Lecturio

Active Learning: Augment Student Engagement and Understanding

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Online Seminar

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Meet Our Learning Science Team

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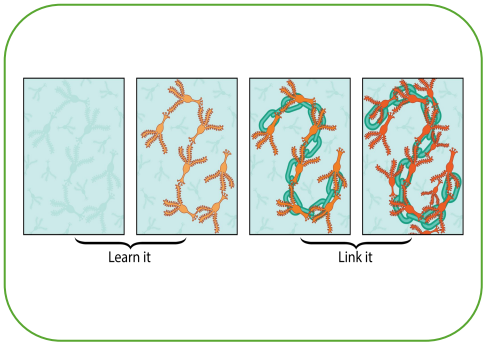
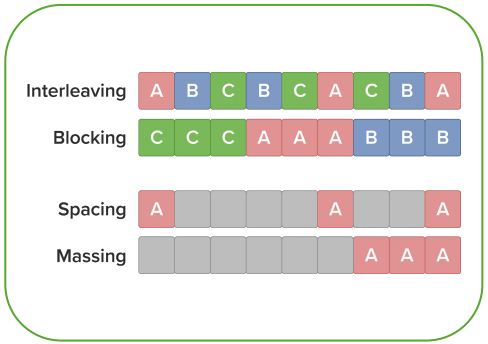
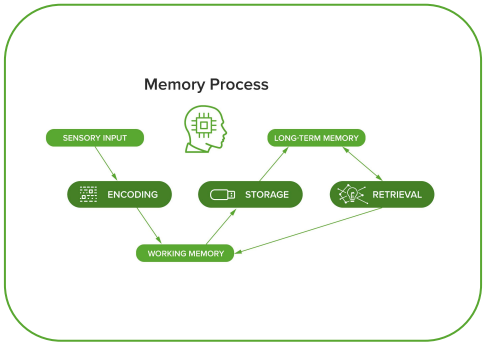
Seminar Topics and Applications of Learning Science

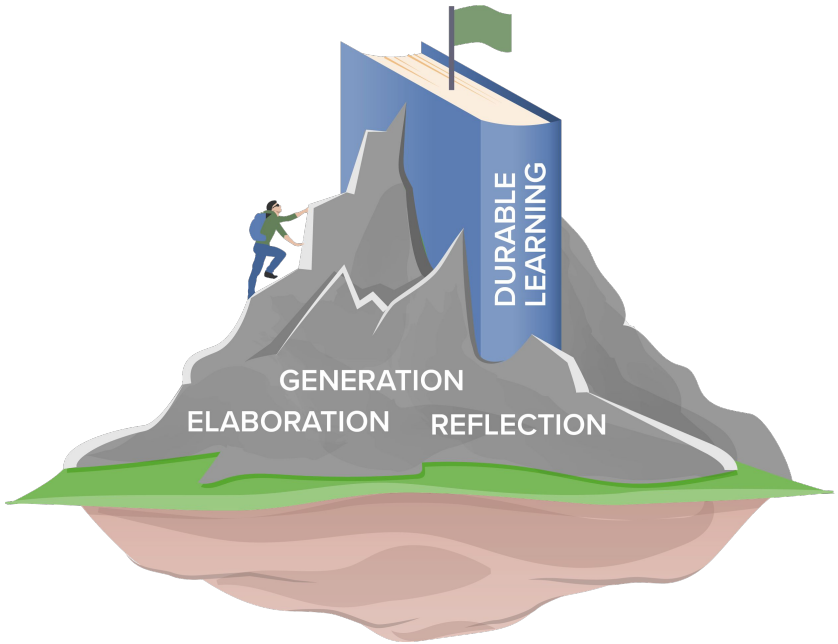
Cognitive Science & Neuroscience → **Instructional Design & Learning Strategies** → **Durable Learning**







What Is Active Learning?



Active learning is when a student ***Retrieves*** a concept and ***Relates*** it to known information.

Seminar Learning Outcomes

1. Participants will be able to **recall** active learning strategies, including elaboration, generation, and reflection.
2. Participants will be able to **interpret** cognitive science and neuroscience evidence that support active learning techniques as effective educational tools.
3. Participants will be able to **utilize** active learning methods from the educator's and student's perspective and **apply** the concepts of elaboration, generation, and reflection in their health education curricula.
4. Participants will be able to **utilize** technology to facilitate the delivery of active learning strategies.

POLL

Do you use active learning in your classes?

Answer the question in the poll.

Why Active Learning Works

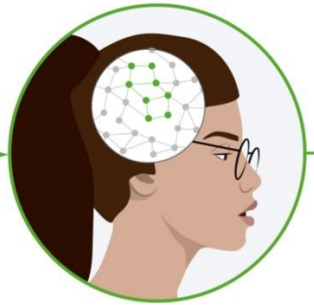
Insights from cognitive science:

- Active learning enhances high-order thinking and metacognition.
- Learners' effort to actively construct their knowledge is in line with the concept of "desirable difficulties."
- Active learning techniques can help decrease students' cognitive load.

Insights from neuroscience:

- Active learning allows for consolidation and reconsolidation of neural links.
- Active learning fosters formation and modification of schemas or mental models.
- The process of schema formation can be supported by scaffolding, resulting in better knowledge retention and mastery.

Learning
new information



Schema formation

Finding
additional information

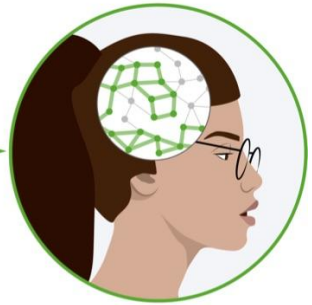
+

Active learning

Elaboration

Generation

Reflection



Schema modification
and enhancement

Case Study (1/2)

- Dr. Z is a teacher at Y Academy.
- He wants to motivate and engage his students more during his classes.
- His students currently prefer studying on their own.
- Dr. Z wants to improve his course, but isn’t sure where to start, so he comes to you for help.

Our Platform Today: Padlet

- Please **scan the QR code** with your phone, or **click the link in the chat** to open Padlet in your browser.
- If you have a second screen, please open the Padlet tab there.

QUESTION

1

What are some common causes of loss of motivation and disengagement in students?

Answer the question by sharing your thoughts and experiences in Padlet.

Case Study (2/2)

- Dr. Z's lectures contain a lot of information, in the form of both narrated and text material.
- He sees students losing focus in his classes and finds it challenging to engage them in Q&A sessions.
- He always expects his students to apply the concepts he presents, but he finds that they struggle to do so.
- Some students have said that his tests are too challenging.

QUESTION

2

Why do you think Dr. Z's students lose focus and find his examinations too difficult?

Answer the question by sharing your thoughts and experiences in Padlet.

QUESTION

3

If you encountered the challenges faced by Dr. Z, how would you try to solve them?

Answer the question by sharing your thoughts and experiences in Padlet.

Generation

Definition of Generation

Definition

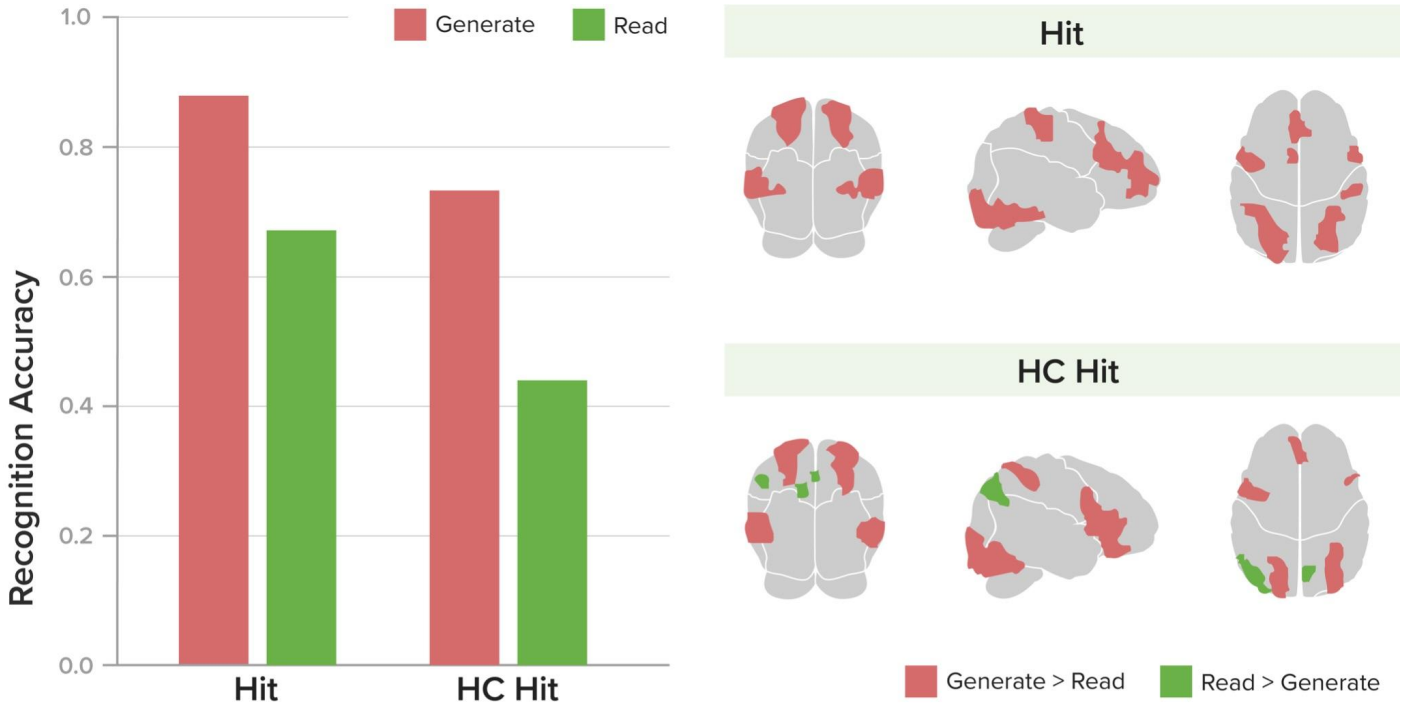
- Involves the learner **generating a solution** or **defining a concept for himself or herself** *before* or *in addition to* being taught a concept[1]
- Makes the mind **more receptive to new learning**[2]

Evidence

- Students generating and independently answering their own questions achieved better retention.[3]
- It has been found to work best when learners produce material during the encoding process. [3]
- Under an fMRI scan, it has been observed to cause broader neural network participation than simple reading. [4]

1. McCurdy MP, Viechtbauer W, Sklenar AM, Frankenstein AN, Leshikar ED. Theories of the generation effect and the impact of generation constraint: A meta-analytic review. Psychon Bull Rev. 2020 Dec;27(6):1139–65.
2. Brown PC. Make it stick: the science of successful learning. Cambridge, Massachusetts: The Belknap Press of Harvard University Press; 2014. 313 p.
3. McCurdy MP, Sklenar AM, Frankenstein AN, Leshikar ED. Fewer generation constraints increase the generation effect for item and source memory through enhanced relational processing. Memory. 2020 May 27;28(5):598–616.
4. Rosner ZA, Elman JA, Shimamura AP. The generation effect: Activating broad neural circuits during memory encoding. Cortex. 2013 Jul;49(7):1901–9.

Evidence for Generation



Adapted from Thegeneration effect: Activating broad neural circuits during memory encoding by Rosner et al. (45)

*)Hit: accurate identification; **)HC= high confidence

1. `Rosner ZA, Elman JA, Shimamura AP. The generation effect: Activating broad neural circuits during memory encoding. Cortex. 2013 Jul;49(7):1901–9.

Applications of Generation

- **Clinical Teaching:** Asking students to **generate** symptoms of a disease before explaining them
- **Simple Application(s):**
  - Asking students to **explain** a discussion point before the formal lesson commences
  - Implementing a problem-based learning approach

Case Study Discussion

What are some common causes of loss of motivation and disengagement in students?

- **Question Structure:** Open-ended, comes before content and/or key information is given
- **Mechanism:**
  - It prompts students to **generate** a response to the question, making learning **effortful**.
  - Any information generated will be **encoded more strongly**.
  - Understanding can be strengthened by any relevant information shared afterward.

Elaboration

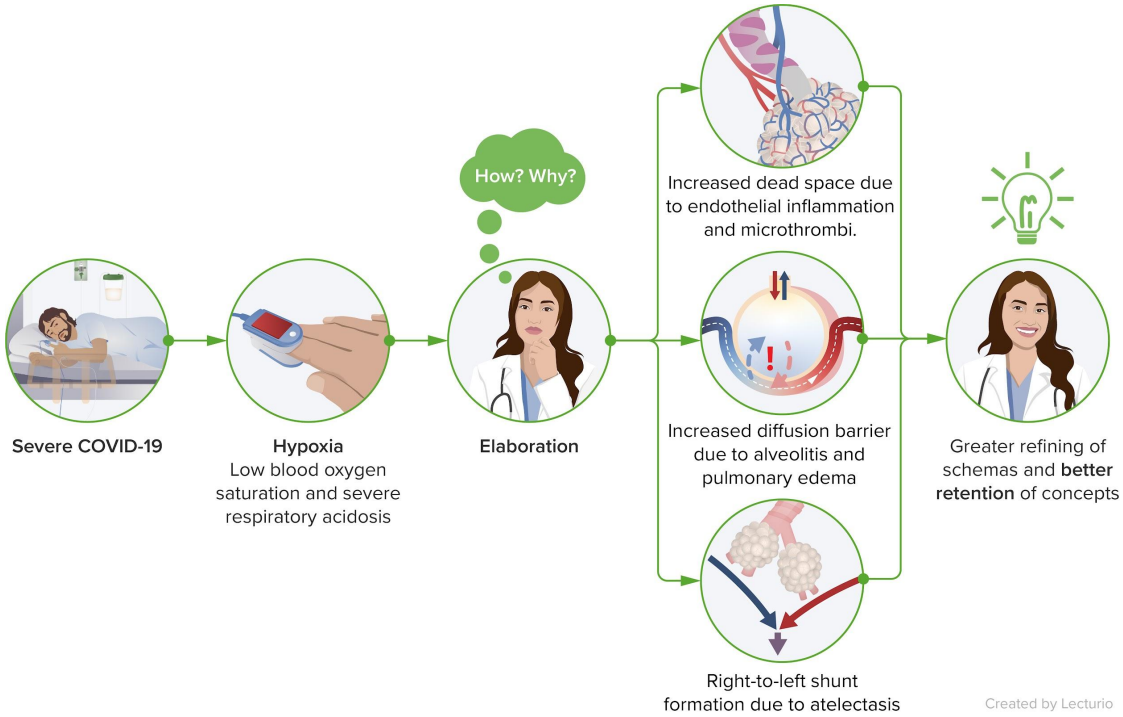
Definition of Elaboration

Elaboration:

- Involves the **learner's enhancement** of information
- Is linked to **desirable difficulty** and is **part of the encoding process**.[1,2]
- Enhances **schema** development by connecting **new content** to **established content** in **long-term** memory.[3]
- Can be implemented by means of an **inference**, **image**, **comparison,** **illustration**, or **overall summary**.

1. Bjork RA. Memory and metamemory considerations in the training of human beings. In: Metacognition: Knowing about knowing. Cambridge, MA, US: The MIT Press; 1994. p. 185–205.
2. Hamilton R. Elaboration Effects on Learning. In: Seel NM, editor. Encyclopedia of the Sciences of Learning [Internet]. Boston, MA: Springer US; 2012 [cited 2021 Dec 4]. p. 1103–5. Available from: http://link.springer.com/10.1007/978-1-4419-1428-6_170
3. American Physiological Association. APA Dictionary of Psychology [Internet]. 2020 [cited 2021 Nov 4]. Available from: https://dictionary.apa.org/

Evidence for and Application of Elaboration



Students can:

- Generate multiple cues for retrieval.[1]
- Add new layers of meaning to concepts.[1]
- Create better long-term memory.[2]
- Experience better comprehension with elaboration[4] and illustrative examples.[3]

1. Pressley M, McDaniel MA, Turnure JE, Wood E, Ahmad M. Generation and precision of elaboration: Effects on intentional and incidental learning. J Exp Psychol Learn Mem Cogn. 1987 Apr;13(2):291–300.
2. Bartsch LM, Oberauer K. The effects of elaboration on working memory and long-term memory across age. J Mem Lang. 2021 Jun;118:104215.
3. Rawson KA, Thomas RC, Jacoby LL. The Power of Examples: Illustrative Examples Enhance Conceptual Learning of Declarative Concepts. Educ Psychol Rev. 2015 Sep 1;27(3):483–504.
4. Pumilia CA, Lessans S, Harris D. An Evidence-Based Guide for Medical Students: How to Optimize the Use of Expanded-Retrieval Platforms. Cureus [Internet]. 2020 Sep 11 [cited 2021 Jan 23]; Available from: link

Case Study Discussion

Why do you think Dr. Z's students lose focus and find his examinations too difficult?

- **Question Structure:** Elaborative, utilizes "*why*" and "*how*" prompts
- **Mechanism:**
  - It prompts students to delineate *reasons for the fact*, encouraging them to utilize existing knowledge to **interpret and build on** available information.
  - Once answered, this builds on the existing knowledge gleaned from the case itself.
  - Elaborating creates more elaborate schemas and adds new layers of meaning to new concepts.

Reflection

Definition of and Evidence for Reflection

Definition

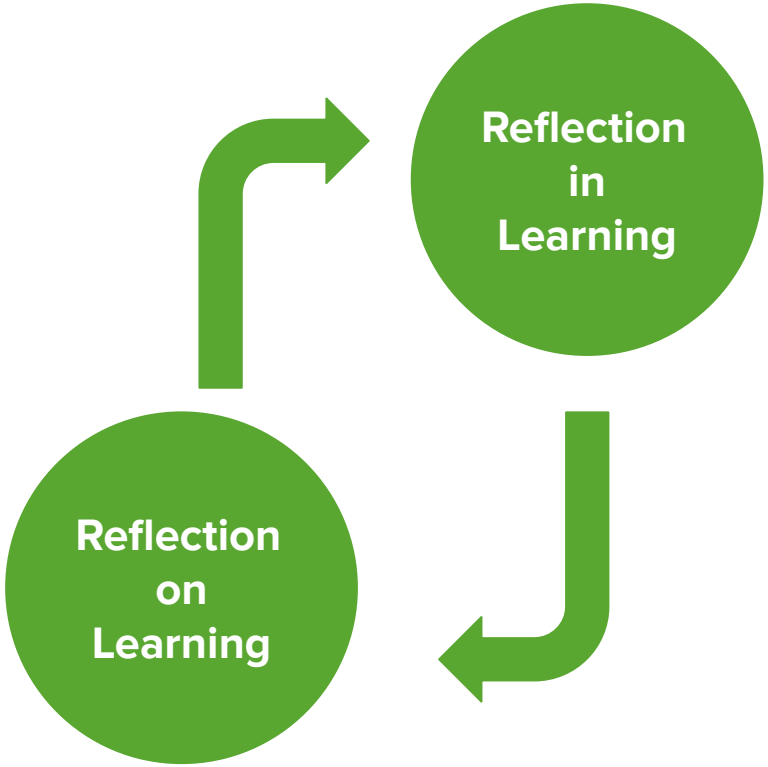
- **Intentional pausing** to give the brain time to **contemplate** observations and experiences, **consider** possible **interpretations**, and **synthesize meaning and context**
- **Involves** another important concept: **metacognition**, or thinking about one's thinking

Evidence

- A short post-work reflection improved employee performance by 23%.[1]
- Self-reflection strengthens the link between fundamental knowledge and prior patient experience to improve "diagnostic expertise and mastery."[2]
- It is an effective way to improve the learning of complex subjects and improve comfort in difficult medical situations.[3]

1. Di Stefano G, Gino F, Pisano GP, Staats BR. Learning by Thinking: How Reflection Aids Performance. SSRN Electron J [Internet]. 2014 [cited 2021 Nov 24]; Available from: http://www.ssrn.com/abstract=2414478
2. Shimizu T. Reflection Of Reflections: Building Diagnostic Expertise. Int J Gen Med. 2019;12:363–5.
3. Sandars J. The use of reflection in medical education: AMEE Guide No. 44. Med Teach. 2009 Jan;31(8):685–95.

Application of Reflection



Reflection in Learning

- Happens **during** learning
- It can act as a teaching strategy, prompting students to reflect on the content.

Reflection on Learning

- Happens **after** learning
- It leads to improvements in learning and in the use of better study strategies for the future

Case Study Discussion

If you encountered the challenges faced by Dr. Z, how would you try to solve them?

- **Question Structure:** Asks the respondents to reflect on past experiences or existing knowledge
- **Mechanism:**
  - It prompts students to reflect, leading them to self-introspection and actively encouraging them to synthesize better solutions.
  - It provides a framework for the reflection process, guiding learners in the appropriate direction relevant to the learning objectives of the course.

Breakout Sessions

Implementation of Active Learning

Active Learning Strategy	Brief Description
Elaboration: Illness scripts[1]	Students are asked to create **illness scripts**, or a cognitive organizer tables for pathophysiology, history, examination and labs/imaging/treatment, as well as three top differential diagnoses to present to the rest of the class.
Reflection: Reflection breaks[2]	Students are given time for **focused thought** at the beginning, middle, or end of class to create a framework for reflection.
Generation: Sabotage/sequence reconstruction[3]	After a lesson is complete, the instructor *removes* a section or includes a deliberate error in the teaching material and asks students to ***recognize*** *the errors* or ***generate*** the correct version of the material.

1. Moghadami M, Amini M, Moghadami M, Dalal B, Charlin B. Teaching clinical reasoning to undergraduate medical students by illness script method: a randomized controlled trial. BMC Med Educ. 2021 Dec;21(1):87.
2. Michael J. Where's the evidence that active learning works? Advances in Physiology Education. 2006 Dec;30(4):159–67.
3. Active Learning | Poorvu Center for Teaching and Learning [Internet]. [cited 2021 Dec 13]. Available from: https://poorvucenter.yale.edu/ActiveLearning

Breakout Sessions—Instructions for Participants

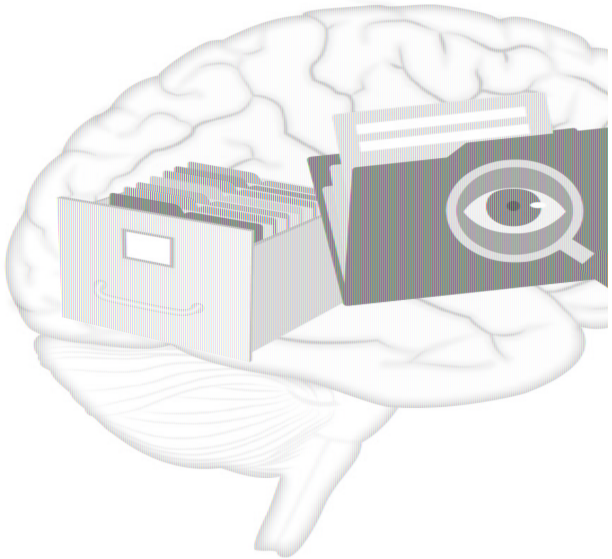
- This room is for you to share and discuss the use of active learning strategies in your classroom and the challenges you have encountered in implementing them.
- The discussion will focus on **2 topics:**
  - **(1)** Active learning methods you use in your classroom; and
  - **(2)** Challenges you have faced when using them.
- Please keep your response to **under 1–2 minutes** so that your fellow educators can participate too, the time being limited.
- Try to stick to the question and avoid changing the topic.
- We will return to the main room in **15 minutes**.
- Use Zoom's "raise hand" feature when you would like to share an idea or question.
- Use the chat to share your thoughts if you would prefer not to speak.
- Don't be shy—your colleagues are interested in your experiences and thoughts!

Breakout Sessions: Instructions for Participants

Head to your respective rooms, and we will ***REFLECT*** when we return from the discussion groups.

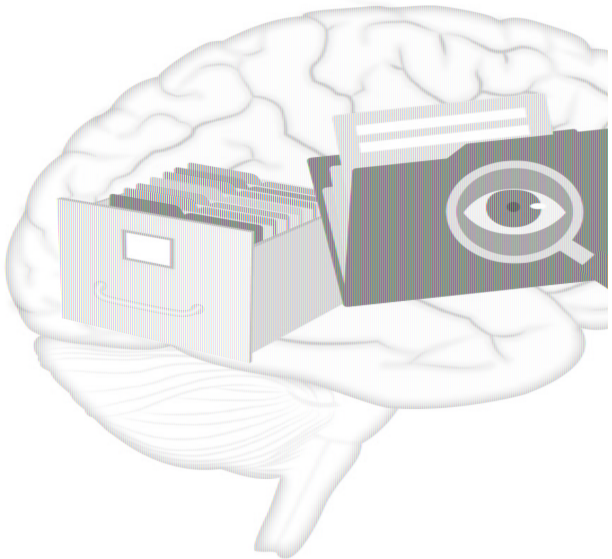
Discussion Group Question 1

What active learning strategies do you use, and how might you apply them to motivate and engage students in your classroom?



Discussion Group Question 2

What challenges have you encountered when applying active learning strategies in your classroom?



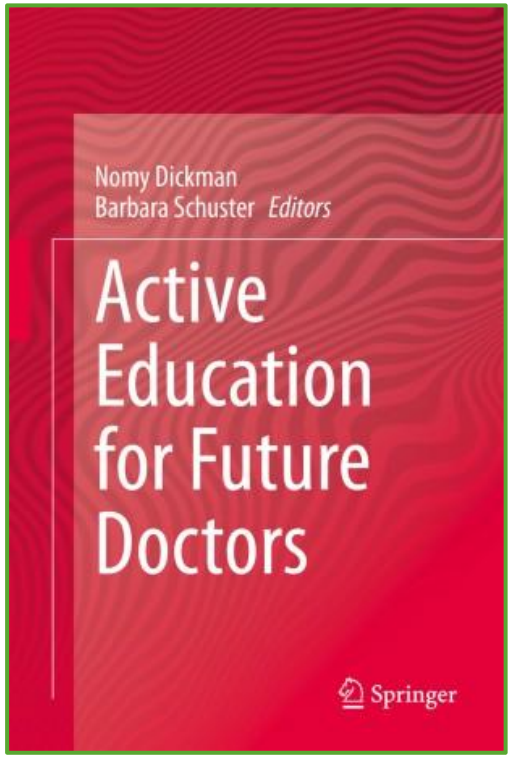
Sharing Outcomes and Takeaway Messages

- Class time is precious.
- Make the most of it by creating an active learning experience in every class.
- Knowledge builds on knowledge—preparation before class is crucial for both faculty and students.
- Leverage technology to facilitate active learning.

Important Post-Event Information

- **Follow-Up:** We will share the active learning strategies handout along with our follow-up survey, which we encourage you to complete.
- **Certificates:** An attendance certificate for the seminar can be requested on the survey form.
- **Summary Document:** A summary document of active learning strategies, including implementation tips and key points from the breakout sessions, will be sent to all participants next week.

Recommended Reading



“Education is the kindling of a flame, not the filling of a vessel.”

– Socrates

Are You Interested in Our Future Events?

Save the date for our upcoming

Durable Learning Seminar

Metacognition—Do You Really Know What You Think You Know?

March 9, 2022, 9:00 PST | 12:00 EST | 18:00 CEST

Are you interested in contributing to learning science?

Join our Learning Science team's research endeavors!

Contact us: learning-science@lecturio.com

Contact us

Learning Science Team
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