Common Active Learning Strategies and Tactics

WMO Resources for Trainers

Strategies are general approaches to achieve a goal. In this case the intended goal is to have students become active in the learning process to deepen their learning and to ensure they can apply what they learn. **Tactics** are the specific actions one can take to achieve the goal. There are many tactics available to trainers to encourage active learning. This resource describes nine of these, as well as four general strategies with which they are associated.

Active learning strategies are those that ask learners to go beyond just memorizing or understanding, but to also engage in analytical thinking, decision making, creative thinking, problem solving, evaluation, or completing practical tasks that require some combination of these.

Active Learning Tactics are presented first. The list is not exhaustive, but representative of the tactics available to trainers. You can adapt them to many contexts, using whatever parts work for you, mixing or matching to meet your particular needs. Following the descriptions of tactics are more detailed presentations of four of the most common Active Learning Strategies with which these tactics are associated—Discussion strategies, Inquiry strategies, Experiential learning, and Case-based strategies. These sections provide more details about active learning approaches, including general principles, guidelines, content suggestions, and rationales for the strategies.

Active Learning Tactics

1. Present instruction around questions or issues rather than information. Encourage students to think deeply about these while they work to propose answers or support a position on the issue. Limit your own lecture or explanations to short, but critical points. (See B. Inquiry Strategies)
2. Use student-centered discussions, letting students answer each other's questions and guide the direction of discussion. Offer your own input only when no student can answer, or when it can expand the discussion in a productive direction. (See A. Discussion Strategies)
3. Break students into small discussion groups to encourage more contributions by all and to bring out more diversity of opinion. Small groups can discuss the same topic and compare outcomes or discuss different topics and then share results with the large group. (See A. Discussion Strategies)
4. Pose questions, problems, or hypotheses that require students to research or gather information about the things you want them to learn during the training. (See B. Inquiry Strategies)
5. Create lab exercises for students that require the application of critical thinking skills. (See B. Inquiry Strategies)
6. Provide case studies to students that require them to make decisions similar to those that would be made in real-world situations. Cases should be realistic, but might be simplified to focus on specific aspects of a case or specific learning objectives. (See D. Case-based Strategies)

7. Create a learning simulation that emphasizes realism, both in the environment in which decisions are made and in the outcomes of the decisions. (See D. Case-based Strategies)
8. Design large-scale problems for students that might require days or weeks to plan, research, and develop a solution. Provide resources and problem-solving strategies, but let learners come up with the solutions. (See B. Inquiry Strategies)
9. Engage learners in real-world tasks and challenges. These might include actual job tasks, internships, apprenticeships, or some other work that contributes to useful outcomes for others. (See C. Experiential Learning Strategies)

Reflection Exercise:

Choose a topic that you currently teach by lecturing. Propose ways of applying at least 5 of the tactics in the list above to teach it in an alternative, more active way. If you feel one or more of the tactics is not applicable, state why you think it should not be applied for teaching your topic.

Active Learning Strategies

A. Discussion Strategies

General principle:

Present instruction around one or more questions or issues and encourage students to think deeply about them while they discuss the questions/issues with the class. Limit your own lecture or explanations to short, but critical points.

Guidelines:

- Keep discussion centered on the students
    - Reverse expectations for who is leading the discussion. Encourage students to contribute as much as you. Facilitate and guide the discussion more than present your own ideas or show your knowledge.
    - Also encourage students to manage the discussion. When erroneous or poorly-conceived statements come up, question them, but let students correct one other as much as possible. If no one appears to be ready to challenge such a statement, first ask the group if they agree rather than just correcting it yourself
- Discuss as a full class or break students into small groups. Small groups have the advantage of encouraging ALL students to talk. Large groups tend to limit the number of students who will participate, but can bring out greater diversity and save time.
    - Small groups might all discuss the same topic, and then compare their outcomes by having a spokesperson from each group summarize to the entire class.
    - Alternatively, small groups might each discuss a different topic or aspect of a topic, and then share to the entire class. This will expand what is covered.
- Choose the best time to provide didactic interventions (find the best "teaching moments"). Add something to the discussion yourself only when you think it will be most instructive or will guide the discussion toward a useful direction.
- You can hold discussions both in a classroom and online. For online discussion, you can use a discussion forum, email group, audio or text-based synchronous discussion tools, or community website.
- Debrief discussions to see how students felt about their success. Summarize, synthesize, and clarify the conclusions with the full group.
- Consider documenting key points from the discussion on a whiteboard or community digital space to make the outcome more visible and substantial.

Content suggestions:

- Discussions might be structured in many ways:
    - Have students do one of their assigned readings, but on a particularly complex topic. Then give them time (in small groups perhaps) to discuss what they learned from it and as a group develop a better understanding of its implications.
    - Compare two instructional descriptions or conceptual models of a phenomenon and discuss which does a better job.
    - Read a case study or other research paper and critically evaluate its structure, processes, and results

- Compare two research studies with contrasting results and critical evaluate them to decide which might be more valid.
- Conduct a debate or have students take on different roles and or points of view in the discussion.
- Transform what could be a lecture into a problem to be discussed.
    - Instead of just providing a definition of fog and a description of the various mechanisms that can cause it to form, ask a question. “Here are 3 very different locations where fog occurs frequently under certain conditions. Discuss what these situations have in common and how they differ. What can you say about the critical ingredients for fog formation?”
    - Instead of describing the way observing systems work, ask students to decide what data would be required to adequately forecast the formation and propagation of a tropical cyclone, and how that data might be obtained.

Rationale:

- Knowledge is developed not so much by ingesting information as through articulation of what is being learned in one’s own words. We learn things when we speak about them. We should encourage students to talk, write, or use other media to articulate what they are learning.
- Learning is not a private act; it is a social and dialectic process. We learn more deeply by testing what we learn with others to get their feedback.
- Discussion teaches critical thinking and problem solving as along with subject matter.
- Discussion allows in-depth exploration of a topic, and is particularly useful when opinions or solutions may differ (breadth vs. efficiency).
- Being a part of a discipline means being able to be conversant in that discipline, being able to discuss it with colleagues.

B. Inquiry Strategies

General Principle:

Pose questions, problems, or hypotheses that naturally engage students' curiosity about the content and encourage them to follow a process of inquiry or research: to form a good question, hypothesis or problem space; to gather and analyze information; and to develop conclusions or solutions. The inquiry process should require students to gather the information you intend them to learn during the course, and to use it toward a meaningful purpose. Inquiry learning requires students to do more than learn facts, concepts, and principles; it also helps them to develop critical thinking, judgment, and problem solving skills in applying what they learn.

Guidelines:

- For some of the critical content in your course, flip your guiding question in the planning process from "what do I want students to know?" to "what critical thinking should students be able to perform (that requires using of what I want them to know)?"
- Inquiries do not have to involve formal scientific research, but they can. Traditional laboratory exercises apply inquiry-based learning strategies.
- "Problem-based Learning (PBL)" can be seen as a subset of Inquiry Strategies. In PBL, students work on complex problems that require some degree of judgment about the best (not the "correct") solutions. They might require days or weeks to resolve. A good complex problem for a hydrology class might be, "Design an effective gauge system for flood warnings for this drainage basin." In PBL, the instructor provides resources and strategies, and learners partially self-assesses by justifying their solutions.
- An inquiry might be designed to merely require the readings you already assign. In this case, inquiry questions can be thought of as traditional "end-of-chapter" questions that help students think more deeply, personalize the content to a local or more narrow interests, or draw conclusions that force students to link the content to other content they already know. You can also push students further by requiring them to do online or library research as well.
- Provide sufficient guidance for students new to inquiry processes. First model the thinking processes of someone doing inquiry in your field, if necessary. Check in along the way to support those having difficulties with their inquiries.
- If your students have the required background knowledge, make them use it. If not, provide it in the form of on-demand resources to use. Don't provide easy answers or you defeat the purpose of the strategy.
- Require students to communicate their results in the form of a written or oral report.

Content suggestions:

- Choose or help students select interesting and rewarding inquiry questions:
  - Why do you think X phenomenon occurs more/less frequently in Y location?
  - How might you go about researching how or why X occurs?
  - What data would you use to forecast X parameter? What are the key ingredients required for X processes to take place?
  - Which conceptual model would explain this weather data we see on xx/xx/xxxx over Eastern Europe?

- What observing systems should be in place for monitoring and forecasting X well?

Rationale:

- Inquiry forms the basis of all meaningful learning. Knowledge results from questions being asked, or from situations requiring a resolution.
- The skills required for an effective inquiry are the ultimate learning goals for those in any profession. People need to be able to solve the problems they encounter and seek the information they need to make decisions.
- Inquiry requires higher-order thinking skills such as critical and creative thinking, analysis and judgment, and problem solving and decision making.
- Questions establish context for students to construct knowledge. It better reflects how experts generate the body of knowledge in the community in the first place.
- Inquiry generates motivation. It sets up a natural drama based on seeking the answer to a question or on developing a deeper understanding to resolve some puzzlement.
- Inquiry processes discourage rote learning, which can be short lived. Instead, they engage higher-order learning that includes creative and analytical/critical thinking.

C. Experiential Learning Strategies

General Principle:

In experiential learning, students engage in real-world activities that require them to apply knowledge and skills in performing complex tasks or solving complex problems. The assumption is that in the process they also will be confronting new information and acquiring new skills that, because these are immediately relevant, will be learned deeply. The key distinction for experiential learning is its real world, or authentic, nature. Experiential learning can be in the form of a project or a job task (such as an internship), but it is meant to include real-world challenges and risks, and useful outcomes.

Guidelines:

- Look for real-world opportunities for student involvement in the discipline you teach. This can involve simply shadowing a practitioner, but ideally students could be given at least apprenticeship tasks as well.
- Students should be independent as much as possible in the learning experience. Part of what they need to learn in resourcefulness, self-confidence, and independence.
- Experience without reflection might not transfer into lasting learning. Students should be encouraged to reflect on the experience. Kolb advises a 4-step cycle for instructional experiences:
    1. Experiencing: Active engagement in the experience
    2. Reflection: Thinking and discussing the experience to identify what occurred and why, including the components of the experience, but also the problems, challenges, and implications
    3. Generalizing: Thinking about what can be taken away from the experience to use in other contexts. What lessons were learned? How might you approach the same experience differently in the future?
    4. Applying: Using what was gained in the experience in new situations. Trying out the generalizations that resulted.

  In real life, these steps are more like aspects of experience, and are often performed amost simultaneously during active experiences. But teachers can turn them into separate events in the teaching process to ensure students make full use of each aspect.
- Provide guidance and coaching, not instruction. Help students through the process of learning from experience, but don't tell them exactly what they should learn. You can always fill in gaps if you see they missed opportunities.

Content suggestions:

- Use any real-world task that can accommodate student participants at some level, even if only shadowing.
- When real-world tasks are not possible due to high risk or costly outcomes for mistakes, realistic shadowing tasks can be used. This is not the same as simulation. For example, students could be asked to make a weather forecast in the same timeframe and using the same data as forecasters on shift. To make it more authentic, student forecasts would be

shared publicly in some venue, such as on campus or on a public website, so there are people who will be paying attention and using them.

Rationale:

- All learning is embedded in experience—trying something out, reflecting about the results, and trying it again to get improved results. Even traditional classroom learning is a form of experience when it includes exercises and feedback.
- However, students learn more deeply in messy, real-world experiences. Only real-world experiences contain the kinds of complexity students need to learn to use what they learn outside the classroom.
- Students learn more deeply when they are emotionally engaged in what they are learning. Authentic experiences carry emotional weight.
- Students learn more deeply when engaged with others practicing in the discipline they are learning about. Learning is a social activity, and is culturally bound. Learning in a real-world environment embeds learners in a culture that teaches many unspoken lessons normally missed.
- Experiential learning avoids having students build only abstract connections to knowledge.

D. Case-Based Strategies

General Principle:

In case-based learning, students practice working through cases that represent real-world examples of situations in which people need to apply the knowledge or skills you expect them to learn. Cases should demonstrate the targeted problem solving and decision making situations you would want students to be prepared for. Case-based Learning is similar to Experiential Learning in that they are both based on real-world experiences and require reflection. However, cases are one step removed from the real-world, more contained and controlled than actual experiences, and more readily digestible as useable knowledge (because one way we store knowledge is as cases—see below). Case-based strategies include simulations.

Guidelines:

- Cases should be chosen and designed to provide opportunities for practicing skills, retrieving information, and applying knowledge you intend students to learn. In other words, you will need to establish intended learning outcomes first before choosing cases.
- Cases can be full-fledged simulations, but they don't have to be. Simulations put extra emphasis on realism both in the environment of the actions, and in the responses to student decisions. Simulations can be critical in preparing students to make quick decisions in complex environments in which repercussions can be costly (e.g., flying a plane, responding to a disaster situation).
- Give cases structure to enable learners to recall them easier later and put them to use. Include all critical information to enable recall and application of the principles they teach:
    - A specific time and date
    - A specific location
    - The people involved and their roles
    - The goals of the people in the case
    - The problems faced
    - Solutions attempted
    - Results of actions and decisions
    - List of situations in which the case might be applicable as a model
- Decide how students will operate in the case.
    - How many and which decisions do they have to make?
    - How do they input their decision?
    - Who do they interact with to make decisions (other students, you), if anyone?
    - How do they get feedback, and what do they do with it?
- Provide resources that will help students perform in the case. These might be traditional learning resources like textbooks and reference books, or online resources used in your discipline. You might provide personalized "scaffolding" or coaching in the form of content and process guidance.
- Try to provide guidance in the form of other cases or stories. If a student says, "I don't know how to decide," try to answer by reminding or telling them of what occurred in a related case. In other words, demonstrate the use of cases to make decisions.
- Review the critical information of each case with students. Providing this feedback helps students transfer what they learn from the instructional cases.

Content suggestions:

- Find cases that are sufficiently complex to require thoughtful decisions, but that can be easily indexed according to clear characteristics (the critical information called for).
- Find cases that represent varying along the dimensions of critical information, such as time, location, people, goals, problems, etc., as well as levels of difficulty.
- Cases might represent varying aspects of disciplinary practice—research and theory building, or expert decisions with primarily technical implications and expert decisions with primarily societal implications.

Rationale:

- One way people store knowledge is as cases that guide future actions. Decision making, particularly rapid decision making, is frequently done by measuring current situations against past ones, taking action, and then comparing results.
- Learners need to reflect on experiences and classify them so they can become cases useful for future decision making.
- People can learn from the experiences of others when they are shared as classifiable stories and cases.
- Learning is most effective when students are trying to achieve goals of interest to them, and to achieve clear outcomes, not learning for its own sake.