CWSEI Science Teaching and Learning Fellows (STLFs) reflections on their job

(ed. note: in this document the terms "faculty", "instructors", and "profs" are used interchangeably)

What is an STLF? (2-sentence summaries produced by 3 groups of STLFs)

1. An STLF is an expert in their discipline and a growing expert in pedagogy who bridges the CWSEI and their department to facilitate the implementation of more effective methods of instruction (based on research) in and across courses, and on a larger scale (departmental, university, larger academic community, THE WORLD!). STLFs design and carry out evidence-based research in the process of improving pedagogy in their department.

2. Based on their scientific and pedagogical expertise, STLFs are course consultants for undergraduate science education who create, adapt or use evidence-based methods, and measure their effectiveness toward learning. An STLF seeks to improve quality of teaching and learning in a sustainable manner, monitor progress, and generate and disseminate relevant knowledge both within and outside the institution by applying disciplinary and pedagogical expertise.

3. An STLF has a high-level background in science and receives training in teaching and learning. They promote pedagogical improvement and influence change from within a department by coaching faculty, consulting with the department on individual-course and curriculum-level projects, and contributing to science education research and best practices development.

STLF Tasks and Skills (lists generated by groups of STLFs)

STLF Tasks
- Observe classes
- Coach instructors
- Facilitate instructional teams
- Feedback to the department faculty on curriculum activities
- Identify areas of instruction that need or could benefit from change
- Measure student learning --> develop and/or implement diagnostics, concept inventories, surveys
- Develop learning goals (learning objectives)
- Analyze exam data (and other student artifacts) for evidence of educational problems and success
- Interview students about their learning and educational experiences
- Design and implement research studies; conduct data analysis
- Write up research for publication, presentations at conferences, etc.
- Apply research findings
- Professional development (in CWSEI training, own reading, and other workshops); literature search and immersion; develop expertise in education
- Host teaching and learning discussions & workshops within department
- Create a dialogue within the department about teaching and learning
- Initiate discussions with instructors about teaching
- Provide technical support
- Support general CWSEI activities (annual mini-conference, help create CWSEI guidance documents, produce website materials, mentor new STLFs, etc.)

STLF Skills

Interactions with people (communication, etc.):
- Active listening
- Facilitation skills
- Coaching skills
- Be outgoing-- be able to approach faculty, staff, and students (educators and learners at all levels)
- Inter-personal skills, including: negotiation, persuasion, motivating, informing
- Disseminating information effectively and professionally (verbal, in writing, private and public)

Organization:
- Time management (including email management)
- Project management
- Ability to change focus throughout the day in balancing many different projects and priorities
- Have efficient meetings
- Goal setting
- Learning to say "no" where appropriate
- Independence

Research Skills:
- Reading and creating the education literature in: own discipline, broader science education, learning sciences, cognitive psychology, and higher education.
- Statistics knowledge
- Experimental design/research methodology
- Data interpretation and analysis (including coding open answer or interview qualitative data)
- Communication of results

Professional Growth:
- Reflection
- Metacognition about own work (note from an STLF: "applicable to entire life!")
- Seeking feedback from various sources
- Flexibility

General:
- Deliberate practice (involved in developing all skills)

What do STLFs do, and how can they improve in these roles?

I. Coaching instructors and TAs on student-centered activities (and maybe doing some of the legwork)
  How to improve in this role:[*]
  - Be concrete. Provide specific examples of what we, the STLF, can offer.
  - Start small, don't overwhelm instructors with multiple changes at once.
  - Scaffold the changes – gradually add small changes in which the STLF is very active in implementing the changes, and over time provide the instructor with more of a role in implementing the changes so eventually it becomes part of their teaching practice versus always the STLF doing the new activities.
  - Have more frequent discussions with instructors, either meet before and after each class and/or agree to have weekly meetings.
  - Present evidence of student learning or non-learning either from the course in question or from other similar courses.

II. Integrating into the department; motivating instructors to participate and building relationships
  How to improve in this role:[*]
  - Be more of a "team member", which means attend seminars, social functions, make "cold visits" at open doors, chat in the hall; all that stuff….
  - Don't hesitate to act as an expert in your field; e.g. do give a seminar on your recent Ph.D. thesis topic, or whatever. This helps ensure credibility, and commonality when working with faculty.
  - Target specific individuals and/or tasks, and monitor (& record) your targeted actions (e.g. writing club that tracks members words/week written). "Tasks" could include producing monthly newsletters for department, updating website, creating 2-page guides, host teaching and learning discussions within department, etc.

III. Designing and implementing classroom activities
  How to improve in this role:[*]
  - Keep abreast of research literature. MOST IMPORTANT ITEM.
  - Discuss with other STLFs, possibly attend workshops
  - Observe activities done in other classes
  - Find/present evidence of how certain activities improve learning
  - Find/present evidence of how current course set up is inefficient or ineffective
  - Practice, practice and practice, i.e. both STLF and instructors may have to run a certain activity several times in order for it to work smoothly and effectively.
  - Increase your knowledge of the students. For the course in question, get data on common student misconceptions, what their baseline knowledge of the subject is, attitudes about the course, etc.
  - Spend more time becoming familiar with course before designing activities. If possible, observe course for an entire term before starting to design materials for it.

IV. Assessing learning (student thinking and attitudes, knowledge and skills, pre- and post-instruction measurements); developing and using tools.
  How to improve in this role:[*]
  - Go to reading group, or at least do the readings
  - Be deliberate about number of readings you review in a particular area of interest (e.g. assessment of group work)
  - Use regular reports to reflect on your own gains or new awareness regarding "making thinking visible". "Forced accountability" (e.g. monthly reporting) may feel like a chore, but treat these as opportunities to help with reflective practice.
  - Make use of metaSTLF opportunities [pairs of STLFs that meet regularly to discuss goals, progress, action items for improvement]

V. Designing research experiments (and publishing results)
  How to improve in this role:[*]
  - Write more, and more often
  - Recognize when something is "good enough" versus waiting for it to be "the best" (get it out there versus sitting on something for years and years wanting to do "a little more")

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[*] *The "how to improve in this role" lists reflect the aspects the STLFs felt they needed to work on – they are NOT characterizations of the roles– particularly for items IV. and V.*

Advice from old STLFs to new STLF:

- Having a faculty champion in your department is very important— have them introduce you to the faculty you will be working with, clarify your respective roles, etc.

- Plan ahead on course transformation, be persistent in getting input from instructor and developing plans with them well before they start teaching the course.

- Get to know the faculty, develop good working relationships.

- Study the research literature on teaching and learning; there is lots of useful information and you can see how research is done. You will find lots of good stuff that you can adopt/adapt for your needs—you don't need to reinvent.

- There is often a mismatch between STLF/CWSEI ideas and methods and what instructors think. Find "hook(s)" for the instructor—things they are particularly interested in or problems they want to fix—and build on those.

- Have many conversations with instructor you are or will be working with; change takes time; conversations with instructors are often worthwhile and will bear fruit later, although they may not appear to get anywhere at the time.

- Spread seeds (ideas of better things to try), nurture sprouts (interest, changes in teaching) when they appear. Find match to instructor's need and wants.

- Data, especially with good visual representations, is powerful in persuading faculty.

- Change can be surprising so stay open-minded. An instructor may not appear to be interested in doing anything different for some time, but then can then suddenly start doing new things and embracing new ideas. Others who you thought were on-board with change may end up resisting doing anything.

- Communication is important; don't take negative reactions to suggestions or ideas about teaching, and general gripes of faculty personally.

- Talk to students—this is very important. Interview students after exams, talk to small sample groups after classes.

- What students say is powerful in affecting what instructors do—use interview data (with appropriate student anonymity) to convince instructors.

- Measure systematically what students know and think. Don't rely on anecdotes or common beliefs.

- Conduct analyses to look not just at where students make errors, but also the source of those errors. Those provide a good guide for how to improve the teaching.

- Document, document, document! Write things down while they're clear in your head, run documentation of conversation with faculty by them to see if you understood correctly; summarize interviews [student or faculty] right away—you will not remember as well later.

- Accept that it can take a little while to get the hang of this job, you will get there, and the rest of us are here to help.

- Also, it may take a while for you to figure out how to describe what you do to people you meet. The curves on these two time lines are not necessarily related.

Brett Gilley's thoughts on features that helped the Earth, Ocean and Atmospheric Sciences Department (EOAS) CWSEI program

[Brett was an STLF in EOAS for about 7 years, and the department's CWSEI program was very successful]

Some of these are more important than others, and some might not be important at all. This is kind of a brain dump, but one that might be useful and might give you something to think about.

1. Internal hires – all of the initial STLFs in our project were internal hires. This means that we each brought a few allies with us. Francis knew Geophys, I knew the lecturers, Ben Kennedy knew the Planetary Science group, Erin the Oceanographers, and Josh the Hydrogeologists. This helped with early momentum, it meant a large portion of the dept. thought we weren't (completely) crazy because we each brought a few allies.

2. There were a lot of us – At the peak we had 4 people working on 3-ish courses each. We reached a lot of people at once, sometimes more than 15 profs at a time.

3. We didn't just work with the keeners – like in teaching, focusing on the only top profs, the people who would come to us, would mean we weren't changing much. We worked with almost everyone, the keeners we got started then left to do their own thing, the most success we had was helping push people who were interested but reticent. Let's call them the reluctant middle.

4. We had strong supportive leadership – Our department CWSEI director, Sara Harris, is well regarded and all 3 chairs who existed during the project were supportive. The Dean was excited, Carl was there for an extra push. We could get clout from these champions if needed.

5. We were content experts first and education people second – this helped us get in the door. We understood the problems

6. Most of us had teaching experience – you have way more credibility saying "try this" if you can back it up with "it works for me"

7. We taught a little during the project and practiced what we preached – also very nice to say "you know what? Just come watch"

8. We "compensated" profs for working with us – they were offered a teaching buyout to optimize a course. Most chose not to take it and instead used the funds for TAs to help with the optimization work.

9. We had profs sign a little agreement – Just a small contract that said we are giving you this buyout, you (and your STLF) will do this work.

10. We were gently persistent when we asked them to change – if they said no, we pressed a little and if it was still no we moved on and maybe asked again in 6 months or so. Often our suggestions came back later as "their" ideas.

11. We worked over long time periods – 2 years was the standard for us. Often this was not long enough. My two biggest successes did almost nothing for 1.5 and 2.5 years respectively. Then bam! Caterpillar to butterfly. Their teaching skills intimidate me now.

12. We were always respectful and tried to work with everyone, even if "conventional wisdom" said people couldn't be reached – sometimes this worked wonders.

13. The group of STLFs had very different skills – for example, people often joke about how different Francis and I are, but that's a huge strength in a project like this. If I hit a block with someone, perhaps Francis could get them from a different angle. And vice versa. This happened more than once with all of us.

14. We used all available opportunities to observe and discuss – For example while testing the COPUS (a classroom observation protocol) we would approach random profs and say "Hey we're testing this thing, can we come observe your class?" Then guess what, we get to have a chat about that class, ideas for activities, etc. This also worked well in random hallway meetings.

15. Having literature to back us up – as Carl says this can be helpful. The best is it gave us good ideas. Sometimes it could convince people (if it wasn't dismissed put of hand). However better is:

16. Using the students' voices – focus groups, interviews, assessments, those little post lecture chats Josh did. If you can make it objective and coming from students, that is way better than hours of argument from an STLF.

17. We always framed everything as us (prof and STLF) versus the insurmountable problem of teaching – as opposed to "I'm here to fix your teaching" which is a nonstarter.

18. Our approach uses Teaching Assistants. They took our grad class, then: helped us change minds, worked the courses, told us what was broken, and gave us the student perspective.

19. We have a very diverse department. There are 50 profs and most people don't really understand what goes on in the other sections. Oceanographers can't ID rocks and I sure don't know my plankton. We have to trust and respect our colleagues even when we don't get what they do. This made it relatively easy for Geoscience Education to slot in as another "not widely understood" discipline in the dept.

20. We were systematic – at the beginning of the project we posted a list of courses to be transformed and we worked through it, trying to involve as many profs as possible.

21. We focused on attitude change – this is covered above but bears repeating. It also means (once we realized it) that we didn't make the changes ourselves. Those aren't sustainable, but if you get the prof to do the work they are more likely to use it the next year, and more likely to do it in other courses. Teach a prof to fish as it were.

22. There is no 22.

23. We were hired at the faculty level; yearlong contracts, but still. I knew I was faculty when I went into an office. This also meant we could get more skilled and experienced people when we hired STLFs, and it meant that people stuck around. Francis and I were both in the project for 7 years and we got raises and pensions and benefits. At this point I think together we could convince a rock to use active learning.