



Professional Development for graduate students

Belle II Summer School 2021

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Learning outcomes

- improved understanding of the developmental goals of PhD thesis research
- understand the importance of professional skills
- determine specific aspects of work on Belle (II) that are important for career development
- Action list

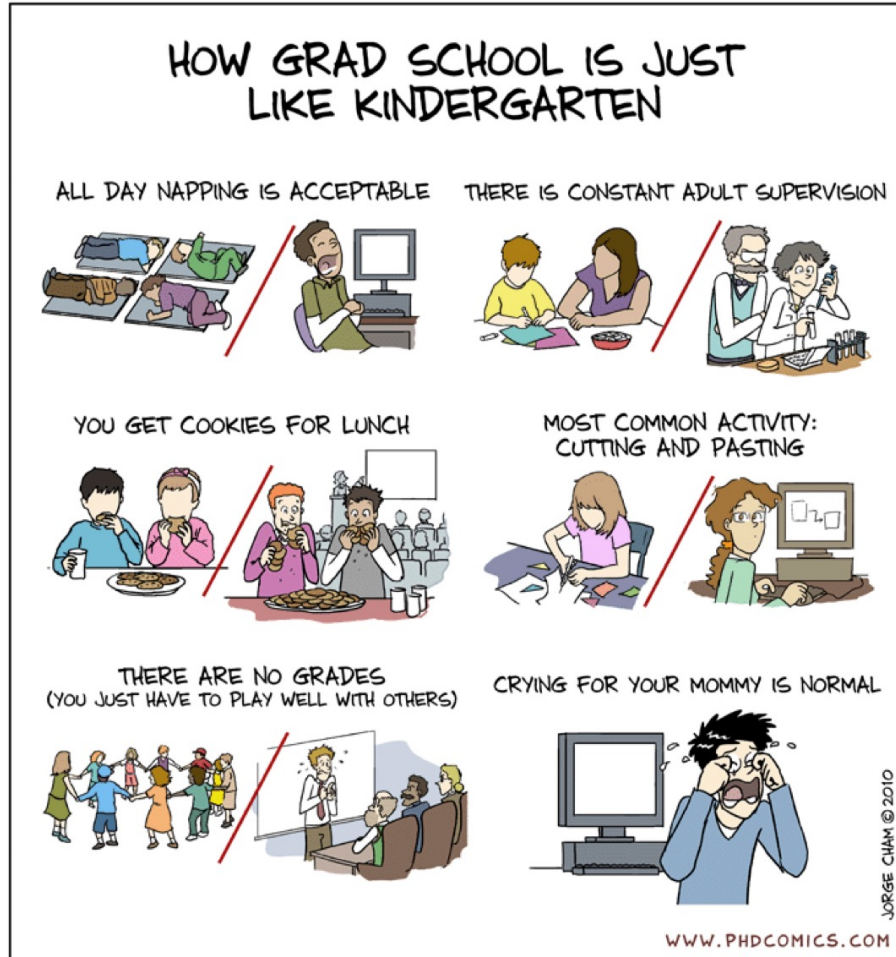
Worksheets (please download)

- for your benefit, not to be handed in
- write down & reflect on your thoughts
- share those you are willing to

Why am I in grad school?

Piled Higher and Deeper by Jorge Cham

www.phdcomics.com





Worksheet I

- I. Briefly describe your motivations for entering a PhD program.
Based on your experience,
 - A. Describe the knowledge you expect to gain while completing the PhD.
 - B. List the technical skills you expect to acquire while completing the PhD.
 - C. Describe some “experiential skills” you have gained while working on your PhD.
- I. More physics knowledge; graduate school experience; US experience; degree -jobs? Research seemed more fun than job hunting
 - A. QFT, particle physics, Machine learning; programming languages; data mining; ROOT
 - B. Coding skills; analytic quantitative skills; troubleshooting;
 - C. Communication; Communicate physics to non-physicists; networking; collaborative; public speaking; cultural awareness

what's the educational model?

- Formal coursework (≈ 2 yrs)
 - similar to undergraduate [w instructors]
- Research (3-4 yrs)
 - \approx apprenticeship; novice \rightarrow master [advisor]
- Professional development
 - ?? (some intersection with research) [who?]
 - self-awareness, mentorship, networking



What is Professional Development?

- *Acquiring new knowledge and skills that relate to one's profession, job responsibilities, or work environment*

(an ongoing process, regardless of career stage)

Peripheral to cognitive skills



What is Professional Development?

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AIP: employment for physics PhD's is >95%

Yet: not a "job mill"; few "physicist" jobs

**Professional skills play a critical
role in career advancement**

How do I acquire these skills?

- Not formal instruction
- Think: “why would <employer> want to hire me?”
 - PhD: not someone who fits a mold → your unique strengths
- hints from online resumé advice:
 - “Results-oriented, hands-on individual with more than XXX years of YYY experience. ... strongly emphasizes teamwork, creativity, and empowering people.”
 - Did I save <current employer> time? Did I reach my goals quickly? Did I exceed my goals often?
- Can be developed via completion of PhD
 - Be aware of beneficial skills
 - be self-aware, proactive in developing



acquiring skills while doing research

My PhD project

- A MAJOR project (<thesis title here>)
 - Original research (under supervision)
 - <Advisor> (usually) asks the question
 - Answer: not known (until I answer it)
 - Needs to be correct (how will I know?)
 - Explain (in 50 pages or more)
 - Publish (hopefully)
 - 3-4 years



Worksheet II

- II. In the context of your PhD research, list at least three skills or abilities you have (or have developed), apart from strictly cognitive physics-related ones, you consider have been essential to advancing you on your path.

Preparing for talks quickly

Analysis notes

Time/energy management

Willingness to ask for help

Asking questions in a talk

Active Listening

Reading critically

Courage for trying new things



non-cognitive research skills: benchmarks

- **Definition of project objectives**
 - active involvement in defining aggressive and achievable objectives that thoroughly address the fundamental project needs.
- **Technical awareness**
 - Awareness of previous work, ability to integrate multiple sources to establish a context for the project at hand
- **Task execution**
 - arrival at meaningful results with minimal supervision



non-cognitive research skills: benchmarks

- **Formulation of conclusions**
 - thorough and correct interpretation
 - well-supported, meaningful conclusions
- **Task/project organization**
 - detailed records, easily followed by others
 - minimal wasted time and effort
 - consistent timeliness
- **Communication**
 - Both written and oral: clear articulation of questions, process, findings



in Belle II: budgeting time/effort

- **tasks**
 - **Belle II operations** (shifts, calibrations, management, maintenance)
 - **development** (detector studies, software, upgrade R&D)
 - **Physics analysis** (analysis coding, running jobs, statistical analysis, ...)
 - **Communications** (Internal discussion & talks; external conference talks, posters, papers, pub process)
- **Products: the bottom line**
 - **Physics results, published!**



Worksheet III

III. Professional skills

A. For each of the “non-cognitive research skills,” consider how the tasks you spend time on at Belle (II) challenge you to develop mastery, and describe briefly.

Objectives Any project: define it, set objectives, execute.
R&D; physics analysis

Technical awareness

Development (data sheets, etc); physics analysis (basf2, ROOT, etc)

Task execution

Development, expert shifts (acquiring necessary knowledge); physics analysis (defining checkpoints); writing procrastination; miscommunication

Conclusions

Physics analysis (good visualization of data,); development; shifts (recognizing problems)

Organization

Physics analysis (sorting many files); development, operations - documentation

Communication

Physics analysis write ups, reporting; development

B. Which class of tasks (operations, development, physics analysis, communications) appears most often, on the above list? Determine the priority order for these tasks, in terms of the development of your research effectiveness and career.



How else can I acquire skills?

- **Mentoring**
 - important – for
 - advice (many types)
 - advocacy (when you have challenges)
 - recommendations (for your next job)
- **Mentoring network**
 - know your needs
 - assemble people who can fill your needs
 - Advisor/Belle (II) senior colleagues
 - ...



Don't limit yourself

Activity 1: Are you limiting yourself?

Consider the reflective comments below. How often have you thought this yourself lately?

Enter an X on all that apply.

	Weekly	Monthly	Rarely
If I do good work, they will notice and I will succeed.			
They are important; I don't want to bother anyone.			
I should figure this out for myself			
I am looking for the perfect mentor			
They are outside my discipline and won't help.			
I don't want to sound like I am self-promoting			
I only spend time with people I already know.			
I will talk/show them once I have something good.			
I wish I had better support			



An Effective Mentor Network

YOU

Substantive Feedback

People who's authority and feedback you trust to provide significant input on your work

Sponsorship (Senior Mentors)

People of influence and power on your side, that support and promote you behind closed doors.

Access to Opportunities

People who are connected and aware of important opportunities or connections and think of you when possibilities come forward

Accountability

Someone who will point out to you if you aren't doing your best, to hold you to the standard you have for yourself.

Safe Space A place or "home" of people with similar life histories and experiences, that will understand how you feel and you trust to speak truthfully.

Professional Development

How to do what you need to be able to do to be successful

Emotional support (Family & Friends)

Close emotional friends/family to turn to to share the good and rant about the bad.

Intellectual Community

For deeply engaging and meaningful intellectual conversations, to read your work and critique your ideas

Role Models

People who are doing right now what we want to do, and head of us in their career path. Someone we can have a personal relationship with.



Q&A

Actions

Reach out more for help, mentor ship,

Communicate more

Organize with more foresight

Write 20 minutes a day - get over the perfectionism

Take breaks



- **Be aware**
 - skills needed for career
- **Be self-aware**
 - your strengths & challenges
- **Be intentional**
 - assemble your network
- **Persist**
 - you will succeed



Thanks, and Good Luck!