



# Aligning Research and Learning Goals

CURE Course Design Institute  
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## Entry Ticket

- What is the single most important thing you want students to take away from your CURE course? (i.e. a skill or a personal quality)
- Which aspect of your CURE research project best fosters your students' growth in this area?



## In this session we will

- Refine your research and learning goals
- Critically reflect on how your course research and learning goals align
- Identify student learning objectives that support your research and learning goals
- Identify potential conflicts that may arise when research and learning goals conflict and brainstorm strategies to mitigate such conflicts



## Why is it important to align research and learning goals?

- CUREs have two distinct sets of goals: Research goals to achieve a desired research outcome, and student learning goals (pedagogical goals)
- Using backward design, we can ensure that the elements of the course are designed to help students progress in research as well as learn and develop as scientists



## Distilling your goals

Try to refine your goals into 2 research goals and 3 student learning goals

- What are the overarching ideas of the research?
  - What are the general mileposts you need to meet to move the research forward?
- What broad knowledge, skills, or dispositions do you want students to develop by participating in research?
  - You are not allowed to say “to think critically” or “understand”
  - Can include affective goals
    - i.e. develop identity as a scientist or confidence/motivation

Fill in template with your goals (see template for examples)



## Discussion

Share your research and learning goals with a partner

- Are they comprehensible? Do they make sense to someone who may not be an expert in your discipline?
- Are they realistic? Too small or too far-reaching? Are they achievable in a semester (or the time allotted)?
- Other feedback or suggestions?



# Aligning your goals

You will choose one of your research goals

- Alignment of goals involves identifying specific objectives for students to achieve that allow progress toward that research goal AND a learning goal
  - Objectives should be measurable and/or observable



## Goal Alignment Example

	Research Goal 1: Compare the salt tolerance of plants found in agricultural and non-agricultural watersheds
Student Learning Goal 1: Make and defend decisions during experimentation	
Student Learning Goal 2: Communicate about research both orally and in writing	





# Goal Alignment Example

	Research Goal 1: Compare the salt tolerance of plants found in agricultural and non-agricultural watersheds
Student Learning Goal 1: Make and defend decisions during experimentation	<ul style="list-style-type: none"><li>• Determine the optimal way to carry out sample collection</li><li>• Design a controlled experiment</li><li>• Determine an appropriate sample size using a statistical power test</li><li>• Generate solutions to problems that come up and judge which solution is most appropriate</li><li>• Refer to other sources for guidance on methods</li><li>• Evaluate experimental design of peers and provide constructive feedback</li></ul>
Student Learning Goal 2: Communicate about research both orally and in writing	<ul style="list-style-type: none"><li>•</li></ul>

# Bloom's Taxonomy can help you write learning objectives

This taxonomy provides a framework for determining and clarifying learning *objectives*.

Learning *activities* often involve both lower order and higher order thinking skills as well as a mix of concrete and abstract knowledge.

**The Cognitive Process Dimension** represents a continuum of increasing cognitive complexity—from lower order thinking skills to higher order thinking skills. Anderson and Krathwohl (2001) identify nineteen specific cognitive processes that further clarify the scope of the six categories (Table 2).

**Table 2. The Cognitive Processes dimension — categories & cognitive processes** and alternative names

lower order thinking skills			→ higher order thinking skills		
remember	understand	apply	analyze	evaluate	create
recognizing <ul style="list-style-type: none"> <li>identifying</li> </ul> recalling <ul style="list-style-type: none"> <li>retrieving</li> </ul>	interpreting <ul style="list-style-type: none"> <li>clarifying</li> <li>paraphrasing</li> <li>representing</li> <li>translating</li> </ul> exemplifying <ul style="list-style-type: none"> <li>illustrating</li> <li>instantiating</li> </ul> classifying <ul style="list-style-type: none"> <li>categorizing</li> <li>subsuming</li> </ul> summarizing <ul style="list-style-type: none"> <li>abstracting</li> <li>generalizing</li> </ul> inferring <ul style="list-style-type: none"> <li>concluding</li> <li>extrapolating</li> <li>interpolating</li> <li>predicting</li> </ul> comparing <ul style="list-style-type: none"> <li>contrasting</li> <li>mapping</li> <li>matching</li> </ul> explaining <ul style="list-style-type: none"> <li>constructing models</li> </ul>	executing <ul style="list-style-type: none"> <li>carrying out</li> </ul> implementing <ul style="list-style-type: none"> <li>using</li> </ul>	differentiating <ul style="list-style-type: none"> <li>discriminating</li> <li>distinguishing</li> <li>focusing</li> <li>selecting</li> </ul> organizing <ul style="list-style-type: none"> <li>finding coherence</li> <li>integrating</li> <li>outlining</li> <li>parsing</li> <li>structuring</li> </ul> attributing <ul style="list-style-type: none"> <li>deconstructing</li> </ul>	checking <ul style="list-style-type: none"> <li>coordinating</li> <li>detecting</li> <li>monitoring</li> <li>testing</li> </ul> critiquing <ul style="list-style-type: none"> <li>judging</li> </ul>	generating <ul style="list-style-type: none"> <li>hypothesizing</li> </ul> planning <ul style="list-style-type: none"> <li>designing</li> </ul> producing <ul style="list-style-type: none"> <li>constructing</li> </ul>

(Table 2 adapted from Anderson and Krathwohl, 2001, pp. 67–68.)

# Bloom's Taxonomy can help you write learning objectives

A statement of a **learning objective** contains a **verb** (an action) and an **object** (usually a noun).

- The **verb** generally refers to [actions associated with] the intended **cognitive process**.
- The **object** generally describes the **knowledge** students are expected to acquire or construct. (Anderson and Krathwohl, 2001, pp. 4–5)

In this model, each of the colored blocks shows an example of a learning objective that generally corresponds with each of the various combinations of the cognitive process and knowledge dimensions.

Remember: these are learning **objectives**—not learning **activities**. It may be useful to think of preceding each objective with something like: “Students will be able to . . .”

\*Anderson, L.W. (Ed.), Krathwohl, D.R. (Ed.), Airasian, P.W., Cruikshank, K.A., Mayer, R.E., Pintrich, P.R., Raths, J., & Wittrock, M.C. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's Taxonomy of Educational Objectives* (Complete edition). New York: Longman.



Model created by: Rex Heer  
Iowa State University  
Center for Excellence in Learning and Teaching  
Updated January, 2012  
Licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.  
For additional resources, see:  
[www.celt.iastate.edu/teaching/RevisedBlooms1.html](http://www.celt.iastate.edu/teaching/RevisedBlooms1.html)



# Aligning your goals

Choose one of your research goals

- Fill in the table with specific objectives for students to achieve that allow progress toward that research goal AND a learning goal
  - Objectives should be measurable and/or observable
  - You may refer to Bloom's Taxonomy
  - See example on template
- If you finish your first research goal, write objectives for the other research goal



## Share your objectives with a partner and discuss:

- Are the objectives measurable, observable, and student-centered?
- Could students reasonably accomplish both the research and student goals by accomplishing the objectives?
- Any other feedback or suggestions for revision?



## Share

- What did you learn from this process of aligning your research and learning goals?
- What insight did you gain from hearing your partner's goals?
- What questions do you still have?

# Deciding what to emphasize in your CURE course

Emphasis on  
student-driven  
inquiry

Relevance to  
limited groups,  
student driven

Emphasis on  
publication  
quality results



What are the tradeoffs of these different approaches?



## What happens when research and learning goals conflict?

- In your group, brainstorm situations in which research and learning goals might conflict with each other and write them on your whiteboard
- For each conflict, write a solution or two that would mitigate that conflict





## Reflection and Revision of Goals

Revisit your goal alignment worksheet

- Are there areas where your research and learning goals conflict?
- Do you want to adapt or alter your goals to have better alignment? To emphasize student inquiry or broad relevance?

Make any revisions necessary to your goals alignment table



## Wrap Up/Exit Ticket - Aligning Research and Learning Goals

- Did any of your CURE course goals change today?  
If so, how?
- What did you learn from reflecting on the alignment of the research and learning goals for your course?

Next step: Developing assignments that help students achieve these goals and objectives