

TRESTLE Course Transformation Report

Date of report: 10/3/2020

Course name: Graduate teaching seminars: The Pedagogy for Future Faculty Seminar (EBIO 5460/ENVS 5100/GEOG 5100) and the Science Education Teaching and Learning Seminar (EBIO 6100/MCDB 5650).

Authors: Nichole Barger, Stephanie Chasteen

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Intro

In 2018-2019, as lead PI Dr. Cheryl Pinzone worked on this project to transform science education seminars for graduate student teaching assistants: The Pedagogy for Future Faculty Seminar (EBIO 5460/ENVS 5100/GEOG 5100) and the Science Education Teaching and Learning Seminar (EBIO 6100/MCDB 5650). Pedagogy for Future Faculty (which was offered through the Graduate Teacher Program; GTP) was discontinued as GTP was incorporated into the new Center for Teaching and Learning. Thus, the remainder of this report focuses on EBIO 6100/MCDB 5650.

Drs. Nichole Barger and Jenny Knight advised Pinzone on this project but Pinzone was the primary lead on the project. During this time Pinzone attended EBIO curriculum committee meetings, the EBIO 6100 Science Education seminar led by Barger, and conducted a graduate student survey. Unfortunately, in the spring of 2019 Pinzone suffered from medical problems and went on medical leave and some objectives from the project were not complete. As a result, the primary research that Pinzone conducted on this project was a graduate student survey which was given to A&S STEM departments in early 2019. This is the primary product from this project

Course specific information

Pinzone led efforts to identify how we can offer a sequence of graduate seminars focused on pedagogy. Since this time there have been quite a number of changes that have altered how we would go about offering these seminars. First, Barger has now cycled out of teaching EBIO 6100 Science Education due to increasing administrative commitments as Associate Chair for Undergraduate Studies and research commitments as the co-chair of the UN Convention to Combat Desertification. Unfortunately, at this time, there are no plans to offer this seminar in the future which is due to increasing commitments and work load due to changes with COVID-19. MCDB 5650, however, continues to be offered.

Graduate student survey

The main produce of this project was the graduate student survey. Overall, the survey results are unsurprising in that there was clear interest in teaching from the graduate students who chose to take the survey but that time appears to be a limiting factor in engaging more deeply. Since graduate students are evaluated primarily on their research performance and progress, it was heartening to see the commitment to developing their teaching among the survey participants.

Findings from graduate student survey

These are provided by PI Chasteen.

What experiences do GTAs have with respect to teaching and with respect to professional development for teaching?

- GTAs are not blank slates – they come in with a wide variety of teaching experience in college and high school. Respondents have been teaching as GTAs for about 2 years.
- The Graduate Teacher Program is a significant draw for professional development.
- However, many do not participate in teaching professional development.

- Time is the biggest impediment; offering PD that is intensive in nature (e.g., summer or fall intensive) might help with the time demands of research. Opportunities on East campus were also requested. Given COVID-19, virtual opportunities might also be considered.
- Lack of prioritization of professional development for TAs is also an impediment; which may explain some of the interest in certificates or other tangible rewards for engaging; this interest in tangible rewards could be leveraged.
- Offering professional development around inclusive teaching and active learning might be well-received.

What are GTAs motivations related to teaching?

- GTAs expect to have teaching as part of their career; though most are interested in research-focused careers.
- GTAs report high levels of intrinsic motivation in teaching.
- This interest can be leveraged in PD offerings and advertising.

To what extent are GTAs confident about their teaching?

- GTAs report high self-efficacy around teaching but I find it difficult to draw clear conclusions from the data as to whether “building confidence” would be an effective motivational strategy to encourage graduate students to pursue professional development.

To what extent do GTAs perceive a positive culture around teaching in the department and institution?

- GTAs perceive some level of support for teaching in their department, and at CU Boulder as a whole – but not a high level of support.
- Thesis advisors are perceived as having a slightly lower level of support for teaching, as was the professional field as a whole.
- There may be some value in exploring differences by department.

What challenges do GTAs face in their TA experience?

- GTAs have limited choice and power in their TA positions – including course selection, practicing different teaching strategies, and getting clear job expectations. While they do perceive some level of support for innovation, this support is not strong.
- GTAs do have some struggles with time management.
- Professional development may take advantage of opportunities to provide support in self-advocacy, negotiation of expectations, and time management, as well as opportunities to practice skills that are not available in the TA position.
- These responses may differ by department.

Implications from graduate student survey

These are provided by PI Chasteen.

Professional development can capitalize on graduate student interest and experience.

There are many opportunities to provide professional development for STEM graduate students, based on these responses. They are interested in improving their teaching, and expect it to be a part of their future career. They feel that PD can help them achieve teaching excellence. They are interested in learning about inclusive teaching and active engagement strategies, among others. Several indicated that having more opportunities on East campus would be a draw.

Tangible rewards may be a draw. Because graduate students struggle to prioritize PD, and because many noted that they took part in GTP certificate programs, such tangible outcomes of PD may help provide an extrinsic boost to the intrinsic motivation that many noted. There is literature to suggest that extrinsic rewards can be the tipping-point to getting people to engage in something that they wish to engage in, but haven't yet prioritized. Of course, there are many extrinsic de-motivators to combat, as shown by participants' perceptions of only moderate value placed on teaching by departments and advisors.

Intensive or virtual professional development may be a draw. Given time constraints and the challenges with scheduling, offering experiences that are intensive (e.g. one month) may be more feasible for many. Respondents did not mention virtual opportunities, but I hypothesize (especially in COVID-19) that this could be a draw – especially if virtual opportunities were asynchronous (on-demand) and paired with synchronous (in real-time) activities. This would allow participants to engage in PD on their own time, but with some accountability and interactivity afforded by regular synchronous opportunities.

Professional development might include professional skills. STEM graduate students are challenged to incorporate teaching professional development into a heavy schedule which prioritizes research over teaching. Most are planning to pursue research-heavy careers, so this will be a lifetime challenge. I expect that professional development that supports STEM graduate students in balancing research and teaching expectations, and time management, would be very well-received – and serve these students well in their future careers. STEM graduate students also struggle with other professional issues: Managing the work of their TA work, and having clear expectations in their TA-ship. Thus, professional development that offers TAs support in self-advocacy and negotiation skills would be likely well-received and help them in their future careers. I would suggest not just including such professional skills in the content of PD, but strongly emphasizing it in the marketing to draw students to these opportunities.

Report on the outcomes of the work

How will you maintain the changes over time and across structures?

The graduate survey will be shared with the EBIO graduate committee and DBER faculty within the department. We anticipate continuing our efforts to offer graduate seminars in pedagogy but we may have some delays due to changes in our teaching this year due to COVID-19.

Plans for future work

As stated above, we hope to offer a sequence of graduates seminars in pedagogy in the future but at this time we have limited capacity to offer these.

Dissemination and products arising from the work

The graduate student survey data will be shared within the EBIO department.

Community and expertise building in the department

Unfortunately, Pinzone has left EBIO and has had little contact with the team. So the community and expertise building in the department has been limited. I also think that the funding to do this work was limited. It takes a lot of effort to build community and expertise in a department which often times requires fairly significant funding streams.

The process and structure of the work in the department

I think the biggest issue was having a non-permanent member of the department doing this work during a difficult period in her life. As a result there weren't many structures put in place in the department that are associated specifically with this project.

Future Plans

At this point the survey will be shared but we don't currently have a plan in place that continues from this work specifically.

Appendix I: Survey Analysis

Created by: Stephanie Chasteen (TRESTLE PI)

Date: 4/17/20

Purpose: To assist Dr. Barger and Dr. Knight in interpreting data

Background

In February 2018 Cheryl Pinzone, Nichole Barger, and Jennifer Knight submitted a proposal to the TRESTLE project entitled “Transforming pedagogy and science education courses for graduate student teaching assistants – integrating models of graduate training.” The proposal was funded for a portion of the requested funds. The aim of the proposal was to provide more coordinated GTA training across biology departments at CU by transforming two graduate level courses, The Pedagogy for Future Faculty Seminar (EBIO 5460/ENVS 5100/GEOG 5100) and the Science Education Teaching and Learning Seminar (EBIO 6100/MCDB 5650). The former course has since been discontinued, and so development focused on the Teaching and Learning seminar, co-taught by Barger and Knight.

An initial step in this work was to develop and distribute a survey for GTAs to identify their needs and current gaps in teaching and professional development training. Using this information, a faculty survey was to be developed, and then the courses developed. Dr. Pinzone developed the survey and interview protocol, and administered the survey, but then left the project. To aid Barger and Knight in using the work completed to fulfill the project objectives, Dr. Chasteen has provided this brief analysis using information from the standard Qualtrics survey report (the raw data file was not provided to Dr. Chasteen).

Evaluation questions

The survey is being treated as an evaluation survey and not a research survey; that is, we are only using it for information to help direct decisions made in the course at hand.

From project records, Dr. Chasteen proposes the following evaluation questions:

1. What experiences do GTAs have with respect to teaching, and with respect to professional development for teaching? To what extent do professional development experiences serve their needs?
2. What are GTAs motivations related to teaching?
3. To what extent are GTAs confident about their teaching?
4. To what extent do GTAs perceive a positive culture around teaching in the department and institution?
5. What challenges do GTAs face in their TA experience?
6. What can we conclude about opportunities for the graduate teaching seminar?

Summary of results

Findings

What experiences do GTAs have with respect to teaching and with respect to professional development for teaching?

- GTAs are not blank slates – they come in with a wide variety of teaching experience in college and high school. Respondents have been teaching as GTAs for about 2 years.
- The Graduate Teacher Program is a significant draw for professional development.
- However, many do not participate in teaching professional development.
- Time is the biggest impediment; offering PD that is intensive in nature (e.g., summer or fall intensive) might help with the time demands of research. Opportunities on East campus were also requested. Given COVID-19, virtual opportunities might also be considered.
- Lack of prioritization of professional development for TAs is also an impediment; which may explain some of the interest in certificates or other tangible rewards for engaging; this interest in tangible rewards could be leveraged.
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Implications

What can we conclude about opportunities for the graduate teaching seminar, or teaching professional development in general at CU?

Professional development can capitalize on graduate student interest and experience.

There are many opportunities to provide professional development for STEM graduate students, based on these responses. They are interested in improving their teaching, and expect it to be a part of their future career. They feel that PD can help them achieve teaching excellence. They are interested in learning about inclusive teaching and active engagement strategies, among others. Several indicated that having more opportunities on East campus would be a draw.

Tangible rewards may be a draw. Because graduate students struggle to prioritize PD, and because many noted that they took part in GTP certificate programs, such tangible outcomes of PD may help provide an extrinsic boost to the intrinsic motivation that many noted. There is literature to suggest that extrinsic rewards can be the tipping-point to getting people to engage in something that they wish to engage in, but haven't yet prioritized. Of course, there are many extrinsic de-motivators to combat, as shown by participants' perceptions of only moderate value placed on teaching by departments and advisors.

Intensive or virtual professional development may be a draw. Given time constraints and the challenges with scheduling, offering experiences that are intensive (e.g. one month) may be more feasible for many. Respondents did not mention virtual opportunities, but I hypothesize (especially in COVID-19) that this could be a draw – especially if virtual opportunities were asynchronous (on-demand) and paired with synchronous (in real-time) activities. This would allow participants to engage in PD on their own time, but with some accountability and interactivity afforded by regular synchronous opportunities.

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TAs support in self-advocacy and negotiation skills would be likely well-received and help them in their future careers. I would suggest not just including such professional skills in the content of PD, but strongly emphasizing it in the marketing to draw students to these opportunities.

Next steps

Write your own implications.

- I have provided my own suggested implications of the data, but please add to this with the things you notice in the data. This will also help you determine the questions you might still have about it, or ways you might use it.
- In particular what conclusions might you draw from the challenges respondents faced in their TA positions, especially in having choice and opportunity to try new things?

Find out how representative the sample is.

- Before drawing conclusions, a sample of 66 is quite small, with only about 10 per department. Approximately what fraction of the STEM graduate students does this represent, and how were they invited? This will help you provide some understanding of the representativeness.

Explore a few questions of interest by department, or groups of departments.

- I only had a summary report at the time of this analysis and so could not cross-tabulate by department. This is easy done in Qualtrics, and you could add to this report to note differences by department. Because you will end up with a wealth of data this way, I suggest restricting this analysis to (1) a few questions and (2) a few key departments of interest. Challenges faced in TA positions, as well as department support, are two areas that may be useful to explore by department.

Explore a few questions of interest by respondents' experience.

- The sample included those who had or had not participated in professional development. The questions indicating reasons why respondents don't participate in professional development, and what they are interested in, would be more informative if those who had and had not participated in professional development were compared.

Use the results to formulate some next steps for the Science Education Teaching and Learning seminar, plus EBIO and MCDB strategy as needed.

- Despite the lack of representativeness of the sample, and the flaws with the survey, the results are likely suggestive for next steps for the seminar, and some other areas of interest for involved departments.

Share the results with other departments and the Center for Teaching and Learning.

- Other departments may be interested in the responses of their students.
- The Center for Teaching and Learning will be interested in these results as they formulate approaches to supporting graduate student teaching and learning.

Survey analysis

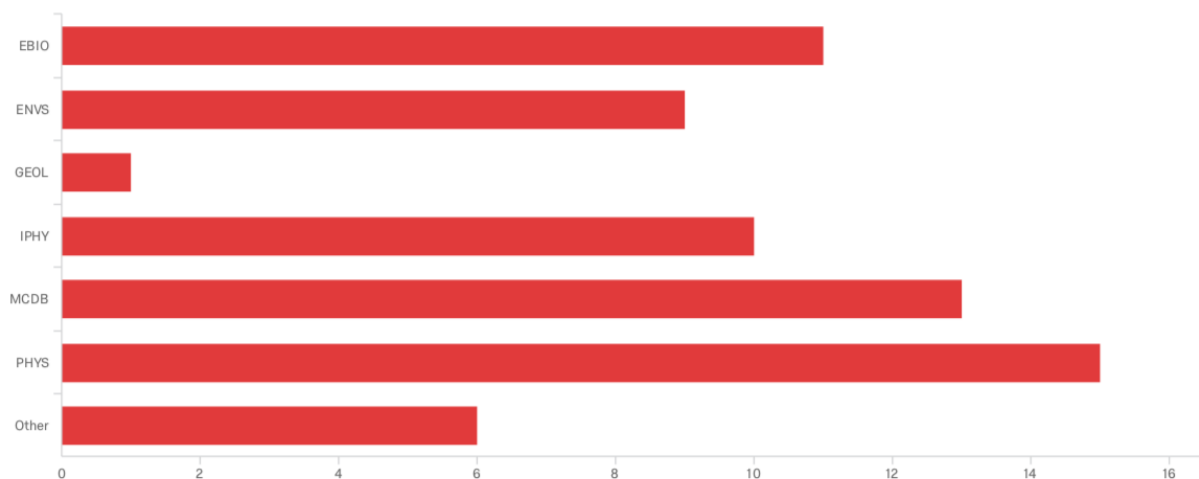
Who took the survey?

Response. A total of 76 respondents answered any particular question. Cheryl indicated that a total of 122 respondents took the survey; it is unclear to me where that number comes from. I do not know how many people it was sent to, and so we do not know how representative this is of the sample. I do not know how respondents were invited to participate. The survey was quite long, and only 66 respondents completed the entire survey.

Department. They were distributed relatively evenly among several STEM departments, but few were in GEOL.

Q39 - Which department do you primarily teach in (or where is your primary adviser

located)?



Gender and ethnicity. The respondents were split roughly equally between male (45%) and female (53%). I do not know how representative this is, but is likely an overrepresentation of females. The vast majority (71%) were Caucasian; 15% Asian, 5% Hispanic.

What experiences do GTAs have with respect to teaching, and with respect to professional development for teaching? To what extent do professional development experiences serve their needs?

Respondents can draw from a variety of existing teaching experience

- Approximately half (45%) had worked as a teacher in another capacity (community college, high school, primary school, museum, etc.)
- Most had worked as a GTA (N=59). The average was 3.7 semesters, and median was 3 semesters.
- About half had worked as a grader (N=36; average of 2 semesters) or guest lecturer (N=33; average of 2 semesters).

Respondents participate in Graduate Teacher Program at a high rate.

- The most common PD experiences cited were GTP workshops (N=46 had attended a GTP workshop, and N=33 had attended 3 or more), receiving a certificate from GTP (N=27), attending workshops or seminars on education (N=19).
- Only a small fraction (N=14) had participated in a faculty led seminar course, such as Pedagogy for Future Faculty.
- See data next page.

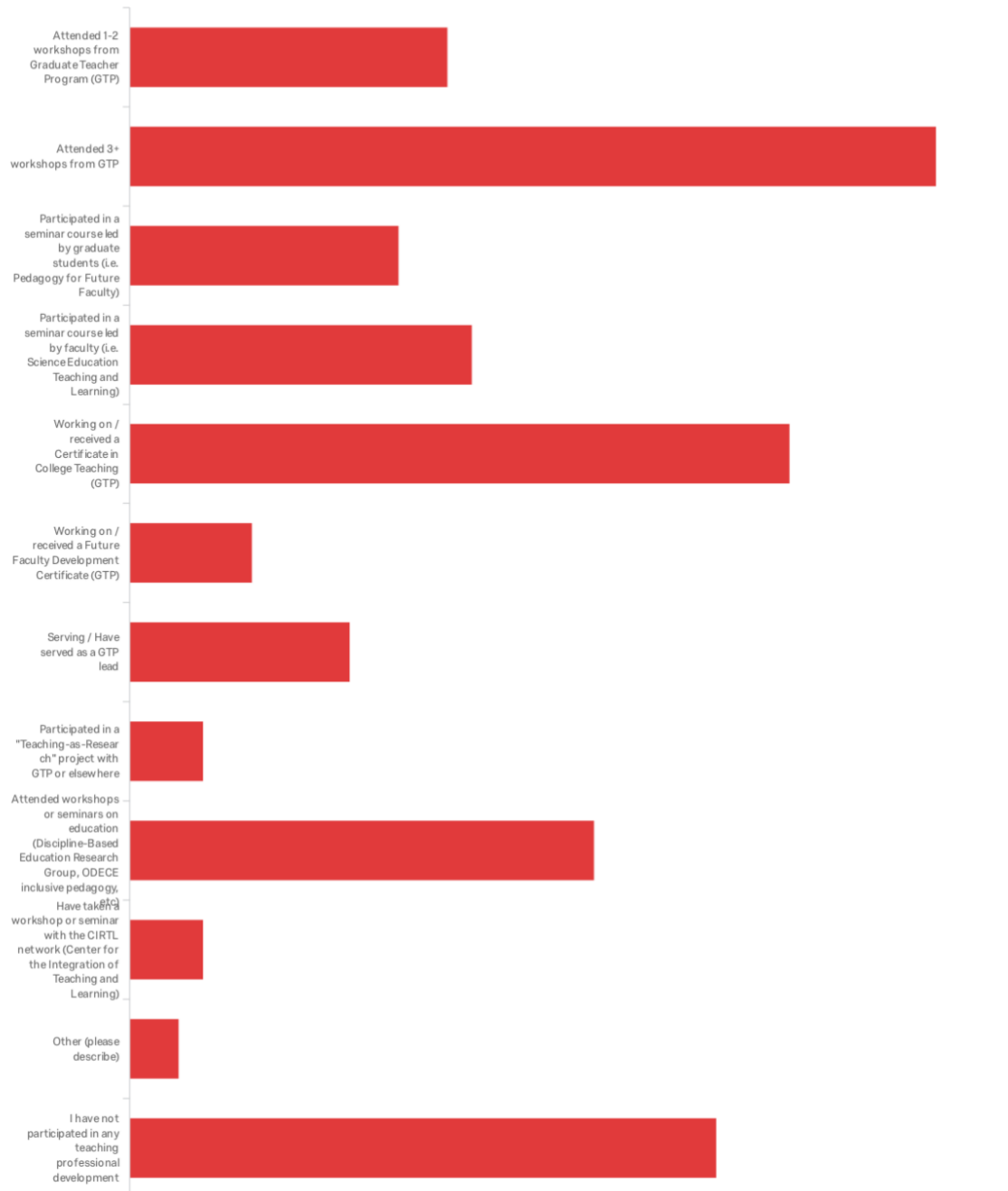
However, a significant fraction didn't participate in any teaching professional development.

- A total of N=24, or about 1/3, didn't participate in any teaching professional development.

Many respondents are interested in learning about inclusive teaching and active engagement.

- In open-ended responses, a total of N=12 (out of 43 responses) mentioned inclusivity or diversity.
- A total of N=10 mentioned active learning or student engagement.
- Other responses were varied and included curriculum development, learning how to lecture and explain, teaching problem solving, and time management.

Q3 - Which teaching-focused professional development programs or activities have you participated in? (select all)



There is room for improvement in respondents' satisfaction with teaching professional development on campus.

- While very few were dissatisfied (N=7), many respondents were neutral (N=30) .
- The largest fraction (N=33) were moderately or extremely satisfied.

The biggest impediments to engaging in teaching professional development is time, awareness, and scheduling.

- On multiple choice questions (see next page) a majority of respondents (N=50) mentioned “not enough time” as a main reason, and half (N=30) indicated that activities conflicted with their schedule. Lack of awareness was cited by N=22, and for some (N=21) it's not a big enough priority.
- On open-ended responses, scheduling came up commonly, including:
 - Schedule constraints with research (note: not with class schedule).
 - Difficulty committing during the semester (intensive training is easier)
 - Lack of opportunities on East campus.
- The team may wish to investigate which of these reasons were given by those that do participate in PD, versus those that don't. (I did not have access to raw data for crosstabs).

The other main impediment to engaging in teaching professional development is lack of prioritization of such activities.

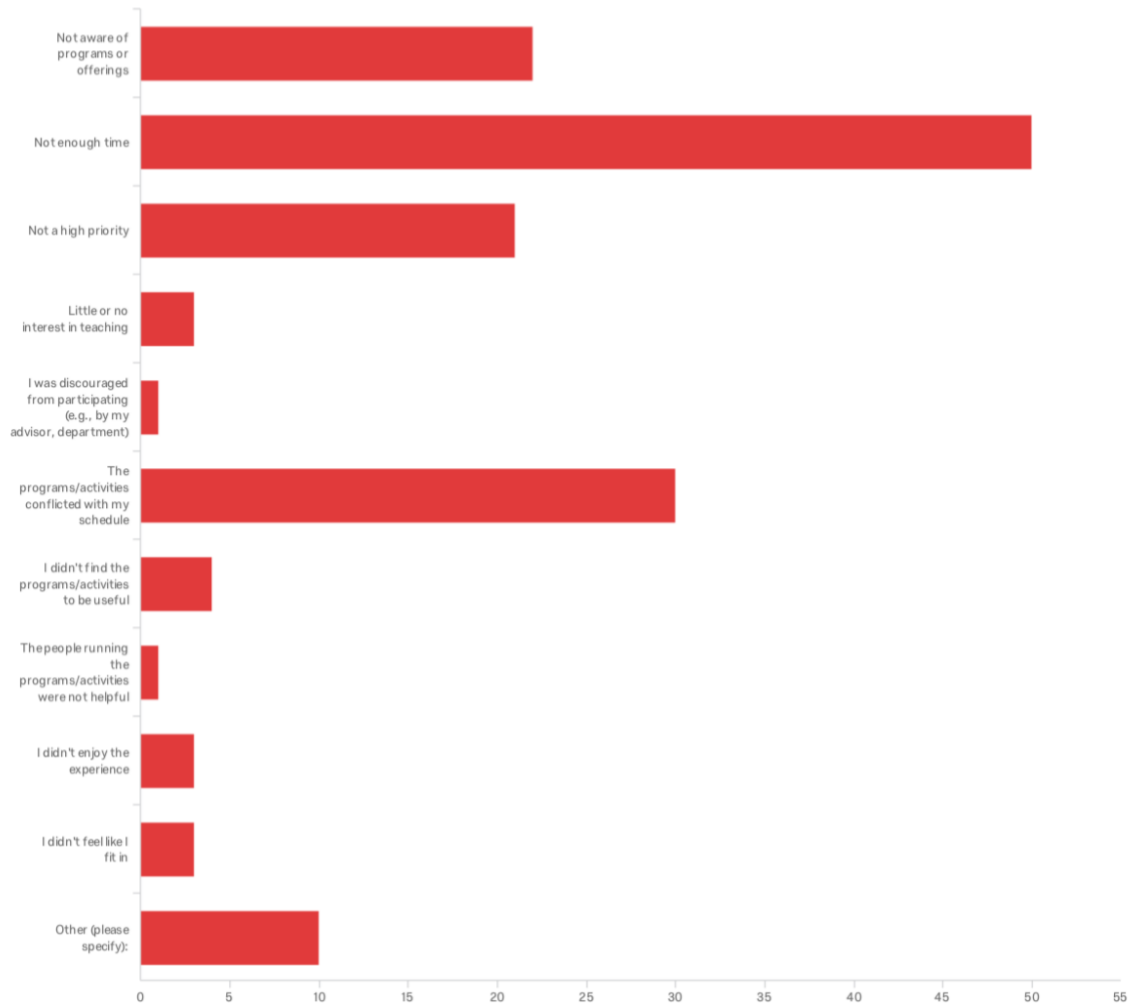
- On multiple choice questions (see next page) for some (N=21) it's not a big enough priority to engage in teacher professional development. Most also indicated that other activities are a higher priority (Q20 below).
- Most also indicated that there was some level of risk associated with professional development (due to lack of time, or judgements from others; Q22 below).
- On open-ended responses, scheduling and priorities came up commonly, including:
 - Lack of prioritization as part of TA training.
 - Greater prioritization of research activities.

Q20 - Do you find that other activities (research, service, personal, etc.) are a higher

priority than engaging in teaching professional development?

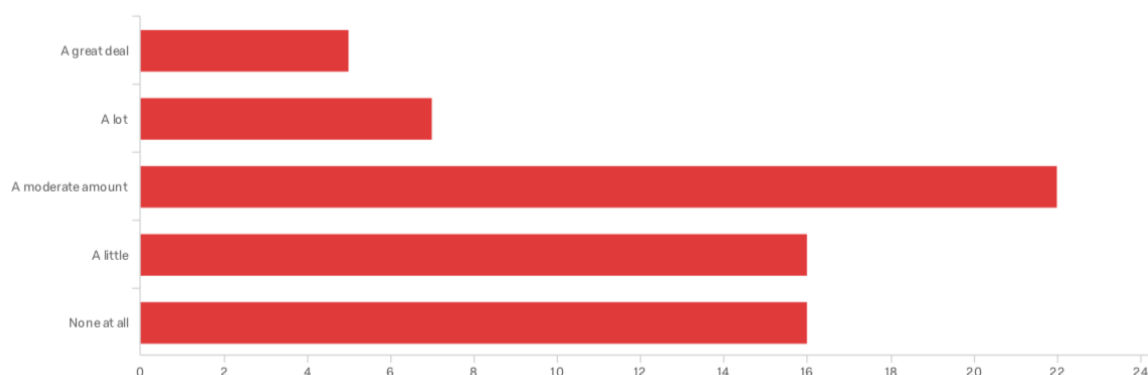


Q6 - Which of the following factors, if any, have discouraged you from participating in teaching-focused professional development programs or activities? (Check all that apply)



Q22 - Does the thought of attending teaching professional development

sessions/workshops feel like you are taking too great a risk (either due to lack of time, or judgments from others on how you spend it)?



Lack of interest or quality is not a major impediment to engaging in teaching professional development.

- Very few people indicated that “lack of interest in teaching” was a reason for not engaging.
- Very few people cited elements of program quality (e.g., people, programs, enjoyability or usefulness of experiences) as reasons for not engaging.

Some conclusions that might be drawn are:

- GTAs are not blank slates – they come in with a wide variety of teaching experience in college and high school. Respondents have been teaching as GTAs for about 2 years.
- The Graduate Teacher Program is a significant draw for professional development.
- However, many do not participate in teaching professional development.
- Time is the biggest impediment; offering PD that is intensive in nature (e.g., summer or fall intensive) might help with the time demands of research. Opportunities on East campus were also requested. Given COVID-19, virtual opportunities might also be considered.
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What are GTAs motivations related to teaching?

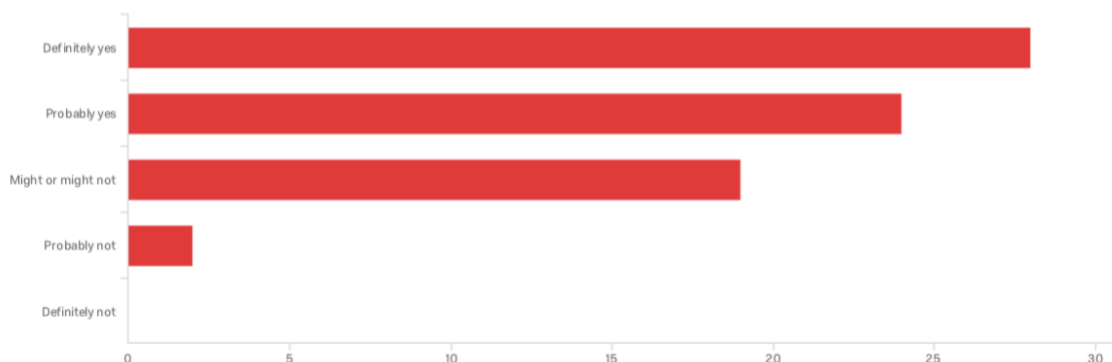
Most respondents plan to have a research career, followed by tenure-track faculty careers.

- About half plan to have a research career in government, industry or business (N=28).
- About half plan to have a tenure-track faculty career at a research-intensive (N=13) or teaching-intensive (N=12) university.
- These results are similar when respondents are asked for their preferences, versus their intentions given job availability.

Most respondents are interested in, and anticipate having, teaching as part of their career.

- When asked to rate their interest in teaching as part of their career (from 1-100) the average was 73, and median was 80.
- Most anticipate that teaching will be at least part of their career.

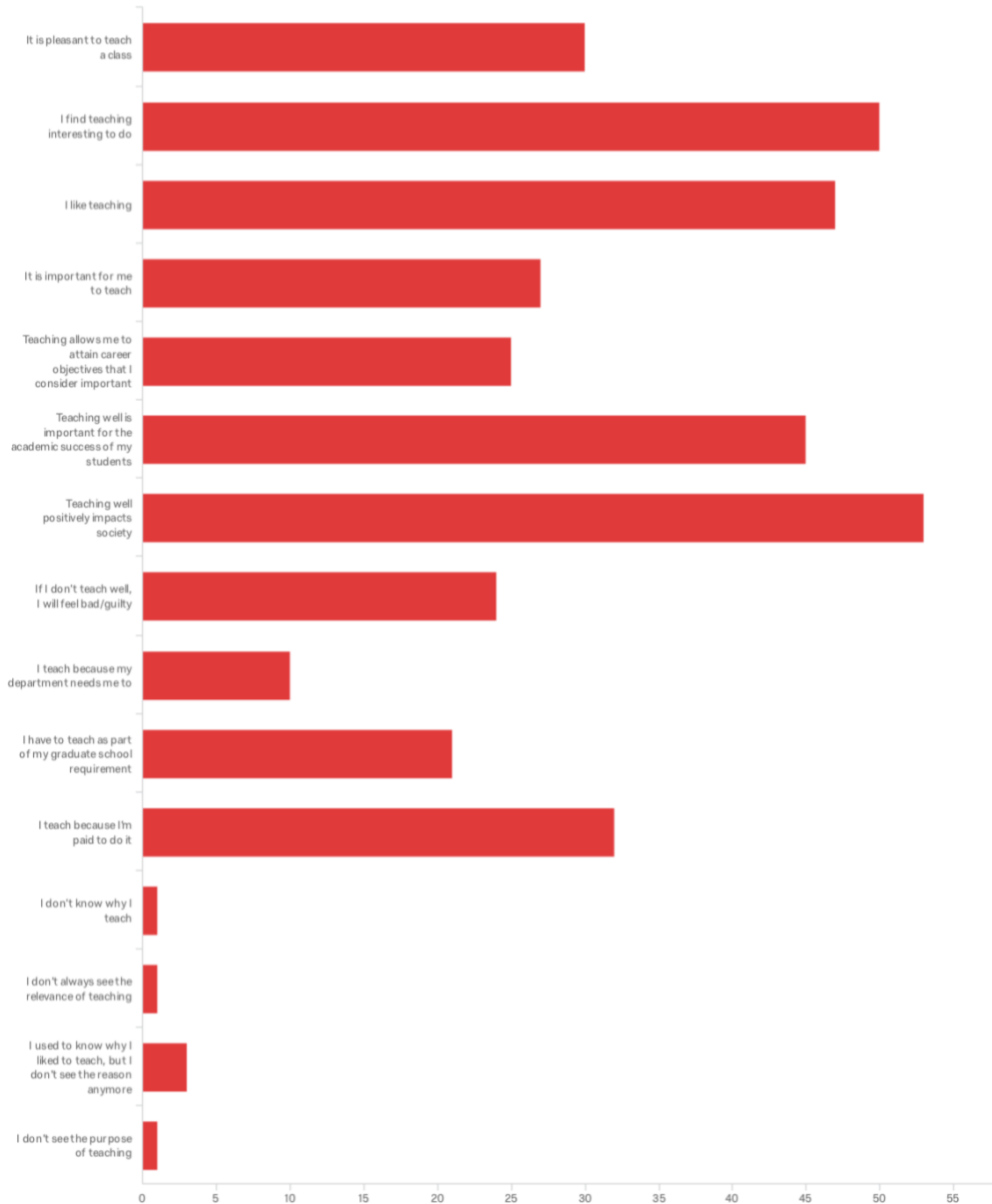
Q11 - Do you anticipate that teaching will be at least part of your future career (in some form)?



Respondents primary motivations to teach are because they find teaching interesting, enjoyable, and important.

- Responses are on next page.
- An associated question about how often they feel positive or negative aspects of teaching did not seem to yield any interesting results.
- An associated question as to whether 'teaching well is valuable to you' yielded overwhelmingly positive results (N=58 definitely yes).

Q13 - Select all that are associated with your motivation to teach most of the time (either as a GTA or in a future career).



Some conclusions that might be drawn are:

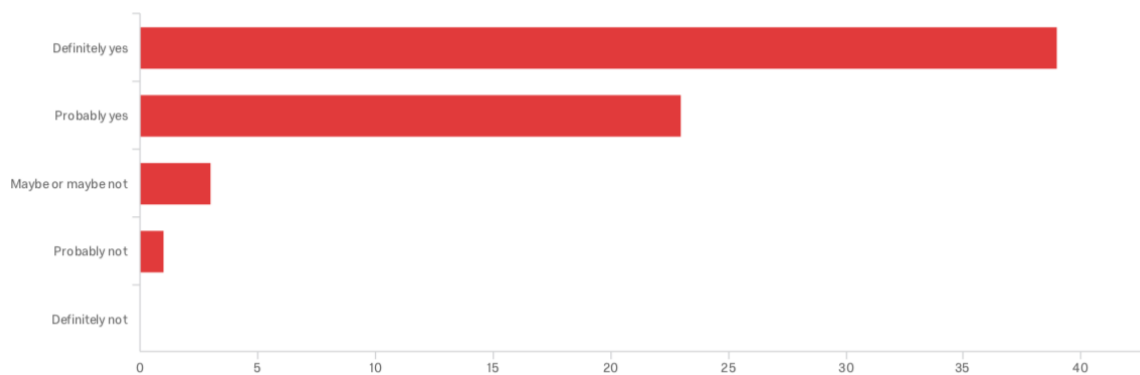
- GTAs expect to have teaching as part of their career; though most are interested in research-focused careers.
- GTAs report high levels of intrinsic motivation in teaching.
- This interest can be leveraged in PD offerings and advertising.

To what extent are GTAs confident about their teaching?

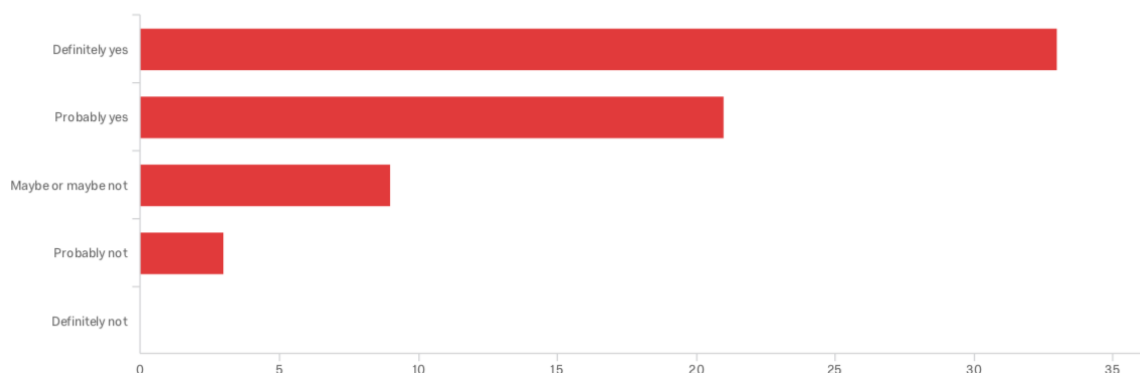
Respondents report high self-efficacy around teaching

- Overwhelmingly, respondents report that they feel they are capable of being an effective educator (Q18 below), and that their engagement with professional development will help them do so (Q19 below).

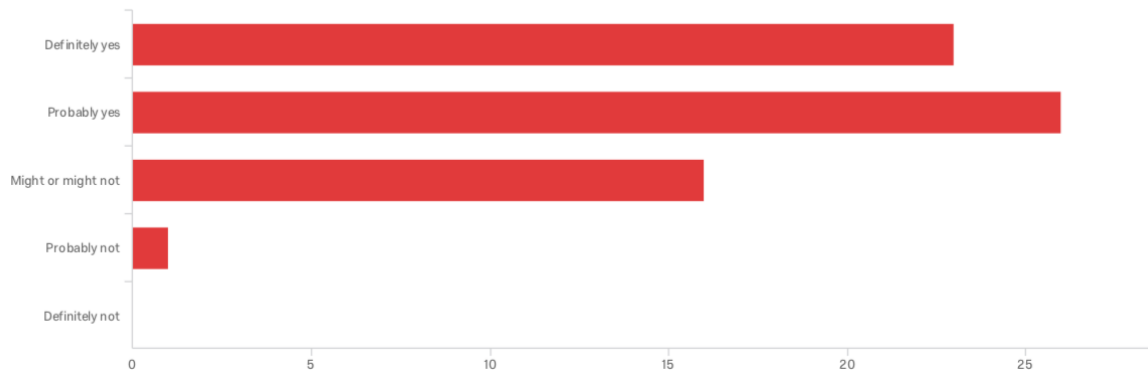
Q18 - Do you believe that you are capable of being an effective educator (possess the skills/abilities either currently or in the future)?



Q19 - Do you envision that your efforts in graduate school to obtain teaching professional development will help you with any future teaching activities you might engage in?



Q21 - Do you think that participating in the available teaching professional development opportunities will result in your improvement as an educator?



Some conclusions that might be drawn are:

- I find it difficult to draw clear conclusions from this data because it asked not about current confidence, but confidence for the future. Thus, it is hard to know whether “building confidence” would be an effective motivational strategy to encourage graduate students to pursue professional development.

To what extent do GTAs perceive a positive culture around teaching in the department and institution?

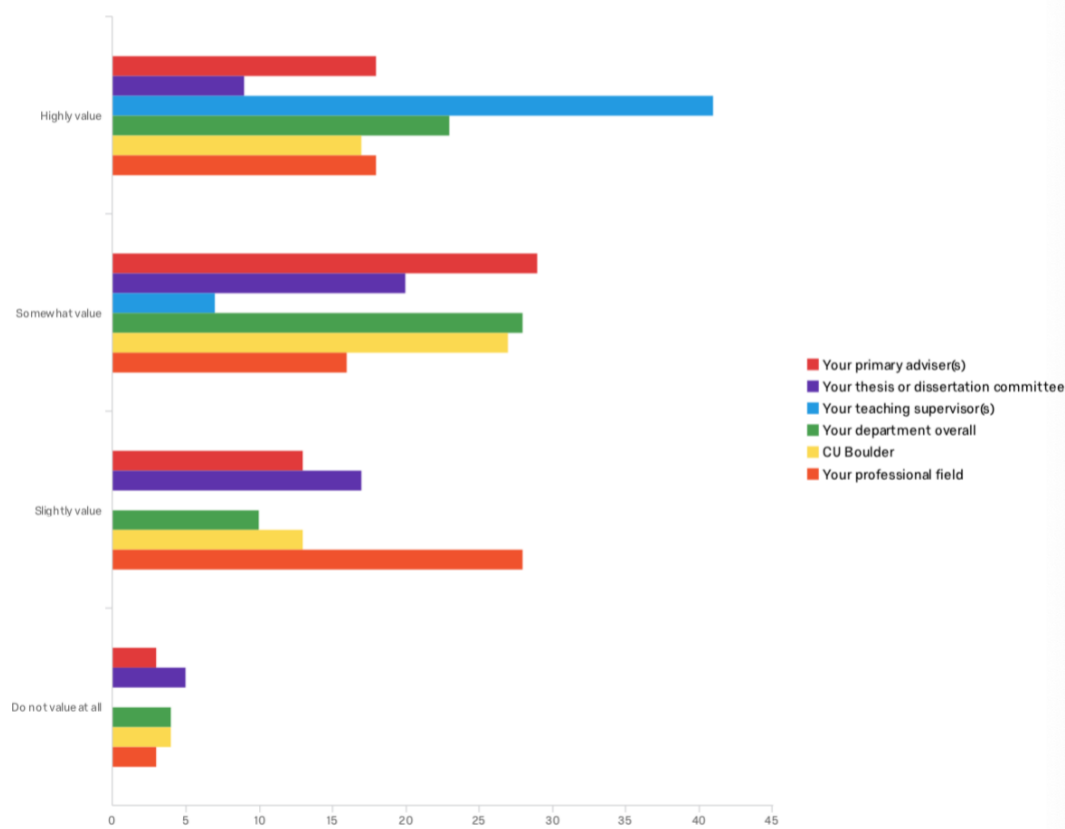
Respondents perceive that their primary advisor values teaching, though not highly.

- Most responded that their **primary advisor** “somewhat” values teaching, see graph below.
- I’m not sure whether to trust the values in the data table (e.g. mean response) as they do not seem to match with the distribution in the graph.

Respondents perceive that the department overall values teaching slightly more than their advisor.

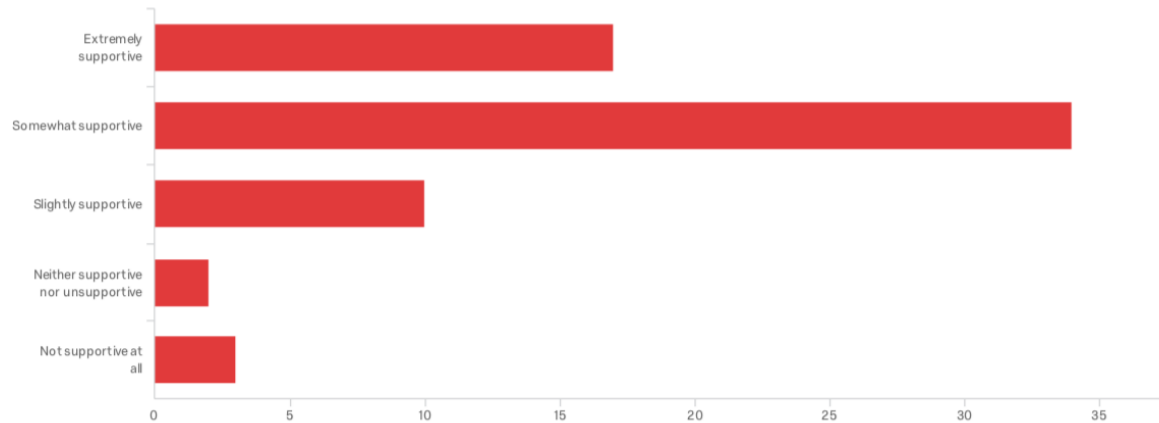
- For the **department as a whole**, responses were split between “somewhat” and “highly” value. They only felt that department leaders were “somewhat” supportive of excellence in teaching (graph next page). Note that respondents are from multiple departments.
- Responses for the department were similar to those for **CU Boulder**. The **professional field** was seen as valuing teaching slightly less than CU Boulder or the department.

Q23 - How much do believe the following groups value teaching?



Q24 - How supportive do you think your department leaders are about supporting

excellence in teaching (awards, resources, seminars, etc.)?



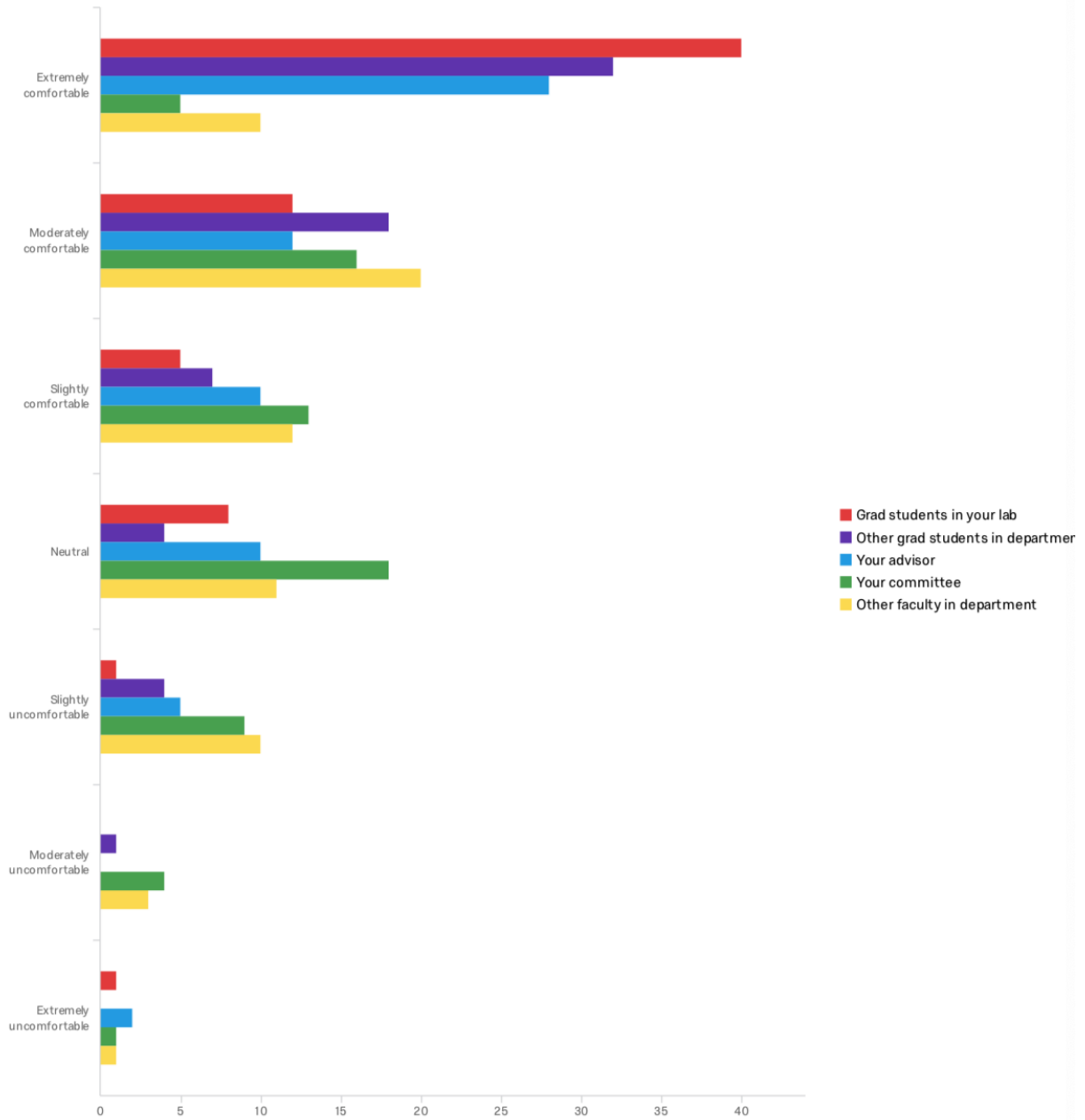
Despite this perception of mediocre value for teaching in their department, respondents are very comfortable seeking advice about teaching from other grad students or their advisor.

- Responses next page; the only people they are not comfortable seeking advice from is their committee (which is likely appropriate).

Some conclusions that might be drawn are:

- GTAs perceive some level of support for teaching in their department, and at CU Boulder as a whole – but not a high level of support.
- Thesis advisors are perceived as having a slightly lower level of support for teaching, as was the professional field as a whole.
- There may be some value in exploring differences by department.

Q25 - How comfortable are you seeking advice about teaching from the following groups?

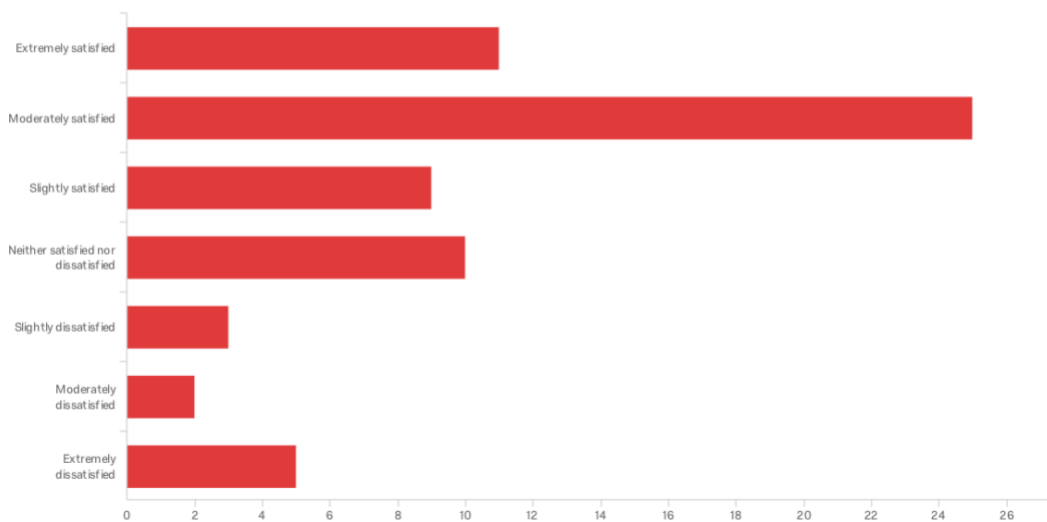


What challenges do GTAs face in their TA experience?

Respondents are mostly satisfied with the course options for TAing, but there is wide spread.

- Graph below; you may wish to explore if there is a pattern of responses by department.

Q26 - Overall, how satisfied are you with your course options to TA for?

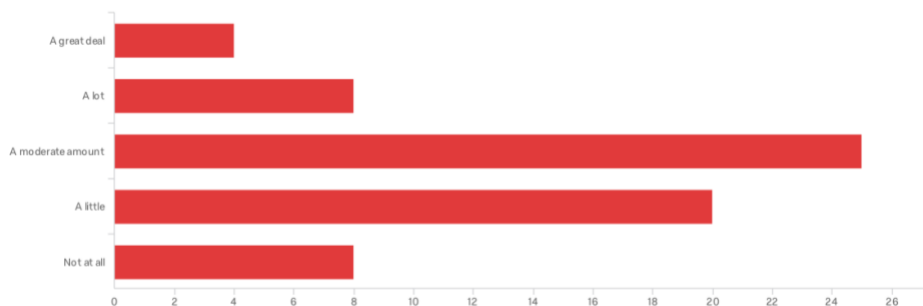


Respondents do not feel they can practice different teaching strategies as a TA.

- Graph below.
- Given the interest in learning about active learning strategies cited earlier, this may present an opportunity (in that PD can provide that practice) and a barrier (in that they do not have authentic opportunities to enact these practices in their TA position).

Q27 - How much are you able to practice different teaching strategies to develop

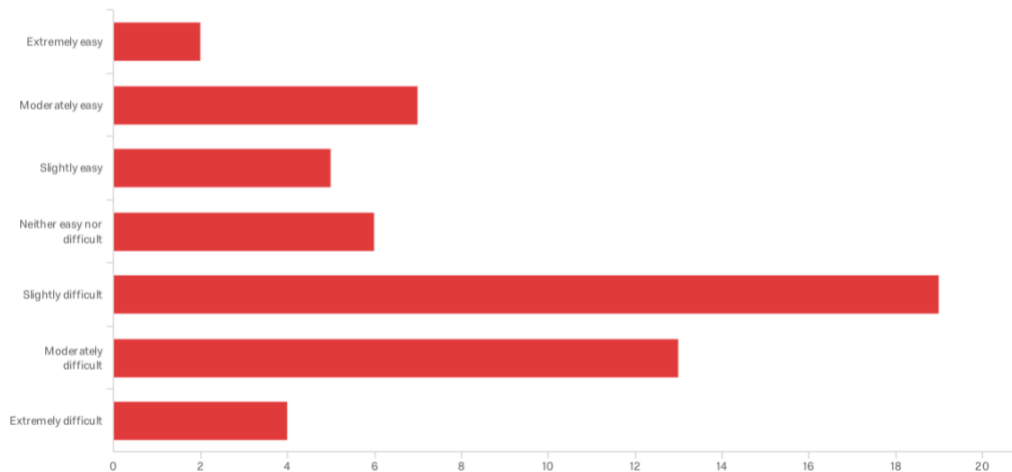
teaching skills in your department?



Respondents generally struggle to keep up with their teaching load.

- Graph below. This finding aligns with the main challenge of “time” as a reason for not engaging in PD. It also suggests that if PD promised to help save time (e.g. in preparation) or manage time that could be a draw.

Q29 - Overall, how difficult is it to keep up with your teaching load during a semester?

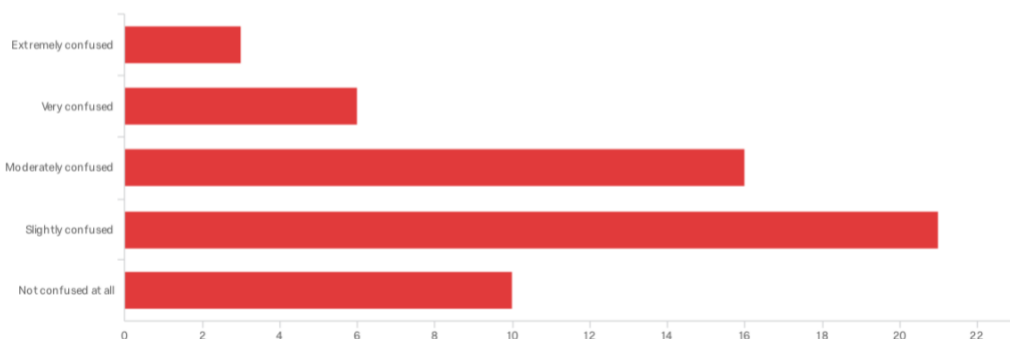


Respondents also report some confusion about expectations in a new course they are TAing for, though this is not strong.

- Graph below. This suggests that PD could offer TAs opportunities to develop self-advocacy skills (e.g., to negotiate and ask for clear expectations in a job).
- Note that the question wording did not specify “as a TA” but given the context, I think we can assume respondents interpreted it in that way.

Q30 - When taking on a new course, how confused are you by what you are supposed to

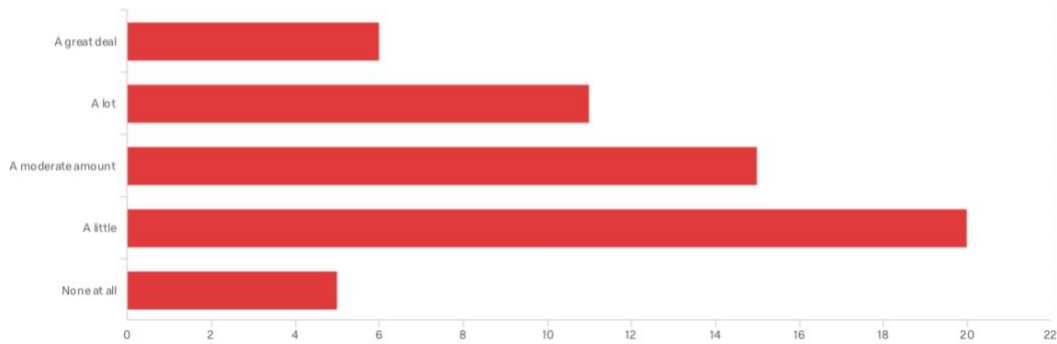
do to be successful?



Respondents feel that they are only somewhat encouraged to try new ideas in their teaching.

- Graph below
- Note that the question asks about frequency, but the answer choices are about degree, and thus it may be difficult to draw strong inferences from this question.

Q31 - How often are you encouraged to try a new idea or have some creative input into what/how you are teaching?



Some conclusions that might be drawn are:

- GTAs have limited choice and power in their TA positions – including course selection, practicing different teaching strategies, and getting clear job expectations. While they do perceive some level of support for innovation, this support is not strong.
- GTAs do have some struggles with time management.
- Professional development may take advantage of opportunities to provide support in self-advocacy, negotiation of expectations, and time management, as well as opportunities to practice skills that are not available in the TA position.
- These responses may differ by department.

What can we conclude about opportunities for the graduate teaching seminar, or teaching professional development in general at CU?

First, I would like to note that the survey design is not high-quality. The purpose of many of the questions is not clear, and there are other problems: The response scale does not always match the question, or there are missing words in the question, or the nature of the question is not clear. I believe Dr. Pinzone required additional support in designing a survey that would have directly addressed the goals of the project. That said, the results are informative.

Possible implications

Professional development can capitalize on graduate student interest and experience.

There are many opportunities to provide professional development for STEM graduate students, based on these responses. They are interested in improving their teaching, and expect it to be a part of their future career. They feel that PD can help them achieve teaching excellence. They are interested in learning about inclusive teaching and active engagement strategies, among others. Several indicated that having more opportunities on East campus would be a draw.

Tangible rewards may be a draw. Because graduate students struggle to prioritize PD, and because many noted that they took part in GTP certificate programs, such tangible outcomes of PD may help provide an extrinsic boost to the intrinsic motivation that many noted. There is literature to suggest that extrinsic rewards can be the tipping-point to getting people to engage in something that they wish to engage in, but haven't yet prioritized. Of course, there are many extrinsic de-motivators to combat, as shown by participants' perceptions of only moderate value placed on teaching by departments and advisors.

Intensive or virtual professional development may be a draw. Given time constraints and the challenges with scheduling, offering experiences that are intensive (e.g. one month) may be more feasible for many. Respondents did not mention virtual opportunities, but I hypothesize (especially in COVID-19) that this could be a draw – especially if virtual opportunities were asynchronous (on-demand) and paired with synchronous (in real-time) activities. This would allow participants to engage in PD on their own time, but with some accountability and interactivity afforded by regular synchronous opportunities.

Professional development might include professional skills.

STEM graduate students are challenged to incorporate teaching professional development into a heavy schedule which prioritizes research over teaching. Most are planning to pursue research-heavy careers, so this will be a lifetime challenge. I expect that professional development that supports STEM graduate students in balancing research and teaching expectations, and time management, would be very well-received – and serve these students well in their future careers. STEM graduate students also struggle with other professional issues: Managing the work of their TA work, and having clear expectations in their TA-ship. Thus,

professional development that offers TAs support in self-advocacy and negotiation skills would be likely well-received and help them in their future careers. I would suggest not just including such professional skills in the content of PD, but strongly emphasizing it in the marketing to draw students to these opportunities.

Next steps

Write your own implications.

- I have provided my own suggested implications of the data, but please add to this with the things you notice in the data. This will also help you determine the questions you might still have about it, or ways you might use it.
- In particular what conclusions might you draw from the challenges respondents faced in their TA positions, especially in having choice and opportunity to try new things?

Find out how representative the sample is.

- Before drawing conclusions, a sample of 66 is quite small, with only about 10 per department. Approximately what fraction of the STEM graduate students does this represent, and how were they invited? This will help you provide some understanding of the representativeness.

Explore a few questions of interest by department, or groups of departments.

- I only had a summary report at the time of this analysis and so could not cross-tabulate by department. Dr. Barger has the full data. You could add to this report to note differences by department. Because you will end up with a wealth of data this way, I suggest restricting this analysis to (1) a few questions and (2) a few key departments of interest. Challenges faced in TA positions, as well as department support, are two areas that may be useful to explore by department.

Explore a few questions of interest by respondents' experience.

- The sample included those who had or had not participated in professional development. The questions indicating reasons why respondents don't participate in professional development, and what they are interested in, would be more informative if those who had and had not participated in professional development were compared.

Use the results to formulate some next steps for the Science Education Teaching and Learning seminar, plus EBIO and MCDB strategy as needed.

- Despite the lack of representativeness of the sample, and the flaws with the survey, the results are likely suggestive for next steps for the seminar and involved departments.

Share the results with other departments and the Center for Teaching and Learning.

- Other departments may be interested in the responses of their students.
- The Center for Teaching and Learning will be interested in these results as they formulate approaches to supporting graduate student teaching and learning.

Appendix II: GTA Survey

GTA Survey

Start of Block: SURVEY INSTRUCTIONS

Dear Participant:

First, thank you for being part of the **STEM Graduate Teaching Assistant Study on Teaching Professional Development**.

We greatly appreciate your involvement. The survey that you are about to take will help us better understand how to better assist you in graduate teaching professional development.

This survey takes approximately 5-10 minutes to complete. Please answer all questions. Your individual responses will remain confidential and will be reported only in aggregated form.

If you have any questions about this survey, please contact Dr. Cheryl Pinzone at cheryl.pinzone@colorado.edu

Clicking the ">>" button below indicates that you are 18 years of age or older, and indicates your consent to participate in this survey. You may withdraw from the survey at any time.

End of Block: SURVEY INSTRUCTIONS

Start of Block: GTA Experience

Q2 In what capacity and for how many semesters have you taught college or university classes? (Check all that apply)

- ☐ I have not yet taught college or university classes
- ☐ Grader for # semester(s) _____
- ☐ Graduate Teaching Assistant for # semester(s) _____
- ☐ Guest lecturer for # class session(s) _____
- ☐ Graduate Part-time Instructor for # semester(s) _____
- ☐ Other (describe): for # semester(s) _____

Q3 Which teaching-focused professional development programs or activities have you participated in? (**select all**)

- ☐ Attended 1-2 workshops from Graduate Teacher Program (GTP)
- ☐ Attended 3+ workshops from GTP
- ☐ Participated in a seminar course led by graduate students (i.e. Pedagogy for Future Faculty)
- ☐ Participated in a seminar course led by faculty (i.e. Science Education Teaching and Learning)
- ☐ Working on / received a Certificate in College Teaching (GTP)
- ☐ Working on / received a Future Faculty Development Certificate (GTP)
- ☐ Serving / Have served as a GTP lead
- ☐ Participated in a "Teaching-as-Research" project with GTP or elsewhere
- ☐ Attended workshops or seminars on education (Discipline-Based Education Research Group, ODECE inclusive pedagogy, etc)
- ☐ Have taken a workshop or seminar with the CIRTL network (Center for the Integration of Teaching and Learning)
- ☐ Other (please describe) _____
- ☐ I have not participated in any teaching professional development

Q4 Which teaching topics or types of training are you MOST interested in?

Q5 Overall, how satisfied are you with teaching-focused professional development on campus?

- ☐ Extremely satisfied
- ☐ Moderately satisfied
- ☐ Slightly satisfied
- ☐ Neutral
- ☐ Slightly dissatisfied
- ☐ Moderately dissatisfied
- ☐ Extremely dissatisfied

Q6 Which of the following factors, if any, have discouraged you from participating in teaching-focused professional development programs or activities? (Check all that apply)

- ☐ Not aware of programs or offerings
- ☐ Not enough time
- ☐ Not a high priority
- ☐ Little or no interest in teaching
- ☐ I was discouraged from participating (e.g., by my advisor, department)
- ☐ The programs/activities conflicted with my schedule
- ☐ I didn't find the programs/activities to be useful
- ☐ The people running the programs/activities were not helpful
- ☐ I didn't enjoy the experience
- ☐ I didn't feel like I fit in
- ☐ Other (please specify): _____

Q7 Which is the biggest barrier you face that prevents you from participating in teaching-focused professional development opportunities?

End of Block: GTA Experience

Start of Block: Career Goals

Q8 Putting job availability aside, which career are you most interested in/attracted to?

- ☐ Tenure-track faculty career at a research-intensive college or university
- ☐ Tenure-track faculty career at a teaching-intensive college or university
- ☐ Non-tenure-track faculty career
- ☐ Non-faculty research career at a university or university-affiliated research institute
- ☐ Research career in government, industry or business
- ☐ Start your own business
- ☐ Undecided
- ☐ Other (please specify): _____

Q9 Considering job availability, which careers will you most likely pursue? (**select all**)

- ☐ Tenure-track faculty career at a research-intensive college or university
- ☐ Tenure-track faculty career at a teaching-intensive college or university
- ☐ Non-tenure-track faculty career
- ☐ Non-faculty research career at a university or university-affiliated research institute
- ☐ Research career in government, industry or business
- ☐ Start your own business
- ☐ Other (please specify): _____

Q10 Rate how interested you are in teaching as part of your future career (in any form).
1= lowest, 100= highest

Q11 Do you anticipate that teaching will be at least part of your future career (in some form)?

- ☐ Definitely yes
- ☐ Probably yes
- ☐ Might or might not
- ☐ Probably not
- ☐ Definitely not

End of Block: Career Goals

Start of Block: Motivation for Teaching

Q12 Please reflect on your current attitudes and beliefs towards teaching, either from experience or how you imagine it is (if you have never been a TA).

Q13 Select all that are associated with your motivation to teach most of the time (either as a GTA or in a future career).

- ☐ It is pleasant to teach a class
- ☐ I find teaching interesting to do
- ☐ I like teaching
- ☐ It is important for me to teach
- ☐ Teaching allows me to attain career objectives that I consider important
- ☐ Teaching well is important for the academic success of my students
- ☐ Teaching well positively impacts society
- ☐ If I don't teach well, I will feel bad/guilty
- ☐ I teach because my department needs me to
- ☐ I have to teach as part of my graduate school requirement
- ☐ I teach because I'm paid to do it
- ☐ I don't know why I teach
- ☐ I don't always see the relevance of teaching
- ☐ I used to know why I liked to teach, but I don't see the reason anymore
- ☐ I don't see the purpose of teaching

End of Block: Motivation for Teaching

Start of Block: Confidence in Teaching

Q14 Please reflect on your current level of confidence towards teaching, either from experience or how you imagine it will be (if you have never been a TA).

How often do you feel these positive aspects of teaching?

	Most of the time	Sometimes	Rarely	Never
I feel certain when deciding how to present new information				
When I am confronted with teaching a new concept I know I can cope with it				
I am confident about a variety of teaching methods				
I love teaching complex concepts in my classes				
I feel at ease explaining complex concepts				
I enjoy the challenge of teaching				

I feel confident in my ability to improvise in class
 I would feel calm if faculty observed in my classroom
 I can create lively and engaging discussions
 I can keep students interested when I teach

Q16 How often do you feel these negative aspects of teaching?

	Most of the time	Sometimes	Rarely	Never
It makes me nervous when I simply think about teaching				
The thought of teaching complex topics scares me				
I am panicked when a student asks a question that I can't answer				
When teaching, my heart begins to beat faster				
Thinking about teaching makes me anxious				
Worrying about teaching makes me exhausted				
I approach teaching with dread				
I have dreams that I did poorly while teaching				
I feel terrified when teaching				

End of Block: Confidence in Teaching

Start of Block: Expectancy Values

Q17 Is teaching well (doing great work as an educator) valuable to you ?

- ☐ Definitely yes
- ☐ Probably yes
- ☐ Maybe or maybe not
- ☐ Probably not
- ☐ Definitely not

Q18 Do you believe that you are capable of being an effective educator (possess the skills/abilities either currently or in the future)?

- ☐ Definitely yes
- ☐ Probably yes
- ☐ Maybe or maybe not
- ☐ Probably not
- ☐ Definitely not

Q19 Do you envision that your efforts in graduate school to obtain teaching professional development will help you with any future teaching activities you might engage in?

- ☐ Definitely yes
- ☐ Probably yes
- ☐ Maybe or maybe not
- ☐ Probably not
- ☐ Definitely not

Q20 Do you find that other activities (research, service, personal, etc.) are a higher priority than engaging in teaching professional development?

- ☐ Often
- ☐ Sometimes
- ☐ Occasionally
- ☐ Rarely
- ☐ Never

Q21 Do you think that participating in the available teaching professional development opportunities will result in your improvement as an educator?

- ☐ Definitely yes
- ☐ Probably yes
- ☐ Might or might not
- ☐ Probably not
- ☐ Definitely not

Q22 Does the thought of attending teaching professional development sessions/workshops feel like you are taking too great a risk (either due to lack of time, or judgments from others on how you spend it)?

- ☐ A great deal
- ☐ A lot
- ☐ A moderate amount
- ☐ A little
- ☐ None at all

End of Block: Expectancy Values

Start of Block: Culture

Q23 How much do believe the following groups value teaching?

	Highly value	Somewhat value	Slightly value	Do not value at all	N/A
Your primary advisor(s)					
Your thesis or dissertation committee					
Your teaching supervisor(s)					
Your department overall					
CU Boulder					
Your professional field					

Q24 How supportive do you think your department leaders are about supporting excellence in teaching (awards, resources, seminars, etc.)?

- ☐ Extremely supportive
- ☐ Somewhat supportive
- ☐ Slightly supportive
- ☐ Neither supportive nor unsupportive
- ☐ Not supportive at all

Q25 How comfortable are you seeking advice about teaching from the following groups?

	Extremely comfortable	to Extremely uncomfortable
	(including moderately, slightly, and neutral)	
Grad students in your lab		
Other grad students in department		
Your advisor		
Your committee		
Other faculty in department		

Q26 Overall, how satisfied are you with your course options to TA for?

- ☐ Extremely satisfied
- ☐ Moderately satisfied
- ☐ Slightly satisfied
- ☐ Neither satisfied nor dissatisfied

- ☐ Slightly dissatisfied
- ☐ Moderately dissatisfied
- ☐ Extremely dissatisfied

Q27 How much are you able to practice different teaching strategies to develop teaching skills in your department?

- ☐ A great deal
- ☐ A lot
- ☐ A moderate amount
- ☐ A little
- ☐ Not at all

Q28 *Only answer the following questions if you have been a TA before (if not, skip to next section).*

Q29 Overall, how difficult is it to keep up with your teaching load during a semester?

- ☐ Extremely easy
- ☐ Moderately easy
- ☐ Slightly easy
- ☐ Neither easy nor difficult
- ☐ Slightly difficult
- ☐ Moderately difficult
- ☐ Extremely difficult

Q30 When taking on a new course, how confused are you by what you are supposed to do to be successful?

- ☐ Extremely confused
- ☐ Very confused
- ☐ Moderately confused
- ☐ Slightly confused
- ☐ Not confused at all

Q31 How often are you encouraged to try a new idea or have some creative input into what/how you are teaching?

- ☐ A great deal
- ☐ A lot
- ☐ A moderate amount
- ☐ A little
- ☐ None at all

End of Block: Culture

Start of Block: Demographic Info

Q39 Which department do you primarily teach in (or where is your primary adviser located)?

- ☐ EBIO
- ☐ ENVS
- ☐ GEOL
- ☐ IPHY
- ☐ MCDB
- ☐ PHYS
- ☐ Other _____

Q32 What gender do you most closely identify with?

- ☐ Female

- ☐ Male
- ☐ Non-binary / other
- ☐ Rather not say

Q33 What ethnic ancestry do you possess?

- ☐ African ancestry
- ☐ Asian ancestry
- ☐ Caucasian / European ancestry
- ☐ Hispanic ancestry
- ☐ Native American or Alaskan Native ancestry
- ☐ Pacific Island ancestry
- ☐ Two or more ancestries
- ☐ Other (not listed)
- ☐ Rather not say

Q34 Other group membership (select all that apply):

- ☐ First-generation college student
- ☐ First-generation low income student
- ☐ Not originally from United States
- ☐ Parent
- ☐ Person with disability
- ☐ Other (please explain) _____

Q35 Have you ever worked as a teacher in another capacity (community college, high school, primary school, museum, etc.)?

- ☐ Yes
- ☐ No

Q36 OPTIONAL - Use this space to provide any additional comments.

End of Block: Demographic Info