

Active Learning Techniques to Address Teaching Problems

Selections from Ambrose et al., 2010. *How Learning Works: Seven Research-Based Principles for Smart Teaching*.
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Underlying Teaching Problem	Active Learning Techniques to Address Problem
<p>Limited, inactive, insufficient, inappropriate, or inaccurate prior knowledge hinders learning</p>	<ul style="list-style-type: none"> • <u>Diagnostic Assessment</u> – Assess your students’ competence in component skills and knowledge by administering a pre-test or concept map early in the semester. This helps you to assess their prior knowledge, alerts students to where they’re going, and helps to activate relevant prior knowledge. • <u>Think-Pair Share</u> – After posing a question to students, ask them to think or write on their own, then discuss their reasoning with a partner before sharing with the class. TPS is highly effective when asking students to make and test predictions. This can be done particularly well with personal response devices using “clicker” questions, a process Eric Mazur calls <i>peer instruction</i>. • <u>Demonstrations</u> – Ask students to predict the result of a demonstration, briefly discussing with a neighbor. After demonstration, ask them to discuss the observed result and how it may have differed from their prediction; follow up with instructor explanation. This approach asks students to test their understanding of a system by predicting an outcome. If their prediction is incorrect, it helps them see the misconception and thus prompts them to restructure their mental model.
<p>Faulty or inappropriate knowledge organization structure for the task at hand</p>	<ul style="list-style-type: none"> • <u>Concept Map</u> – Have students complete a concept map early and often to visualize knowledge organization structure and how it changes throughout the course. Concept maps can be used at the beginning of a course or activity to help you get a sense of how students organize their knowledge. It may be useful for students to compare their concept maps with one another or with one you create to interrogate their own understanding. • <u>Categorizing Grid</u> – Present students with a list of different problems, concepts, or situations. Ask students to sort the terms into categories to highlight how they organize their knowledge. Have students share their grids in pairs or small groups and note similarities and differences. This approach allows students to express and question the distinctions they see within a field of related items and can help you to identify any misconceptions. • <u>Templates</u> – Have students generate a skeletal outline of what they know about a given topic, then share your own skeletal outline or template for organizing knowledge on this topic. This can help students to develop mastery by developing their skills in competence and consciousness.
<p>Lack of engagement with the material or motivation to learn</p>	<ul style="list-style-type: none"> • <u>Decision-Making Activities/Cases</u> – Provide authentic, real-world situations that require students to apply their knowledge to reach a conclusion on how to resolve an open-ended problem. The problem should help demonstrate the relevance of skills acquired in your class to students’ future professional lives. Allow students to work in small groups, ask them to decide what they know that is relevant to the situation, what other information they may need, and the broader impacts of any decisions they may make. • <u>Minute Papers</u> – Ask students to reflect on their learning process by asking specific questions to help them identify the value of their own work (e.g., “What did you learn from this assignment?” or “What was the most valuable feature of this project?”). Ask students to share their responses to stimulate discussion or collect all responses to inform future class sessions. • <u>Students as Producers</u> – Ask students to generate a “product” where they have some autonomy in addressing an open-ended problem and an authentic audience beyond the classroom. Not only does this model motivate students to take the work more seriously (it’s not “busy work”), but it also helps prepare them for the open-ended problems they will face when they leave college.

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Inability to integrate or apply component skills to a higher-order problem	<ul style="list-style-type: none"> • <u>Student-Generated Rubrics</u> – Have students work in small groups to brainstorm elements of rubrics that spell out differing levels of performance for a given activity. This practice can help students focus their attention on the key aspects of the task needed to achieve mastery. • <u>Strip Sequence</u> - Give students the steps of a process (e.g., photosynthesis, fractionation, fossilization) on strips of paper that are jumbled; ask them to work together to reconstruct the proper sequence. This approach strengthens students’ logical thinking processes and their mental model of a process. • <u>Structured Comparisons</u> – Ask students to make comparisons between different problems, cases, or scenarios. This facilitates knowledge transfer by promoting recognition of the deep features of each case that would make it analogous or non-analogous to other cases. • <u>Targeted Practice</u> – Create opportunities for students to practice weak or missing skills in relative isolation, focusing their energies on one aspect of the task and helping to develop that particular skill. Move to practice that requires students to integrate these skills, being explicit about the practice. • <u>Problem Sorting</u> – Have students sort problems into categories based on the deep features or principles used to solve them (see Categorizing Grid).
Misdirected practice and/or lack of targeted feedback	<ul style="list-style-type: none"> • <u>Incorporate a Self-Reflection Step in your Activities</u> – Have students answer questions such as ‘what did you learn from doing this project?’ or ‘what skills do you need to work on?’ at the end of an assignment. This can help students take charge of their learning process and identify their strengths as well as the areas in which they currently struggle. • <u>Exam Wrappers</u> – Provide short handouts that students complete when an exam is returned to them, which guide students through a brief analysis of their own performance on the exam and then ask students to relate their performance to various features of how they studied or prepared. Have students submit their exam wrappers and return their responses before the next exam so they have a ready reminder of what they learned from their prior experience that can help them to study more effectively. • <u>Peer Feedback</u> – Using a rubric, have students provide constructive feedback after an assignment on one another’s work. This helps students to better identify aspects of good work and diagnose their own problems. It may be useful to have students write down the specific changes they are going to make in response to the peer feedback
Students lack self-direction and have trouble assessing their own learning and performance	<ul style="list-style-type: none"> • <u>Self-Assessment</u> – Give students practice exams that replicate the kinds of questions that they will see on real exams, and then provide answer keys so that students can check their own work. Emphasize to students that the real benefit comes from <i>doing</i> the activity and reflecting on the experience rather than simply looking over the answers provided. • <u>Guided Self-Assessment</u> – Have students assess their own work against a set of criteria that you provide. Allow students to first see the difference between good and poor work (for example, share annotated samples of student work, in which good and poor qualities of the work are highlighted). Then, ask students to assess their own work using these same qualities. This technique raises students’ awareness of task requirements and teaches them how to monitor their own progress towards achieving learning goals. • <u>Planning Stages</u> – For complex assignments, provide students with a set of interim deadlines or a time line for deliverables that reflects the way that you would plan the stages of work (e.g., annotated bibliography, draft of thesis statement, visual representation of paper’s structure, first draft, final draft). For students at a higher level of planning ability, have them create their own plan as the first ‘deliverable’ in larger assignments (e.g., project proposal, time line).