

GIFT GUIDEBOOK

Julianne Wenner, Donna Llewellyn, Megan Frary, Paul Simmonds
Boise State University

This guidebook is being produced as part of **NSF-IGE: Graduate Identity Formation through Teaching (NSF Award IGE-1806698)**. This describes the intervention we used so that others may implement similar programs. For additional information about the program, please contact Megan Frary (meganfrary@boisestate.edu) or Julianne Wenner (jwenner@clemsun.edu).

TABLE OF CONTENTS

1. Program overview	2
2. Prerequisites for starting a similar program	2
3. Growing the program at the institution	3
3.a. Approaching STEM departments about participating in a similar program	3
3.b. Recruiting students	3
4. Implementing GIFT in different disciplinary settings	3
4.a. Guidance for instructors who are teaching science methods courses	4
4.a.i. Preparation for involvement as the education instructor	4
4.a.ii. Resources from our intervention related to the education instructor's role	4
4.a.iii. Strategies to apply in the ED course for successful GS-TC partnerships	4
4.b. Guidance for instructors who are teaching disciplinary courses	5
4.b.i. Preparation for involvement as a disciplinary instructor or liaison	5
4.c. Guidance for instructors teaching the pedagogy course	5
4.c.i. Preparation for involvement as the pedagogy instructor	5
4.c.ii. Resources from our intervention related to the pedagogy instructor's role	6
5. Practices we find to be most effective in supporting transformation of GSs' professional identities	6
6. Options and modifications	7
7. Lessons learned	8

1. Program overview

Graduate Identity Formation through Teaching (GIFT) is a new and potentially transformative graduate educational model. GIFT uses teaching – defined here in the broadest sense as the application of disciplinary knowledge and clear communication of that knowledge to others – to promote professional identity formation among STEM graduate students. GIFT focuses on the cultivation of graduate student professional identity via the concept of disciplinary stewardship, wherein professionals learn not only the knowledge and skills of their discipline, but also how their discipline connects to and serves society as a whole.

In our model, through a one credit-hour course, GIFT helps graduate students develop a deeper understanding of pedagogy, as well as issues related to teaching and learning. The graduate students (GS) serve as disciplinary experts as they teach elementary teacher candidates (TC) specific topics related to the Next Generation Science Standards at the elementary level. The teacher candidates subsequently turn this knowledge into 15-minute mini-lessons for elementary students.

This guidebook serves to provide information about our model as well as ways in which the model could be adapted for different settings.

2. Prerequisites for starting a similar program

In order to offer a program similar to GIFT at another institution, the following are the requirements.

Minimum requirements:

- STEM graduate programs from which to recruit participants
- Elementary education program which includes a science- or integrated methods course
- Graduate course (or equivalent) to support GS's exploration of teaching and learning

Desired requirements:

- An existing partnership between education faculty member and a local elementary school so that the teacher candidates can teach their lessons there
- Existing programming for graduate students related to teaching and learning so that the program can build off of that
- STEM faculty members who are interested in the holistic development of their GS as they will be more interested in participating and encouraging their graduate students to do the same
- Education faculty members who are willing to be creative and flexible in their teaching so that they can partner with others on campus to offer the program

An important note regarding resources: This program was piloted before it was funded by NSF. With NSF funding, the program was able to expand across campus and we were able to study the impacts of the intervention on graduate students. However, the program itself could run without any external funding so long as the graduate student pedagogy course / opportunity exists on campus.

3. Growing the program at the institution

When the requirements described above have been met, the GIFT team will, at a minimum, consist of a faculty member from education, a faculty member teaching the graduate pedagogy course (referred to as the pedagogy instructor in what follows), and at least one liaison from a STEM graduate program (referred to as the disciplinary instructor in what follows). The initial offering of the program can be done within a single STEM discipline and with this team of collaborators. To scale up from this initial offering, additional STEM disciplines can be added and additional sections of the science methods course could participate.

3.a. Approaching STEM departments about participating in a similar program

If there's not already a disciplinary instructor on the GIFT team, or to expand the program into a new department, the following steps are helpful.

- Find a potential liaison / disciplinary instructor by connecting with faculty members in the target department who may be interested in collaborating on a program like GIFT.
- Consider approaching departments that align with K-12 science standards goals (e.g., biology, geology, physics, chemistry, engineering).
- Once an initial connection has been made, present about the program and its benefits at a faculty meeting so that faculty know what students will get from participating in the program ([example presentation](#)).
- When we started GIFT, students were incentivized to participate because they were able to choose between participating in GIFT or completing a different assignment in a graduate STEM course. Although this model worked very well with some disciplines, we found that it wasn't necessary in all. We did, however, always try to find instructors in each discipline who were willing to work with us this way ([example email](#) inviting instructors to offer GIFT as an option).

3.b. Recruiting students

Once a STEM discipline is on board, the next step is to recruit graduate students to participate in GIFT and enroll in the 1-credit pedagogy course. The recruiting process included different strategies for connecting with students.

- Email ([example](#)) from department liaison to GS directly
- Email ([example](#)) from department liaison to faculty in their discipline who could then encourage their graduate students to participate
- Email ([example](#)) from disciplinary course instructor to students (in the case where student can choose between GIFT and another assignment)
- Presentation by GIFT team member during a class session of a graduate course in the STEM discipline
- Meet with STEM graduate student organizations (e.g., a Bridges to Doctorate program, a professional seminar, or other programs that have a number of STEM graduate students)

4. Implementing GIFT in different disciplinary settings

In what follows, we describe what is involved for each of the different GIFT team members. Appendix A includes a timeline which shows who needs to do what when.

4.a. Guidance for instructors who are teaching science methods courses

4.a.i. Preparation for involvement as the education instructor

The instructor should:

- Reach out to a local elementary school to find a grade level/teachers who are interested in hosting science centers for one day (this may be part of a larger semester-long science center component [see Wenner & Kittleson, 2018 and Kittleson et al., 2013 for more information on this structure] and the GIFT science centers are at the end of the semester). See below for modifications if partnering with a local elementary school isn't possible.
- Discuss with the elementary teacher the STEM area(s) that are represented by the semester's GSs' disciplines and ask what standards the teacher would like to cover. Alternatively, if the teacher is not particular about the content, the GSs could select the standards instead.
- Once the standards are selected, group the students into the appropriate number of groups (perhaps ~4 groups per elementary classroom and ~3-4 TCs per group). Match the GS to the TC groups, with one GS per TC group. It is also possible to have one GS partner with more than one group of TCs depending on the number of GSs and TCs.
- For each group of TCs, provide a formative assessment on the standard that will help guide the GS instruction ([see example here](#)). Share those results with the GS before they start making their lesson plan.
- [Create a timeline/schedule](#) for TCs that account for all meetings with GSs as well as checkpoints/additions to lessons.
- Be prepared to provide a workshop or assistance (depending on the level of instruction in the GS instructional course) on inquiry-based instruction and/or the 5E learning cycle so GSs have a framework for teaching. This will happen early in the semester.
- Consider providing some drop in office hours for GS who may want support in preparing their lesson plans (before the lesson plan is due).
- Provide feedback on GS lessons for the TCs.
- Provide feedback on the TC lessons for the elementary students.
- Be prepared to purchase/find the appropriate materials for all lesson plans.

4.a.ii. Resources from our intervention related to the education instructor's role

- [Formative assessment of ED students](#) to be provided for GS
- [Lesson plan template](#) (for GS and TC)
- Template for presenting 5E framework to GSs (here is an example of a [face-to-face lesson](#) and an [online lesson](#))
- If you are doing science centers throughout the semester (see Wenner & Kittleson, 2018 and Kittleson et al., 2013), [a reflective assignment may look like this](#). Alternatively, if you would like students to create [a stand-alone video of a science lesson, the assignment may look like this](#).
- Google forms for feedback to grad students
 - [Meeting #1](#)
 - [Meeting #2](#)
 - [Overall](#)

4.a.iii. Strategies to apply in the ED course for successful GS-TC partnerships

- Don't assign groups until after the drop / withdrawal deadline passes

- Create a document that has all groups, their email addresses, and standards that is accessible by all involved.
- Create feedback mechanisms (such as the Google forms linked above) to make sure interactions are effective and beneficial. Consider including part of a professionalism or participation grade that is dependent upon peer evaluations of the interactions.

4.b. Guidance for instructors who are teaching disciplinary courses

4.b.i. Preparation for involvement as a disciplinary instructor or liaison

In the semester before implementation, the disciplinary instructor or liaison will observe many aspects of the program and do the following to see how GIFT works:

- Meet with all three instructors (pedagogy course, ED-CIFS course, disciplinary course or other liaison) at least one time.
- Attend the workshop (if applicable) for GSs on inquiry-based instruction and/or the 5E learning cycle.
- Attend the science centers (or whatever the culminating experience is).

The disciplinary instructor or liaison is very involved in recruiting students, as described in [Section 3.b](#). Additionally, if an instructor is integrating GIFT within their course, they should update their course in the following ways:

- Devise ways to incentivize students to participate:
 - For example, provide a choice between doing GIFT or a term paper
 - Make participation in GIFT an alternative to an assignment (especially useful in 400/500 level courses (e.g., undergrad / graduate) where the 500-level students need to do extra work).
- Really advocate for participation in GIFT and emphasize the benefits of participation
- Consider inviting previous participants to talk about GIFT during a class session.
- Consider having some of the GIFT team members attend the class to talk about the project.

The disciplinary instructor or liaison plays a mostly supporting role during the semester when GIFT occurs, with their primary responsibilities being:

- As needed, help GS select a standard.
- Attend the lesson plan brainstorming meeting to help GS come up with ideas for their own lesson plans.
- Review the GSs' lesson plans to help them refine it and reinforce 5E ideas.
- As needed, help track down supplies for the lesson plans.

4.c. Guidance for instructors teaching the pedagogy course

4.c.i. Preparation for involvement as the pedagogy instructor

The instructor should:

- Schedule the course at a time that doesn't conflict with graduate classes being offered in participating departments.
- As needed, support the disciplinary instructor in recruiting students for the course.
- Choose class topics that support and reinforce the ideas that we are trying to convey in GIFT (e.g., growth mindset, impostor phenomenon, active learning, flipped classes, etc.).

- Facilitate an information session about GIFT early in the semester; we typically did this immediately following the first class session. This is to help students better understand the commitment they are making.
- Give assignments that align with the interactions that GS and TC will have.
- Model active learning in every class session.
- As needed, support GS in choosing an appropriate standard for their lesson.
- Help coordinate the lesson plan brainstorming meeting; as our course met only every other week, we used one of the open weeks to hold this meeting.
- As needed, and with the education and disciplinary instructors, support GS in developing their lesson plans.

4.c.ii. Resources from our intervention related to the pedagogy instructor's role

Course information:

- [Course schedule](#)
- [Course syllabus](#)

Assignments related to the GS-TC partnership:

- [Lesson plan](#) and [lesson plan template](#)
- [GS-TC meeting #1: GS teach their lesson](#)
- [GS-TC meeting #2: GS provide feedback on TCs' lessons](#)
- [GS-TC meeting #3: TC teach their lesson](#)
- [Science center event](#)

Reflection assignments:

- [Pedagogy exploration reflection #1](#)
- [Pedagogy exploration reflection #2](#)
- [Pedagogy exploration reflection #3](#)
- [End-of-semester reflection](#)

5. Practices we find to be most effective in supporting transformation of GSs' professional identities

- Including topics such as growth mindset, impostor phenomenon, and/or stereotype threat in the pedagogy course is very useful because many STEM graduate students haven't been exposed to these topics and learning about them is useful not only in their lives as teachers but also as students and STEM professionals.
- Having graduate students actually experience an inquiry-based/5E lesson. This often demonstrates to graduate students that there are different ways of teaching and learning that they could add to their repertoire.
- The reflection assignments are helpful because they help students recognize the impact and importance of what they are learning and/or doing. At first, the STEM graduate students are quite uncomfortable with this kind of assignment ("I really just write about what I thought of the reading?"), but they make a lot of progress in being able to reflect on their learning.
- Ensuring that the graduate students attend the lessons at the elementary school to see their work in action and observe the whole process from their initial inputs via the TCs to the school children. This was a fairly profound experience for some of the graduate students and really

helped them to see how their work was having “real world” impact - something that is pretty rare in standard STEM graduate courses.

- Encouraging the graduate students to meet with one another outside of class time. Graduate school can be very isolating (especially during a pandemic) and many of our graduate student participants found a real sense of community and connection with the other GIFT GSs.
- Making connections between what the graduate students are learning and doing to careers outside of the academy. For some students, GIFT impels them to more seriously consider faculty positions, but for others it validates that they can “teach” others in a multitude of other career paths and that this is a valid and valued contribution that a STEM professional makes to society.
- Always showing respect to the TCs – many of the graduate students gain a tremendous respect and admiration for the role that teachers play in society and modeling this as the Education Instructor is a first step.

6. Options and modifications

The following are ways that GIFT could be modified from the way that we ran it in order to better fit at another institution or within another context.

- GIFT could be run with more than one department at a time (or not focused within any particular programs but for all STEM students at once). This is only limited by the partnership with the school (or wherever the TCs will do their teaching) and what their needs are. In our case, teachers at the partner elementary schools wanted lessons that were aligned with their grade level and the topics they were covering at a particular point in time.
- Although we partnered with an elementary school for most of GIFT (except when COVID required some flexibility), the partnership could be with someone other than an elementary school (e.g., an after school program, an online school, a STEM night at a school, a science museum, etc.). The key is simply that the TCs have the opportunity to develop and teach a lesson in an authentic way.
- As described earlier, we initially thought that we’d run GIFT within a graduate course in each discipline (as that’s how the program began). However, we learned that that wasn’t necessary and that the program works well with a liaison in each department to help recruit students broadly from within the department.
- GIFT worked just as well in the remote environment required by the COVID pandemic. GS and TC lessons and interactions all happened via zoom. And while the same shortcomings we all experienced by working over zoom were present, the essential elements of the program were maintained and the outcomes of the intervention were all as strong.
- If it is absolutely necessary, TCs could create stand-alone lesson videos rather than teach a live lesson; without seeing the TCs teach kids in real time though, the experience doesn’t come full circle for the graduate students (we learned how useful and important it was for the GS to have this experience as we were piloting GIFT).
- If there is a graduate student who wants to participate but absolutely can’t make the scheduling work to partner with a team of TCs (something we experienced once), an alternative experience is possible. In our case, the student created supplemental materials to go along with the lessons being taught by the other TCs – a one page handout about each standard including teacher-level content knowledge, common misconceptions, and follow up activities that the teachers could do

or could send home. The GS then met with the classroom teachers one-on-one during the live event.

7. Lessons learned

The following points are some of the most important things we learned along the way about the implementation and outcomes of GIFT:

- The graduate students don't need to be experts in the standard that they have chosen / are assigned. If it happens to align with their research or area of interest, that can allow them to bring in examples to the lesson based on their work. The GS should have enough disciplinary knowledge to create a sufficient lesson for standards even not directly related to their research.
- We believe that it might be easier to recruit GS in departments where K-12 outreach is already happening. We found a disparity in the ease of recruiting GS from one discipline to another. We don't believe that there's any inherent reason for this (e.g., why more biology students than engineering students may want to participate) but instead attribute it to the differences in these departments *at our institution*.
- The NGSS are necessarily very broad, and as disciplinary experts, the GS are able to realize this. However, this can cause some concern for the GS as they try to consider how to teach their TC team a lesson the standard. It is therefore helpful and necessary to support the GS in narrowing down what they will teach. It is best if the GS finds a narrow slice of the standard to focus on: choose just one big idea and focus on teaching that one main concept in the lesson.
- Graduate students are better served when they first participate in a 5E lesson and then do the reading about that framework. By having experienced the process beforehand, the reading has more impact as they reflect on their own experiences.
- It is helpful to have a meeting between the grad students and the education and disciplinary instructors before the GS create their lesson plans. This allows for the expectations to be made clear and for everyone to work together in brainstorming ideas for the lesson plans.
- Because the TCs are eventually going to teach elementary-aged students, the GC sometimes believe that they too need to create a lesson at that level which the TCs will then adapt somehow. We had to work hard to clearly establish that the audience for the GSs' lessons was the TCs (e.g., adult learners who need adult-level content). Furthermore, the TCs need to recognize they are NOT repackaging the GS lesson, but are instead transforming the content.
- In order to make scheduling easier (and more predictable), it works best to have the GS and TC teams meet during the education course. We have run GIFT where the teams met outside of class time and it was nearly impossible for some teams to find times that worked. By having team meetings during the education course, all students knew ahead of time about the meetings and could plan for them more easily.
- Because many STEM graduate students have experienced nothing but lecture courses throughout their undergraduate programs and graduate school, asking them to NOT lecture is a big ask. It is essential that the pedagogy course both model and teach active learning approaches. We focused on "hands-on/minds-on" ideas; and when using the 5E Learning Cycle, we encouraged the GS to focus on the student role during the Explain phase (sharing observations and noticings).

- Graduate students are skeptical about active learning being applicable in STEM and in higher education. It can be helpful to share some data about the effectiveness of these practices (e.g., [Freeman et al. in PNAS](#) and [Prince in J Eng Educ](#)).
- It may be helpful to use some “short getting to know you” activities for the GS and TCs so that they could both learn more about the other’s disciplines and career goals. For example, at one of the TC/GS meetings, we could have asked the GS to give a 5 minute overview of how the topic ties to their research.

GIFT SCHEDULE OF ACTIVITIES

The table below highlights the overall workflow and key activities required to run a program like GIFT.

	any GIFT team member	pedagogy instructor	science methods instructor	disciplinary instructor
semester before GIFT is implemented				
early in semester	<ul style="list-style-type: none"> find liaison in target department attend faculty meeting to introduce project 			
mid-semester	ask instructors of graduate courses in partnering discipline to consider offering GIFT for credit in course	schedule pedagogy course to not conflict with grad courses in disciplines doing GIFT		
at end of semester	work with liaison to recruit GS; this may take multiple emails and some targeted outreach			begin recruiting GS to participate →contact directly →contact through GSs' advisors
semester when GIFT is implemented				
first week of the semester	<ul style="list-style-type: none"> collect any pre-GIFT data from GS conduct GIFT info session for GS 		if partnering with local teachers, set days/times/standards for the science centers	continue recruiting efforts as needed; goal is 1 GS for every 3-4 TCs
identify NGSS standards		have graduate students learn about NGSS; depending on partnership, GS may select a standard on their own	NGSS standards can be assigned based on needs of partner organization or chosen by GS (either freely or within constraints)	
assign GS / TC partnerships (after drop deadline)			create teams of 3-4 TCs and one graduate student	
before GS submit lesson plans		<ul style="list-style-type: none"> model active learning within the class; consider including topics that address active learning explicitly assign 5E reading and reflection after GS experience 5E lesson 	<ul style="list-style-type: none"> offer workshop on 5E framework lead lesson plan meeting and optionally facilitate drop-in meetings for GS to talk about their lesson plan ideas 	attend lesson plan meeting to brainstorm lesson ideas with GS
after GS submit lesson plans			give feedback on GSs' lesson plans from pedagogical perspective	give feedback on GSs' lesson plans from a disciplinary content perspective

GS/TC meetings			facilitate interactions between GS and TC during class sessions	optionally attend GS/TC meetings to see how the partnership works
end of semester	collect any post-GIFT data from GS			