



# STEM COLLEGE TEACHING PROFICIENCY SELF-ASSESSMENT TOOL

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## Introduction

This tool is designed to help educators of undergraduates in science, technology, engineering, and mathematics (STEM) settings assess their proficiency for performing certain teaching practices.

The tool contains three major elements:

1. directions for completing the self-assessment,
2. resources about teaching-focused professional development for STEM college educators, and
3. sections in which teachers assess their current and desired proficiency for performing teaching practices.

The central, self-assessment element of the tool contains tasks organized around broad domains related to undergraduate STEM teaching. More information about the sources from which these domains and tasks were drawn can be found in the resources at the end.

## Completing the Assessment

This self-assessment tool focuses on STEM college teaching proficiency, that is, the knowledge, skills, and attitudes that comprise a teacher's capability to perform if given the opportunity. Teachers using this tool evaluate the level at which they perform certain teaching practices and identify any gaps between their current and desired proficiency. If gaps are found, teachers determine whether they are motivated to formulate action plans to address the gap.

Using research and exemplars, we have specified four levels of teaching proficiency:

1. *Novice*: The teacher does not perform this practice, or if performed, the practice is not having positive effects on student learning.
2. *Developing*: The teacher sometimes performs this practice, and sometimes notices positive effects on student learning.
3. *Competent*: The teacher performs this practice well and notices steady positive effects on student learning.
4. *Expert*: The teacher sees their performance of this practice as a strength, can adapt the practice to fit student learning needs, and sees significant positive student learning and achievement outcomes.

In the self-assessment sections, mark your *current* and *desired proficiency* for performing each teaching practice using the levels identified above, if applicable to your professional role. Then, use the text boxes provided to reflect on your assessments in three key ways:

1. *Identify gaps* between your current and desired proficiency levels for any of the teaching practices.
2. *Reflect* on whether you are motivated to address these proficiency gaps, and consider what factors influence that motivation. Examples include professional growth, job satisfaction, improved teaching evaluations, and the respect of your colleagues. Think about your professional values and goals when assessing your motivations.
3. *Think of actions* you could take to address any teaching proficiency gaps. Such steps could include seeking out the support of your colleagues or administrators at your institution; identifying courses, conferences, webinars, or other trainings in which you can learn more about a teaching practice; and finding a mentor or teaching specialist who can support your professional development goals.

We encourage people using this tool to respond to only those items that are appropriate to their institutional and disciplinary contexts, goals, and professional roles.

### Using Self-Assessment Tools

Self-assessments can be used...

- By undergraduate teachers wanting to to develop their knowledge and skills;
- To point toward targeted professional development offerings
- By learners and programs to identify areas of strength and opportunity

Self-assessments should not be used to...

- Suggest failures or deficiencies in learners
- Breach the confidentiality or trust of the learners who complete them

<b>CURRENT TEACHING PROFICIENCY</b> At what level do you believe you <i>can perform</i> these teaching practices?					<b>Section A: Designing the Course</b>	<b>DESIRED TEACHING PROFICIENCY</b> At what level would you <i>like to perform</i> these teaching practices?					
Not applicable	Novice	Developing	Competent	Expert		PRACTICE DESCRIPTION	Not applicable	Novice	Developing	Competent	Expert
					A1. I articulate learning goals to students						
					A2. I select textbooks or readings that help meet course goals						
					A3. I design student assessments						
					A4. I plan class exercises or activities						
					A5. I articulate grading criteria to students						

Is there a gap between how well you can perform any of these teaching practices and how well you would like to perform them? Are some gaps more important to you than others?

If so, are you motivated to address this gap? What factors influence this motivation for you?

What actions could you take to improve your proficiency in designing and planning a course?

Other notes and comments:

<b>CURRENT TEACHING PROFICIENCY</b> At what level do you believe you <i>can perform</i> these teaching practices?					<b>Section B: Classroom Teaching</b>	<b>DESIRED TEACHING PROFICIENCY</b> At what level would you <i>like to perform</i> these teaching practices?				
Not applicable	Novice	Developing	Competent	Expert		PRACTICE DESCRIPTION	Not applicable	Novice	Developing	Competent
					B1. I use a variety of teaching strategies to support learning					
					B2. I clearly communicate my expectations to students					
					B3. I actively engage students in learning activities					
					B4. I give students opportunities to build confidence in their abilities through practicing application of their skills					
					B5. I provide class activities in which students collaborate with each other					

Is there a gap between how well you can perform any of these teaching practices and how well you would like to perform them? Are some gaps more important to you than others?

If so, are you motivated to address this gap? What factors influence this motivation for you?

What actions could you take to improve your proficiency in teaching in the classroom?

Other notes and comments:

<b>CURRENT TEACHING PROFICIENCY</b> At what level do you believe you <i>can perform</i> these teaching tasks?					<b>Section C: Creating the Classroom Environment</b>	<b>DESIRED TEACHING PROFICIENCY</b> At what level would you <i>like to perform</i> these teaching tasks?				
Not applicable	Novice	Developing	Competent	Expert	<b>PRACTICE DESCRIPTION</b>	Not applicable	Novice	Developing	Competent	Expert
					C1. I explicitly encourage students to ask questions during class					
					C2. I explicitly encourage students to express their ideas in class					
					C3. I encourage participation from women or members of racial and ethnic minority groups					
					C4. I encourage students to respect one another in class					
					C5. I address disagreements between myself and my students					

Is there a gap between how well you can perform any of these teaching practices and how well you would like to perform them? Are some gaps more important to you than others?

If so, are you motivated to address this gap? What factors influence this motivation for you?

What actions could you take to improve your proficiency in creating a positive classroom environment?

Other notes and comments:

<b>CURRENT TEACHING PROFICIENCY</b> At what level do you believe you <i>can perform</i> these teaching practices?					<b>Section D: Assessing Student Learning</b>	<b>DESIRED TEACHING PROFICIENCY</b> At what level would you <i>like to perform</i> these teaching practices?				
Not Applicable	Novice	Developing	Competent	Expert	<b>PRACTICE DESCRIPTION</b>	Not applicable	Novice	Developing	Competent	Expert
					D1. I develop assessments of student learning that are consistent with the learning objectives for the course					
					D2. I assess students' subject matter knowledge					
					D3. I grade students' assignments using clear criteria					
					D4. I provide students with constructive suggestions on how to improve their course performance					
					D5. I provide students with prompt feedback about their performance at regular intervals throughout the term					
Is there a gap between how well you can perform any of these teaching practices and how well you would like to perform them? Are some gaps more important to you than others?										
If so, are you motivated to address this gap? What factors influence this motivation for you?										
What actions could you take to improve your proficiency in assessing student learning?										
Other notes and comments:										

<b>CURRENT TEACHING PROFICIENCY</b> At what level do you believe you <i>can perform</i> these teaching practices?					<b>Section E: Interacting with Students</b>	<b>DESIRED TEACHING PROFICIENCY</b> At what level would you <i>like to perform</i> these teaching competencies?				
Not applicable	Novice	Developing	Competent	Expert	<b>PRACTICE DESCRIPTION</b>	Not applicable	Novice	Developing	Competent	Expert
					E1. I foster students' independent thinking					
					E2. I address sensitive issues in ways that help students to deal with them maturely					
					E3. I foster students' confidence in their ability to learn on their own					
					E4. I work outside of the classroom with students who are having problems with course materials					
					E5. I recognize students who are not achieving to their fullest potential					

Is there a gap between how well you can perform any of these teaching practices and how well you would like to perform them? Are some gaps more important to you than others?

If so, are you motivated to address this gap? What factors influence this motivation for you?

What actions could you take to improve your proficiency in interacting with students?

Other notes and comments:

<b>CURRENT TEACHING PROFICIENCY</b> At what level do you believe you <i>can perform</i> these teaching practices?					<b>Section F: Focusing on Subject Matter</b>	<b>DESIRED TEACHING PROFICIENCY</b> At what level would you <i>like to perform</i> these teaching practices?				
Not applicable	Novice	Developing	Competent	Expert	<b>PRACTICE DESCRIPTION</b>	Not applicable	Novice	Developing	Competent	Expert
					F1. I provide students with an overview of my field of study					
					F2. I demonstrate passion for the material I am teaching					
					F3. I stay current in my knowledge of the subject matter					
					F4. I help students understand the relevance of what they are learning					
					F5. I enrich my teaching with my research					

Is there a gap between how well you can perform any of these teaching practices and how well you would like to perform them? Are some gaps more important to you than others?

If so, are you motivated to address this gap? What factors influence this motivation for you?

What actions could you take to improve your proficiency in focusing on subject matter?

Other notes and comments:

<b>CURRENT TEACHING PROFICIENCY</b> At what level do you believe you <i>can perform</i> these teaching practices?					<b>Section G: Scholarship of Teaching and Learning</b>	<b>DESIRED TEACHING PROFICIENCY</b> At what level would you <i>like to perform</i> these teaching practices?				
Not applicable	Novice	Developing	Competent	Expert	<b>PRACTICE DESCRIPTION</b>	Not applicable	Novice	Developing	Competent	Expert
					G1. I use my own assessments of student learning to improve my teaching					
					G2. I use self-reflection to improve my teaching					
					G3. I conduct research on teaching and learning					
					G4. I publish research on teaching and learning					
					G5. I influence my department culture with respect to teaching					

Is there a gap between how well you can perform any of these teaching practices and how well you would like to perform them? Are some gaps more important to you than others?

If so, are you motivated to address this gap? What factors influence this motivation for you?

What actions could you take to improve your participation in the scholarship of teaching and learning?

Other notes and comments:



Section H: Reflection on Teaching	<u>TEACHING REFLECTION</u> How often do you the following?				
OPPORTUNITIES TO REFLECT	Never	Rarely	Sometimes	Often	Very often
H1. I reflect on teaching with my peers and colleagues					
H2. I reflect on teaching with my friends or family members					
H3. I ask peers or colleagues for feedback on my teaching					
H4. I ask students for feedback on my teaching					
Has reflecting on your teaching with others helped you identify a gap between your current and desired overall STEM college teaching proficiency? If so, in what ways?					
Has the feedback you have received on your teaching helped you identify a gap between your current and desired overall STEM college teaching proficiency? If so, in what ways?					
If a gap was identified, were you motivated to address it? What factors influenced this motivation for you?					
What kinds of actions have you previously taken to improve your overall STEM college teaching proficiency? Were these actions effective? What additional actions, if any, might you take to improve your overall STEM college teaching proficiency?					
Other notes and comments:					

## Taking Steps to Improve Your STEM College Teaching

### What is Teaching-focused Professional Development?

Teaching-focused professional development (TFPD) activities are formal programs designed to help prepare doctoral students, postdoctoral scholars, and early-career academics for teaching at colleges and universities. TFPD activities include, but are not limited to:

- Teaching Assistant (TA) orientation or training
- Formal courses on teaching
- Workshops about teaching, such as those about how students learn or how to write a teaching philosophy
- Talks or presentations about teaching
- Preparing Future Faculty (PFF) programs and events
- Teaching certificate programs

### Developing an Action Plan: TFPD Resources for STEM College Teachers

STEM college teachers who identify gaps in their teaching proficiencies and are motivated to address those gaps should next develop an action plan. The resources and suggestions below are intended to help you identify, locate, and access TFPD opportunities related to your individual goals.

1. *If possible, participate in TFPD at your institution.* Many colleges and universities have centers for teaching and learning with the purpose of supporting doctoral students, postdoctoral scholars, and faculty members in their teaching development. Sometimes these centers are located in academic departments, a specific school or college, the graduate school, or provost's office. Additionally, many of these centers are focused on teaching and learning in STEM disciplines and offer targeted learning opportunities. Participating in teaching development at your home institution can increase your networking opportunities, introduce you to new colleagues and collaborators, remove you from your disciplinary silo, and connect you with others who take teaching seriously.
2. *Seek teaching development at nearby institutions.* If no teaching development is offered by your institution or you cannot participate in it, investigate whether nearby colleges, universities, or community and technical colleges have centers for teaching and learning or other training possibilities. Ask the providers whether you can access their programs, or if they have recommendations for teaching development opportunities in your area.
3. *Use online teaching development resources.* There are many TFPD resources available online to support STEM college teachers. Examples from centers for teaching and learning, postsecondary institutions, and national alliances and leadership organizations committed to improving undergraduate STEM education are shown in the table below.

TFPD TYPE	TFPD PROVIDER	TFPD WEBSITE
Listserv	Tomorrow's Professor	<a href="http://web.stanford.edu/dept/CTL/Tomprof/index.shtml">http://web.stanford.edu/dept/CTL/Tomprof/index.shtml</a>
Centers for Teaching and Learning	Delta Program (University of Wisconsin-Madison)	<a href="http://delta.wisc.edu/">http://delta.wisc.edu/</a>
	Center for Teaching (Vanderbilt University)	<a href="http://cft.vanderbilt.edu/">http://cft.vanderbilt.edu/</a>
	Center for Teaching and Learning (Stanford University)	<a href="https://teachingcommons.stanford.edu/ctl">https://teachingcommons.stanford.edu/ctl</a>
	Center for Research on Teaching and Learning (University of Michigan)	<a href="http://www.crlt.umich.edu/">http://www.crlt.umich.edu/</a>
Institutional Programs	Arizona State University	<a href="https://provost.asu.edu/resources/teaching/support">https://provost.asu.edu/resources/teaching/support</a>
	Michigan State University PREP	<a href="http://grad.msu.edu/prep/">http://grad.msu.edu/prep/</a>
Multi-Institutional Initiatives	Center for the Integration of Research, Teaching, and Learning (CIRTL)	<a href="http://www.cirtl.net/">http://www.cirtl.net/</a>
	Association of American Universities	<a href="https://stemedhub.org/groups/aau">https://stemedhub.org/groups/aau</a>
	National Postdoctoral Association	<a href="http://nationalpostdoc.org/">http://nationalpostdoc.org/</a>

## Resources for Undergraduate STEM Education Reform

The domains of undergraduate STEM education addressed in this tool--course design, teaching in the classroom, creating a positive classroom environment, assessing student learning, interacting with students, focusing on subject matter, engaging in the scholarship of teaching and learning, and evaluating one's own teaching--are drawn from recent scholarship and national reports advocating reform of undergraduate STEM education. We included college teaching domains other than classroom instruction in order to acknowledge (1) the broad variety and scope of the roles that college STEM teachers can fulfill and (2) the elements of college learning that make up a comprehensive educational experience for both students and teachers.

Teachers and teaching development providers who want to learn more or participate in the reform of undergraduate STEM education should consult the resources below. These reports and representative articles from leading STEM education scholars, explain how specific teaching these practices are applied in undergraduate STEM education and what the impact or effect has been for learners and teachers. They represent a small but strategic sample of policy documents and research studies that not only explain how to implement teaching practices, but also provide evidence of their effectiveness.

### National Reports

- President's Council of Advisors on Science and Technology. (2012). *Engage to excel: Producing one million additional college graduates with degrees in science, technology, engineering, and mathematics*. Washington, D.C.: The White House, Executive Office of the President.
- National Research Council (2012). *Discipline-based education research: Understanding and improving learning in undergraduate science and engineering* (Eds. S. R. Singer, N. R. Nielsen, & H. A. Schweingruber). Washington, D.C.: The National Academies Press.
- Kober, N. (2015). *Reaching students: What research says about effective instruction in undergraduate STEM teaching and learning*. Washington, D.C.: The National Academies Press.
- Coalition of Reform of Undergraduate STEM Education (2014). *Achieving systemic change: A sourcebook for advancing and funding undergraduate STEM education*. (Ed. C. Fry). Washington, D. C.: Association of American Colleges and Universities.

### Representative Scholarship

- Freeman, S., et al. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academies of Science*, 111(23), 8410-8415.
- Mazur, E. (1997). *Peer instruction: A user's manual*. Upper Saddle River, NJ: Prentice Hall.
- Knight, J. K., & Wood, W. B. (2005). Teaching more by lecturing less. *CBE-Life Sciences Education*, 4(4), 298-310.
- Henderson, C., Beach, A., & Finkelstein, N. (2011). Facilitating change in undergraduate STEM instructional practices: An analytic review of the literature. *Journal of Research in Science Teaching*, 48(8), 952-984.

## Supporting Teachers in Developing an Action Plan: Recommendations for TFPD Providers

When teachers and other professionals “tak[e] initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes,” they are engaging in *self-directed learning* (Knowles, 1975, p. 18). Self-directed activities to learn about college teaching include completing self-assessments like this tool, reading books and articles to gain content knowledge, and participating in webinars, talks and presentations, workshops, conferences, and formal courses to learn about ways in which to use their new knowledge and skills. Individuals may also call on a variety of teaching mentors, experts, and professional development providers who bring with them a wealth of knowledge, experiences, and skills.

The resources below provide both research findings and practical recommendations for supporting teachers who have completed self-assessments and are developing action plans to change their knowledge, skills, and attitudes. These selected references are an excellent introduction to the rich literature on adult learning and continuing professional development.

### Selected Resources

- Caffarella, R. S., & Daffron, S. R. (2013). *Planning programs for adult learners: A practical guide*. San Francisco, CA: Jossey-Bass, Inc.
- Knox, A. B. (1980). Proficiency theory of adult learning. *Contemporary Educational Psychology*, 5(4), 378-404.
- Merriam, S. B., & Bierema, L. L. (2014). *Adult learning: Linking theory and practice*. San Francisco, CA: Jossey-Bass, Inc.
- Merriam, S. B., Caffarella, R. S., & Baumgartner, L. M. (2006). *Learning in adulthood: A comprehensive guide* (3rd ed.). San Francisco, CA: Jossey-Bass, Inc.

### Points for Practice

Professional development providers should...

- Support learners who have identified areas in which they wish to advance
- Consider the levels of both independence and proficiency of program participants, and meet them at their point of readiness for learning and change
- Encourage continuous reflection among program participants as they participate in teaching development offerings
- Use the self-assessment ratings of participants before and after a training opportunity to identify evaluate the impact of programs
- Determine the amount of focus to point toward specific topics in teaching development offerings and adjust according to participant need, program mission, and identified outcomes



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