Supplementary Material

Kleinschmit AJ, Govindan B, Larson JR, Qureshi AA and Bascom-Slack C (2023) The CURE assessment landscape from the instructor’s point of view: knowledge and skills assessments are highly valued support tools for CURE adoption. *Front. Educ.* 8:1291071. doi: 10.3389/feduc.2023.1291071

A graph with text and numbers

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**Supplementary Figure 1**. Instructors overwhelmingly value attitudinal, skills-, and knowledge-based course learning outcomes (CLOs) in their CURE-integrated lab, while instructors’ department and/or institution places less importance on meeting attitudinal CLOs in courses and/or as part of reaching longitudinal programmatic goals when compared to skills- and/or knowledge-based CLOs.

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**Supplementary Figure 2**. Few instructors have attitudinal course learning outcomes (CLOs) on the books as part of their CURE-integrated course (or part of departmental/academic programmatic outcomes) even though most institutions’ curriculum committees are flexible and likely to approve course CLOs that would include attitudinal in addition to skills- and knowledge-based CLOs.

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**Supplementary Figure 3**. Departments and/or institutions as well as instructors rarely collect evidence for attitudinal course learning outcomes (CLOs) compared to knowledge and skills CLOs.

A screenshot of a graph

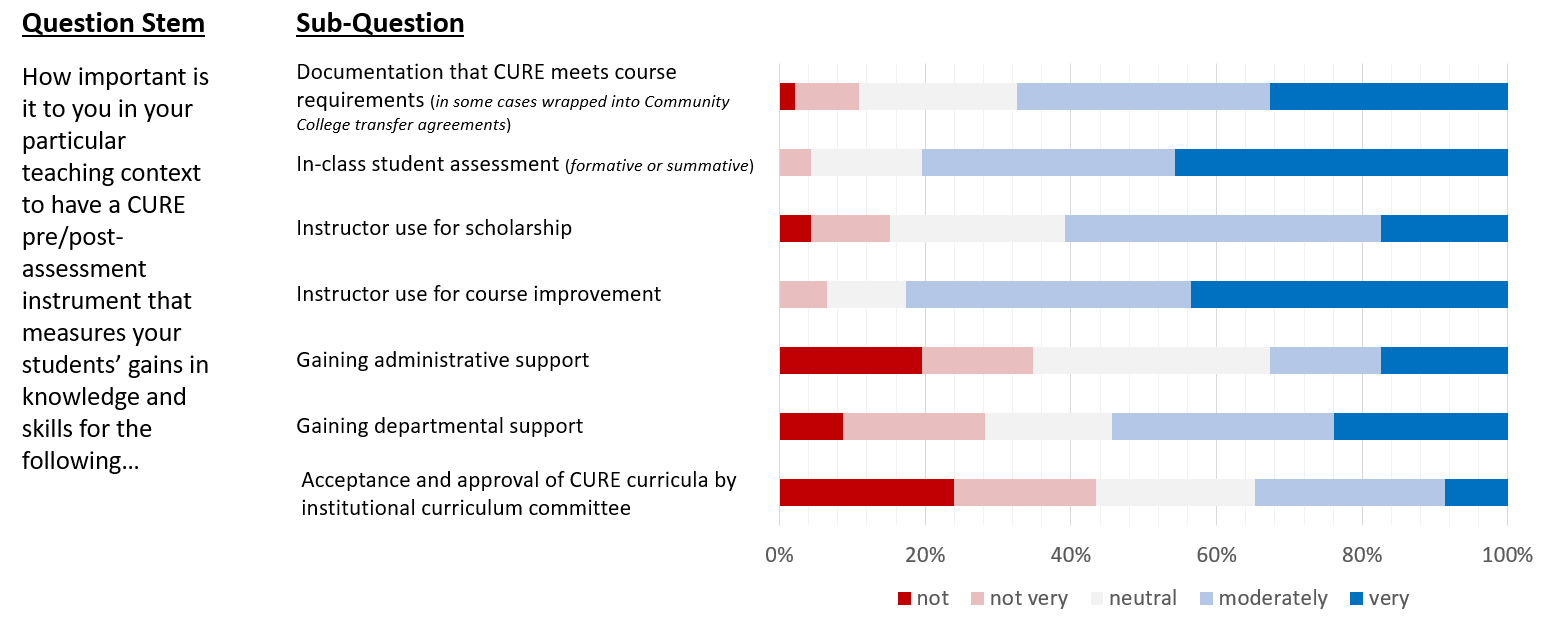
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**Supplementary Figure 4**. When considering whether to adopt a CURE, faculty generally value knowledge- and skills-based course learning outcome (CLO) data more than attitudinal CLO data. Assessment data are important for documenting that a CURE will meet course requirements.

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**Supplementary Figure 5**. Knowledge and skills-based assessments were preferred by respondents independent of institution type, but non-associate’s college respondents were more open to attitudinal assessments as their primary ranked preference.



**Supplementary Figure 6**. Instructors place importance in having access to a CURE pre/post-assessment instrument for measuring students’ gains in knowledge and skills after CURE adoption.

# Survey Instrument

**PARE Instructor Survey on the value of CURE Assessment Instruments**

*The PARE network assessment team would like to better understand the perceived value of CURE student assessment instrument types to better serve our community.*

**Part I - Teaching Context**

*Please tell us about the level of students you teach.*

1. What level of student do you primarily teach?

* High School
* College/University
* Other \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*High school–yes—take to a survey exit page that says thank you for your interest, but the survey questions are specific to undergraduate teaching. College/University or Other–takes respondent to the actual survey start page.*

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**Part II - Teaching Context**

*Please tell us about your institution where you teach.*

1. Your Institution Type (or closest match) [*multiple choice*]
   * Associate’s College
   * Baccalaureate College
   * Master’s College
   * Doctoral University
   * Other \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Part III - Stakeholder Perceptions of CURE Assessment**

*Please read the terminology definitions and respond to the associated questions below. If you are no longer teaching a CURE-integrated lab, answer for when you were teaching one.*

-----------------------Contextual Informational Text -----------------------------

*Definitions for Survey Question Terminology*

***Course Learning Outcomes*** *(****CLOs****) are specific and measurable statements that define the knowledge, skills, and/or attitudes learners will demonstrate by the completion of a course and are typically validated by an institutional curriculum committee as part of the course proposal or modification process.*

***CLOs*** *may focus on one or more domains of learning:*

1. Cognitive (**knowledge**) *- e.g., comprehension of concepts, theory, terminology*
2. Psychomotor (**skills**) *- e.g., technical, analytical, problem solving, calculations*
3. Affective (**attitudes**) *- [thoughts/feelings/actions] - e.g., scientific identity, persistence, grit, self-efficacy, sense of project ownership*

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1. Indicate the importance your **department and/or institution** places on meeting the following categories of **CLOs** (*see definition above*) within your CURE-integrated lab. ***[5-point Likert:*** *(Not at all important, low importance, neutral, somewhat important, very important)]*
   * knowledge-based CLOs *(e.g., comprehension of concepts, theory, terminology)*
   * skills-based CLOs *(e.g., technical, analytical, problem solving, calculations)*
   * attitudinal CLOs *(e.g., scientific identity, persistence, grit, self-efficacy, project ownership)*
2. Indicate the value **you as the instructor** place on meeting the following categories of **CLOs** within your CURE-integrated lab. *[****5-point Likert****: not at all valuable, low value, neutral, somewhat valuable, very valuable]*
   * knowledge-based CLOs *(e.g., comprehension of concepts, theory, terminology)*
   * skills-based CLOs *(e.g., technical, analytical, problem solving, calculations)*
   * attitudinal CLOs *(e.g., scientific identity, persistence, grit, self-efficacy, project ownership)*
3. Your **CLOs** are generated by…
   * Individual instructor teaching the course *(i.e., yourself)*
   * Agreement of a group of instructors that teach the course
   * Agreement of a group of instructors not all whom teach the course *(e.g., a group of biology faculty, biology program faculty)*
   * A multi-institutional board *(e.g., Community College System)*
   * Other - provide an explanation \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (**open field**)
4. Indicate the level of flexibility your institution *(e.g., institutional curriculum committee*) grants toward creation of **CLOs** for lab courses [**5-point Likert**: *not flexible, not very flexible, neutral, somewhat flexible, very flexible]*
5. How likely would your institution’s curriculum committee approve… *[5-point Likert; very unlikely, somewhat unlikely, neutral, somewhat likely, very likely]*
   * adding attitudinal CLOs *(e.g., scientific identity, persistence, grit, self-efficacy, project ownership)* to a lab course in addition to knowledge/skills-based CLOs.
   * having solely attitudinal CLOs for a lab course (w/out knowledge/skill-based CLOs).
6. Does your CURE-integrated lab course have curriculum committee-approved **CLOs** that are… *Note: if you are no longer teaching a CURE-integrated lab, answer for when you were teaching one.*
   * knowledge-based
   * skills-based
   * attitudinal-based
7. Does your **department and/or institution** collect evidence of meeting the following laboratory CLOs? *[****5-point******Likert****: never, not necessary, neutral, encouraged, required]*

*Direct evidence may include evaluation of student products, student work, proficiency testing, etc., while indirect evidence may include interviews, surveys, self-evaluation, etc.*

* + knowledge-based CLOs *(e.g., comprehension of concepts, theory, terminology)*
  + skills-based CLOs *(e.g., technical, analytical, problem solving, calculations)*
  + attitudinal CLOs *(e.g., scientific identity, persistence, grit, self-efficacy, project ownership)*

1. What type(s) of evidence (if any) does your **department and/or institution** require for meeting laboratory CLOs? *[free response]*
2. Do **you as the instructor** formally collect evidence of meeting the following laboratory **CLOs** (for individual instructor use) at least one time during a typical semester? *[****4-point******Likert****: never, not likely, likely, very likely]* 
   * Meeting knowledge-based CLOs *(e.g., comprehension of concepts, theory, terminology)*
   * Meeting skills-based CLOs *(e.g., technical, analytical, problem solving, calculations)*
   * Meeting attitudinal CLOs *(e.g., scientific identity, persistence, grit, self-efficacy, project ownership)*
3. Indicate the importance **your department and/or institution** places on meeting the following categories of **CLOs** toward reaching **longitudinal programmatic goals**. *[****5-point Likert****: not at all important, low importance, neutral, somewhat important, very important]*
   * knowledge-based CLOs *(e.g., comprehension of concepts, theory, terminology)*
   * skills-based CLOs *(e.g., technical, analytical, problem solving, calculations)*
   * attitudinal CLOs *(e.g., scientific identity, persistence, grit, self-efficacy, project ownership)*
4. Does your **department/academic program** have long-term **attitudinal-based** (*e.g., scientific identity, persistence, grit, self-efficacy*) **programmatic outcomes**? If so, are they assessed/how assessed? [open-response]

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**Part IV - Instructor Perceived Value of Assessment**

1. Indicate the level of support that is provided to you for implementing a CURE by your… [**5-point Likert**: *not supportive, not very supportive, neutral, somewhat supportive, very supportive]*
   * Department
   * Institutional Administration
2. When considering to adopt a network CURE, **how important is it to see data** (provided by the network) on student outcomes in the following categories?

*network CURE = multi-institutional CURE with centralized support providing curricula, training, professional development, etc.* [**5-point Likert**: *not important, not very important, neutral, somewhat important, very important]*

* + knowledge-based outcomes *(e.g., comprehension of concepts, theory, terminology)*
  + skills-based outcomes *(e.g., technical, analytical, problem solving, calculations)*
  + attitudinal-based outcomes *(e.g., scientific identity, persistence, grit, self-efficacy, project ownership)*

1. When considering to adopt a network CURE, **how important is it to see data** (provided by the network) on student outcomes for the following uses? [***5-point Likert:*** *not important, not very important, neutral, moderately important, very important*]
   * Documentation that CURE will meet course requirements (in some cases wrapped into Community College transfer agreements)
   * Acceptance and approval of CURE curricula by institutional curriculum committee
   * Gaining departmental support
   * Gaining administrative support
2. How important is it to you in your particular teaching context to have a CURE pre/post-assessment instrument that measures your students’ gains in **knowledge and skills** for the following… [***5-point Likert:*** *not important, not very important, neutral, moderately important, very important*]
   * Acceptance and approval of CURE curricula by institutional curriculum committee
   * Gaining departmental support
   * Gaining administrative support
   * Instructor use for course improvement
   * Instructor use for scholarship
   * In-class student assessment (*formative or summative*)
   * Documentation that CURE meets course requirements (in some cases wrapped into Community College transfer agreements)
3. How important is it to you in your particular teaching context to have a CURE pre/post-assessment instrument that measures your students’ gains in **attitudes** for the following… [***5-point Likert:*** *not important, not very important, neutral, moderately important, very important*]
   * Acceptance and approval of CURE curricula by institutional curriculum committee
   * Gaining departmental support
   * Gaining administrative support
   * Instructor use for course improvement
   * Instructor use for scholarship
   * In-class student assessment (*formative or summative*)
   * Documentation that CURE meets course requirements (in some cases wrapped into Community College transfer agreements)
4. **Rank** your preference in administering the following types of focused pre/post CURE assessment instruments: *numbers will appear after initial movement of items below, which can then be ordered by preference - 1 is most preferred* **[rank *1-3*]**
   * knowledge-based outcomes *(e.g., comprehension of concepts, theory, terminology)*
   * skills-based outcomes *(e.g., technical, analytical, problem solving, calculations)*
   * attitudinal outcomes *(e.g., scientific identity, persistence, grit, self-efficacy, project ownership)*
5. What factored into your **lowest ranked** assessment category preference for the previous question? **[5- point Likert:** *strongly disagree, disagree, neutral, agree, strongly agree*]
   * least useful for student feedback
   * least useful for me to improve my teaching of the course
   * least useful for my own scholarship
   * least useful for gaining departmental and/or institutional support to continue using CURE
   * least useful for documenting that CURE meets course requirements (in some cases wrapped into Community College transfer agreements)
   * Least useful for in-class student assessment (formative or summative)
   * did not previously consider assessing
6. Assuming you would **NOT assess** all three assessment categories (*i.e., knowledge, skills, attitudes*), **what factors into that decision**? **[5- point Likert:** *strongly disagree, disagree, neutral, agree, strongly agree*]
   * limited class time
   * to avoid student assessment fatigue
7. Does your **department and/or administration** call for evidence of CURE effectiveness prior to integrating CURE-based lab curricula in the classroom. [***4-point Likert****: never, indifferent, encouraged, required*]
8. Have you used the PARE knowledge/skills survey and/or its associated data? [**yes/no**]

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**Part V - PARE Student Knowledge/Skills Assessment Instrument Usage**

*[survey logic - “yes” respondents are taken to the following set of open-response subquestions. “No” respondents are pushed to end of survey]*

1. What prompted you to use the PARE student knowledge/skills assessment instrument in your classroom? *[free response]*
2. How did you use the results from the PARE student knowledge/skills assessment instrument? Why? *[free response]*

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**Part VI - Participant Metadata**

*Please tell us about you as an instructor and your institution*

1. Your Name (e.g., John Doe) [*open field*] (optional)
2. Your non-abbreviated Institution Name (e.g., Tufts University) [*open field*] (optional)

**-----------End Survey---------------------------------------------------------------------**