

Communication Skills, Professional Development

Report prepared by Chandralekha Singh (session chair) and Sherry Yennello (discussion leader)

The discussion leader for this session was Dr. Sherry Yennello from Texas A&M University. Dr. Yennello who is a Regents professor of chemistry and an associate Dean in the College of Science started out by presenting some anecdotal evidence about how good communications skills (or lack thereof) can affect the prospects for getting a job.

During her presentation she discussed a number of skills that graduate students should have by the time they have completed their PhD, including the following.

- Give a talk to fellow physicists
- Give a talk to a general audience
- Write a research paper
- Write an abstract
- Write a proposal
- Write a technical report
- Have a conversation about science
- Negotiate
- Manage a group of people
- Work within a team
- Do some budgeting / cost analysis
- Inspire others
- Sell an idea
- Critically analyze a problem and make a plan of action
- Create new knowledge
- Explain complicated issues to other people
- Run a project
- Know when to let go of a project

Then, Dr. Yennello asked everybody to fill out a sheet indicating to what extent their graduate program trained students to be able to accomplish these learning outcomes as part of their professional development. Most people indicated that students received training in writing an abstract and a paper, giving a talk to fellow physicists, generating new knowledge, explaining complicated issues to other people, critically analyzing a problem and making a plan of action. Very few indicated that their students had any professional development in giving a talk to a general audience, negotiating, budgeting, inspiring others, managing a group of people or learning when to let go of a project. Then, she handed out Post-it notes to each participant and asked them to write down each point they had listed on the sheet and describe the activities that they did with the graduate students that supported it. Then, she asked everybody to stick their Post-its on the wall in clusters in such way that similar activities were grouped together. After this, she read aloud what participants had written in each cluster and asked them to come up with a way to summarize each cluster. The bullet points summarizing each cluster and what the participants wrote on the Post-it notes are listed below.

Some participants noted that graduate students were already so busy that there was no time to help develop these professional skills. Others noted that development of these skills is so important for success in any future career that it is the right of the graduate students to be given the time to develop these skills even if it means publishing one less paper or performing one less experiment.

It was noted that there was a large variation in what individual faculty members did to develop their students' communication skills. While some faculty members have weekly journal clubs, give their students an opportunity to talk to fellow students in group meetings, regularly take students to conferences and help them write drafts of manuscripts, others do not encourage these activities. It was suggested by the participants that perhaps some requirement from the department regarding the minimum number of presentations that the students must make or the number of manuscripts that they must prepare themselves before they graduate (or perhaps each year) would be useful.

Main bullets

Write short, write often

Write a proposal

Keeping notebooks / proper documentation of research

Group meetings with constructive criticism

Coaching and practice for talks

Giving talks at professional conferences

Strategies for writing papers: developing writing skills

Communication with general audience

Communication about career development

Literature review

Project management (time and money)

Learn to be team player

Interacting with diverse environment

Teaching

Learning to think independently

Selecting projects based on good science

Negotiating, marketing ideas

Social communication

Scientific integrity to community / practical ethics training

Post it notes

Write a proposal about your dissertation project

A communications/writing course teaches students how to give a technical powerpoint presentation and how to develop and write a short proposal

Give seminars, talks at group meetings, colloquiums, journal clubs

Individual research group meeting

Students give talks in weekly group meetings

Graduate students have the responsibility to explain how to proceed on the research topic to undergrads. We work together to learn how to do that

Students write abstracts to submit for talks at APS meetings. Give internal seminars at group meetings once per semester. "communications in physics" class compulsory for every grad student (4 semesters). Teach by being an example. Discuss own problems / ideas for my own talks with students, require their feedback after my presentations

Students give talks to other students in group

Most faculty have weekly group meetings where all aspects of graduate life are eventually discussed

Long weekly meetings to discuss publications of others and results of students reports

In weekly group meeting students are assigned to give short presentation on their research. These are critiqued and discussed by group as a whole

Day to day tasks of teaching and research (analyze problem, make plan)

Create new knowledge research feedback read

Run project day to day tasks

Meet to talk about an outline. Met again to look at plots. Prepare presentation. Go through presentation with interruption for corrections and suggestions. Go through again after modifications

Meet to discuss data and analysis. Go over format and content. Get 1st draft. Correct and iterate

My students and I work together on a detailed outline of a manuscript after which they complete the first draft. We go through many iterations.

Allow students to interact with the colloquium speaker as a group

Meet to talk about data and analysis to date. Go over any new additions. Meet to talk about outline and structure of paper. Wait for first draft of paper. Correct and iterate.

Virtually all grad students write (co-author) one or more papers

A lot of group discussions about each others work

Budgeting and other hard business skills through a business class for scientist in our business college which we manage

As part of my research mentoring I explain to my students my motivation for pursuing a particular line of research as well as discuss with my students with my students how I draw conclusions from their results

By directly involving grad students in your research. Discussions, presentations, feedback, writing of papers, team them up

Critically analyze a problem; create new knowledge – isn't that what we do?

Know when to let go – dissertation

Budgetary cost analysis. Make them aware why we have to do some things in an awkward way

Work in a team Students are expected to help each other in more than one way. Senior train juniors – socialize. We party together.

Work in a team. Collaborative group theory. Assign team tasks

Explain to others, teach access impact

TA training: How to address an issue and keep it concise. How to rely on activities by students to produce learning rather than explaining things in front of a class.

A departmental level active training for all students in the department

Negotiate, inspire others thru a professional development workshop

Write abstract. Show example. Ask for drafts and redrafts

Write research paper. Review outline, edit drafts, give ref (elements of style), reedit and iterate

Workshop about critiquing research articles

My group uses peer mentoring, grad students are assigned undergrads to work on research projects. We have explicit sessions on mentoring.

Inspire others. I encourage my students to provide feedback, positive and negative, to each other. Pat on the back , collective thinking

Write abstracts for conference presentations. Write papers

Write research papers
Provide general outline. Ask for drafts and redrafts

Give feedback. They edit paper. They write papers

Grad students must write research papers

Workshop on writing a research paper

Write abstract. Practice, edit , feedback

Teach students to write clearly and succinctly (and perhaps spell)

When preparing abstracts for a meeting we meet several times (weekly meetings) and discuss the drafts, as well as features of a good abstract

Write about your research at certain points(6months, 12months after being admitted to PhD program) regular reports on progress

Publish 3-4 papers in peer reviewed journals before yr PhD.

All students in group will be helped by faculty members to write their papers. There is a departmental requirement to require courses to include writing skill concepts in classes

Entrepreneurship for scientists class

Meet more often with students 1 on 1

More seminars by granting agencies, proposal writers, reviewers

There is a proposal writing class in our requirement for students in the first couple of years

Write proposals. They edit, give feedback, discuss process, tips

Critically analyze a problem – this goes on continually in research meetings and 1 on 1 discussions

Manage group of people. Students organize group meeting, journal club

Determine when a project needs to be changed. Many students come up with ideas I encourage it.

I'd love to be able to organize a real course on writing and giving talks

Provide a good course in technical writing for all grad students. Same for writing science for general audience

Sell idea

Literature review chapter research ideas

Workshop on giving presentations

Write technical report. Require code documentation and "how-to" reports every few months on project. Let them understand that their documentation is all that will be left of their research for those who follow after them

Create new knowledge: this is the main purpose of thesis research

general audience

Workshop on presentation skills –

My students occasionally help me in outreach activities by giving talks to K-12 students

Send students to give talks to HS students

I would like to give students more opportunities to present talks to varied audiences

Give talk to fellow physicists

Refer to websites on how to give talk. Have students give pretalk to each other, me.

Time talks

Give a talk with min 2 faculty present at least once every semester

Every student in the group (when they are ready to present in a conf) will be actively coached by us to give professional presentation. There is a departmental requirement for all courses to have some form of a presentation requirement for students

Provide a workshop(or two) in public speaking for all grad students and faculty

Show best example. students to prepare draft provide feedback, redraft and actual practice and critique

Virtually all grad students give several 10-min APS talks

Practice talks with feedback. Give talks at meetings.

Give students opportunity to give more talks (pay for travel to conf)

Send students to more meetings. More resources?

Analyze problems, plan of action

I do not impose my solution on students. I can make suggestions for their research, for next steps etc, but if they do choose not to follow them that is OK. Do not condemn them for exploring dead-ends – learn to value theses as useful info

In your graduate program do graduate students receive deliberate training, coincidental training or little to no training in the following areas?

	Active Training	Passive Training	No or Little Training
•Give a talk to fellow physicists	11	6	0
•Give a talk to a general audience	1	4	11
•Write a research paper	12	4	1
•Write an abstract	11	6	
•Write a proposal	5	6	6
•Write a technical report	6	8	3
•Have a conversation about science	0	12	5
•Negotiate	1	2	14
•Manage a group of people	0	9	8
•Work within a team	5	10	2
•Do some budgeting / cost analysis	3	4	10
•Inspire others	1	5	11
•Sell an idea	2	9	6
•Critically analyze a problem and make a plan of action	10	7	0
•Create new knowledge	8	6	2
•Explain complicated issues to other people	6	8	1
•Run a project	2	9	6
•Know when to let go of a project	2	4	11