Principles and Strategies for Effective Teaching: A Workshop for Pre- and Postdoctoral Trainees in the Biomedical Sciences [†]

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The 2012 National Institutes of Health (NIH) Biomedical Workforce Working Group Report documented that graduate training in the biomedical sciences predominantly prepares people for academic research positions. The report recommended that NIH provide funds for institutions to develop broader career development opportunities, including training related to teaching. Indeed, teaching is not only a required component of any faculty position, it is the primary task for trainees who seek employment at small liberal arts colleges and other primarily undergraduate institutions. NIH funding for the BEST (Broadening Experiences in Scientific Training) programs allowed us to develop a six-week training workshop for bioscience trainees to introduce participants to research-based, student-centered pedagogies and instructional design techniques and to inspire them to view teaching as an intellectual endeavor. The methods and outcomes of our case study should be applicable in a variety of programs and organizations, especially those with a separate health science campus, where faculty mentors often do not teach many classes and there are few, if any, apprenticeship-teaching opportunities for trainees.

INTRODUCTION

In the biomedical sciences, the work of graduate students and postdoctoral researchers (collectively referred to as "trainees") drives advances in science and technology at major research institutions. Research productivity is the main focus of their training, and many trainees aspire to a career in the professoriate. However, their training often omits many core faculty responsibilities, including service, leadership, and, our focus here, teaching. Those trainees looking beyond a career focused solely on research often consider blended or teaching-focused positions. Shockingly, despite the need for quality teaching and mentoring across disciplines, many trainees in the biomedical sciences often receive no formal pedagogical training and have few to no opportunities to teach. In addition, their research mentors or course instructors may not serve as effective teaching mentors, as many have not received any formal teaching training themselves.

In the last 15 years, many institutions have started to offer pedagogical training to meet the needs of current and future faculty and their students (1–3). A number of universities, including participants in the Preparing Future Faculty (PFF) program (4), offer teaching certificates within their graduate schools. Postdoctoral training programs, such as Faculty Institutes for Reforming Science Teaching (FIRST), have successfully prepared future faculty to utilize a breadth of learner-centered instructional techniques (5). However, there is need for more training programs centered on principles and strategies of effective teaching, particularly in the biomedical sciences, which are often housed on a separate medical campus with limited teaching opportunities for trainees.

Here we describe a workshop on the fundamentals of teaching for graduate students and postdoctoral fellows. We provide some institutional context and discuss particular challenges and realities that informed our work, as these may be of interest to colleagues. We place particular emphasis on

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issues arising on medical campuses, the setting for our work, and more broadly on issues that may influence pedagogical training efforts across the biomedical sciences.

We have offered this workshop on the fundamentals of teaching and learning at the University of Colorado Denver Anschutz Medical Campus (AMC). At AMC, most faculty team-teach in courses according to their research expertise, and there is currently little emphasis on assessing the quality of faculty instruction beyond the standard course evaluations each semester. Pedagogically-focused professional development opportunities that center on teaching are often perceived as not "fitting" into the schedules of research faculty, and such efforts are often also not recognized for tenure and promotion. In 2013, Rutebemberwa and Wefes (unpublished results) conducted a survey of trainees and junior faculty at AMC to inquire about their pedagogical experiences, including formal training and mentoring. Of 150 respondents, 81% of postdocs ($n=83$) and 98% of junior faculty ($n=47$) reported an interest in teaching, but fewer than 30% of respondents had received any form of teaching training prior to taking on teaching responsibilities. At the same time, 70% of postdocs and over 95% of junior faculty expressed interest in receiving such formal teaching preparation.

The work we describe here is part of the larger effort of the NIH BEST award to our institution (6). In response to national needs for broader career development of biomedical science trainees, the BEST program aims to develop best practices for training and educational opportunities that prepare students and postdocs for broader career options, including the pedagogical training discussed here.

In designing our workshop, we considered many challenging questions: How do we design a meaningful teaching workshop for biomedical trainees with minimal disruption of their research? How can we effectively introduce pedagogical ideas to a population with little or no teaching experience, and have them value such training? Given that trainees may be steeped in an environment that may take a narrow view of teaching, how do we encourage a broader view in a student-centered way? Finally, given time constraints and a breadth of student experiences and career goals, what would be the right balance of theory, practice, and "takeaways"?

Intended audience

This workshop was designed for graduate and postdoctoral scholars on biomedical campuses. However, this workshop could be adapted to any STEM context.

Prerequisite student knowledge

There is no prerequisite knowledge for participants in this workshop. The workshop is designed for participants who are likely not currently engaged in classroom teaching but envision that they might be someday.

Learning time

The model we present here is an intensive 15-hour workshop evenly distributed over six sessions. Our workshop facilitation plan (see Table 1) could easily be expanded to fill more sessions as needed.

Learning goals

As a result of this course, students will

1. Describe their core values and philosophy about teaching and the habits they want to practice as an educator
2. Describe the attributes of a positive classroom culture and a variety of actions one could take to foster the development of a positive classroom culture for diverse learners
3. Explain the value of research-based and principle-based teaching for learning and inclusion
4. Describe and practice using the elements and applications of backward design
5. Begin to develop a toolbox of teaching practices and techniques that are aligned with their own teaching philosophies and backward design

Workshop core aspects

Although practical classroom skills, such as effective presentation techniques, syllabus design, and grading, are very important, the fundamental spirit of our workshop was that teacher preparation should go well beyond amassing pedagogical tools. Rather, we strove to foster a reflective teaching mindset in trainees, supported by exposure to research-based pedagogies. We emphasized the importance of a student-centered approach to teaching and wanted our participants to finish the workshop with the understanding that teaching is a scholarly endeavor that exceeds subject expertise and requires thought and preparation. To these ends, we looked to teach by example, practicing the strategies of backward design and promoting an active classroom culture in which ALL students could learn and thrive. Our backward-design process began with development of the five above listed learning objectives for the workshop and supporting session level objectives (Table 1).

Workshop guiding principles and values

To support the session level objectives in Table 1, we developed a list of five core values and guiding principles: 1) facilitators' motivations and rationale should be transparent; 2) all activities and discussions should be participatory and student-centered; 3) the workshop should be well organized, with a clear outline available to participants; 4) the experience should be transformative to participants'

TABLE 1.

Overview of Sessions One to Four for the Principles and Strategies for Effective Teaching workshop for trainees in the biomedical sciences. Session Five was devoted to "Teachable Tidbit" presentations and Session Six was devoted to "workshopping" Teaching Philosophy Statements.

Session Level Learning Objectives	Activities, Discussions, and Readings
Session One	
1. Share motivations for attending the workshop and compare expectations with workshop goals. 2. Reflect on experiences of teaching and learning. 3. Articulate major principles and values as a teacher. 4. Identify aspects of classroom culture and describe actions that could cultivate a desired culture.	**Pre-workshop Assignment** Introspection Exercise (8): Participants are asked to "recall an influential teacher from your past, select terms that best describe that teacher, and compare these terms to those from the list that you hope your students will use to describe you." **Activities/Assessments** 1. In groups using "think-pair-square," share goals, principles, and values for your teaching and for your role in the workshop. Facilitators then share their goals, values, and principles for the workshop, which we revisit throughout. 2. Collectively define classroom culture and brainstorm a list of actions that could foster positive and negative classroom cultures. 3. Discuss how students will experience classrooms (and your teaching) in different ways: the Lesson of Grace in Teaching (9), Taking my Parents to College (10), "Active Learning" Case study from *Scientific Teaching* (11). Through short biosketches of fictional students that are written on notecards (e.g., lactating mother, veteran with Traumatic Brain Injury, English Language Learner), each student will expound on visible and invisible factors that affect student learning.
Session Two	
1. Identify the critical elements of backward design and explain the importance of alignment among the elements. 2. Describe what makes a worthy and clear learning objective and create sample objectives. 3. Begin to develop a written teaching philosophy. 4. Begin to develop a teachable tidbit that clearly implements the three elements of backward design.	**Pre-workshop Assignment** Read "A Framework for Constructing a Teachable Unit" from *Scientific Teaching* (11), Various University Teaching Philosophy Resources, watch "Teaching Philosophies" (12) **Activities/Assessments:** 1. Begin developing teaching philosophies. What are the key components of a teaching philosophy? What is your purpose for your teaching philosophy (e.g., employment, self-guidance, a contract with your students)? Who is your audience? What are the elements that could be in your teaching philosophy? 2. Discuss Backward Design. How is backward design similar to conducting research? What would be evidence of alignment or misalignment among objectives, assessments, and activities? 3. Discuss the motivation to develop learning objectives. Independently rate the learning objectives on a handout. Discuss – How do your philosophy, guiding documents in your field, institutional goals, and departmental structure influence your learning objectives? 4. Work alone to develop the learning objectives for your teachable tidbit, then workshop with peers to improve your objectives.
Session Three	
1. Explain what a mental model is and how mental models are constructed and changed over time. 2. Compare and contrast formative and summative assessment. 3. Describe the characteristics of good assessments. 4. Describe how to ask different questions for different purposes. 5. Explain the benefits of regular, ongoing assessment.	**Pre-workshop Readings** Mental Models (13), Assessment (14), *How to Ask the Right Questions* (15) **Activities/Assessments:** 1. Watch "Lessons from Think Air" (16) and discuss how it illustrates key ideas about forming and changing mental models. Discuss why active learning is more powerful for shaping mental models than a passive lecture. 2. Discuss ways that assessment can complement and enhance active learning. 3. In groups, select a familiar, non-STEM topic, such as a story or movie. Roll a die to select a level of Bloom's Taxonomic Pyramid (17) and then construct and discuss a question on the selected topic that is at that level. (1=remember; 2=understand, 3=apply, 4=analyze, 5=evaluate, 6=create). 4. Investigate peer instruction using resources from The Science Education Initiative at the University of Colorado Boulder (http://www.colorado.edu/sei/fac-resources/workshops-clickers.htm)
Session Four	
1. Explain why active learning is more effective than passive learning. 2. Describe some active learning approaches. 3. Choose active learning techniques for particular learning objectives and classroom cultures. 4. Describe how active learning can impact students' mental models.	**Pre-workshop Readings** "Structure Matters: Twenty-One Teaching Strategies to Promote Student Engagement and Cultivate Classroom Equity" (18), Collaborative Learning (19) **Activities/Assessments** 1. Discuss "Structure Matters" with a focus on a) which strategies enable effective assessment; b) how assessment can support equity. 2. Conduct a jigsaw activity to learn about active learning techniques, including "roundtable," "structured problem-solving," and "send-a-problem," from Millis & Cottell (20). Playing cards can be used to sort and call on participants to contribute.

pedagogical perspectives and practices; and 5) all activities should be grounded in empirical evidence and/or principles.

These guiding principles allowed us to establish a common language and a shared focus about how we might achieve our goals. By sharing our goals, principles, and values with workshop participants, we were better able to explain our rationale and motivations. This approach helped us to model explicitly our core value of transparency and to demonstrate how a clear set of principles can strengthen strategic planning. Additionally, we wanted participants to leave the workshop with a first or second draft of a teaching philosophy in hand. To this end, we worked with participants to build those philosophies around their own goals, values, and principles as educators. In discussing how our own goals, principles, and values influenced our process, we hoped to encourage deeper reflection among the participants.

Backward design

Backward design (7) is a planning strategy widely known among K–12 educators, but seemingly underutilized in university settings. Educators often default to thinking first about how they will present information to students rather than initially considering their goals for student learning, or how they will facilitate and assess the attainment of those goals. Backward design starts with the creation of learning objectives, followed by the design of assessments aligned with the objectives and then the development of activities aligned with both assessments and objectives.

Backward design played three prominent roles in our workshop. First, we decided that exposure to the three parts of the process would provide participants with a useful framework in which they could situate their developing pedagogy. Second, we used backward design as the instructional concept for our planning and provided lesson plans for each workshop session that showed the alignment of the learning objectives, assessments, and activities. Third, we asked participants to use backward design as a framework to design their "teachable tidbit," a micro-teaching experience described below. The development of their teachable tidbit afforded participants the opportunity to apply sequentially the components of backward design and obtain constructive feedback at each step.

PROCEDURE

Materials

Materials needed include a meeting place, boards and markers, a projector with sound, and access to readings cited in Table 1. Some of the activities require handouts and other simple materials including dice, note cards, and playing cards (see Table 1). We used an on-line course management system to distribute materials and communicate with students, but paper copies, electronic mail, or a free web-based system would all work to organize information.

Student instructions

The course is very participatory. Students must complete pre-workshop readings and engage in class activities in order for the learning community to be effective.

Faculty instructions

We provide lesson plans (abbreviated versions in Table 1, full versions in Appendix 1) that give instructors necessary information about suggested readings to assign and activities to facilitate discussions. We devoted the first four weeks of the workshop to exploring and discussing the backward-design process. Session 1 centered on participants' pedagogical identity, including discussions of their ideal classroom culture and their goals, principles, and values as educators. Session 2 featured a formal introduction to backward design, further development of participants' teaching philosophies, and a discussion of well-developed learning objectives. Session 3 focused on mental models, effective assessment, including the distinction between formative and summative assessment, a discussion of questioning techniques and types, and an introduction to Bloom's taxonomy (17). Session 4 addressed instructional strategies and unified a workshop-wide emphasis on active learning techniques.

Participants developed their teaching philosophies throughout the first four weeks of the course (Table 1), shared their draft philosophies online in Week 5, and received significant written feedback from three to four fellow trainees and an instructor prior to Session 6. Students discussed the feedback with their group members and brainstormed additions or edits to their philosophies. We did not provide rubrics for evaluating teaching philosophies as we wanted to avoid restraining participants. However, we had a variety of rubrics on hand (e.g., [21]) as potential discussion prompts.

The lead-discussant model

The workshop can be facilitated by a single person. However, we co-designed and co-delivered the workshop. Each session had two to four facilitators. We adopted a workshop leadership strategy in which one instructor coordinated and led each session and another instructor was designated as the session's *discussant*. The discussant provided a summary of the session and addressed emergent themes or questions that arose. This arrangement allowed us to provide multiple instructional perspectives while maintaining a consistent instructional voice within each session. Furthermore, it allowed us to introduce a strategy that workshop attendees might use in future co-teaching opportunities.

Suggestions for determining student learning

The Teaching Statement and Teachable Tidbit are both excellent work products that can be used to assess student

learning. The workshop activities can all also serve as formative assessments. In our first offerings of this course, we did not offer course credit. In our latest offering, we did offer course credit. For those students, we assigned short reflection assignments related to the readings and used their Teaching Statement and Teachable Tidbit for evaluation.

To hone classroom skills in a supportive setting while receiving feedback from instructors and peers, we asked participants to deliver a 15-minute Teachable Tidbit, a lesson on any topic they chose. Tidbits ranged from participants' own research to eclectic topics such as the professional athlete Tim Tebow. To provide a hands-on experience with backward design, we asked participants to select their tidbit topic after Session 1 and incrementally to incorporate their new knowledge of backward design into their presentations. For instance, in Session 2, after discussing aspects of effective learning objectives, participants developed two to three initial learning objectives for their teachable tidbit. Participants subsequently planned their tidbit activities and assessments with reference to their learning objectives, emphasizing effective questioning. We also asked participants to integrate at least one active learning strategy into their tidbit as a way to expand their "toolbox."

Given the time constraints and our overarching philosophy, we made a deliberate choice not to focus on classroom skills before the teachable tidbit presentations; i.e., we did not address issues such as slide layout, effective board management and pace and audibility of speaking. In our opinion, participants can develop these skills in other settings, and we thought it better to use the teachable tidbit to reinforce the naturally more complex backward design process.

Sample data

Students produced two reflection papers, a draft teaching philosophy, and a lesson plan for their teachable tidbit. We have provided samples in Appendix 2.

Safety issues

This course takes place in a classroom setting and the format is discussion-based. There are no expected safety issues.

DISCUSSION

Field testing

We have delivered this workshop at the University of Colorado Denver Anschutz Medical Campus four times over four years, with an average of 16 registered participants per workshop. Participants have included mainly postdoctoral fellows and graduate students. In one iteration of the workshop, several medical school faculty members asked to take part. The faculty members had no advisory role over any of the postdoctoral fellows or graduate students.

Our development and instructor team spanned 10 to 35 years of teaching and research experience in biology, psychology, mathematics, biomedical sciences, and teacher preparation. In our collective opinion, this disciplinary variety enriched our workshop design and execution, allowing us to demonstrate a diverse spectrum of thought processes and teaching styles. Despite this value, we feel that the involvement of multiple instructors is not necessary to adapt our model successfully.

Evidence of student learning

We conducted regular assessments throughout all four iterations of the workshop, which helped us make a number of changes and improvements each year. As an example, in the first year, the session on teaching philosophies was an optional "bonus" session. After that year, participants clearly asked for more emphasis on the development of teaching philosophies, leading us to the six-week format discussed above. We now view the integrated development of teaching philosophies as an essential part of the workshop. Overall, participants' feedback provided a subjective but important way to assess the achievement of our workshop learning objectives (Table 1) and core values and principles.

Likert-scale questions

We gave participants a 17-question pre/post Likert scale survey with items related to each of our learning objectives and measured the participants' self-efficacy; i.e., the self-reported gains in their perceived understanding of, and preparation for, implementing topics related to each of the five learning objectives given above (Table 2). In particular, all respondents agreed or strongly agreed that their self-efficacy regarding mastery of the workshop's learning objectives had increased, thereby setting the stage for success in upcoming teaching engagements (22).

Student comments

In addition to the standardized Likert scale questions, after each session, we asked participants to answer three questions:

1. What are three things you learned about and/or liked in today's session?
2. What did not seem to work for you in today's session?
3. What suggestions for improvement do you have?

Although we did not conduct a formal qualitative analysis of these responses, overall feedback was extremely positive, and we identify several themes that we think could be useful to colleagues looking to replicate or adapt our model. The quotes included below generally reflect the opinions expressed by a larger group of participants.

As our goals included exposing participants to active learning strategies and modeling these strategies across the workshop, we were pleased that participants seemed to feel that the sessions had more value when they were more active. One participant specifically commented that he/she "enjoyed using active learning to learn about active learning."

TABLE 2.
Combined pre- and post-session responses from participants in 2017 and 2018 *Principles and Strategies for Effective Teaching* Workshop.

Question	Objectives Addressed	Pre-workshop[a]				Post-workshop[a]				Mean	
		1	2	3	4	1	2	3	4	Pre	Post
I can describe my personal principles and values related to being a teacher.	1	2	6	16	3	0	0	6	22	2.74	3.79
I can describe my own Teaching Philosophy statement.	1	7	10	8	2	0	0	10	18	2.19	3.64
I can describe a variety of ways that my students may differ from one another and from me.	2	1	4	16	6	0	0	12	16	3.00	3.57
I can describe the elements of a classroom culture that are effective for a spectrum of students.	2	0	12	14	1	0	0	17	11	2.59	3.39
I can name a variety of actions I could take to foster a positive classroom culture.	2	2	8	14	3	0	0	7	21	2.67	3.75
I can explain the concept of active learning.	2, 3	1	11	14	1	0	0	3	25	2.56	3.89
I can develop an effective 15- to 30-minute "teaching tidbit" that includes specific learning outcomes as well as assessments and activities aligned to the learning outcomes.	4, 5	8	10	8	1	0	0	8	20	2.07	3.71
I can explain the importance of the proper alignment of Backward Design elements (learning objectives, assessment, activities).	4	11	9	7	0	0	1	10	17	1.85	3.57
I can write clear and effective learning objectives for a teaching unit.	4, 5	3	12	12	1	0	0	15	13	2.39	3.46
I can describe the characteristics of good assessments.	4, 5	4	15	8	0	0	0	17	11	2.15	3.39
I can explain at least five uses/benefits of assessments.	3, 4	7	11	7	2	0	1	8	18	2.15	3.63
I can explain the differences between formative and summative assessments.	4	7	7	1	0	0	0	6	9	1.60	3.60
I can create assessment items that are conceptual and challenging for students. (2018 only)	4, 5	0	5	6	1	0	1	8	4	2.67	3.23
I can describe some of the many and varied active learning approaches.	3, 4, 5	7	14	6	0	0	0	9	18	1.96	3.67
I can choose appropriate (active) learning strategies for a set of sample learning objectives and a particular classroom culture.	2, 4, 5	12	10	7	1	0	0	9	19	1.90	3.68
I can choose appropriate learning activities for a set of sample learning objectives and a particular classroom culture. (2017 only)	2, 4, 5	5	3	6	0	0	0	4	10	2.07	3.71
I can explain how mental models are constructed and changed over time.	3	12	13	1	0	0	1	13	13	1.58	3.44
I can describe how active learning can help change a student's mental model of a particular concept.	3	9	12	5	0	0	0	13	14	1.85	3.52

[a] Scale: 1, strongly disagree; 2, disagree; 3, agree; 4, strongly agree.

Many participants commented that the collaborative, interactive atmosphere and opportunities to engage with both instructors and other participants improved their experience. One participant shared: "I got to discuss some of the issues faced in teaching with folks who understand; everyone … wants to share." Another stated: "I learned not only the differences between values, principles, and goals, but also heard a lot of ideas of these that I want to include in my own teaching."

Nearly all participants identified the development of teaching philosophies as a strong aspect of the workshop. With many participants facing an employment search in the relatively near future, we expected positive feedback. However, we also saw evidence that participants viewed the process of constructing and refining their philosophies as something more than a necessity for future employment. "Writing drives thoughtfulness," one participant noted.

Many of the suggestions for improvements centered on participants' desire to have more time to cover certain topics and activities. Common requests included more information about mental models and how people learn, more time devoted to teaching statements, and greater exposure to active learning techniques. Our six-week format and trainees' schedules limit our ability to expand on these topics, but we continue to explore ways to use the allotted time more efficiently.

Other suggestions reflected one of the challenges discussed at the outset of this article: namely, that trainees often juggle a number of responsibilities in their laboratories, making it more difficult to reflect meaningfully and engage fully in the workshop readings and assignments. Without a significant shift from the research community to appreciate the importance of pedagogical preparation, we anticipate this will remain an issue.

Analysis of teaching philosophies

Finally, we conducted a two-fold analysis of the teaching philosophies developed by participants in the 2019 workshop. Each philosophy was scored *preliminary, proficient,* or *polished* in regard to three key questions. Was the philosophy comprehensive? Was it self-reflective and internally consistent? Was it clearly presented? The rubric utilized to score each dimension is presented in Table 3. Additionally, each philosophy was scored 0, 1, or 2 according to how it discussed six key ideas covered in the workshop.

1. Goals for student learning
2. Assessment
3. Teaching methods and activities
4. Desired classroom culture
5. Importance of equity and inclusion
6. Citations and/or discussions on one or more evidence-based practices or theories of learning

A score of "0" in a category reflects little or no discussion of the idea, a score of "1" reflects that the idea was discussed to some extent, and a score of "2" reflects that the idea was discussed more fully, generally with clear examples or rationale. For both the rubric and the dimensions, each philosophy was scored independently by at least two of the authors. Disagreements in score or rating were discussed and rectified. Table 4 presents the counts of each rating across the three rubric categories, and the mean score across all raters for each of the six key ideas. Most participants scored as proficient in the three categories. This is consistent with expectations for the first draft of a teaching philosophy. Almost all participants discussed five of the six key ideas from the workshop. Only half of the participants included references to learning theories or discussed rationales for evidence-based practices. The workshop introduced some learning theories, but we weren't able to deeply discuss these because of time constraints.

Possible modifications

Our workshop could be expanded to include other sessions about teaching and learning that would be of interest to your participants. Our participants have asked for additional exposure to teaching. We have considered having participants collectively visit exemplar courses to conduct course observations followed by a group debriefing session with one another and the instructor. We have also considered adding an optional follow-on experience in which a participant would be matched with a faculty member and they would collectively design and deliver a unit of a course. This would be a mentored teaching experience.

CONCLUSION

Teaching is a principle- and empirically-based art that requires introspection, coaching, and practice. It also represents one of the two core missions of universities: the creation and dissemination of knowledge. Therefore, professional teaching training should be imperative to serve the mission of universities; the model presented here is one way that this critical goal may be accomplished, and it has proved successful from the students' perspective.

Our workshop took into account the experiences, professional realities, and potential career paths of our participants and the lack of a teaching culture that may reflect other biomedical campuses. Our aim was to provide research trainees with transformative ideas, highlighting the value of research-based, student-centered instruction that would help prepare them for their early teaching experiences. We hope our detailed workshop guide will be of interest to colleagues facing similar challenges and needs (Appendix 1).

SUPPLEMENTAL MATERIALS

Appendix 1: Full lesson plans
Appendix 2: Sample student products

TABLE 3.
Rubric used to assess teaching philosophies, aligned with course learning objectives.

Comprehensive: • Reference to text, other reading, and/or class discussions • Covers values, principles, goals, strategies, techniques • Covers activities in and out of the classroom (advising, meetings with students, mentoring, classroom pedagogy, assessment) • Includes discussion of diversity, inclusion, classroom culture • Applicable to different classroom environments, courses • Balance of specificity and broad thinking (e.g., principles are grounded with an example)

Learning Objectives Assessed: 1, 2, 3, 5

Preliminary. Little use of course material; one-dimensional; little evidence of applicability to a variety of situations; minimal coverage of values, principles, goals, strategies and/or techniques; minimal coverage of diversity, inclusion, classroom culture; lack of balance	*Proficient.* Use of course material; evidence of complexity; variety in application; coverage of diversity, inclusion, classroom culture; coverage of values, principles, goals, techniques; balance of thinking	*Polished.* Excellent use of course material; full appreciation of complexity; full coverage of diversity/inclusion/classroom culture; coverage of values, principles, etc.; balanced presentation

Self-Reflective and Internally Consistent: • Reference to personal values, principles, experiences, attributes, etc. • Addresses areas for improvement/challenges • Cohesive – "hangs together" – has an internal frame or framework (e.g., metaphor, narrative, chronology) • Explores relationships among elements of the philosophy (not just a list)

Learning Objectives Assessed: 1, 4, 5

Preliminary. Lack of integration of personal aspects; insufficiently addresses areas for improvement; lacking cohesion; poor relationships among elements	*Proficient.* Integration of personal aspects; addresses potential challenges; sense of cohesion; relationships among elements are apparent; elaborates on ideas	*Polished.* Strong integration of writer's experience, values, etc.; engages and discusses challenges; strong cohesion; demonstrates strong relationship among elements; creative; unique

Clearly Presented: • Accessible to the reader • Writing is clear, not hampered by grammatical and other problems. • Precise (vs. vague) • Showing rather than telling • Actively written; 1st person

Learning Objectives Assessed: 5

Preliminary. Significantly unclear, perhaps due to grammar, lack of precision, too much telling rather than showing, passive voice, etc. Not in 1st person	*Proficient.* Accessible to readers; minor problems in grammar and/or precision; precise; some telling but an effort to show; minimal passive voice; at least some use of 1st person	*Polished.* Writing is clear and accessible, free of grammatical and other problems; very precise throughout; excellent balance of telling and showing; consistently active voice and 1st person

TABLE 4.
Assessment of philosophies.

	Comprehensive	Self-Reflective	Clarity
# Preliminary	2	2	4
# Proficient	10	7	7
# Polished	0	3	1

Big Idea	Learning Objectives	Assessment	Activities	Classroom Culture	Equity and Inclusion	Evidence-based practices
Mean Score	1.33	1	1.5	1.42	1.0	0.58

Counts of preliminary/proficient/polished scores for each rubric category (see Table 3) and mean scores for each of the six big ideas from the workshop scored on a 0-1-2 scale. A score of "0" in a category reflect little or no discussion of the idea, a score of "1" reflects that the idea was discussed to some extent, and a score of "2" reflects that the idea was discussed fully, generally with clear examples or rationale.

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