

Making the most of active learning: The role of teaching expertise



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shifting
toward



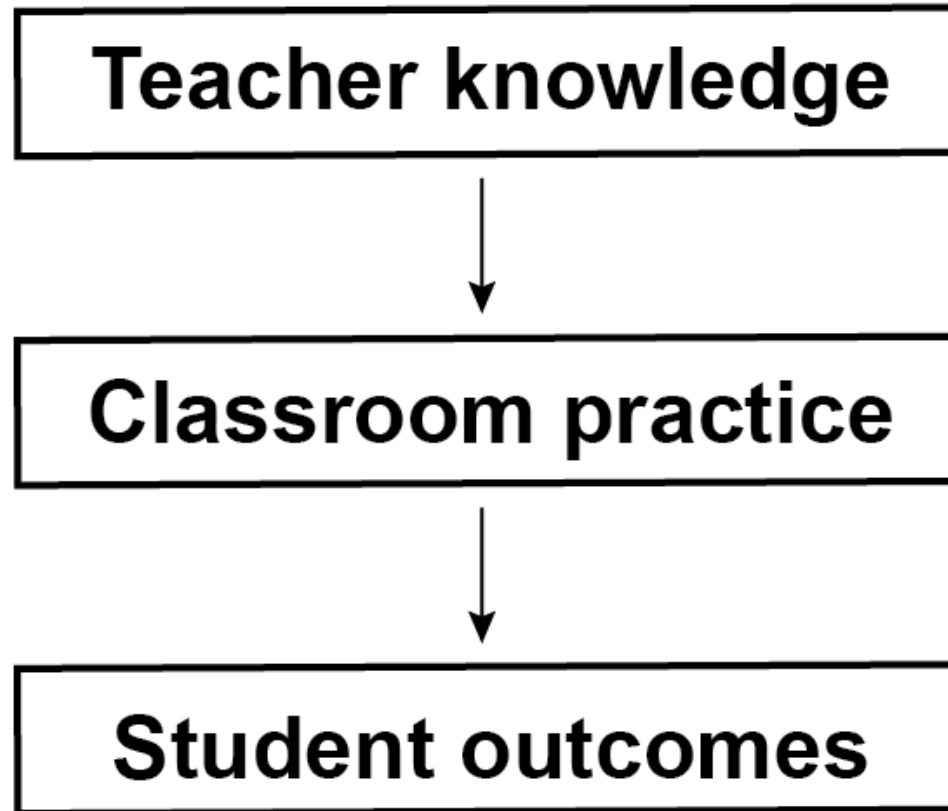
Active learning CAN be more effective....



“If the experiments analyzed here had been conducted as randomized controlled trials of medical interventions, they may have been stopped for benefit—meaning that enrolling patients in the control condition might be discontinued because the treatment being tested was clearly more beneficial.”

Freeman et al. (2014), pg. 4. (meta-analysis of active learning in undergraduate STEM)

...but implementation is key.

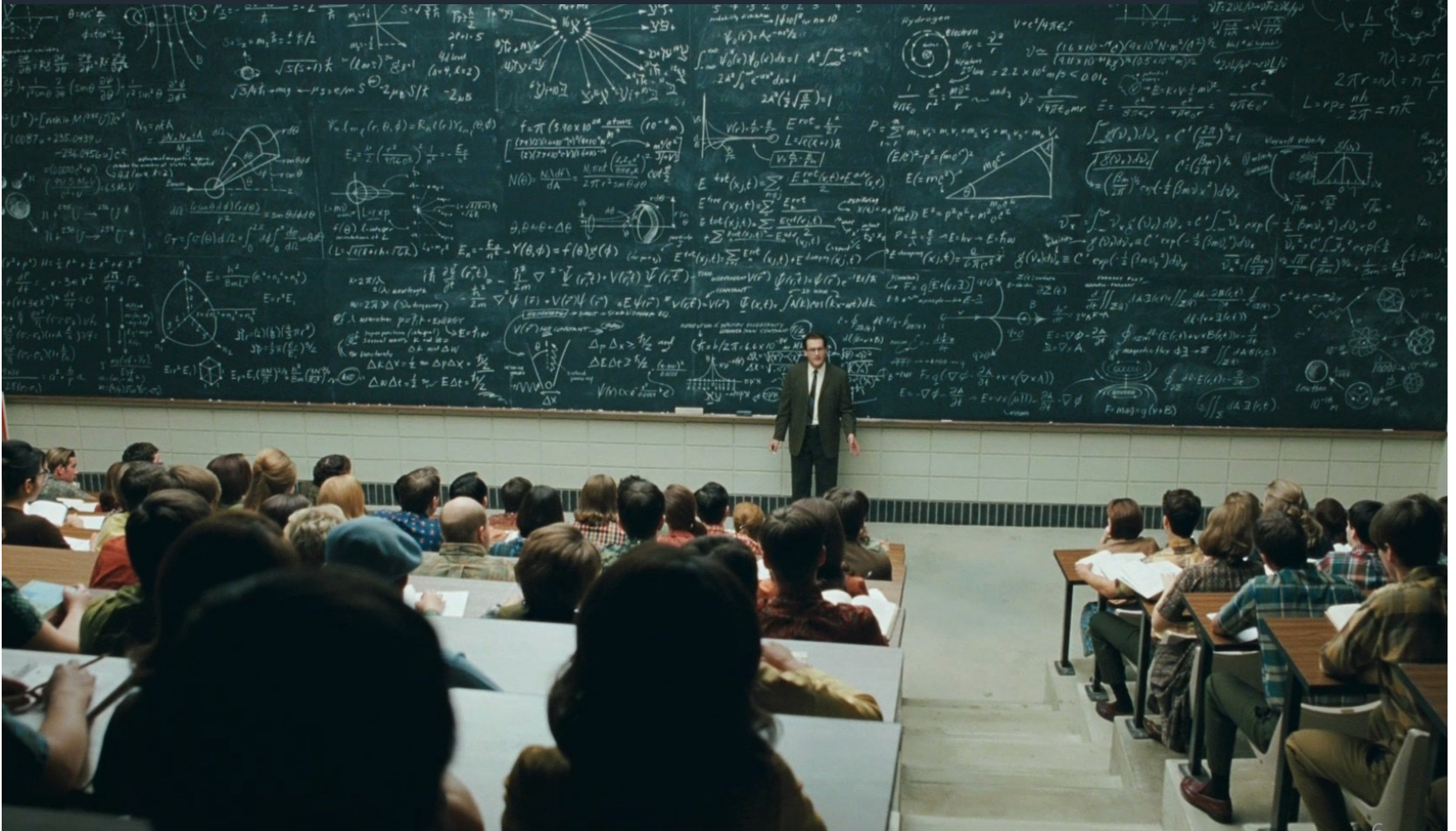


Can you recall a professor who had excellent content expertise but was not successful in helping you learn?

Teacher knowledge

Classroom practice

Student outcomes



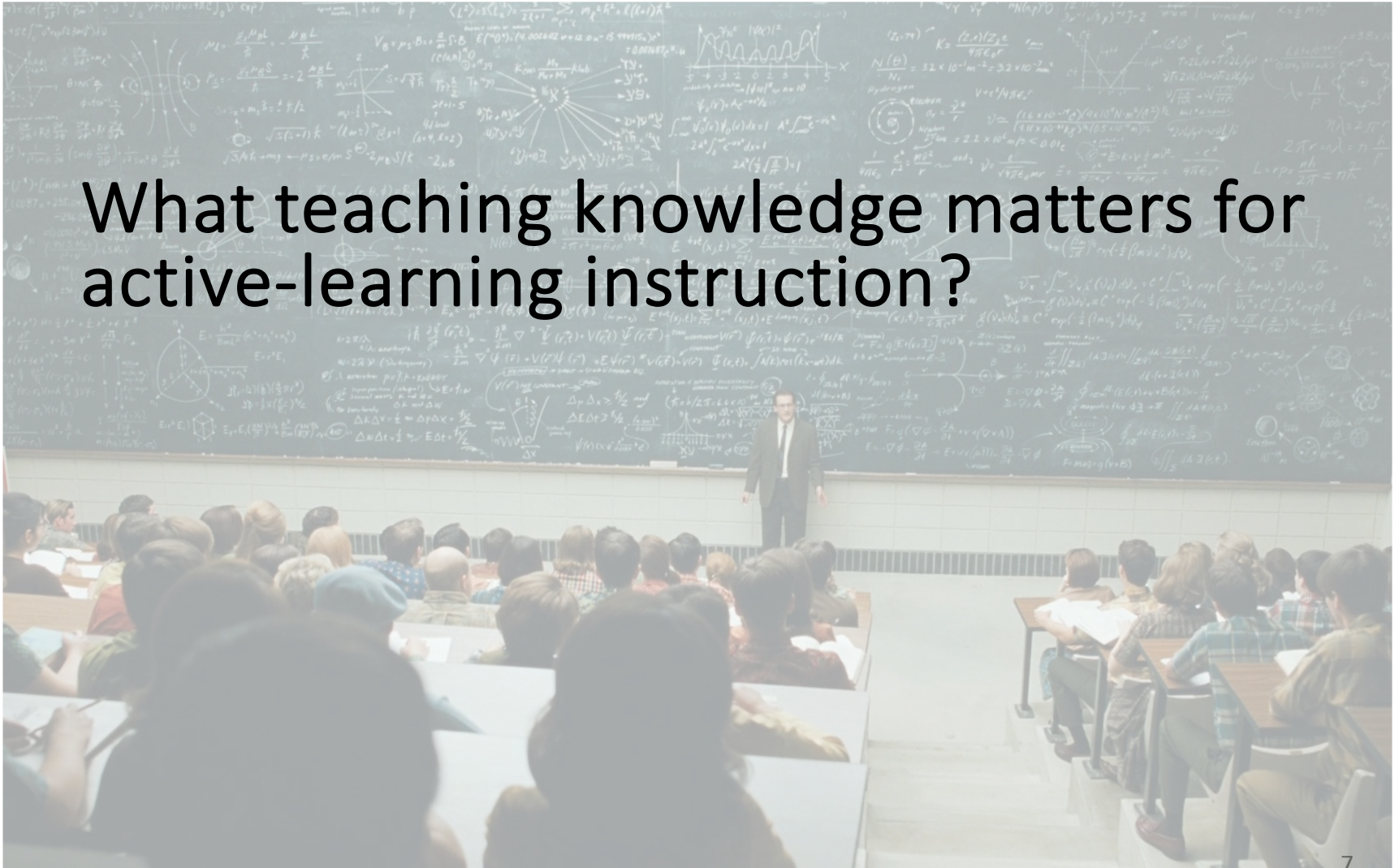
Teacher knowledge

Classroom practice

Student outcomes

If content knowledge alone is insufficient,

What teaching knowledge matters for active-learning instruction?



Why do we study knowledge?



Because you need expertise to adapt and innovate.

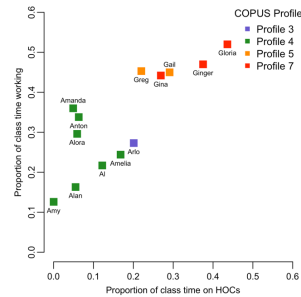
What teacher knowledge matters for active-learning instruction?

Study 1: Experts and novices analyze lessons



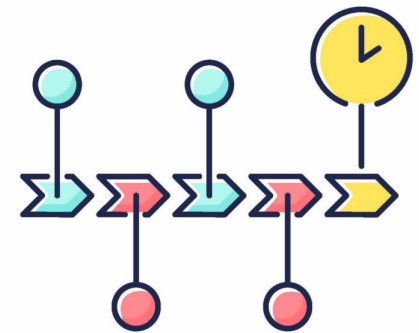
Auerbach et al. 2018
Auerbach & Andrews 2018

Study 2: In-depth contrast of knowledge while teaching



Andrews et al. 2019

Study 3: Longitudinal, in-depth study of development



Papers in prep

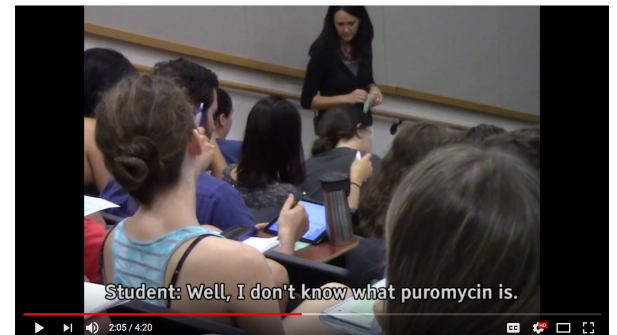
Study 1: Experts and novices analyze lessons

We are interested in your observations of teaching and learning in these classrooms. For each video, we will ask you to answer the following:

1. What was effective and why do you think it was effective?

2. What needs to be improved and why? How would you do it differently?

Auerbach et al. 2018



Study 2: In-depth contrast of knowledge while teaching

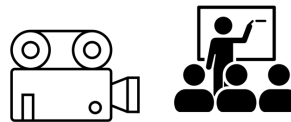
Eliciting teacher knowledge used in planning, enacting, and reflecting on instruction:

1. Pre-lesson interview (semi-structured)



Created by Cuputo from the Noun Project

2. Video-recorded “target” lesson



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3. Post-lesson interview (semi-structured + stimulated recall)

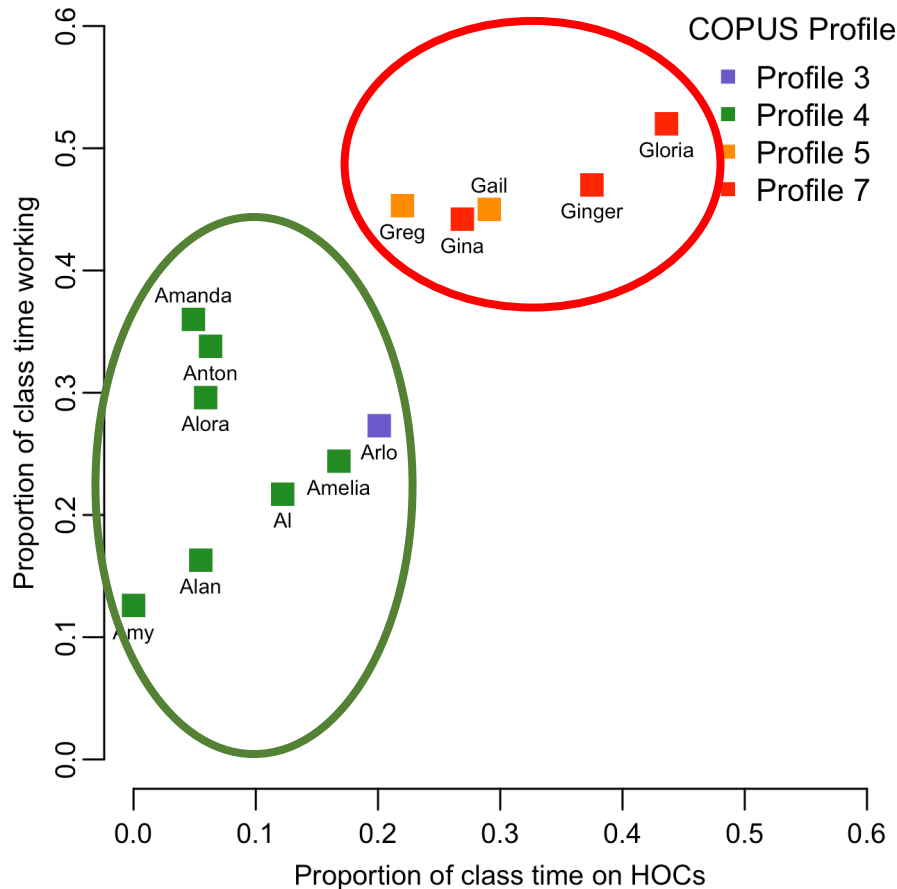


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Created by Discafeft

Study 2: In-depth contrast of knowledge while teaching



How do instructors using active learning that requires **higher-order cognitive skills** differ in their knowledge from those using active learning focused on **recall and comprehension**?

Study 3: Longitudinal in-depth study of development

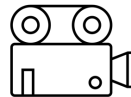
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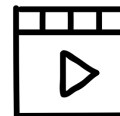


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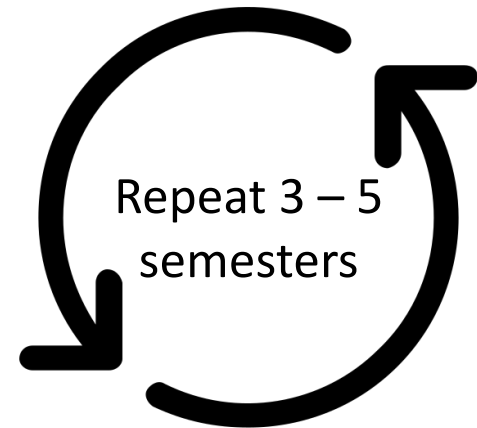
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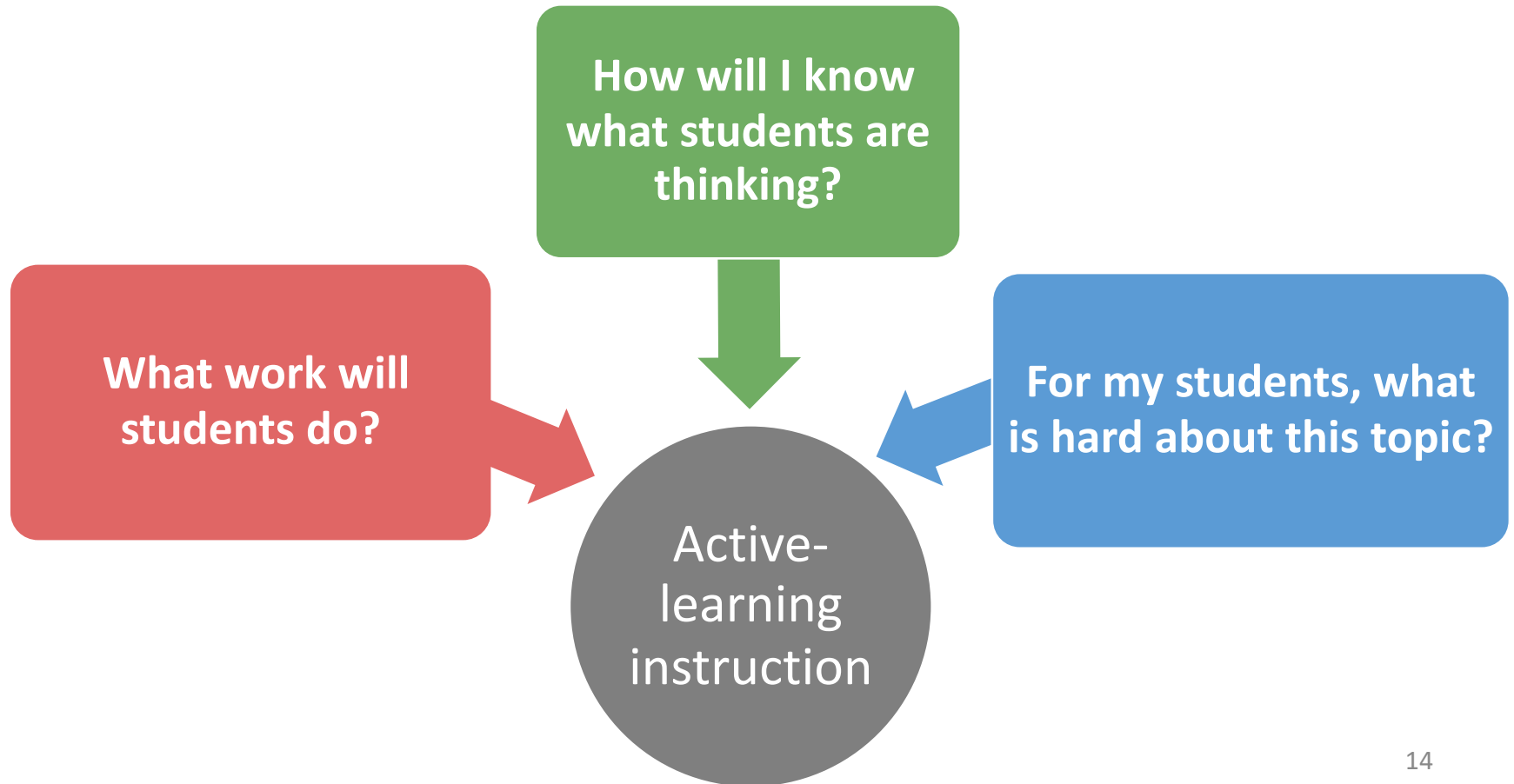
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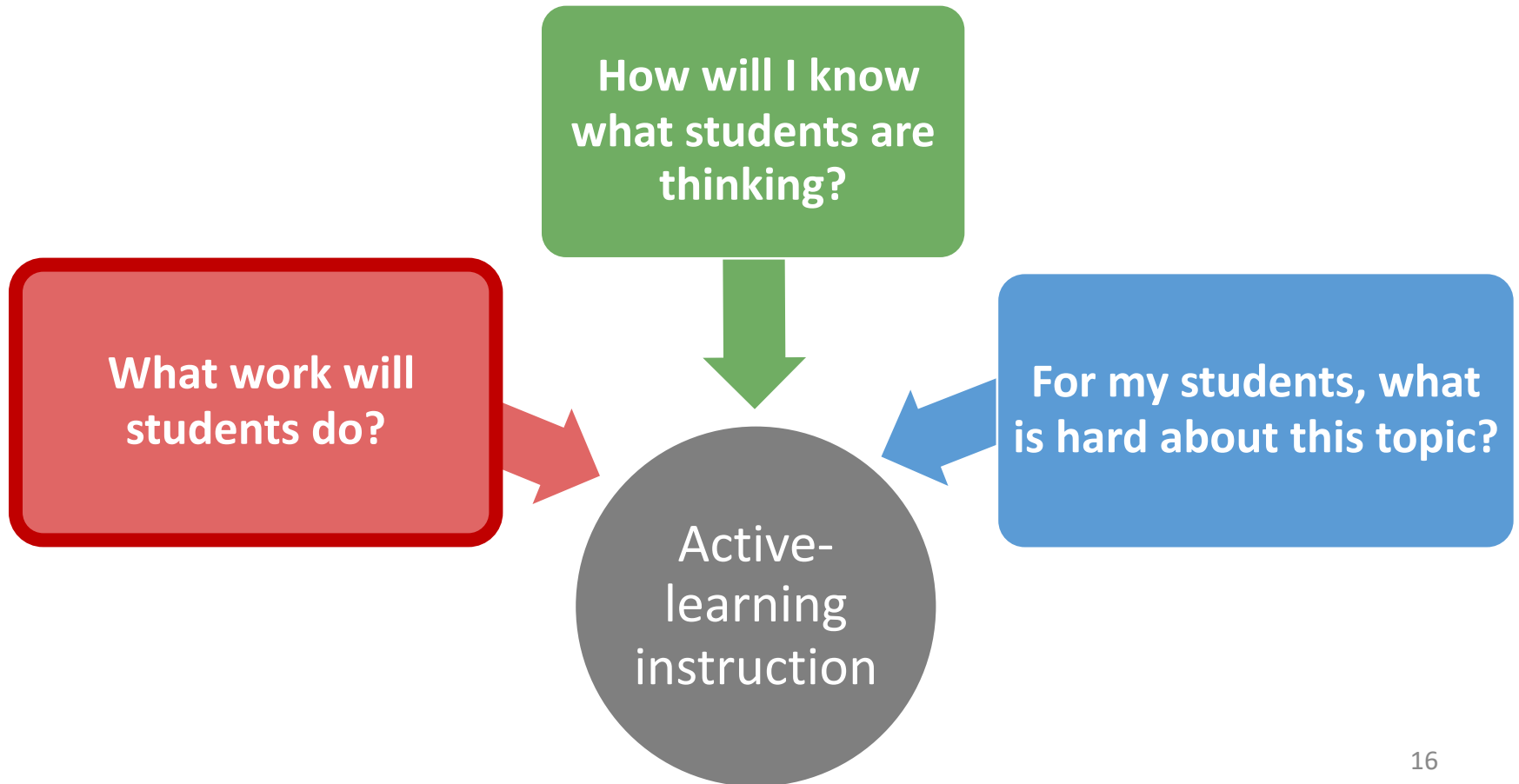
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Three important questions that expert active-learning instructors ask



Three important questions that expert active-learning instructors ask



What work will students do?

Recall an active-learning strategy that has worked well in your teaching (e.g., clicker questions, worksheet problem sets, peer instruction).

Answer this: **WHY** is that strategy helpful for student learning?

We will answer this question on Padlet. You can access it using this QR code or a link in the chat.



Expert active-learning instructors prioritize lessons that ask students to explain their reasoning

Study 1:

Experts were
1.8 times
more likely to
notice this in
a lesson ($p < 0.05$)

Study 2: Expert active-learning instructors planned and implemented lessons that prioritized time for students to articulate their reasoning.

Novice active-learning instructors wanted students to work in class, often to break-up lecture and to provide practice for exams.

Expert active-learning instructors prioritize lessons that ask students to explain their reasoning

“If they’re just listening then they—I think when students listen, things make sense to them. They either zone out or they think, ‘Yeah. It makes a lot of sense.’ But then when they have to explain something new in terms of what they think they know, they have to recall stuff and they have to put it in a correct order and they have to draw the correct relationships. And that takes work and the discussions give them that opportunity to do that ... I love it when they start to argue with each other because then they’re running up against some misconception that somebody has. And they really have to justify why they think a certain way.” --Gina

Trajectory of expertise development

Aims to break up the lecture, keep attention, test recall of ideas



Aims to provide practice with a concept and applying knowledge



Aims to provide opportunities for students to explain their thinking in order to recognize what they do and do not know

Passive:
Receiving
information

Active:
Physical engagement
& recall

Generative:
Generating something beyond
what has been presented to you

Shallow

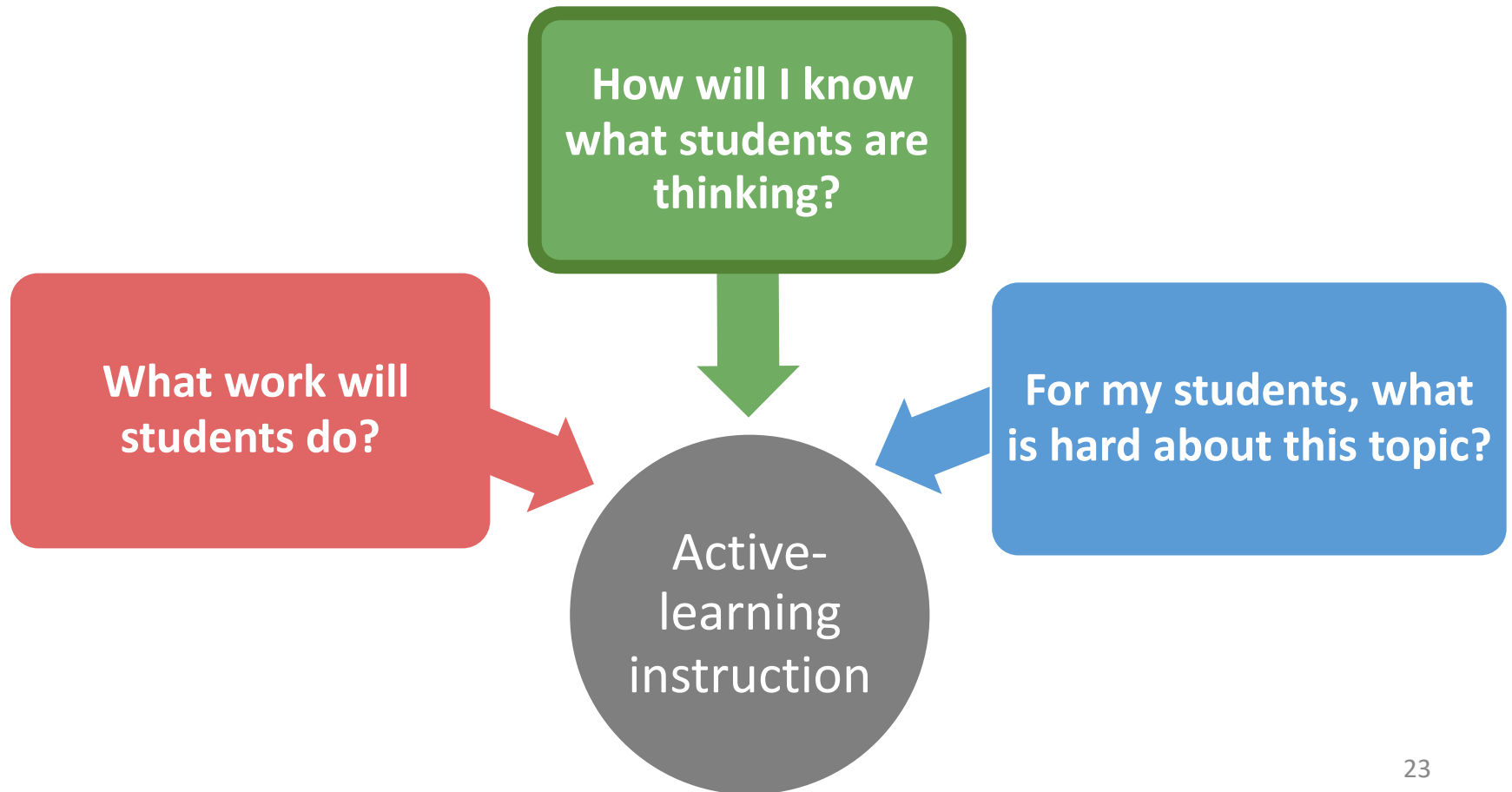
Depth of knowledge constructed

Deep

Examples of generative work:

- Apply knowledge to a novel scenario
- Explain the reasoning beyond your thinking
- Debating and justifying an argument
- Analyzing data and drawing conclusions based on those data

Three important questions that expert active-learning instructors ask



How will I know what students are thinking?

Recall the most recent class session that you taught (excluding exam days) and how you learned about what students were thinking during class.

Answer this: **WHY** did you try to learn what students were thinking during class?

We will answer this question on Padlet. You can access it using this QR code or a link in the chat.



Expert active-learning instructors monitor student thinking during class, typically by talking to students

Study 1:

Experts were 4.4 times more likely to notice this in a lesson ($p < 0.01$)

Study 2:

Expert active-learning instructors talked to students as they worked, trying to figure out what they were thinking.

Novice active-learning instructors typically created few opportunities to access student thinking.

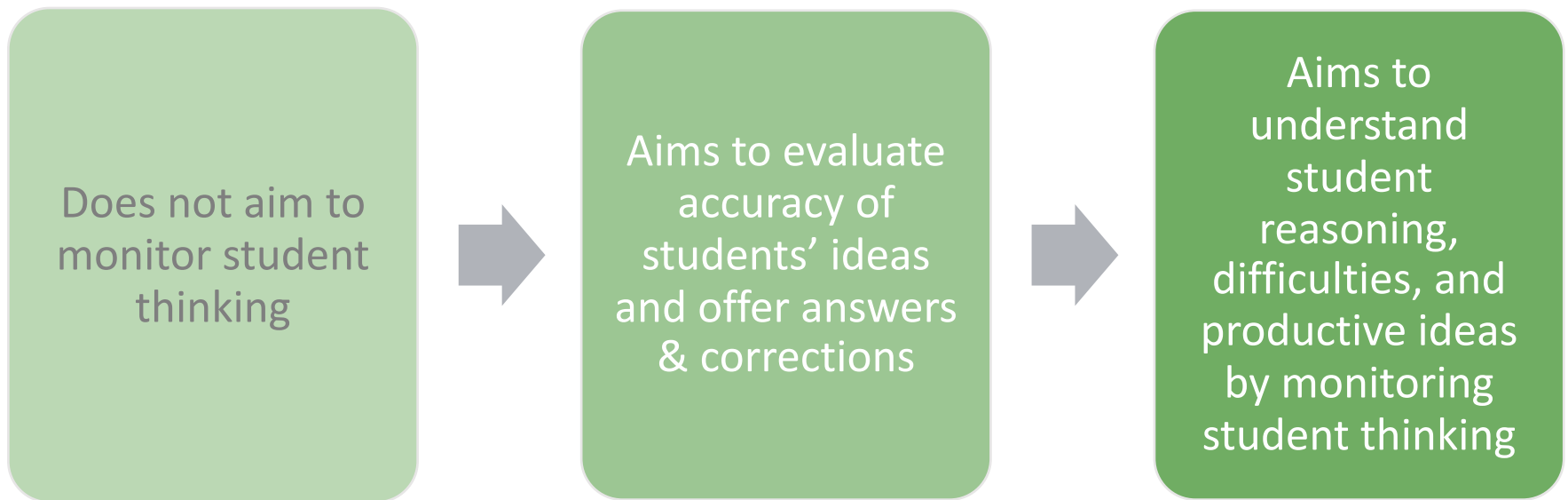
Expert active-learning instructors monitor student thinking during class, typically by talking to students

Gloria: I had a feeling what she had done wrong, but without doing math very quickly in my head, it was a lot easier for me and better learning experience for her to just explain it to me.

Interviewer: Why do you think her explaining her thinking is a better learning experience?

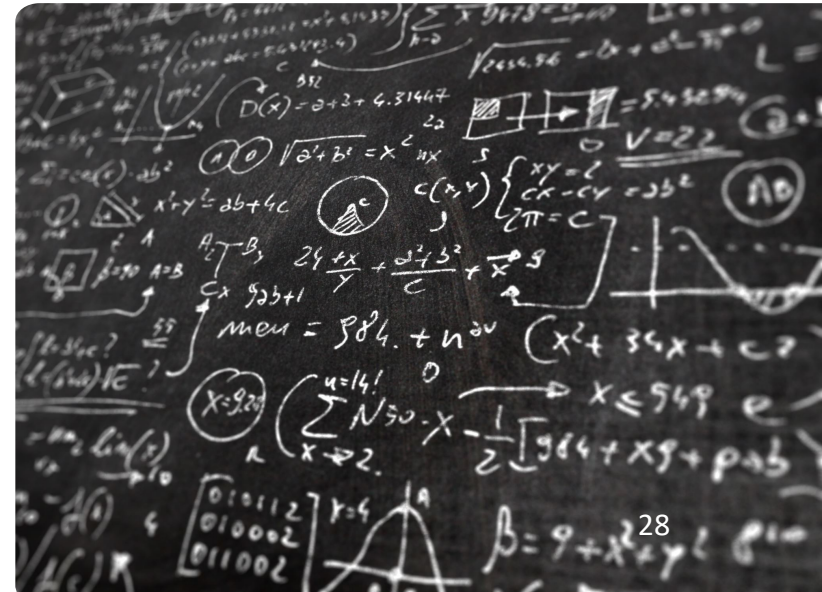
Gloria: Because she has to think through what she did, and then I can see where she went wrong and hopefully be able to draw out from her, how she can get to the right answer without me telling it to her. But I can't do that if I don't know where she is going wrong in her thinking.

Trajectory of expertise development

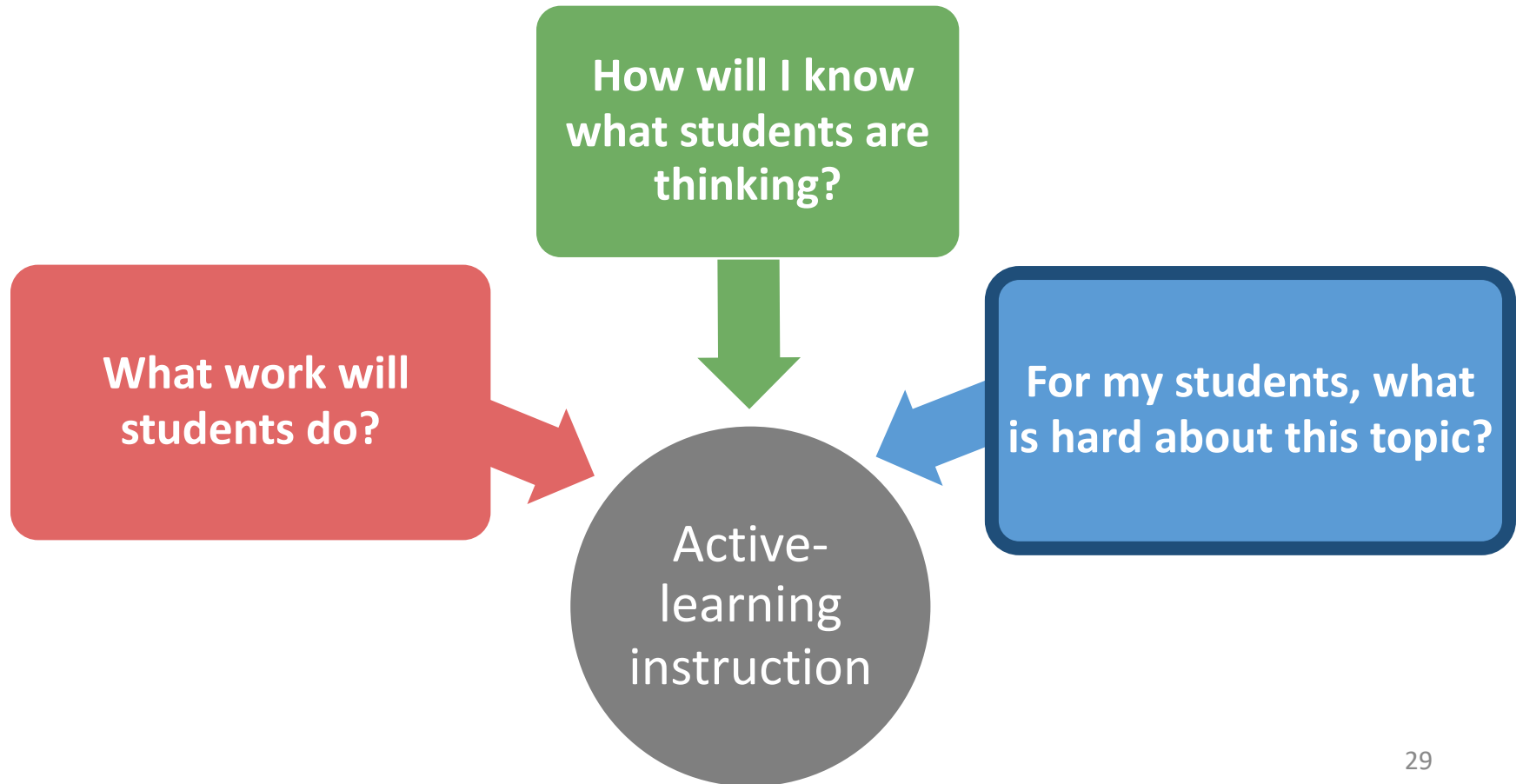


“If I had to reduce all of educational psychology to just one principle, it would say this: The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly.”

-Davis Ausubel, Educational psychologist



Three important questions that expert active-learning instructors ask



For my students, what is hard about this topic?

Think of a topic you teach that is predictably challenging for students.

Answer this: What is hard about learning this topic for your students? (i.e., where do they get stuck?)

We will answer this question on Padlet. You can access it using this QR code or a link in the chat.



Expert active-learning instructors prioritize lessons designed to target common difficulties

Study 1:

Experts were
4.7 times
more likely to
notice this in
a lesson ($p < 0.01$)

Study 2:

Expert active-learning instructors
anticipated their students' thinking and
made it central to lesson design,
prioritizing what was most difficult for
students.

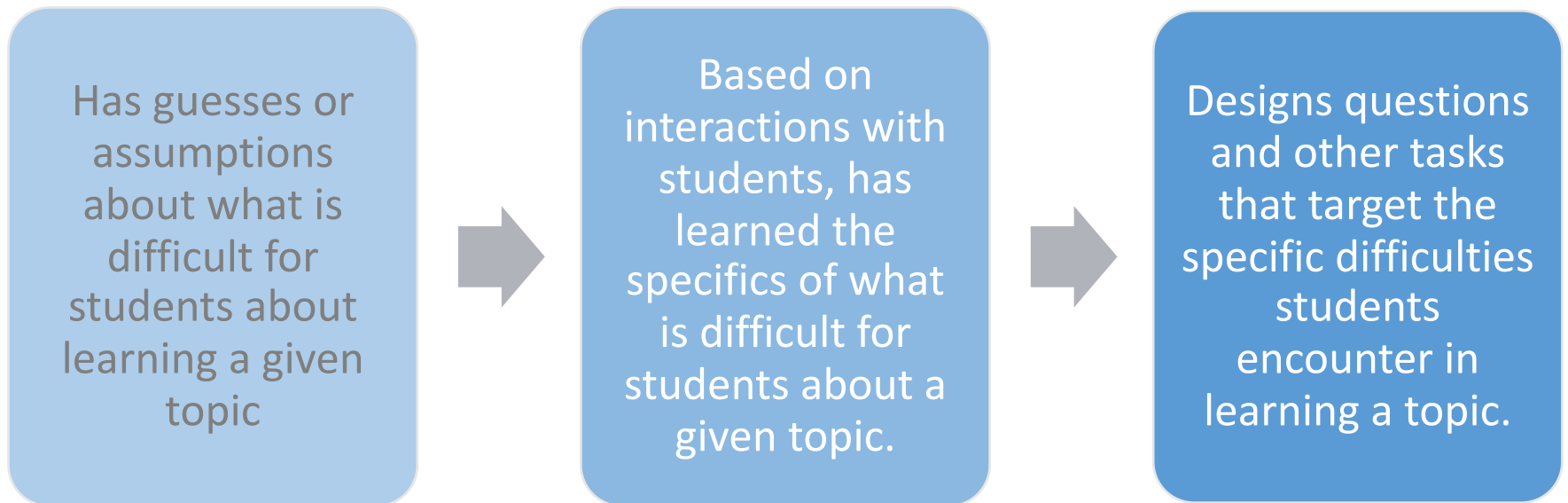
Novice active-learning instructors lacked
awareness of what was difficult for
students and/or did not prioritize it in
lesson design.

Expert active-learning instructors prioritize lessons designed to target common difficulties

Greg designed an activity on which students would struggle if they relied on a common wrong idea. He also planned to provide students with a different, but related task in the next class:

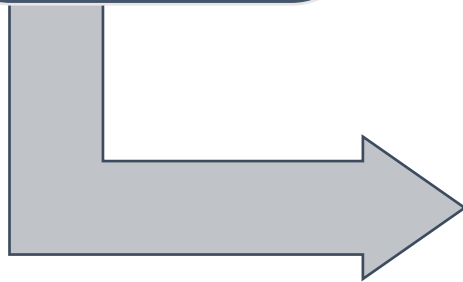
“With this type of activity, students attack it with a very memorize-y sort of approach. And so, I worry that if we do this once, they will look at it in this specific way and so when the test comes around they’ll try to attack it exactly the same way and it won’t go well.” --Greg

Trajectory of expertise development



Implications for our teaching

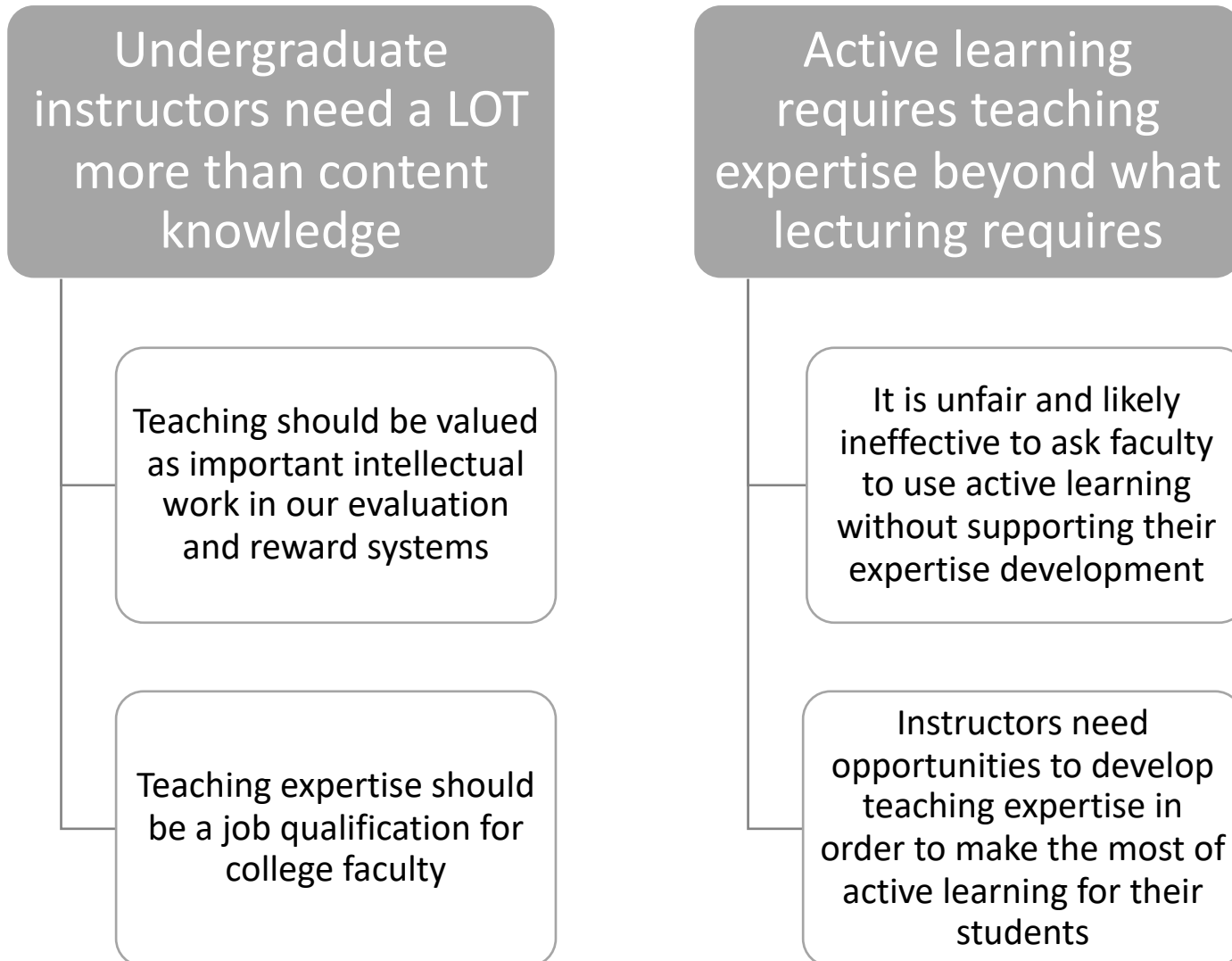
Student-centered teaching



Student-thinking-centered teaching

- Ask questions that **require reasoning** (not just recall)
- **Listen** to students as they work on those questions
- **Discover and prioritize what is especially difficult** for students

Implications for the larger system



Do you want more time to think about teacher knowledge?



The QR code will take you to a google doc that includes:

- Ideas for reflection and actions to build your own teaching knowledge
- Links to relevant essays and research articles

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Photo/icon credits

- discussion by Muhammad Irvanudin, Noun Project
- University of Minnesota
- <https://phillys7thward.org/2016/12/teacher-colleges-we-need-you-to-step-up/>
- questions, by Seochan, Noun Project
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Questions



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