

Learning Pathways

Connect	Link new knowledge with prior knowledge
Acquire	Active processing of new information
Practice	Apply acquired knowledge to new situations
Feedback	Information for students indicating how performance compares with expectations

What strategies do you typically use?

Connect	<ul style="list-style-type: none"> ● Show examples of a given concept and ask students to explain what they're looking at before teaching that particular concept ● Show examples in the field - hands on learning. ● Videos of unexpected examples of the course material (I love cool animal videos) ● Discuss and create a concept map linking prior knowledge to reading/lecture material ● Students bring in materials from day-to-day life ● Show real-world applications and use cases in daily life ● Simple discussion - "what do you know about this?" ● Each class individually or in small groups reflect on skills and knowledge they already have related to the topic ● Introduce new concepts by showing real-world examples ● Use a "real life" example from case law, the news, personal story ● Use real problems from life sciences, use public databases to show them real biological data ● Discussion boards, have them find material that aligns with the course content and explain its connection ● Question of the day to baseline their existing knowledge prior to new material being presented and to also provide feedback ● What's the most important thing we've learned? What's the thing that you're having the hardest time with?
Acquire	<ul style="list-style-type: none"> ● Reading, podcasts, videos ● Explanations and demonstrations in the field or classroom in small groups. ● Literature review ● Lecture ● Reading, videos, listening examples ● Show examples on slides, provide a short reading, or watch a video ● Problem formulation, describe various methods to solve the problem ● Collaborative worked examples ● Online Educational Resources (OER)

	<ul style="list-style-type: none"> • Demo examples of what this skill would look like in a real situation • Step-by-step derivation on the board • Weekly “mini-research” activities
Practice	<ul style="list-style-type: none"> • Give students opportunities to try practice problems during class time, often before they’ve seen me work one. This gives them a chance to get stuck and think about how to work through it, rather than just following a recipe. • In-class activities • Peer groups to work through problems in class • Small group practice - going out and doing something together • Have students go out and do the activity/skill - repeating it multiple times, building up the complexity or reducing the guidance given. • Students will explore a new skill/activity after learning about the topic in class and then reflect on how that experience went for them • Start the following class with a review question of previous material • Hands-on projects with real world data • Students work in a group of 3 or 4 and are assigned a topic covered in class; they must “teach” the topic and include an example of the topic in practice. • Apply a concept to an example problem • Ask students questions in class, activities as assignments • Open ended projects that are iterable
Feedback	<ul style="list-style-type: none"> • Peer-to-peer • One-on-one discussion, small group discussion • Comments on (Canvas) assignments • Instructor feedback using an example rubric • Observing students and then talking through the skill in small groups or individually. • Rotating through the room and giving instructor feedback in a non-graded format (+1) • Written discussion on Canvas accessible to all students • Quiz re-working opportunities. Students can gain a letter grade by resubmitting a “perfect quiz,” using professor, other students, etc. to work on it - also require a reflection on how they prepared, what they misunderstood, and what they learned • Auto-graded canvas quizzes are simple, fairly effective, low stakes and feasible • Ask and grade an exam question, effective but takes awhile and not usually an opportunity for students to reflect on what they got wrong/right • Detailed comments on a lower-stakes assignment that feeds into the final project • Assignment grades, feedback in office hours • Resubmitting assignments • Unlimited re-tries on homework problems - lets the students work through it until they succeed. • Community of Practice feedback • Personal reflection

What new ideas could you try?

Connect	<ul style="list-style-type: none">● Bring in parts or components and have students engage hands on prior to new material● Discuss and create a concept map linking prior knowledge to reading/lecture material● Have students describe why they chose their project topic - what it means to them (might spark ideas in other students)● Peer-to-peer - sharing what they know and practice of the topic and other students can utilize the information for their own practice● Bring in guest speakers to help make connections
Acquire	<ul style="list-style-type: none">● Get students to demonstrate to small groups● Bring in guest speakers / outside experts that students can interview● Find a game that incorporates some of the concepts, e.g., FoldIt for protein structure prediction and ask students to play the game and identify challenges (this can go to Practice as well)
Practice	<ul style="list-style-type: none">● Have students explain how they are doing the activity to faculty/TA as they do it.● Open-topic real world projects demonstrating understanding of a key learning outcome in the● Team “Teach in”● Add a reflection question to each assignment - what is going well and what am I still missing or struggling with● Evaluate/analyze AI outputs● Create a game where two students play against one another, for example connect two Arduinos and have one output and unknown frequency and the other to measure and guess the unknown frequency
Feedback	<ul style="list-style-type: none">● Self or peer evaluation of skills● Feedback to peers on final project / presentation● Give students credit for responding to feedback● Cutting back on lecture provides more time for feedback