The Five Minute Teach: Active learning pedagogy to support TA training and writing instruction in the sciences

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Abstract:

The Five Minute Teach (5MT) serves as both a training tool for graduate teaching assistants (TAs) and a format for explicit writing instruction in inquiry-based lab courses. Here the authors describe the development and execution of the 5MT as part of a professional development course for TAs in the sciences. Specifically, the 5MT utilizes learning objectives and a structured lesson plan template to help TAs design writing-related activities. In addition, the 5MT encourages TAs to use active learning strategies to provide undergraduate students with additional writing support in courses that have limited time for adapting instruction to meet student needs. The authors used surveys and reflection prompts about the 5MT to gather self-report data from TAs in a writing-intensive pedagogy course. Data collected shows that TAs view the 5MT as a creative, effective way to explore active learning pedagogy and learn how to address student needs. They also believe the 5MT approach can help undergraduates learn to improve their writing in small, yet productive increments. In conclusion, the 5MT serves as a pedagogical training tool as well as a potential intervention to improve writing instruction in undergraduate lab courses and could benefit TAs in a variety of disciplines.

Introduction

Despite the teaching responsibilities graduate teaching assistants (TAs) have at research universities, pedagogical training opportunities are scarce, especially in the sciences. Often, graduate students—and faculty members—become instructors with minimal pedagogical training (Burke, Hand, Poock, & Greenbowe 2005; Connolly, Savoy, Lee & Hill 2016). Participation in writing-in-the-disciplines initiatives adds complexity to both the training TAs

require and their teaching expectations (Rodrigue 2012). Unfortunately, rarely are TAs trained to teach and respond to student writing (Hendergren 2001). In this article, we focus on a pedagogical training method that introduces TAs to instructional design, so they can insert small doses of active, student-centered writing instruction into a content-heavy curriculum.

This project investigates a short well-structured lesson we call the Five Minute Teach (5MT) as a training tool and teaching resource to advance professional development for graduate students and improve writing-intensive science courses for undergraduate students. Microteaching has been used for decades in preservice teacher training programs in several countries (e. g. Mergler & Tangen 2010; He & Yan 2011). However, it is much less frequently used as a tool for TA training (e.g. Troop, Waller, & Aspenlieder 2015). Previous utilizations of microteaching vary in length, structure, and feedback format. Here, the authors explore whether preparing, delivering, and observing mini-lessons designed to address writing-related problems effectively support TAs who teach writing-intensive introductory biology laboratory courses. The main objectives of this study were to 1) evaluate the perceived effectiveness of the 5MT as a training tool, 2) evaluate the perceived effectiveness of the 5MT as an instructional practice, and 3) evaluate the impact of the 5MT on teaching confidence.

Teaching writing in the sciences

Writing-intensive science courses can effectively introduce undergraduate students to scientific communication conventions and skills (Brownell, Price, & Steinman 2013; Colabroy 2011). Because of their smaller class size, laboratory courses offer an attractive learning environment for teaching writing. In particular, inquiry-based lab courses are conducive to writing instruction because students can learn about scientific writing processes, genres, and conventions while designing and executing laboratory research (Carfora & Blessinger 2015). In turn, the authentic writing and learning experiences facilitated by inquiry-driven labs become meaningful for

students (Moskovitz & Kellogg 2011). At the same time, students may be overwhelmed by a curriculum that extends from content knowledge and research methodologies to scientific literacy and writing conventions. Lab instructors may be similarly overwhelmed in their efforts to complete a rigorous lab agenda while also teaching, responding to, and assessing writing. For instructors who are new to writing pedagogy and have little prior teaching experience or training, writing-intensive introductory laboratory courses can be a grueling introduction to teaching undergraduate science. As a result, writing instruction may take second place to covering content and completing laboratory tasks.

Pedagogy training in the sciences

According to Tanner & Allen (2006) and Luft, Kurdziel, Roehrig, & Turner (2004), graduate students in STEM fields in particular often have limited opportunities for pedagogical training as part of their graduate education. Such training, however, can enhance TAs' self-efficacy and teaching practices in the classroom (DeChenne, Koziol, Enochs, & Needham 2012; Connolly et al. 2016). The literature describes various approaches to preparing graduate students to teach (e.g., Cassidy, Dee, Lam, Welsh, & Fox 2014) and wide diversity in topics covered in teaching preparation programs (e.g., Handelsman, Miller, & Pfund 2006; O'Neal, Wright, Cook, Perorazio, & Purkiss 2007). Such variety suggests that pedagogical training for graduate students tends to be idiosyncratic and largely designed for specific institutional objectives and instructional contexts.

Without dedicated training focused on effective teaching principles and practices, TAs may not have a chance to learn fundamentals of lesson design or become acquainted with evidence-based educational research (e.g. Lumsden 1993). Instead, graduate students learn how to teach from teaching and the feedback, if any, they receive from students and administrators (Shannon, Twale, & Moore 1998). They may develop teaching strategies from exposure to

faculty teaching practices (Golde 2008), such as the lecture and discussion (Shannon et al. 1998). These teaching approaches, however, are typically used as content-delivery mechanisms; accordingly, they may fail to attend to the development of undergraduate students' communication skills.

To help TAs cultivate active learning environments in their writing-intensive labs, we introduced them to lesson planning. We anticipated that such knowledge would increase TA confidence and competency in the classroom following Shannon et al.'s (1998) recommendation to shift attention from programmatic policies to pedagogical methods and opportunities for active learning and practice in TA training programs. In this paper, we outline a training method that equips TAs with a template for lesson design, gives them opportunities to practice developing and presenting lesson plans, and facilitates a cooperative learning environment in which TAs can observe and provide feedback on the lesson plans developed by their peers.

Overview of institutional context

At a large public, land-grant institution, all introductory biology laboratory courses for majors and non-majors are taught as writing-intensive. For many of the TAs teaching these lab courses, this is their first experience teaching, and the training they receive in writing pedagogy is one of few required teaching-related professional development opportunities available to science graduate students. TAs are also required to attend a brief orientation covering university policy and take a short course on teaching pedagogy offered by the graduate school.

A seminar in writing pedagogy is required for all graduate TAs either prior to or concurrent with their first semester teaching an introductory biology lab course. This class aims to introduce graduate students to the theory and practice of teaching writing in the disciplines. To meet this objective, the course addresses a range of topics, such as conferencing with students,

responding to student writing, and developing rubrics. During the 2016-2017 academic year,

three sections of the course (two in fall and one in spring) were co-taught by the authors, a

collaboration that brought together expertise in writing pedagogy with expertise in teaching and

writing in the sciences.

Overview of the Five Minute Teach

In preparing to teach the writing pedagogy seminar for biology lab assistants in the summer of

2016, the authors discussed facilitating more instruction on active learning. As well, we

considered how we might encourage more writing instruction in introductory biology labs despite

a highly-structured and time-limited classroom environment. The 5MT presented a strategy that

met both objectives. Essentially, the 5MT is a fully articulated and executed lesson that takes up

approximately five minutes of instructional time, from initial motivational starter to final

assessment and closure. As a training tool, the 5MT—and lesson planning more generally—

provides the structure for TAs to consider teaching and learning as practices that require critical

thought, collaborative learning, creativity, and intentional design. As an instructional strategy,

the 5MT encourages TAs to reflect on student learning and consider how they might best

address students' struggles throughout the semester. Further, we saw the 5MT as an ideal

method for inserting small doses of writing instruction in the lab courses and facilitating the

incremental and continual development of writing-related knowledge and skills. Accordingly, the

5MT helped us reinforce for TAs that writing is not something learned once and for all (Carroll

2002); rather, it suggests an approach to teaching scientific writing that prioritizes regular and

frequent interventions as students are grappling with the ways of writing, thinking, and learning

in the sciences.

The lesson plan model we used for the 5MT was an adapted version of the BOPPS model for

lesson design (Pattison & Day 2006). We selected this model because it provided TAs with an

accessible set of heuristics to facilitate active, student-centered learning and encouraged TAs to assess student learning in real time (Appendix 1).

The model features the following sections:

- an opening bridge to motivate students initially

- pre-assessment to determine students' prior knowledge

- activity(ies) broken down into steps to facilitate learning

- post-assessment to evaluate what students have learned

- closure to bring the lesson to an end and prepare students for what follows

To this list, we added a first section for TAs to specify a learning objective and a final section for TAs to include notes and list necessary materials. Altogether, these components required TAs to consider from the outset what it is they want students to learn, how they want students to engage in the learning experience, and how they planned to evaluate student learning. At the same time, the template encouraged TAs to start the lesson planning process by determining the desired learning objective, so they could align the learning objective, activities, and assessment.

Methods

Out of the 36 TAs enrolled in the 3 sections of the writing-intensive pedagogy course we taught during 2016-2017, 27 agreed to include their materials in the study. Of those, four did not provide their final 5MT materials. While their lesson materials are not included in the analysis, their reflections and survey responses are included. Study participants entered the course from a variety of science and math doctoral and master's programs, at various stages of graduate school, and with a range of teaching experiences, from assisting with lecture courses and

teaching laboratory courses within their home departments to having no prior experience. We recruited TAs for the study in class with the expressed understanding that their involvement would not assist their grade nor would choosing not to participate hinder them in any way.

Early in the semester, we introduced the 5MT by walking TAs through definitions and expectations for each section of the template and asking them to practice brainstorming writing-related lessons collaboratively. Outside of class, TAs worked independently to create complete lesson plans and develop necessary instructional materials. Finally, they taught their lessons during a course meeting. Whether or not the students chose to participate in this study, they were given the option to submit their 5MT plans and materials to be part of a publicly shared, online database. All TAs enrolled in the course were required to complete a final reflection, which included specific questions related to the 5MT assignment (Appendix 1).

TAs who elected to participate in this study gave permission for the authors to use data collected from three sources: 1) 5MT lesson plans and associated instructional materials, 2) end-of-term reflections pertaining to the 5MT, and 3) a brief online survey. We designed the online survey instrument to elicit self-reported quantitative and qualitative data. Quantitative data took the form of ratings on a 5-point scale from completely disagree to completely agree in response to nine statements (Appendix 2). Qualitative data took the form of short answer responses to three questions designed to allow participants the opportunity to record more detailed and specific feedback about the 5MT project and its utility as part of a pedagogy training program and as a strategy for teaching writing. Sections of the end of semester reflections that pertained to the 5MT were also used as qualitative data (Appendix 3).

Following the spring semester, all study data were compiled for analysis. We catalogued the topics and strategies used in the teaching materials (Table 1). From a close reading of TA

reflections and responses to short answer survey questions, we identified key outcomes GLAs perceived from the 5MT process, as well as sources of dissatisfaction with the project and potential for use in the classroom. These steps were initially completed by one author and then confirmed by the other. The university's institutional review board approved this study's procedures and data collection instruments.

Results

Topics addressed and strategies used by TAs

All TAs were required to write a single learning objective for their 5MT. While these learning objectives addressed a range of topics, three topics appeared more frequently: working with figures, writing concise methods, and writing hypotheses (Table 1). TAs used various strategies to address their learning objectives; however, all TAs utilized examples in some way. For instance, one TA created a figure with missing information, which students had to work together to complete during the 5MT. Another TA shared excerpts from a research article that students had to label according to the section of the paper they represented. Taken together, TAs used examples—ones they generated, curated from student work, or excerpted from published scholarship—to engage students in active learning, illustrate conventions of scientific writing, and model effective writing processes. Part of every 5MT included whole class discussion or presentation of key concepts. Some TAs chose to address the class for the entire 5MT while others only introduced the activity. Other strategies included small groups working collaboratively on worksheets, peer feedback, writing practice, and problem-solving to fix issues in writing samples (Table 1). In many 5MTs, students engaged in writing, rewriting, and peer review in group settings rather than as individuals.

TAs' self-reported outcomes of the 5MT

Although TAs reported varying levels of confidence in their ability to teach scientific writing (Figure 1A,B,C), all study participants found the 5MT project to be a productive part of the pedagogy course (Figure 1C), and they each described at least one benefit of the 5MT. We sorted these described benefits into three categories: lesson planning, student engagement, and time management.

Lesson planning

The most commonly described benefits related to general challenges that accompanied teaching writing and lesson planning. TAs discussed planning to use 5MTs early and regularly in the semester, as well as periodically to address emergent student needs. They recognized that the complexity of scientific writing could overwhelm students unless they designed writing instruction around specific goals and clear guidelines. Many of the TAs shared the realization that teaching writing in small, focused lessons over the course of the semester would benefit students more than trying to teach writing in only a few large discussions or designated writing workshops (Table 2, row 1). TAs also recognized the necessity of clearly articulating their expectations for assignments and principles of effective writing (Table 2, row 2). Such feedback demonstrates the value of the 5MT to improve general approaches to teaching writing.

Some TAs described learning the value of lesson planning, especially when given the opportunity to practice and reflect in efforts to improve their teaching strategies (Table 2, rows 3 & 4). Beyond metacognitive benefits, TAs also outlined the benefits of peers providing feedback and sharing their work (Table 2, rows 5 & 6). Accordingly, working with peers was perceived to be helpful both as a source of feedback and as a source of inspiration for future lessons.

Many TAs stated that the 5MT helped them develop a problem-solving or goal-oriented approach to teaching. That is, the 5MT encouraged them to meet their students where they are and respond to their learning needs. TAs learned to identify problems in their own classes and create lessons to address those problems (Table 2, row 7).

Student engagement

Though they may not have used the term "active learning" in their remarks, TAs recognized that the 5MT engaged students in their own learning (Table 2, row 8). One TA reported on the challenges of creating active learning opportunities (Table 2, row 9). This feedback highlights a classic struggle teachers face in writing-intensive classes—covering content versus creating opportunities for skill development—and the way time presents as a scarce commodity in the classroom. In some cases, TAs linked student engagement with the shortened time frame for the lesson (Table 2, row 10).

Time management

Time emerged as a key theme in response data. TAs appreciated the brevity of the 5MT, which in turn supported time management in the classroom (Table 2, rows 11 & 12). From the survey results, 22 TAs felt prepared to utilize small units of class time to teach a writing topic because of the 5MT (Figure 1D).

Future use of 5MTs by TAs

Most of the TAs reported being likely to use either the 5MT, the 5MT of a peer, or elements of lesson design when teaching in the future (Figure 1E,F,G). They were interested in continuing to use 5MTs again because the lessons are short, specific, efficient, and engaging for students and because of the success they had leading an initial 5MT (Table 2, rows 13 & 14). This

feedback reflects the impact of the 5MT on TAs' developing pedagogies, motivating a commitment to active learning and goal-directed teaching.

Not only do TAs intend to use 5MTs in their classes, but most enjoyed developing their own 5MT and participating in their peers' lessons (Figure 1H,I). The authors did not ask the TAs to explain why they enjoyed or did not enjoy the 5MT exercise, but one potential reason was reported in their reflections. Several TAs appreciated that the 5MTs encouraged them to be creative and concentrate on improving their teaching (Table 2, row 15).

Four TAs stated they were unlikely to use their own 5MT in class, and only one stated that they were unlikely to use another TA's 5MT (Figure 1E,F). The reason given for this unlikelihood, however, pointed to a lack of class time, rather than the 5MT itself (Table 2, row 16). Some TAs also stated that they would not use the 5MT they made in its current state but could improve their lesson and then use it in class (Table 2, row 17).

Discussion

From this study, we have learned that even when a course includes writing assignments it may not necessarily include writing instruction. This is especially true when courses rely on TAs who have limited experience with pedagogy and even more limited experience with writing pedagogy. However, explicit training in writing pedagogy alone is insufficient for TAs to introduce appropriate and effective teaching strategies into their classrooms. Time needs to be built into the course for TAs to apply these strategies and create structured opportunities for students to learn about writing before and during the writing process. These blocks of time do not, and maybe should not, be large. Writing instruction in the sciences can occur in small doses, in as little as five minutes of class at a time. The current study also reinforces the need

for such instruction to be intentional, ideally arising directly out of the challenges students are facing, in order to help students understand the conventions of scientific writing while they work to implement those conventions in their writing. Having several short periods of class time dedicated to 5MTs may promote this problem-solving approach to writing instruction.

The 5MT also encourages TAs to be mindful of the time available during a class period and what it means to teach and learn. Such mindfulness involves thinking critically about how they use class time and thinking creatively about what they ask students to investigate on their own. Again, we discovered that increasing attention to lesson design principles motivates TAs to be aware of student learning in real time and how to develop activities to address student needs. Because the 5MT asks for a single learning objective, TAs are encouraged to consider learning as a process of accomplishing those objectives, building knowledge and skills incrementally and over time. At the same time, composing learning objectives requires TAs to be cognizant of and reflect upon what additional instruction could benefit a large number of their students. Additionally, the 5MT introduces TAs to active learning by modeling student-centered lesson planning and practice (Burke et al. 2005). In creating opportunities for active learning, TAs learn what it means to share responsibility for learning with students.

For writing pedagogy more specifically, TA training that involves lesson design provides a context for encouraging TAs to respond to student writing by creating opportunities for active learning, rather than responding by disseminating information to students through written feedback. Thoughtful comments that motivate students to revise and re-engage with their work in progress can require more time to compose than TAs have available to them (Sommers 1982), and students may or may not read, understand, or know how to engage with the written feedback they receive (Blair, Curtis, Goodwin, & Shields 2013). As well, the 5MT as a response strategy presents a way to address common struggles students face when they confront

unfamiliar genres and their conventions. Students access opportunities for active learning while

TAs have the ability to determine if and to what extent students are learning and improving

through pre and post assessment.

Limitations and future directions

The current study does not take into consideration feedback from undergraduate students about

the 5MT, nor do we evaluate samples of student writing. Without this data, we are unable to

evaluate whether undergraduates perceived the 5MT to be beneficial to their learning and the

extent to which the 5MT contributed to gains in student writing. Future research might also

investigate the effectiveness of the 5MT as a way to structure writing instruction in a variety of

disciplines and learning contexts.

Based on the findings we present here, we see the value in continuing to include the 5MT in TA

training and the potential for the 5MT to be applied more extensively in undergraduate biology

lab courses to support student learning. Making TAs more aware of pedagogy, more reflective

about their teaching, and more prepared for their classroom experiences support the likelihood

that they will foster productive learning environments. While our data do not provide evidence

that the 5MT promotes self-efficacy in TAs, other studies with pre-service teachers and

graduate students have found that authentic teaching experiences such as microteaching

promote self-efficacy (Mergler & Tangen 2010; Troop et al. 2015). Our design did not originally

set out to evaluate self-efficacy and therefore further investigation is required to understand the

benefits that the 5MT may provide in this area.

This project further suggests the potential for big gains from small changes and brief moments.

Introducing one new project in professional development for TAs and encouraging short

opportunities for active learning in introductory lab courses supported training and learning

outcomes without necessitating complete overhauls to existing programs or adoption of new

frameworks or approaches. Instead, the 5MT provided TAs with a simple tool to use in their

classrooms, helping them respond to their students' needs and think critically, creatively, and

intentionally about teaching writing in the sciences.

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Figures, Tables and Appendices

Figure 1: Participant Responses to Survey Questions. Response options are on the x axis and the number of participants on the y. Titles are the questions used in the survey.
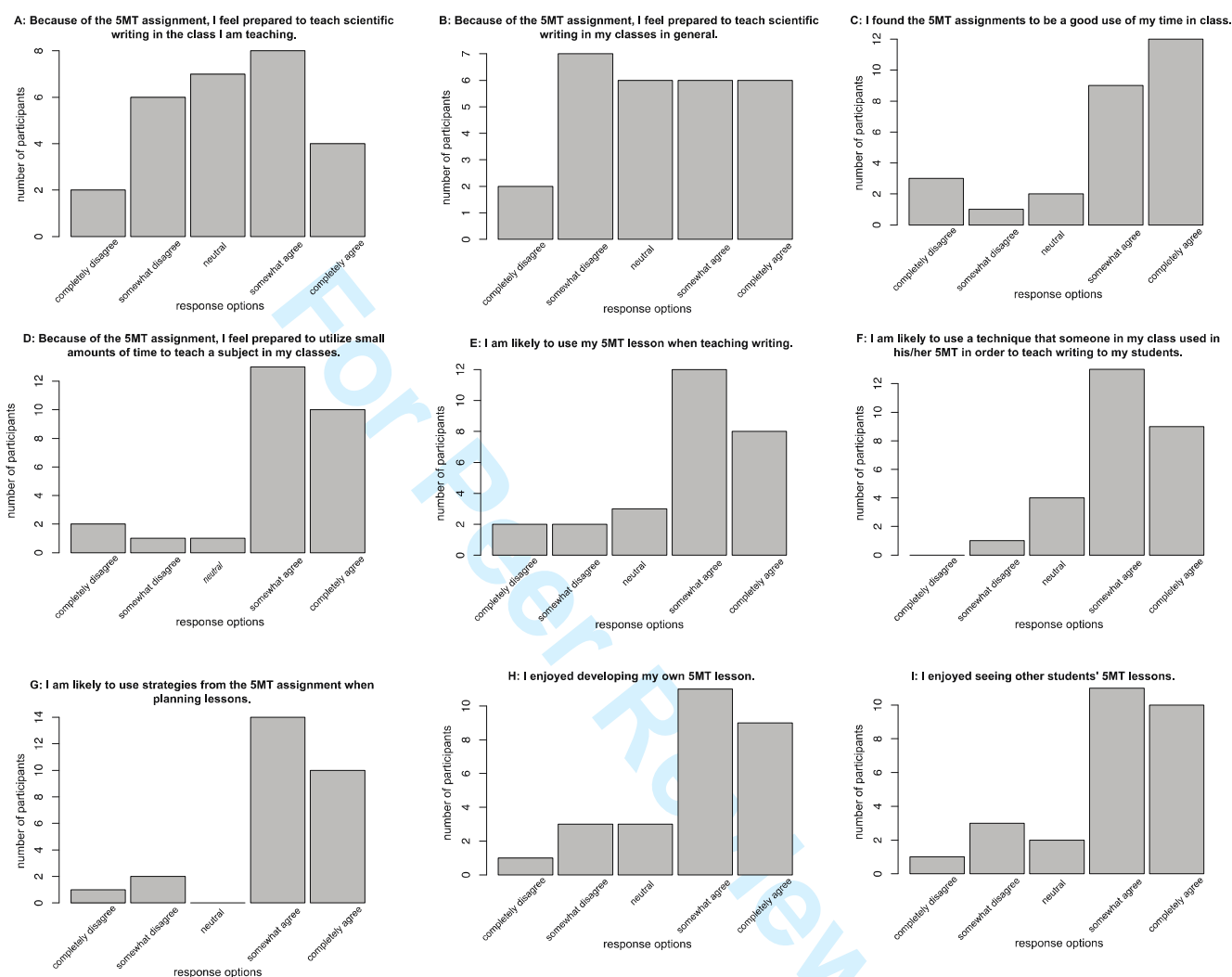
Table 1: Topics and Methods Used in Submitted 5MTs. Each 5MT is a row in the table where the topic is the subject being taught in the 5MT and the general methods used are listed in the right column. When the methods are blank, the TA primarily spoke to the group. These method determinations are based upon the materials submitted by the TAs and their lesson plan and do not necessarily represent the final in-class distribution.

Topic for each 5MT	Methods used in each 5MT*
creating data tables	practice the activity, group work
experimental vs. observational studies	practice the activity, peer feedback, group work
identifying parts of a research article	group work
peer-reviewed vs. non-peer-reviewed work	group work
elements of scientific writing style	rewriting
peer-reviewed vs. non-peer-reviewed work	
using in-text citations	
creating figures	group work, rewriting
oriented writing in mathematics	
paraphrasing primary literature	group work, rewriting
making sense of figures	practice the activity, peer feedback
writing for your audience	group work, rewriting
using active vs. passive voice	group work
using semicolons vs. commas	group work
writing figure legends	group work, practice the activity
writing figure legends	group work, rewriting
writing a scientific abstract	practice the activity
writing concise methods	practice the activity, peer feedback
writing concise methods	group work, rewriting
writing concise methods	group work
writing hypotheses	practice the activity, peer feedback
writing hypotheses	group work, rewriting, peer feedback
writing testable questions	group work, rewriting

*using examples and whole class discussion or presentation was not included because it occurred to some degree in every 5MT

Table 2: Sample Responses to 5MT Survey Questions and Reflection Prompts.
Qualitative data are presented anonymously, and may have been lightly edited for
clarity and grammar. Topic describes the general topic for the quote. Sample responses
are quotes from either survey or reflection responses from various participants. Row
numbers correspond with in-text references.

	Topic	Sample responses
1	Lesson Planning	"It helped me develop an understanding for teaching students individual parts of the bigger whole of scientific writing, because teaching them how to write scientifically can be overwhelming and there are so many components that breaking them down into interactive pieces will help both me and the students."
2		"Also, writing is (ideally) an inherently creative and original thing, yet it is important to be explicit about 'what makes good writing' and specifically what you are looking for in the assignments for the course. Despite how obvious it seems, it never occurred to me to do that."
3		"It gave me some much needed experience in lesson design. It taught me that I might need to practice lessons before I attempt to teach them, which was something I had not previously thought of."
4		"I think many of us self-reflected that what we set out to teach was too complex or would take more time that we had initially thought before we gave our presentation."
5		"[T]his assignment required everyone to think through their lesson goals and then get feedback on it from the perspectives of other students."
6		"I think seeing these lessons was a good way to show me a variety of teaching methods and strategies even in such a short amount of time."
7		"The 5MT experience was good because it provided me the opportunity to develop a presentation on a narrow topic that my students were struggling with. Being able to repeat this experience in the future will greatly benefit my teaching. Each class is unique in some way so just because one class struggled with writing figure captions doesn't mean every class will."
8	Student Engagement	"The five minute teach assignment helped me come up with an inventive way to teach without lecturing and to leave discussion primarily with students. The key focus in my opinion was to facilitate learning while putting the ball in the student's court."
9		"Coming up with an in-class activity that was integrated into a lecture was extremely difficult, and made me realize how difficult it must be to come up with active learning strategies even when you have relatively longer amount of time just because of the sheer amount of information you are supposed to cover in a class."

10		"I think it is an easy way to get students to pay attention to what you're saying because students (and all people) have very short attention spans. It's probably more likely that they will get the information through a shorter amount of time than me droning on for an hour."
11	Time Management	"It really helps save time. Time management became much easier once I focused on keeping my lectures shorter."
12		"In designing [the 5MT], I had to be creative with my time, and decide which information was important to discuss, versus which information could be left for the students to investigate on their own time."
13	Future Use	"The five-minute teach was a great lesson that I will probably use again in my teaching career. I see it as a really efficient way to deal with issues that have come up in the class, particularly with writing mechanics."
14		"Before the five-minute teach in my class, hardly any students were using the journal abbreviation as directed to in the lab manual. I made a five-minute teach, designed an activity to practice the journal abbreviation and almost every single person's citations were fixed for the next post-lab. It was amazing! I am planning to cut down on the lectures about writing and start using five-minute teaches with active-learning-activities to see more impact. I will definitely use five-minute teaches as I continue teaching writing-intensive lab courses."
15		"The [5MT] is a lovely teaching strategy because it allowed me some flexibility to be creative and further develop my own teaching style."
16		"I would like to incorporate this into my teaching, my only concern is that with teaching labs that I won't have time. I understand that this is only a 5 minute exercise, but some class meetings we don't have a minute to spare!"
17		"I am not likely to use it because it needs work. If I fix it up enough I think it could be a good lesson."

Appendix 1: Lesson Plan Template for the 5MT.

Five Minute Teach Lesson Plan Template

Learning Objective:

The learner will be able to . . .

given [the following learning/writing experience]. . .

Bridge [to kickstart your lesson]:

Pre-assessment [to determine what students already know]:

Activity Steps/Practice [to facilitate learning]:

The learner will. . .
1.

Post-assessment [to determine what students have learned]:

Closure [to wrap up the lesson and prepare students for what is to come]

Materials and Notes [what you need to execute the lesson and tips for success]:

Appendix 2: Survey Questions.

Q1: Please rate the following statements from completely disagree to completely agree.

- I am likely to use my 5 minute teach lesson when teaching writing.
- I am likely to use a technique that someone in my class used in his/her 5 minute teach in order to teach writing to my students.
- I am likely to use strategies from the 5 minute teach assignment when planning lessons.
- I found the 5 minute teach assignments to be a good use of my time in class.
- I enjoyed developing my own 5 minute teach lesson.
- I enjoyed seeing other students' 5 minute teach lessons.
- Because of the 5 minute teach assignment I feel prepared to teach scientific writing in the class I am teaching now.
- Because of the 5 minute teach assignment I feel prepared to teach scientific writing in my classes in general.
- Because of the 5 minute teach assignment I feel prepared to utilize small amounts of time to teach a subject in my classes.

Q2: Why are you likely/unlikely to use your five minute teach lesson when teaching

writing?

Q3: Why are you likely/unlikely to use a technique that someone in your class used in his/her 5 minute teach in order to teach writing to your students?

Q4: Why are you likely/unlikely to use strategies from the 5 minute teach assignment when planning lessons?

Appendix 3: Relevant Section of the End of the Semester Reflection Prompt.

Additionally, please reflect on your experience with the 5 minute teach assignment. How did this assignment help you think about the way you design lessons and teach writing in the sciences? What parts of the assignment will you take with you into your next teaching experience? What did you learn from watching the other students teach? Is there anything else you would like to share with us about the assignment?