GRAND VALLEY STATE UNIVERSITY
THE ROBERT AND MARY PEW FACULTY TEACHING AND LEARNING CENTER

ACTIVE LEARNING STRATEGIES

Time	Activity	Description	Example
1 min	Minute Paper	Students write on a notecard or sheet of paper, for 1-5 minutes, in response to an open-ended prompt.	*Mechanical Engineering* – "Today we discussed conductive heat transfer. In one minute, list as many of the principal features of this process as you can remember." *Biology* - What does the term "biodiversity" mean to you?
1 min	Muddiest Point	Students write on a notecard or sheet of paper the concept or idea they are still struggling with the most.	*General* – "On your note card, write the one concept you are having the most trouble understanding, and which you could use more practice on."
1 min	Clarification Pauses	Throughout a lecture, particularly after stating an important point or defining a key concept, stop presenting and allow students time to think about the information. After waiting, ask if anyone needs to have anything clarified. Ask students to review their notes and ask questions about what they've written so far.	*Nursing* – After reviewing the scope and standards of practice, ask students if they can identify at least one nursing responsibility (e.g., autonomy and accountability).
5 min	Think-Pair-Share	Have students answer a question individually, then compare their answers with a partner and synthesize a joint solution to share with the class.	*English* – "From the Barthes reading, identify the author's main point using two supporting reasons from the text." *Economics* - "How would the output of this model change is we relaxed the assumption that this market is a monopoly?"

1 min	Application Card	Students are provided with a task that challenges them to apply a concept or skill to a situation they have not encountered before or challenged to generate examples that illustrate a concept to demonstrate transfer of knowledge.	*Psychology* – *"*Describe two examples that contrast positive versus negative reinforcement.' *Art History* - Is the surrealist work *The Hunter* by Miro as landscape? Why or why not?"
5 min	Brainstorming	Introduce a topic or problem and then ask for student input. Give students a minute to write down their ideas and then record them on the board. Students could talk in pairs or groups.	*Civil & Environmental Engineering* – "What are possible safety issues we might encounter with the process unit we just designed?" *Exercise Science* – "What are the most common physiological responses to exercising?"
5 min	Self-Assessment Quiz	Students take a quiz (typically ungraded) or complete a checklist of ideas to determine understanding of a concept. This can be used at the beginning of the semester, or the beginning of a chapter for students to gauge prior knowledge and identify misconceptions.	*Computer Science* - Provide increasingly difficult questions to gauge a student's knowledge of a particular area: 1. Describe the principles of a binary search tree. 2. What is the average big-O search time for a node in a binary search tree? 3. Describe the degenerate tree that accounts for the worst-case search time of O(n).
5 min	3-2-1 Reflection	Ask students to list three takeaways from the reading; two examples or uses of the takeaway; and one unresolved/remaining question about the reading. Use this reflection for class discussions or small group activities.	*Sociology* – Students are reading and learning about culture, and you prompt them to: • 3 - List three takeaways from X reading • 2 - Give two examples of cultural relativism • 1 - Pose an unresolved/remaining question you have about this week's content.
5 min	Set It Up	After providing students with a quantitative problem, ask them to solve it using only variables and units, emphasizing the problem-solving process rather than a specific numerical answer. For example, you could ask students to identify which course concepts are relevant to finding a solution, what assumptions need to be made, or what information is missing and how they might calculate it.	*Physics* – "Using the provided circuit diagram, label the different components (resistors, capacitors, battery, etc.) with variable names. Using Kirchoff's circuit laws, set up the equations you would use to calculate the current through the circuit at the points identified in the diagram using only variables."

5 min	Waterfall	In an online synchronous Zoom session, ask students to answer a question in the chat, but do not click send. Instructor says "Waterfall!" and all students all press send together for a cascade of answers.	*Education* – "What makes an effective lesson plan?" *Legal Studies* – "What is a prosecutor's primary role?"
5-10 min	Concept Maps	Direct students to create a concept map in pairs or small groups. Concept maps represent networks of nodes and links. Nodes are labeled boxes representing concepts; nodes are connected by links (lines connecting the nodes that are defined by verbs). Call on pairs/groups to share their concept map. Alternatively, mapping constraints can be relaxed and students can represent relationships among concepts visually in any way that provides new perspectives. Such visual representations create an overview of related ideas and encourage thinking about a subject in a global, holistic or flexible sense.	*Biology* – "Create a concept map to connect your understanding of the following terms: natural selection, Hardy-Weinberg equilibrium, Mendelian genetics, allele frequencies, and evolution. Include connecting phrases between map items." *Public Policy* - Create a visual representation of the factors that influenced U.S. immigration policy under President Obama. Indicate your arguments for the relationships among and relative strengths of factors.
5-10 min	Role-playing	Students are asked to act out a part. In doing so, they get a better idea of the concepts and theories being discussed. Role-playing exercises can range from simple to complex.	*Social Work* - In preparing for clinical practice, students can role play a family therapist whose client has revealed she has committed a criminal act. *Public Policy* - "Each member of the group should adopt the perspective of a different stakeholder from the case study on arsenic contamination. Discuss the three proposed policies from those perspectives."
5-10 min	Contrasting cases	Provide students with two examples illustrating a single concept. Ask them to work in groups of 2-3 to list the similarities and differences between the cases. Students should be able to see both examples at the same time. Ask groups to share what they came up with. Another way to implement contrasting cases is to show a correct and incorrect procedure. Give students a problem with solutions from two hypothetical students. Ask them to first determine which solution is correct, then compare the correct and incorrect solution, and locate the errors in the incorrect solution.	*Psychology:* "This handout lists two examples, one for operant conditioning and another for classical conditioning. Work with a partner to think about what similarities and differences you see across the two examples." *Math:* "On your handout, you will see a problem with two solutions by two different students. Your job is to work with a partner and figure out which one got it correct and then compare the correct and incorrect solutions to identify the errors in the incorrect one."

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10 min	Case Studies	Use real-life stories that describe what happened to a community, family, school, industry, or individual to prompt students to integrate classroom knowledge with real-world situations, actions, and consequences.	*Business* - "Consider the marketing strategies that P&G used to develop its *Pringles* line of potato chips . Would you consider their marketing strategies successful? Why or why not?"

10 min	Analogical Thinking	By using analogies, students reassemble elements from existing knowledge in a novel fashion to create a new idea. Students harvest and combine elements from the analogies generated and apply them to the problem at hand.	*Biomedical Engineering:* Here is an example of a medical product that does not stick to the patient's skin. What else is like this? What have others done? Which of those ideas can I modify to fit my problem (i.e., finding another way to prevent this wheelchair sticking to the patient and causing sores)? *History:* Did US public health practitioners handle the AID/HIV outbreak in the 80s well? How did approaches and outcomes compare to previous epidemics of Typhoid, Influenza and Cholera? Did they learn anything?! Can any lessons learned be applied to the next epidemic (e.g., Zika virus) ?
10 min	Inquiry-Based Learning	Students use an investigative process to discover scientific or engineering concepts for themselves. After the instructor identifies an idea or concept for mastery, a question is posed that asks students to make observations, pose hypotheses, and speculate on conclusions. Then students are asked to tie the activity back to the main idea/concept.	*Chemistry* – Before electroplating zinc onto the surface of a penny, ask students to predict what will happen. After giving students time to reflect and explain their observations, change the scenario – "What will happen when the Zn-plated penny is heated?" *Biology* - We hypothesize that a predator (dragonfly larvae) is influencing outcomes of competition between Green Frog and Bullfrog tadpoles in ephemeral ponds. Design an experiment to test this, identifying dependent and independent variables? Draw various ways data from your experiment would support or refute the hypothesis.
10-15 min	Gallery Tour	Set up stations or displays throughout the room. Organize so students rotate through each station (individually or in groups), completing a task or responding to a specific prompt at each station. Conclude with a debriefing discussion, writing activity, or assignment that helps students synthesize and reflect on the information they learned. If physical movements are not viable for all students, offer an anonymous digital submission alternative (e.g., a digital form).	*Writing* – Students bring a printed copy of their resumé to class. Each student tapes their resumé on wall around the room. Prompt students walk around to different resumés and provide feedback on design contrast and visual hierarchy using sticky notes.

10-15 min	Crowd Crumple	Students write either a question or response to a question on scrap paper. The paper is then crumpled and thrown across the room to another student, who reads the question and offers a response. Crumple and rethrow several times to gather answers. If physical movements are not viable for all students, offer an anonymous digital submission alternative (e.g., a digital form).	*Movement Science* – "Name an exercise to work out the shoulder girdle muscle." *Integrative Studies* – "How does DuBois' concept of double-consciousness relate to code-switching?"
20 min	Idea Checklists (Design Heuristics)	Students use a checklist provided by the instructor that will encourage them to examine various characteristics and design possibilities of a subject. Check-lists may include design prompting questions, such as "magnify?", "modify?", "rearrange?", "fold?" and "reverse?", or illustrate functional perspectives or common design elements/techniques). Whatever the format, check-lists prompt students to consider a menu of unexpected or seemingly unrelated possibilities to inspire alternative approaches and ideas.	*Architecture* - Assuming a fixed budget of $X, use the list of "green materials" and techniques provided. Propose 3 specific, alternative interventions that would minimize the environmental footprint of the new Carnegie Public Library branch. *Design* - Using the checklist of design heuristics provided, what ideas can you generate for the design of a camping stove that is powered entirely by solar power without increasing cook times by more than 20%?
20 min	Jigsaw	A general topic is divided into smaller, interrelated pieces. Student groups are assigned one of the pieces to review/confirm knowledge. Then the groups "jigsaw" so that there's a representative from each piece in each new group; students then teach each other about their piece.	*Psychology* - Students are assigned to read one of three recent journal articles on neural networks and autism in children. After discussing the study design with their "home groups," students split into new groups and share the results of their paper, and its strengths and weaknesses with each other.
20 min	Peer Review	Students are asked to complete an individual homework assignment, paper, or project. On the day the assignment is due, students submit a copy to one or two classmates. Each student then gives constructive feedback (e.g., corrects mistakes in problem-solving, makes suggestions about improving argumentation, etc.)	*Drama* - After drafting one-act plays, pairs students swap drafts and give each other feedback on their writing. *Computer Science* - Students swap pseudo code and give each other feedback before implementing the code.

20 min	Morphological Analysis	Students divide a problem into functions or subfunctions that must be performed. Next, students generate ideas for each function (or subfunction) in isolation. Then, students examine the many permutations of solutions by combining ideas from across categories. This approach rapidly produces combinations of ideas that may not arise in open brainstorming or other methods and challenges students to consider options beyond the first feasible design idea generated.	*Art:* To explore novel approaches and create artwork distinctive to your practice, develop a matrix with various possible canvases (column headers, e.g., paper, wood, clay, glass) and materials (row headers, e.g., ink, pastels, oil paint, organic matter). Discuss pairings within the matrix and their pros and cons. Identify, experiment with, and reflect upon 5 combinations. and engages students in using the matrix to make various pairings of materials and canvases to help them identify new ways to create their artwork.

Sources

Carnegie Mellon University, (n.d.). *Active Learning Strategies—Eberly Center—Carnegie Mellon University*. Retrieved from https://www.cmu.edu/teaching/resources/instructionalstrategies/activelearningstrategies/index.html

Johns Hopkins University. (n.d.). *Active Learning Card Set & Online Resource | Center for Teaching Excellence and Innovation*. Retrieved from https://ctei.jhu.edu/teaching/active-learning-cards/

University of Georgia. (n.d.). *Active Learning Techniques*. Active Learning at UGA. Retrieved from https://activelearning.uga.edu/instructor-development/instructor-resources/