading, relying on an external authority such as an instructor for clarification of the task.
Reader's Voice *Participating in*	Discusses texts with an independent intellectual and	Elaborates on the texts (through interpretation or	Discusses texts in structured conversations (such	Comments about texts in ways that preserve the author's

academic discourse about texts	ethical disposition so as to further or maintain disciplinary conversations.	questioning) so as to deepen or enhance an ongoing discussion.	as in a classroom) in ways that contribute to a basic, shared understanding of the text.	meanings and link them to the assignment.

15. Teamwork VALUE Rubric

Definition

Teamwork is behaviors under the control of individual team members (effort they put into team tasks, their manner of interacting with others on team, and the quantity and quality of contributions they make to team discussions.)

Framing Language

Students participate on many different teams, in many different settings. For example, a given student may work on separate teams to complete a lab assignment, give an oral presentation, or complete a community service project. Furthermore, the people the student works with are likely to be different in each of these different teams. As a result, it is assumed that a work sample or collection of work that demonstrates a student's teamwork skills could include a diverse range of inputs. This rubric is designed to function across all of these different settings.

Two characteristics define the ways in which this rubric is to be used. First, the rubric is meant to assess the teamwork of an individual student, not the team as a whole. Therefore, it is possible for a student to receive high ratings, even if the team as a whole is rather flawed. Similarly, a student could receive low ratings, even if the team as a whole works fairly well. Second, this rubric is designed to measure the quality of a process, rather than the quality of an end product. As a result, work samples or collections of work will need to include some evidence of the individual's interactions within the team. The final product of the team's work (e.g., a written lab report) is insufficient, as it does not provide insight into the functioning of the team.

It is recommended that work samples or collections of work for this outcome come from one (or more) of the following three sources: (1) students' own reflections about their contribution to a team's functioning; (2) evaluation or feedback from fellow team members about students' contribution to the team's functioning; or (3) the evaluation of an outside observer regarding students' contributions to a team's functioning. These three sources differ considerably in the resource demands they place on an institution. It is recommended that institutions using this rubric consider carefully the resources they are able to allocate to the assessment of teamwork and choose a means of compiling work samples or collections of work that best suits their priorities, needs, and abilities.

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone 4	**Milestone** 3	**Milestone** 2	**Benchmark** 1
Contributes to Team Meetings	Helps the team move forward by articulating the merits of alternative ideas or proposals.	Offers alternative solutions or courses of action that build on the ideas of others.	Offers new suggestions to advance the work of the group.	Shares ideas but does not advance the work of the group.
Facilitates the Contributions of Team Members	Engages team members in ways that facilitate their contributions to meetings by both constructively building upon or synthesizing the contributions of others as well as noticing when someone is not participating and inviting them to engage.	Engages team members in ways that facilitate their contributions to meetings by constructively building upon or synthesizing the contributions of others.	Engages team members in ways that facilitate their contributions to meetings by restating the views of other team members and/or asking questions for clarification.	Engages team members by taking turns and listening to others without interrupting.
Individual Contributions Outside of Team Meetings	Completes all assigned tasks by deadline; work accomplished is thorough, comprehensive, and advances the project. Proactively helps other team members complete their assigned tasks to a	Completes all assigned tasks by deadline; work accomplished is thorough, comprehensive, and advances the project.	Completes all assigned tasks by deadline; work accomplished advances the project.	Completes all assigned tasks by deadline.

	similar level of excellence.			
Fosters Constructive Team Climate	Supports a constructive team climate by doing all of the following: • Treats team members respectfully by being polite and constructive in communication. • Uses positive vocal or written tone, facial expressions, and/or body language to convey a positive attitude about the team and its work. • Motivates teammates by expressing confidence about the importance of the task and the team's ability to accomplish it. • Provides assistance and/or encouragement to team members.	Supports a constructive team climate by doing any three of the following: • Treats team members respectfully by being polite and constructive in communication. • Uses positive vocal or written tone, facial expressions, and/or body language to convey a positive attitude about the team and its work. • Motivates teammates by expressing confidence about the importance of the task and the team's ability to accomplish it. • Provides assistance and/or encouragement to team members.	Supports a constructive team climate by doing any two of the following: • Treats team members respectfully by being polite and constructive in communication. • Uses positive vocal or written tone, facial expressions, and/or body language to convey a positive attitude about the team and its work. • Motivates teammates by expressing confidence about the importance of the task and the team's ability to accomplish it. • Provides assistance and/or encouragement to team members.	Supports a constructive team climate by doing any one of the following: • Treats team members respectfully by being polite and constructive in communication. • Uses positive vocal or written tone, facial expressions, and/or body language to convey a positive attitude about the team and its work. • Motivates teammates by expressing confidence about the importance of the task and the team's ability to accomplish it. • Provides assistance and/or encouragement to team members.

Responds to Conflict	Addresses destructive conflict directly and constructively, helping to manage/resolve it in a way that strengthens overall team cohesiveness and future effectiveness.	Identifies and acknowledges conflict and stays engaged with it.	Redirecting focus toward common ground, toward task at hand (away from conflict).	Passively accepts alternate viewpoints/ideas/opinions.

16. Written Communication VALUE Rubric

Framing Language

This writing rubric is designed for use in a wide variety of educational institutions. The most clear finding to emerge from decades of research on writing assessment is that the best writing assessments are locally determined and sensitive to local context and mission. Users of this rubric should, in the end, consider making adaptations and additions that clearly link the language of the rubric to individual campus contexts.

This rubric focuses assessment on how specific written work samples or collectios of work respond to specific contexts. The central question guiding the rubric is "How well does writing respond to the needs of audience(s) for the work?" In focusing on this question the rubric does not attend to other aspects of writing that are equally important: issues of writing process, writing strategies, writers' fluency with different modes of textual production or publication, or writer's growing engagement with writing and disciplinarity through the process of writing.

Evaluators using this rubric must have information about the assignments or purposes for writing guiding writers' work. Also recommended is including reflective work samples of collections of work that address such questions as: What decisions did the writer make about audience, purpose, and genre as s/he compiled the work in the portfolio? How are those choices evident in the writing -- in the content, organization and structure, reasoning, evidence, mechanical and surface conventions, and citational systems used in the writing? This will enable evaluators to have a clear sense of how writers understand the assignments and take it into consideration as they evaluate

The first section of this rubric addresses the context and purpose for writing. A work sample or collections of work can convey the context and purpose for the writing tasks it showcases by including the writing assignments associated with work samples. But writers may also convey the context and purpose for their writing within the texts. It is important for faculty and institutions to include directions for students about how they should represent their writing contexts and purposes.

Faculty interested in the research on writing assessment that has guided our work here can consult the National Council of Teachers of English/Council of Writing Program Administrators' White Paper on Writing Assessment (2008; www.wpacouncil.org/whitepaper) and the Conference on College Composition and Communication's Writing Assessment: A Position Statement (2008; www.ncte.org/cccc/resources/positions/123784.htm)

Glossary

The definitions that follow were developed to clarify terms and concepts used in this rubric only.

- Content Development: The ways in which the text explores and represents its topic in relation to its audience and purpose.
- Context of and purpose for writing: The context of writing is the situation surrounding a text: who is reading it? who is writing it? Under what circumstances will the text be shared or circulated? What social or political factors might affect how the text is composed or interpreted? The purpose for writing is the writer's intended effect on an audience. Writers might want to persuade or inform; they might want to report or summarize information; they might want to work through complexity or confusion; they might want to argue with other writers, or connect with other writers; they might want to convey urgency or amuse; they might write for themselves or for an assignment or to remember.
- Disciplinary conventions: Formal and informal rules that constitute what is seen generally as appropriate within different academic fields, e.g. introductory strategies, use of passive voice or first person point of view, expectations for thesis or hypothesis, expectations for kinds of evidence and support that are appropriate to the task at hand, use of primary and secondary sources to provide evidence and support arguments and to document critical perspectives on the topic. Writers will incorporate sources according to disciplinary and genre conventions, according to the writer's purpose for the text. Through increasingly sophisticated use of sources, writers develop an ability to differentiate between their own ideas and the ideas of others, credit and build upon work already accomplished in the field or issue they are addressing, and provide meaningful examples to readers.
- Evidence: Source material that is used to extend, in purposeful ways, writers' ideas in a text.
- Genre conventions: Formal and informal rules for particular kinds of texts and/or media that guide formatting, organization, and stylistic choices, e.g. lab reports, academic papers, poetry, webpages, or personal essays.
- Sources: Texts (written, oral, behavioral, visual, or other) that writers draw on as they work for a variety of purposes -- to extend, argue with, develop, define, or shape their ideas, for example.

Definition

Written communication is the development and expression of ideas in writing. Written communication involves learning to work in many genres and styles. It can involve working with many different writing technologies, and mixing texts, data, and images. Written communication abilities develop through iterative experiences across the curriculum.

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone 4	**Milestone** 3	**Milestone** 2	**Benchmark** 1
Context of and Purpose for Writing *Includes considerations of audience, purpose, and the circumstances surrounding the writing task(s).*	Demonstrates a thorough understanding of context, audience, and purpose that is responsive to the assigned task(s) and focuses all elements of the work.	Demonstrates adequate consideration of context, audience, and purpose and a clear focus on the assigned task(s) (e.g., the task aligns with audience, purpose, and context).	Demonstrates awareness of context, audience, purpose, and to the assigned tasks(s) (e.g., begins to show awareness of audience's perceptions and assumptions).	Demonstrates minimal attention to context, audience, purpose, and to the assigned tasks(s) (e.g., expectation of instructor or self as audience).
Content Development	Uses appropriate, relevant, and compelling content to illustrate mastery of the subject, conveying the writer's understanding, and shaping the whole work.	Uses appropriate, relevant, and compelling content to explore ideas within the context of the discipline and shape the whole work.	Uses appropriate and relevant content to develop and explore ideas through most of the work.	Uses appropriate and relevant content to develop simple ideas in some parts of the work.
Genre and Disciplinary Conventions *Formal and informal rules inherent in the expectations for writing in particular forms and/or academic fields (please see glossary).*	Demonstrates detailed attention to and successful execution of a wide range of conventions particular to a specific discipline and/or writing task (s) including organization, content, presentation,	Demonstrates consistent use of important conventions particular to a specific discipline and/or writing task(s), including organization, content, presentation, and	Follows expectations appropriate to a specific discipline and/or writing task(s) for basic organization, content, and presentation	Attempts to use a consistent system for basic organization and presentation.

	formatting, and stylistic choices	stylistic choices		

Sources and Evidence	Demonstrates skillful use of high-quality, credible, relevant sources to develop ideas that are appropriate for the discipline and genre of the writing	Demonstrates consistent use of credible, relevant sources to support ideas that are situated within the discipline and genre of the writing.	Demonstrates an attempt to use credible and/or relevant sources to support ideas that are appropriate for the discipline and genre of the writing.	Demonstrates an attempt to use sources to support ideas in the writing.
Control of Syntax and Mechanics	Uses graceful language that skillfully communicates meaning to readers with clarity and fluency, and is virtually error-free.	Uses straightforward language that generally conveys meaning to readers. The language in the portfolio has few errors.	Uses language that generally conveys meaning to readers with clarity, although writing may include some errors.	Uses language that sometimes impedes meaning because of errors in usage.

Section 11 | Inclusive Student Assessment Practices

Resource 1. Public Exam Example

I first learned about Public Exams from Dr. Benjamin Wiggins (Biology Professor and Manager of Instruction at the University of Washington) who found that this summative assessment format fosters deeper learning and reduces anxiety. I have now been using this exam format for two years and I will never go back.

The following Public Exam description was taken from my course, but can be easily adapted for any course. When I post the following description for students, I also give them a list of exam questions (the "question bank"). I let them know that about half of the questions from the question bank will end up on their exam. I should mention again that there are many versions of the question bank—some people opt to give students a fraction of the questions instead of more than will actually be on the exam. I go with the excess question route because I view this as an opportunity to have students study more than I can feasibly fit on one exam.

I distribute the question bank at least a week before the exam (ideally 8-9 days) and ask them to provide their feedback on questions three days before the exam, so that I have time to make edits before printing the exam, if needed. I use a simple shared Excel spreadsheet to collect anonymous feedback on each exam questions (image below).

I have surveyed my students extensively about their experience with this test format. From the surveys, I have learned that students actually spend *more* time studying and thinking critically about course material compared to traditional exams. This method also significantly reduced their test anxiety. Most notably, the simple act of asking for their feedback about the clarity of wording on questions helped students feel supported and valued.

Assignment Details

Introduction | The Public Exam is designed to foster critical thinking and analysis. This format involves providing students with a question bank—in advance of the exam date—that will closely mimic the questions that will be on the exam. One caveat is that you will not know which questions will end up being multiple choice and which ones will end up being short answer/matching/fill-in-the-blank. The multiple-choice questions on the question bank will not be provided with the list of answer options—you will only see the question.

Some questions on the question bank will not end up on the exam at all.

Once you receive the question bank, you will have a period of time for reviewing the questions

and providing any feedback if a question is unclear. The purpose of this is two-fold:

- It will give you time to critically think about exam questions in advance of the exam, thereby fostering learning (rather than just memorizing), while simultaneously decreasing test anxiety.
- It should reduce the possibility of students missing a question because of unclear wording on questions. (We all communicate differently, so there are times when I think my wording is perfectly clear, but it may not be to all of my students—my hope is that student review of and feedback on question wording will address this issue.)

The Process | The question bank has been posted on Canvas. **I also posted a link for students to ask for clarification on wording of each question.** You can submit questions about wording anonymously on the link or non-anonymously on the public exam channel on Slack.

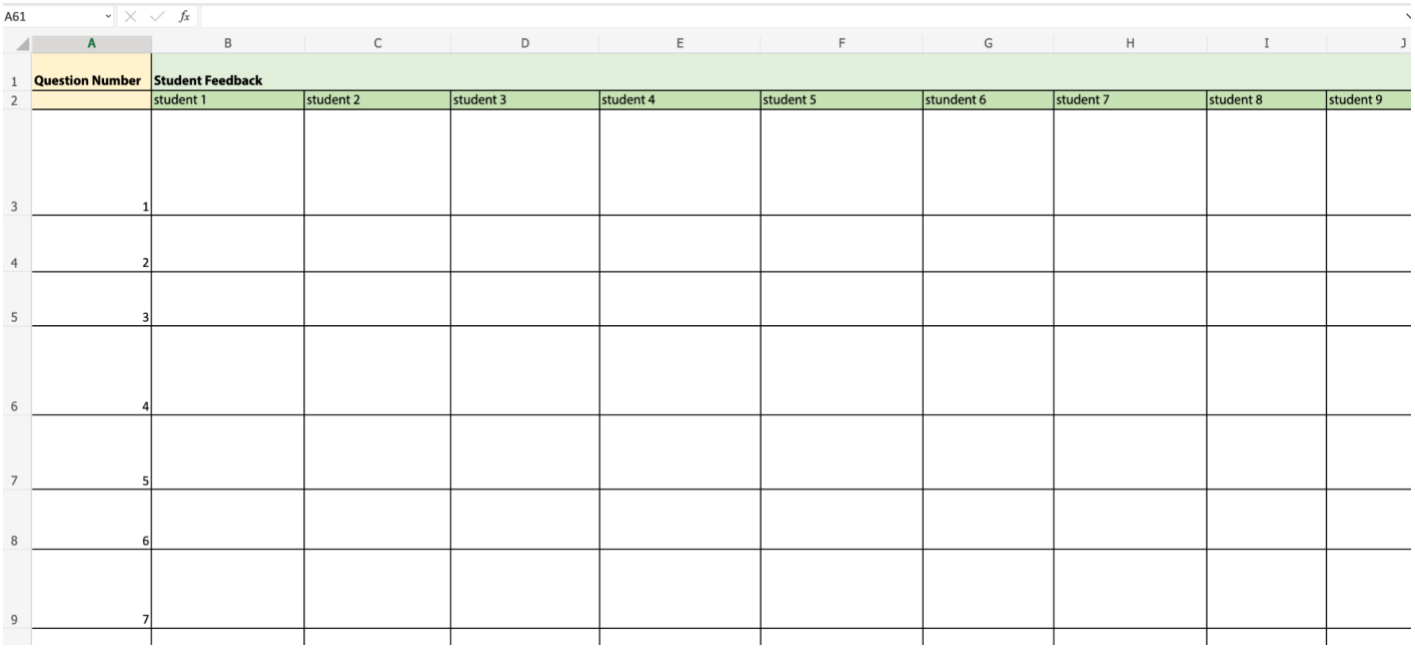
Please submit your question clarification requests **by Friday (2/18) at 2pm,** so that I can have time to incorporate changes prior to the actual exam and submit my exam to the testing center for those using that option. After that time, I can still clarify wording to you or on the form, but I won't be able to change the wording on the exam. So, be sure to at least read through all of the questions by Friday to make sure you understand them, even if you don't have time to answer the questions just yet.

Your actual exam will be **in class** on Monday, Feb. 21st at 3pm, unless you have made arrangements with the Testing Center.

Shared Spreadsheet for Anonymous Student Feedback on Exam Questions

There are many options for collecting student feedback, but providing a mechanism for anonymous feedback is the most important consideration. Especially because students from historically minoritized groups might otherwise be leery to share their feedback—they may be navigating stereotype threat and worry that when communicating issues related to exam question clarity, the professor might minimize their comments or make them feel it is a deficit in their thinking/preparation.

In the partial screenshot of my question bank, you can see that I simply put individual question numbers on one axis and space for individual student feedback on the other.



	A	B	C	D	E	F	G	H	I	J
1	Question Number	Student Feedback								
2		student 1	student 2	student 3	student 4	student 5	stundent 6	student 7	student 8	student 9
3	1									
4	2									
5	3									
6	4									
7	5									
8	6									
9	7									

Resource 2. Exam Corrections Assignment Example

The following Exam Corrections assignment was shared with us by Dr. Jennifer Lundmark, Professor of Biological Sciences.

Assignment Details

For each short answer question missed (even if you just missed a portion), please address these three things:

1) Whether you either misunderstood the question (if so, please indicate how you misunderstood it—this will help me to improve, too!) **or** made a misstep in your answer (e.g. "I knew the person was in shock, but I was confused on the type because…").
2) Did you understand the concept when it was covered in class? Please elaborate. Was there a different explanation that would have helped you (please indicate anything specific!)
3) **If there is something that is still confusing to you, please let me know and let's address it during class or office hours.
4) Did you work with the Open Exam Questions***** ? If not, why not?

Finally, **to receive full credit, everyone must write one paragraph about what you plan to do differently** on the next exam to improve your performance (specific actions are required).

**Special Option: IF you do these corrections, you may substitute a future exam score (any

exam, based on %) for this one, essentially making this first exam score obsolete. BUT, this is only an option if you turn in the corrections.

*"*Open Exam Questions" refers to Dr. Lundmark's Public Exam question bank. (Please refer to the description of the Public Exam on the previous page for further explanation.)*

Section 12 | Self-Assessment: Equity Gaps & Student Perception

Resource 1. Example Sense of Belonging Survey

Survey questions from Goodenow, 1993 and Knetka et al., 2020.

Note: You do not need to include all questions provided below. You can delete or add questions. You can also add demographic questions (race/ethnicity, gender, ability/disability, LGBTQIA+ identity, veteran status, first generation status, Pell eligibility, etc.) to the beginning of the survey in order to understand the backgrounds and identities of students who have or lack a sense of belonging.

Sense of Belonging Survey

Instructions

Please rate your agreement with the following statements based on how you feel about the Department of Biological Sciences at Sacramento State.

Use the following scale for your responses:

1 = strongly disagree

2 = disagree

3 = slightly disagree

4 = slightly agree

5 = agree

6 = strongly agree

1. I feel like a real part of the biology department.
   1 2 3 4 5 6
2. People in the biology department notice when I'm good at something.
   1 2 3 4 5 6
3. Faculty and staff at the biology department value my opinions.
   1 2 3 4 5 6
4. Other students at the biology department take my opinions seriously.
   1 2 3 4 5 6
5. It is hard for people like me to be accepted here.

1 2 3 4 5 6

6. Most faculty and staff at the biology department are interested in me.
   1 2 3 4 5 6
7. Sometimes I don't feel as if I belong here.
   1 2 3 4 5 6
8. There's at least one instructor or other biology faculty or staff at the department I can talk to if I have a problem.
   1 2 3 4 5 6
9. People at the biology department are friendly to me.
   1 2 3 4 5 6
10. Students in the biology department help each other to succeed.
    1 2 3 4 5 6
11. I am included in lots of activities at the biology department.
    1 2 3 4 5 6
12. I am treated with as much respect as other students.
    1 2 3 4 5 6
13. I have a good relationship with other students at the biology department.
    1 2 3 4 5 6
14. I can really be myself at the biology department.
    1 2 3 4 5 6
15. The faculty and staff here respect me.
    1 2 3 4 5 6
16. People here know I can do good work.
    1 2 3 4 5 6
17. I wish I were in a different department.
    1 2 3 4 5 6
18. The instructors here give me compliments when I do something good.
    1 2 3 4 5 6
19. I feel proud of belonging to the biology department.
    1 2 3 4 5 6
20. Faculty and staff in the biology department really want me to succeed.
    1 2 3 4 5 6
21. Other students here like me the way I am.
    1 2 3 4 5 6

References

Goodenow, C. (1993). The psychological sense of school membership among adolescents: Scale

development and educational correlates. Psychology in the Schools, 30(1), 79-90.

Knekta, E., Chatzikyriakidou, K., & McCartney, M. (2020). Evaluation of a questionnaire measuring university students' sense of belonging to and involvement in a biology department. CBE—Life Sciences Education, 19(3), ar27.

Resource 2. Resources for More Student Perception Surveys

https://www.lifescied.org/doi/full/10.1187/cbe.13-12-0241

https://sites.lafayette.edu/addyt/2021/12/04/measuring-inclusion-efforts-tools-for-assessment-feedback-and-reflection/

https://case.edu/ucite/sites/case.edu.ucite/files/2018-02/College-and-University-Classroom-Environment-Inventory.pdf

https://www.globalbelonging.org/repository

https://files.eric.ed.gov/fulltext/EJ1251571.pdf
