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# Fostering Students' Growth Mindset

## How would you recognize or observe students' fixed mindset in your class?

Students that are engaging with a fixed mindset may be more likely to withdraw from course participation when faced with a challenge, fail to engage with you following discouraging assignment feedback, and use language that indicates that they may believe their intelligence to be unchangeable (e.g., "I am just not a math person"). They may also tie their identify to certain strengths and be disheartened at the first sign of a challenge (e.g., "I've always been good at biology, how could I get a C – this must not be for me"). Students with a growth mindset, on the other hand, may be more willing to share when they are experiencing barriers to their learning.

## What can you do about it?

### When Designing Your Course

- Make it worthwhile for students to learn from their mistakes: Providing opportunities for students to correct prior mistakes and see their grade increase as a result is a great way to reinforce that learning is an iterative process. Illustrate to students that sometimes getting the answers "wrong" is part of the process of learning and is moving them closer to "getting it right." By assigning extrinsic value to mistake correction, students will learn that you believe in this as part of the learning process. There are many approaches that minimize your time commitment in the short term while maximizing efficiency in the long term. Consider allowing exam retakes, rewrites of certain assignments, and multiple quiz attempts with fixed bonus points assigned to new attempts. Or consider allowing students to hand in a written reflection of the study strategies they used for the exam, where they think their preparation went wrong, and ideas for what they will do differently next time for some additional points back on their exam!

- Identify how your content helps them achieve what's important to them: It may be the case that some students aren't very intrinsically interested in the process of learning for your subject. This can be a difficult barrier to learning and studying, particularly if difficulties arise early in the learning process. However, there is likely a reason that they signed up for your class. They may be interested in something they'll be able to accomplish down the road once they have these skills. If so, validate that! They don't have to want to learn the material for the same reasons you did, and they may not all start with an intrinsic curiosity about the subject you're teaching. Those things can grow with time if the student can connect with an initial reason to "buy in" to the course. Reflect: When students seem to be struggling with a challenging aspect of the course, provide them an opportunity to reflect on how this content will personally help them along the way to achieving what they care about, either within the course or beyond it.

### Engaging Students During the Course

- Ask students to recall a time in their life when they have overcome challenges: Give students the following prompt to reflect on: "Think about a time that you did something that started out challenging but got easier over time. How did you feel in the beginning? What did you do to

improve? How can you apply these strategies to your academics when things get challenging?" Sharing your own examples can also help normalize this process.

- Show students letters or "before" and "after" exam scores of former students who initially struggled, then went on to do well in the class: This strategy provides an opportunity to see growth mindset in practice. Seeing evidence that other students can face a challenge and overcome it can help build motivation to try new learning strategies, particularly if these examples are given following the first major exam or assessment.

- Make uncertainty safe: Model the statements: "I'm not sure about that yet" and "I don't know yet." Allowing those statements to exist in a classroom creates a safe space for students to express confusion and ask new questions to help solidify understanding. It also emphasizes the process of learning, rather than the achievement of learning, which is what growth mindset is all about!

# Promoting Students' Metacognition

## PLANNING

### How would you recognize or observe students' effective planning in your class?

Students who arrive early, have a clear system for taking notes, who ask questions about exams or other assignments well-ahead of the deadline, and who attend office hours in advance of an exam likely have some well-developed planning skills. Other indications of effective planning can be assessed in office hours. Students may talk about how they use a planner of some kind, block off studying time, regularly meet with a study group, and start studying days or weeks ahead of deadlines.

### How would you recognize or observe when students inadequately plan?

Students who are often late to class, who seem to have difficulty taking notes, who appear surprised by upcoming deadlines, and who turn assignments in at the last minute or not at all, may have less effective planning strategies. This skill can also be assessed in office hours.

### What can you do about it?

- Share the research on effective planning with your students: Share the science behind effective planning and encourage them to experiment with new planning strategies, such as using a planner, blocking off time for studying, and consulting their syllabus regularly to organize their study time effectively. You can find some short videos and reading resources here.

- Give students the structure of the course ahead of time: Provide students with the tools to conceptually understand the organization of your course at 30,000 feet. This will help inform their metacognition as they relate smaller pieces of information to the larger picture and learning goals. Consider organizing your syllabus by learning goals or key competencies, providing access to all topic headings or modules at the beginning of the course, providing a map with the major sections and subsections of your course, and verbally describing the outline of the course on the first day of class. Remember to regularly reorient students to where you are in the topography of the course in addition to where you have been and where you will be going next.

- Explicitly share the organization of each lecture, lab, or discussion: Provide students with a roadmap at the beginning of each meeting that illustrates your course goals and how they will achieve them. Provide updates along the way as you progress through the main topic areas, so that students can keep up with the flow of the class. If using a slide presentation, consider using an outline slide with the major topics for the day. Then, copy and paste the outline slide at each topic transition within your slide deck. This will allow you to provide a one sentence summary of what you covered, and cue students that you are moving to the next topic.

- Make your expectations as clear as possible: Provide rubrics for major individual and group projects ahead of time in addition to a schedule of when major components of the projects are due and

when you would ideally have them start working on each component. Provide exemplars of both what you are looking for and what you do not want to receive from students. By clarifying the demands of the task for students, they are then able to implement more effective strategies to reaching them.

- Make connections among concepts explicit: Model for students the connections among the pieces of material that you hope they will make. For example, ask students: "What have we already learned about X, that might help you do Y?" or: "We've already learned that X ….. That's important, because it helps us understand why Y " By understanding how pieces of information in your class relate to one another, students will have a better chance of generalizing their new learning to the next pieces of content, and to the world beyond your course.

- Share the steps you hope students are planning on taking: For instance, if you are assigning a paper, what steps would you hope students in your course would take to execute the assignment? Be explicit about your experiences and expectations in the steps that go into creating the final product (e.g., brainstorming, outlining, drafting, peer review, etc.) and the timeline on which students should work to accomplish each of these steps.

## MONITORING

### How would you recognize or observe students' ability to effectively monitor their learning in your class?

Students who are engaging in effective monitoring will be more likely to ask clarifying questions throughout classes and attend office hours. These students will also be more likely to ask questions following assignments. Generally, students who seem to have a good understanding of what they don't know yet, and who are engaging in behaviors to fill in those learning gaps, are students who are engaging in effective monitoring.

### How would you recognize or observe when students inadequately monitor their learning in your class?

Students who show disengaged body language, who do not take notes during class, who do not participate, or who do not ask questions during class may not be engaging in active monitoring of their learning. Students who come to office hours without clear questions and instead express a general confusion about course content may also not have engaged in accurate monitoring.

### What can you do about it?

- Muddiest point exercise: Rather than asking your students what questions they have (which requires a high degree of in-the-moment monitoring), ask them what feels most unclear to them, or what the "muddiest point" about the material you've covered thus far is. This will give them a chance to engage in self-monitoring of what they feel most and least confident about in their

learning. Plan these self-monitoring moments by using tools like TopHat, clickers, and discussion posts on a regular basis.

- Knowledge checks: These are low-stakes 1-2 question quizzes. Incorporating a knowledge check by asking a question that your students should know by the end of a section allows you to monitor how well they've achieved your learning goal. This is a win-win strategy. If they can't do it, you can go back and provide additional scaffolding, and if they can do it, they get some nice retrieval practice to strengthen their memory of what they just learned!

- Small group workshops: Have you ever had the experience of forgetting what it was like to not know something? (What *was* it like to not know how to drive, ride a bike, add and subtract, read, etc?). This is sometimes referred to as the "expert blind spot." Sometimes, peer teaching can be even more effective than expert teaching for certain aspects of scaffolding. This is because peers may be able to more readily identify what barriers the other person has, because they, themselves, might have recently overcome them.

  Have students break out into small group workshops, with one very specific learning goal in mind. Listen in as students help scaffold one another and fill in each other's points of confusion. If you hear the same points of confusion across all groups, you likely need to revisit something, and explain it in a different way.

## EVALUATING

### How would you recognize or observe students' effective evaluation of their learning in your class?

Students who express high confidence in their learning progress and who correspondingly perform well on coursework and class activities are likely engaging in accurate evaluation. Similarly, students who are endorsing low confidence in their learning progress and who are subsequently performing poorly in their coursework and class activities are *also* likely engaging in accurate evaluation. When students indicate which topics are still confusing to them or identify what they need to spend more time on, you are witnessing the process of evaluation in practice.

### How would you recognize or observe when students inadequately evaluate their learning in your class?

Students who express surprise about their grades on assignments may not have engaged in accurate evaluation of their learning progress. Further, students who endorse high confidence in their learning progress but are receiving lower-than-expected grades in the course may also not be engaging in accurate evaluation.

## What can you do about it?

- Design opportunities to give frequent feedback: Use small, short assignments that can give students opportunities for more regular feedback. This feedback can be given on an individual, automated (using presentation logic), or group level. For large courses, consider allowing students to give each other feedback in small groups. You could also give feedback about general themes and sources of confusion that you saw across the larger group level. Additionally, ICON quizzes can be used to your advantage. For example, after multiple-choice questions, paste in explanations of why an answer is the best choice or why it's incorrect. This will allow students to find their response and reflect on their answer. Students could then get credit for this response, regardless of if they got the multiple-choice questions themselves correct. This structure allows you to build in a reward for students' self-evaluation.

- Provide feedback at the group level: Providing feedback on a group level is a great way to save time while still giving students a chance to monitor and evaluate the progress that they are making in their learning goals and identify areas where they may still be facing some confusion. Are there commonly missed questions or sources of confusion among students? If so, this material might be worth revisiting and reteaching in a different way. This can take the form of providing students with a list of common errors and discussing these errors as a group. In addition, you can show the group a couple of examples of "high quality" work and discuss the features that made the work "successful."

- Incorporate peer feedback: This is a great opportunity to give students more opportunities for feedback without increasing your workload. Be sure to be clear with students about your expectations for what feedback should look like or sound like. The more specific you can be with your expectations, the more helpful this feedback will be to your students.

# Improving Students' Effective Memory Strategies

## How would you recognize or observe students using effective memory strategies in your class?

Students who are using effective memory strategies may be seen reorganizing their notes, practicing recalling the information, and coming to office hours earlier than other students in relation to when an exam is scheduled. Students may also disclose their use of effective strategies during office hours.

## How would you recognize or observe students using less effective memory strategies in your class?

Students may be most likely to disclose their study and learning strategies in an office hour context. You may also observe students highlighting their notes or their textbook. Students who "cram" may also be more likely to email you or attend office hours right before an exam or major deadline in your course. Less effective and less efficient study strategies that are popular among college students include rereading their notes, lecture slides, or textbooks many times, highlighting their materials, and using flashcards incorrectly (i.e., looking at the answer on theback of the card before committing to an answer).

## What can you do about it?

### Spacing

"Cramming" material feels effective to students in the short term, but it is detrimental to memories that you'd hope they can successfully recall in the long term. "Spacing" material means separating study of the material across time, content areas, or tasks. This approach improves long term memory. You can help students by encouraging them to use it in their own studies:

- Share the science behind the spacing effect and encourage them to use this approach in their own studying. You can find some resources here.
- Having low stakes quizzing about previously learned material at multiple points in time throughout the course.
- Incorporate "old and new" on students' homework assignments. While the bulk of your homework questions may cover the most recent topics covered in class, including some questions from previous portions of the course is a great way to space retrieval practice.
- Activate prior knowledge by referencing and drawing connections between newly learned material and previously learned material.
- Eliciting student participation in recalling information from previous classes (e.g., how does this relate to what we talked about in _____section? Briefly write down everything you remember about _____from the previous class).

### Retrieval

Humans are particularly prone to the "fluency bias." This occurs when we read and reread information and it begins to feel more familiar. It makes us feel more confident that we're learning, and confidence

feels good. Unfortunately, familiarity is rarely a helpful skill. Instead, removing the material and practicing the retrieval of that material from memory has been shown to be more effective, because you're practicing the skill you hope to execute. Students aren't inclined toward using this strategy because it's effortful and often can be discouraging at first, especially if they aren't able to retrieve information accurately the first few times. This failure to recall, however, is also an important monitoring strategy for students' metacognition, because it provides a more accurate assessment of what they have learned and what they still need to learn more about. This is one of the most robust effects in the research and makes learners more efficient and effective. You can encourage students to use this strategy and also incorporate the testing effect in your own course by:

- Sharing the science behind the testing effect and encouraging them to use this approach in their own studying. You can find some resources here.
- Having regular, low stakes quizzing that forces memory retrieval practice.
- Asking them to summarize in small groups or with a partner what they've just learned (without referencing their notes).
- Writing down everything they can remember from the first part of class at the end of class (or from a previous class).

**Elaboration**

Elaboration is a method designed to connect newly learned material to previously learned material to enrich the connections in memory between old and new. These techniques help encode new information and "tie" it to easily retrieved personal or previously learned information, which helps boost effective recall.

- Use exit tickets by having students write down a 1-2 sentence summary of the important concepts of the day and how they relate to each other prior to them leaving the classroom. This technique can help students consolidate their comprehension and "zoom out" to grasp the major points in each class, rather learning course material as a conglomeration of seemingly unrelated facts.
- Explicitly link new knowledge to prior knowledge from your own course and others' courses
- Use analogies to connect new material to everyday examples in class. If students come to office hours, ask them about their interests outside of the classroom. If you can make analogies between the material that they are struggling with and a topic that they have a passion for, they are more likely to remember the information.

# Fostering Your Own Mindset and Metacognition

**Your own impressions:** How confident are you in how the lecture went? Do your impressions line up with evaluations of students' learning?

**Learning goal evaluation:** At the end of the course, assess how confident students feel about how well they've mastered each learning goal. This can be done simply by using a "thumbs up, thumbs down, thumbs in the middle" if you can't assess this more formally.

**Course/presentation evaluation:** If you have the opportunity, formally assess how students felt you did, including what they liked or disliked about your style and which strategies they felt helped solidify their learning.

**Inventory of how effectively time and resources were used:** Finally, how do you feel you did *given the time and resources that you had*. Could you have planned more effectively or reallocated content in a different way? Were you as flexible as you hoped to be if Plan A didn't go smoothly? If your time was limited, did you feel that students made progress toward the learning goal, even if they haven't reached it yet?