What do you want them to learn today?

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Adapted from SEI Learning Goals Workshops at CU Boulder

Learning goals for today

You will be able to:

- Appreciate the value of developing learning goals
- Develop and communicate your learning goals clearly for your course as a whole, and for a particular topic
- Recognize the value of aligning assessments with goals

CASE STUDY: Frustrated Student

Think-Pair-Share

5 Minutes

- What issues might be contributing to this situation?
  - In the assessments? In shared understanding of expectations?
- What suggestions do you have for the professor?

An issue…

We do not always design for what we value.

AND

There is a huge disconnect between how students see the course and how we do. (They operate in a different reality!)

So…it’s critical to be explicit about purpose and expectations.

Teacher Centered Approach

Identify topics to "cover" in the course

What topics do ***I*** *need to teach my students?*

Create the syllabus and lecture slides

When will ***I*** teach the topics? How will ***I*** give them the information?

Write exam questions

How will ***I*** know that students learned the material ***I*** covered?

Learner Centered Approach

Identify learning goals/objectives → Decide on assessments → Create activities and syllabus

How will my ***students*** *be different?*

What evidence will ***students*** provide that they have changed?

What do ***students*** need to achieve those goals?

“Twin sins” of traditional course design

“Hands-on without minds on”

engaging without a clear purpose

“Coverage”

traversing all factual material within
a textbook or topic = learning

An old adage:

“If you don’t know exactly where you are headed, then any road will get you there.”

Wiggins and McTighe, Backward Design, 1998:

“How will we distinguish *merely interesting* learning from *effective* learning?”

“Good design is about learning to be more *thoughtful and specific* about our purposes and what they imply.”

For instruction to be effective…

- Lessons should be logically inferred from the results sought, not created without the results in mind

- Curriculum should lay out effective ways of achieving results, and these should be transparent to students

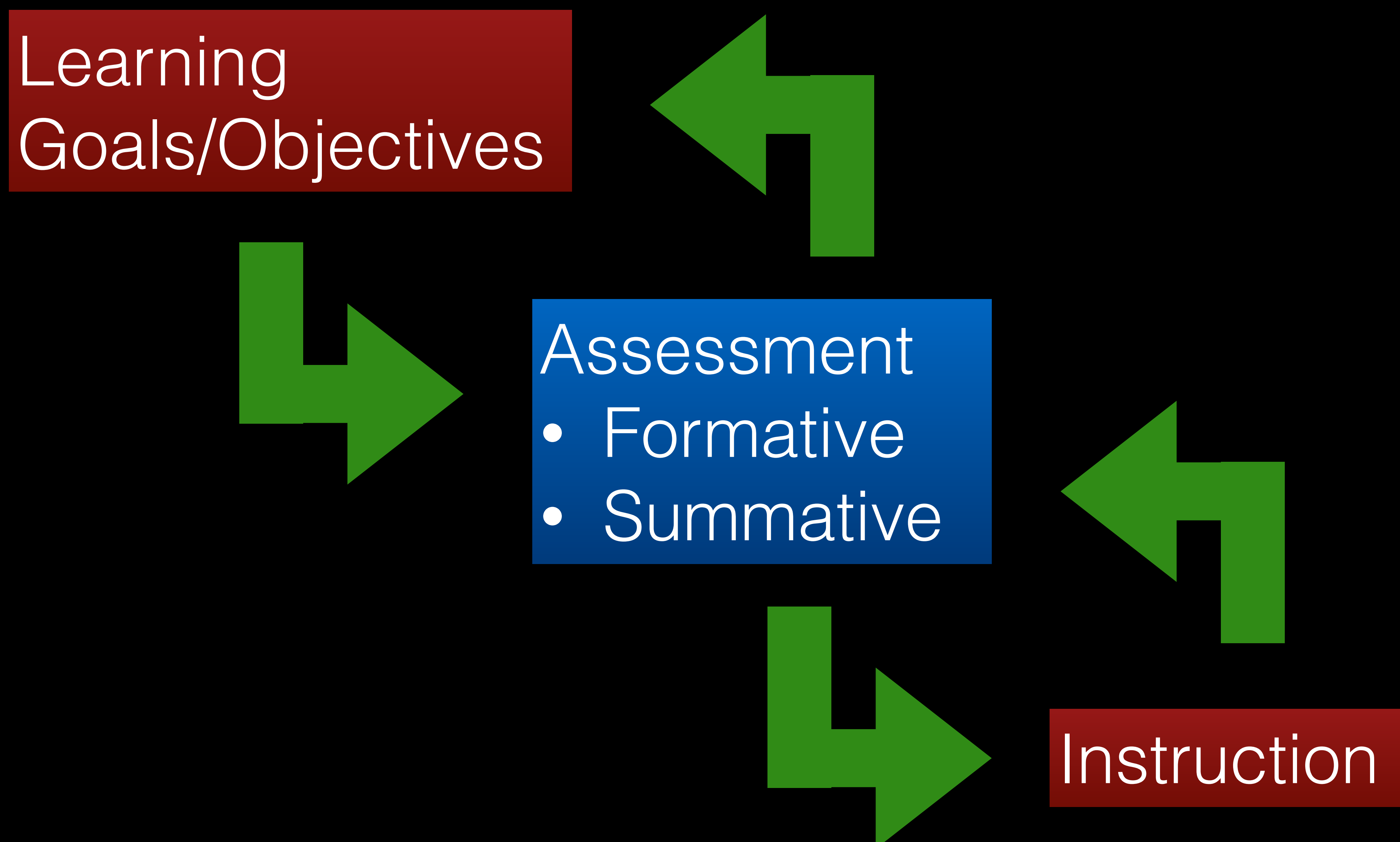
(i.e., Backward Design)

Backward Design

What should students know or be able to do by the end of the course/ session?

What evidence will convince you that they got there?

How will you help them get there?


Learning Goals/Objectives
Assessment
• Formative
• Summative
Instruction

Terminology

- **Learning goal:** Broad description of what students will understand and learn: often COURSE LEVEL (usually 5-10 per course)

- **Learning objective:** specific, action-oriented description of what students will <u>be able to do</u>: often CLASS LEVEL (usually 2-5 per topic)

This is not just a list of the syllabus topics, but statements of what students can do as a result of learning about the topic.

Example of Learning Goal vs. Learning Objective

Course learning goals	Topic-level learning objective
Students will understand the basic concepts of probability and random variables	Students will be able to: • Explain probability in terms of long-term relative frequencies • Find probabilities of single and complementary events • Calculate the mean and variant of a discrete random variable

Credit: UBC CWEI, www.cwsei.ubc.ca Stat 200

Example of Learning Goal vs. Learning Objective

Course learning goals	**Topic-level learning objective**
Students should see the various laws in the course as part of the coherent field theory of electromagnetism; ie., Maxwell's equations	Students should be able to interpret the third and fourth Maxwell's equations for electrostatics (divergence and curl of B) and use them to describe magnetostatics (i.e., Ampere's Law and Biot-Savart law are just applications of these laws).

Credit: Michigan State University, PHY 481

Different kinds of learning goals/objectives

- Content:
  - Memorizing, explaining, analyzing, integrating
- Skills:
  - Demonstrate complex problem solving skills
- Beliefs and Affect:
  - Thinking like a scientist, using scientific approaches
  - Appreciating/valuing/reflecting on science
- Metacognition:
  - Learning to learn, becoming an expert learner

We want our students to achieve all these goals, but articulating them is the hard part.

Activity: Develop course-scale goals for computation

On the whiteboards, write a few course-scale learning goals for a canonical physics course that form the driving goals of using computation in that course.

Work in pairs to do this.

You may work on a course at any level.

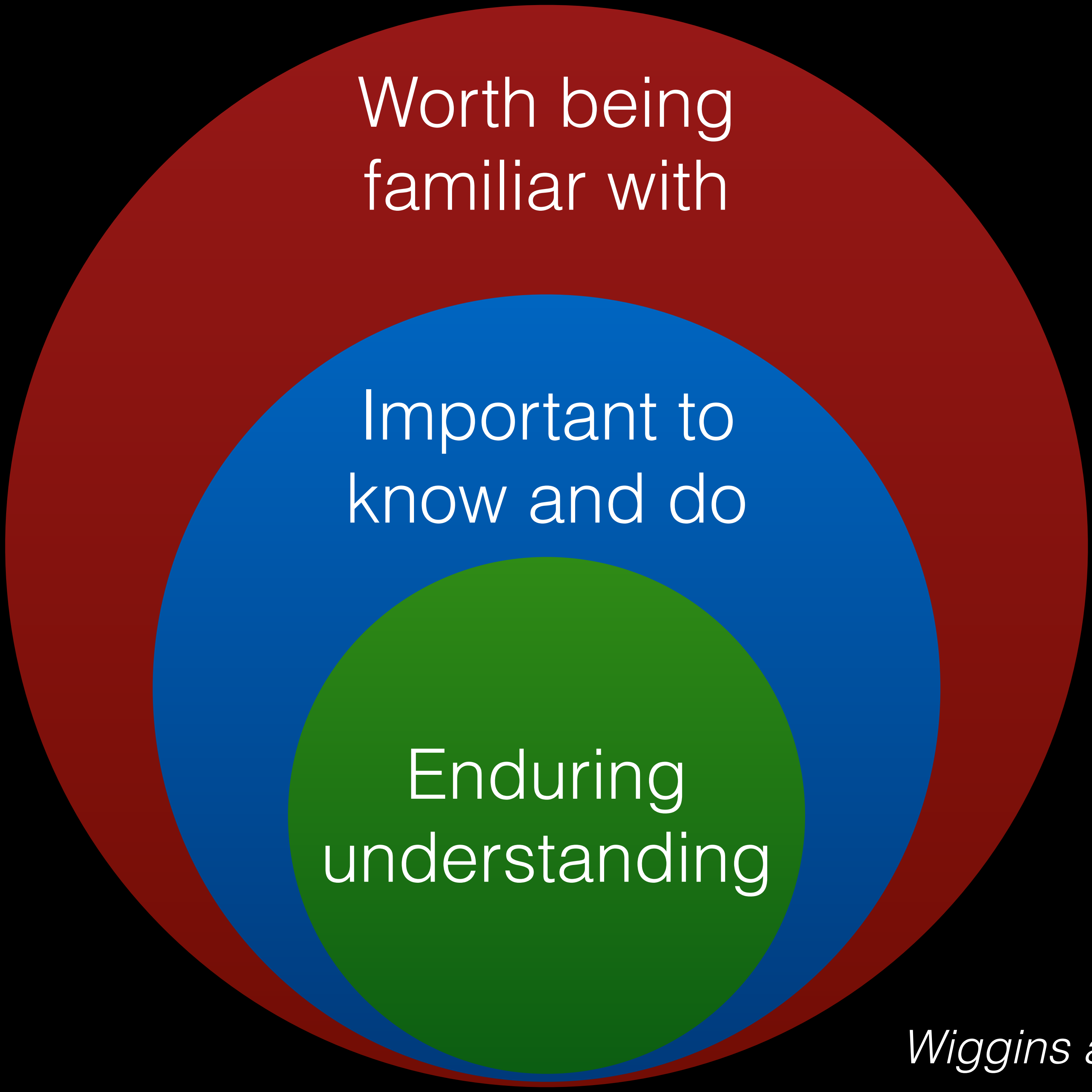
5 Minutes

Categorize your goals

- In a group, see if you can organize your goals into some categories or themes.
- We will then share-out.

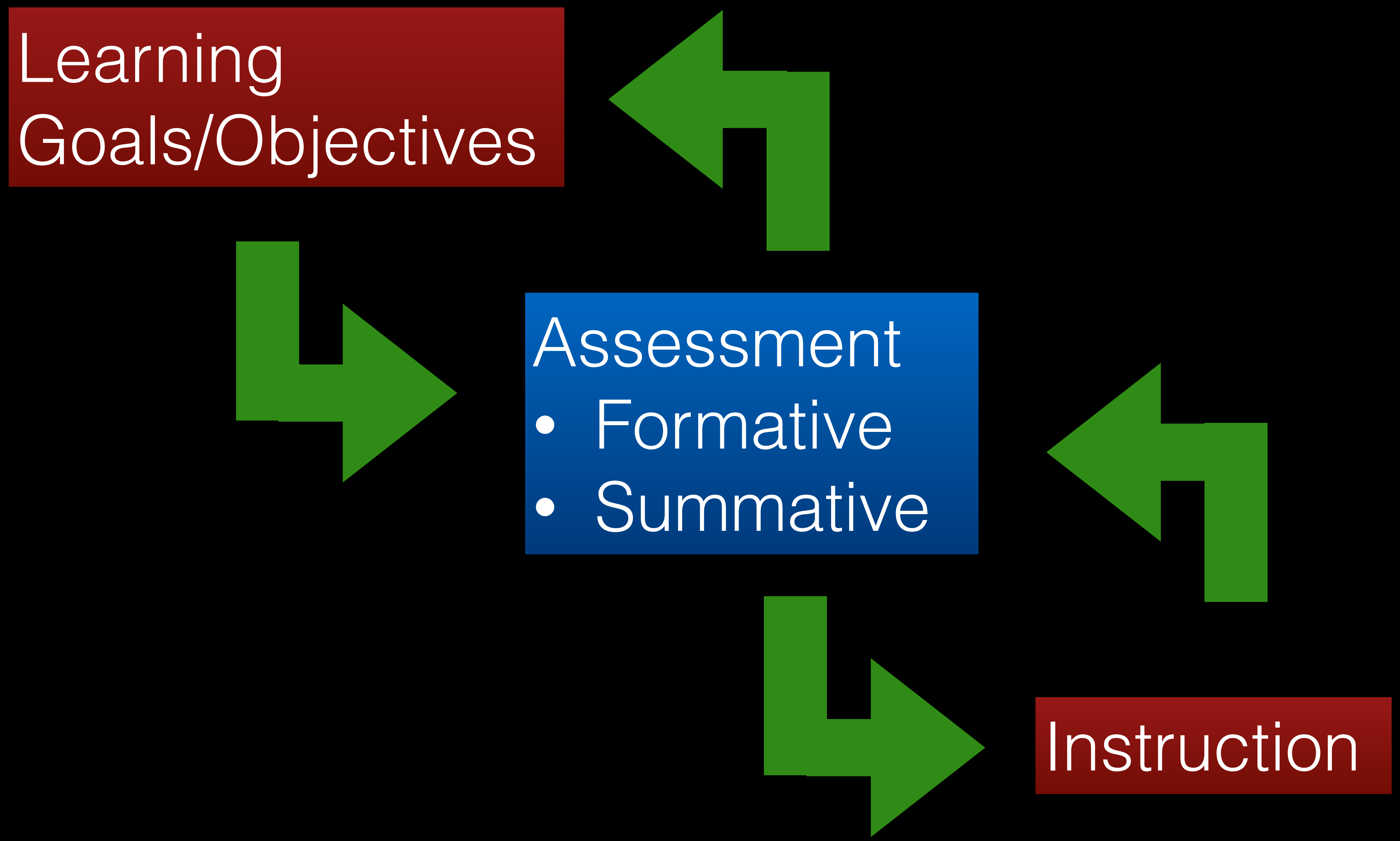
10 Minutes

Do your goals represent "enduring understandings"?



Wiggins and McTighe, 1998

Remember – this is just part of the process, you then need to align assessments & instruction



Look at your course goals

- What kind of knowledge is being assessed? Cognitive, procedural, metacognitive, affective?
- Is anything missing? Certain types of knowledge that are also important?
- How would students demonstrate success (assessment)? How might they achieve these goals (instructional activities)?

10 Minutes

Now let's look at topic-level learning objectives…

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Activity: Discussion

With a partner, think of a computational topic

- What are the essential pieces of student understanding in that topic?
- What are the lower- and higher-level components of that understanding?
- How does a student build mastery from these components?

5 Minutes

If you finish one, you are welcome to do another.

Write Learning Objectives

With your partner, write learning objectives for a specific computational physics topic.

Consider only a single lesson (class meeting, activity, lab, etc.)

5 Minutes

Check-list for refining **topic-scale** learning objectives:

- Is goal expressed in terms of **what the student will achieve** or be able to do?
- Is the goal **well-defined?** Is it clear how you would measure achievement?
- Do chosen verbs have a **clear** meaning?
- Is **terminology familiar**/common? If not, is the terminology itself a goal?
- Does the goal **align** with course-scale goals?
- Do your goals cover a range of types of knowledge?
- Is it relevant and useful to students?

5 Minutes

Now what?

- When would you write your learning goals?
- When do you refer to your written learning goals?
- How would you use these to streamline your course content?
- What are some pitfalls and troublespots?

Communicate your learning goals

Students appreciate knowing the explicit expectations of them.

It helps them focus their effort.

e.g., dannycab.github.io/teaching/phy481_lgs.html

How well did you achieve today's learning goals?

You will be able to:

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WARNING

INITIAL TRY
MAY NOT PRODUCE
DESIRED OUTCOME

Questions/Comments?

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