

Tool #5: Identifying your skill sets

As a physicist, you possess a unique set of skills but it can be challenging to articulate those skills for the different job opportunities you may pursue. Many jobs you apply for will be labeled something other than “physicist.” **That’s ok!** In order to stand out among a pool of applicants, you must be able to competitively represent yourself on paper, through a resume and cover letter, and in person, through networking opportunities and interviews. In addition, you need to know how to do so accurately and succinctly. This means that you must figure out who you are and what you know. As a physics major, you have unique knowledge and skills that are valuable in the job market.

The goal of this section is to learn how to articulate your **transferable skills** in a way that makes it obvious to an employer that you are the right person for the job that they are hiring for.

Skills and knowledge evolve and develop over the course of your education in several ways:

- Mastery of introductory and advanced lab courses
- Development of communication and professional skills through internships, research, service and other experiences
- Active participation in extracurricular activities
- Familiarity with broad and advanced problem-solving skills across a wide variety of topics
- Assuming leadership roles and/or taking initiative (learning to self-direct)
- Experiencing a diverse range of group and team experiences
- Completing projects that achieve a defined goal

Departments who have been recognized as being successful in helping students secure post-graduate employment typically offer the following experiences to further these skills in students.

From courses and lab work:

- Varied and high-quality lab courses
- Research opportunities for undergraduates
- Curricular flexibility and computational coursework embedded within classes
- Building communication skills as part of the undergraduate physics experience

Outside the classroom:

- Faculty and staff commitment to physics majors’ success at all levels, regardless of career goals
- Strong community of students within the physics department
- Opportunities for physics majors to be involved in outreach activities

Many of these features are consistent with those identified in thriving physics departments in the SPIN-UP report:

www.aapt.org/Programs/projects/ntfup/

Each of the curricular or extracurricular components contributes something different to your set of knowledge and skills and could be a potential point in your resume or CV. You may be surprised to find how well skills can translate from one job or position to another.

Figure 4 displays information gathered from physics students who graduated and were employed in engineering and computer-related positions in the private sector. They were asked how often they used a given list of skills, including items such as technical writing and working on a team. These students graduated with a degree in physics and reported through an AIP Statistical Research Center survey of employed bachelor’s degree recipients.

These results are surprising to many students, not because of the skills listed, but the ranked order in which they are reported. Being able to solve complex problems, work on a team, communicate effectively through technical writing and make decisions about the effectiveness of tools and procedures top the responses.

An even more surprising result for many students is that the typical courses a physics and astronomy student take train them very well for the most useful skills and knowledge cited. Laboratory experiments, theoretical courses, and research experiences are great job training activities. Let’s explore how...

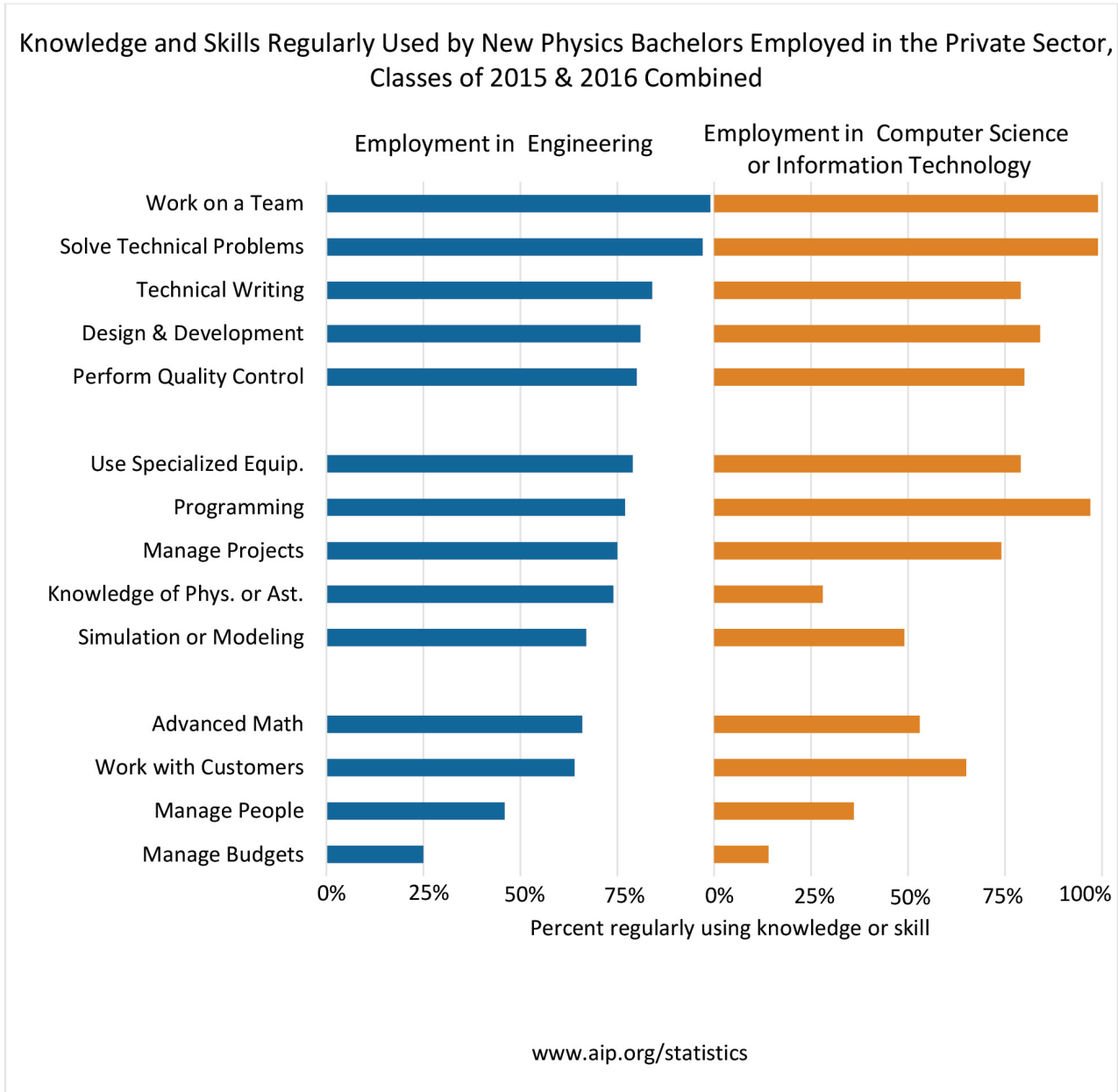


Figure 4: Recent data listing skills commonly used by physics bachelors in the workplace for the combined classes of 2015 & 2016. Percentages represent the physics bachelors who choose “daily”, “weekly”, or “monthly” on a four point scale that also included “never or rarely”.



Working on a team and solving technical problems are some of the most useful skills physics majors can offer potential employers.

Assessing your own skills and knowledge

The first step in assessing your skill set is to consider the broad categories of skills that physics students commonly develop and how to express them in language that is meaningful to employers. This may not be obvious but can be learned.

Identifying, assessing, and writing down your skills can be time consuming but is one of the most efficient ways to increase the odds of landing a job that is a good fit for you. You must also be prepared to repeat this self-assessment process as you progress through school, adding to and refining your list of knowledge and skills.

This assessment process is key because these skills form the basis of your resume, cover letters, and interview talking points. By carefully examining your own experiences, you can extract your personal knowledge and skills and learn to express your capabilities in ways that are meaningful in the job application and interviewing process.

Below are some examples of common skills sought by employers and how you might acquire them during your undergraduate experience.

Skill: Working with laboratory instruments

Students who are pursuing a major in physics often have a wide variety of laboratory experiences. Virtually all physics curricula require students to take a lab with the introductory courses and as a part of a senior thesis or a capstone project. Many physics departments have labs during the 2nd and 3rd years as well. Astronomy courses are often laboratory-based. In addition, many students participate in research experiences that deal extensively with research equipment or computer programming. Through these experiences, students learn how to use a variety of different instruments (e.g., optical components, electronics, machine shop tools, vacuum systems, telescopes, spectrographs) and often develop skills related to their operation, maintenance, repair, quality control, and troubleshooting.

Skill: Conducting research

Many physics majors participate in open-ended research. This includes on-campus experiences with professors, off-campus research experiences (maybe as part of a Research Experience for Undergraduates program or an internship), working on an independent research project, or working on a project for a specific course. Research experiences engage students in higher-order thinking skills and complex knowledge, including research design, data analysis, creative thinking, critical thinking, error analysis, and problem solving. An often-overlooked skill developed through conducting research is the ability to find, read, analyze, and interpret relevant background information to simplify a problem. **Physics majors are trained in encountering problems that cannot be solved by an online search or looked up in a book.** This is useful in a wide variety of settings.

Skill: Proficiency with computer hardware and software

Studying and conducting research in physics often provides opportunities for students to develop knowledge and skills in computer hardware and software. Many physics majors write new code or modify existing programs, use statistical analysis software, or use modeling, image processing, and simulation techniques for research activities. In addition, many students use programs like LabVIEW or Python to run equipment, take data, or build specialized interfaces for this purpose. **Programming is a valuable skill.**

Skill: Effective communication of complex ideas

All students need to develop good written and oral communication skills during their undergraduate career. Physics students are no exception. You have likely had a lot of experience presenting complex information or ideas to a wide variety of audiences. Beyond the general education requirements, physics students usually develop **written communication skills** through writing technical lab reports and research papers that are part of the required curriculum. Physics students may also have the opportunity to publish research in a professional journal or to write about science for a nontechnical audience, e.g., a school newspaper or website. **Oral communication skills** are developed when you present research or class work via a talk or poster presentation - another common experience for physics students. Students in physics often further develop these skills through regular presentations to a research group or as part of a journal club. Many students also attend regional or national professional meetings where they present research findings.

✓ Skill: Analysis and quantitative thinking

Physics students have a demonstrated ability to apply mathematics to a variety of practical problems in industry and otherwise. When seeking employment in a science, technology, engineering, and mathematics (STEM) field, application and synthesis are especially important. Employers value the analytical skills that help people manage information effectively, think logically, and interpret data. The ability to analyze quantitative data helps in examining a problem thoroughly and developing potential solutions. The quantitative physics intuition that students possess is developed over years of physics coursework, endless hours of homework, and *unique* problems. The ability to analyze information and determine what is and is not relevant is also developed over years of laboratory work and problem solving. Merely knowing what one doesn't know can be a huge asset in the workplace.

✓ Skill: Working with others

Many students are members of a research team, are active in campus organizations like the Society of Physics Students, and have extensive experience with group projects. Do not underestimate the importance of these experiences and skills. Teamwork, collaboration, leadership, and decision making are important skills to employers that are evidenced by examples of effective group work. Working with others is often one of the most challenging aspects of a job. Developing this skill takes many forms: from helping to put on a demo show to designing a set of experiments.

✓ Skill: Problem solving and critical thinking

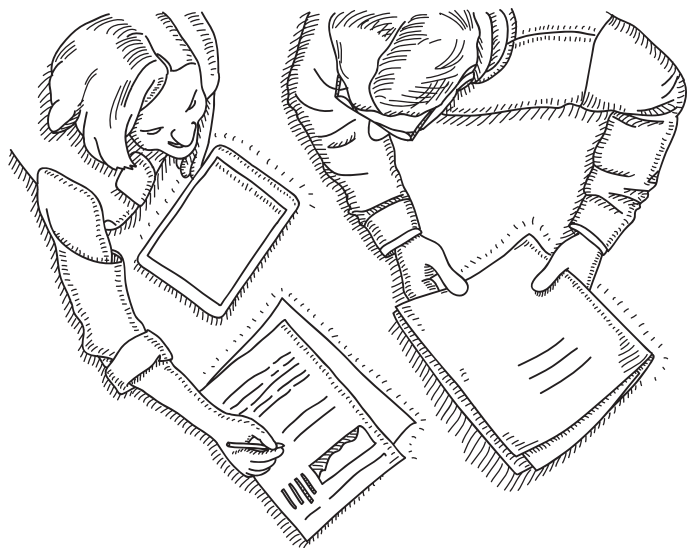
Underlying many of these skills is the ability to examine a situation, identify problems, and think creatively about potential solutions. Physics students do this again and again in labs, research, group projects and homework. You have also learned how to find solutions through literature and online searches, collaborating with colleagues, experiments, and reasoning. This skill is incredibly valuable to all types of employers because problem solvers save employers time and money.

Important notes about this list: Each entry on this short list should be considered as a “set” of skills. You may have several specific skills that fall into a particular skill set ‘category’. Also note that this list is not exhaustive. There are a number of other important skills that you might possess and that may be useful to a potential employer. This list represents data obtained by surveying physics bachelor’s degree holders who have entered the workplace, and should be considered as a starting point.

Summary:

Commonly used skills for *Physics Bachelor’s Degree Holders in the Workplace*

- ⇒ Communicating complex ideas
- ⇒ Analysis and quantitative thinking
- ⇒ Working with others
- ⇒ Problem solving and critical thinking
- ⇒ Working with laboratory instruments
- ⇒ Designing and conducting research
- ⇒ Proficiency with computer hardware and software



Exercise - Tool #5 – Part 1: Brainstorming your experiences

Before you can do an assessment, you need to recall the experiences where you acquired your various knowledge and skills.

Brainstorm away.

The first step is to make an exhaustive list of your experiences that may have relevance in a job. Your life experience is NOT just a list of courses. Instead, focus on skills/knowledge that you achieved in the classes/labs, etc. The same is true for any experience (whether paid or volunteer), leadership experiences, clubs, events sponsored organizations in which you have been actively involved...and many others. Keep master list of everything you've done because you won't remember everything months years later.

Focus on skills, knowledge, experience, and projects on your resume.

Be specific.

⇒ Focus on making notes about the experience AND the knowledge/skills gained. This means making notes about your level of expertise or breadth of experience that has led to a skill or some knowledge that you possess. Even a few sentences can be helpful down the road. Projects are great items to illustrate your skills.

Make use of your immediate network – your classmates and colleagues.

⇒ Consider working with a group. This is a great exercise to do with a study group, or even in an SPS chapter meeting. Working with a group of students who have shared classes, labs, and extracurricular activities with you can be a great way to help remember all the things that you have accomplished as a student. It can also give you ideas about things you might **need to work on** to expand your experience and increase your set of knowledge and skills.

Try to stay organized.

⇒ Use the template below to organize your life experiences. You should feel free to reconfigure this table in a way that makes it easier for you. Remember the exercise templates are available online if you would rather do an electronic brainstorm sheet. **You may have some experiences that fall into more than one category.**

Experiences (template)

Classes / training / workshops/ tutorials	Leadership experiences / group activities / professional associations / clubs and societies
Jobs: research experiences / internships / volunteer work	Hobbies / clubs / independent projects / other activities

Exercise - Tool #5 – Part 2: Identifying Skill Sets from Your Experiences

The next step is to carefully review your list of brainstormed experiences to identify your strengths and skills.

- ⇒ Think about those experiences as you review the list of skills on page 30. Think about which skills you may have acquired as part of a particular experience. For example, many lab courses require group work, so this falls under the working with others skill. Most of your experiences will have provided you the opportunity to acquire multiple skills.
- ⇒ Identify skill categories which are prevalent among your collection of experiences. For example, if much of your coursework, laboratory work, and summer research involved computation, “proficiency with computer hardware and software” might be a good place to start.
- ⇒ Write the skill set category that you have identified at the top one of the pages labeled “Identifying My Skills – An Assessment Worksheet” (page 36).
- ⇒ You are now ready to begin using the worksheet to flesh out the specific details about the particular skills in that category. Follow the “Skills Assessment Activity Guidelines” (next page). These guidelines will take you through a simple process to refine your experiences and identified skills into polished statements ready for your resume, cover letter, or interview questions.
- ⇒ Note: You will repeat this process several times, identifying skills that you found in your brainstormed list of experiences. By the time you graduate, you should have a well-honed bullet point list of 8–12 well-articulated skills. Remember, you may have several specific skills that fall into a single skill set category. For example, you may have several unique skills related to “use of laboratory instruments.”
- ⇒ Make extra copies of the pages entitled “Identifying My Skills – An Assessment Worksheet”, since you will want to reiterate this process as you grow professionally, have new experiences, and attain new skills. You should revise your skills assessment every semester.



Aside:

While you might have many skills, also take the time to think about what you enjoy doing. Almost as important is reflecting on a why you enjoy certain activities. Your mental health and personal preferences are important and deserve consideration. You are not a title or a job.

Skills Assessment Activity Guidelines

- 1. Carefully examine your experiences.**

Identify one of the commonly used skills that appears among your collection of brainstormed experiences. Write this skill at the top of the "Identifying My Skills -An Assessment Worksheet". Remember that these are broad categories. You may identify other important skills on your own.
- 2. Using your brainstormed list of experiences, write down all the experiences that are related to the building of the skill you have identified.**

Often, these experiences will be listed in more than one of the categories while brainstorming. List all the experiences that contribute to the development of the skill or skill category that you are working on. Be sure to **consider not only classes**, REU or internship experiences, summer jobs, teaching or research assistant experiences, but also club activities, outreach experiences, volunteer experiences and other related hobbies and projects. Study this list of experiences that are related to the skill, and start thinking about how you might tell someone (a potential employer) about this skill that you possess.
- 3. Narrow it down.**

Once you have collected the experiences that have contributed to the skill, you are ready to draft a bullet point related to this skill that you might use on a resume. Keep this **short and to the point**. You will refine this later, so just go for it!
- 4. Refine the language.**

Starting with draft one, begin to refine your bullet point, focusing on a concise statement that states *what you know how to do* and *how well you know how to do it*. This may take several drafts. Get feedback from peers and advisors on which is most clear, concise, and meaningful.

Wording suggestions: Took data, made measurements, built, assembled, repaired, interfaced, performed troubleshooting, maintained, designed, calibrated, trained others, taught, investigated, wrote, organized, led, provided support, managed, coordinated, analyzed, presented, modeled, processed, constructed, oversaw, modified, simulated, collaborated with, solved...

Tips on explaining how well you know how to do something: Words like expert and proficient are vague and do not tell employers very much. Instead, describe your experience quantitatively or give evidence of your expertise. Possible quantitative descriptors: several times over the course of a semester, daily during the internship, x hours, x times...Possible evidence of expertise: trained colleagues, taught introductory students, published a paper...

- 5. Tell your story.**

Once you have the concise statement that will go on your resume, write down a few specific anecdotes that demonstrate and illustrate your experiences related to this skill.

Go back to your experiences: Write down specific examples that demonstrate how you made use of this skill or how you attained it. Think about how these examples might help you answer some of the common behavioral interview questions.

Identifying My Skills – An Assessment Worksheet

Use the skills assessment activity guidelines to work through the process of developing a skill statement for your resume.

Skill category: _____

Back to brainstorming: Write down all the experiences that are related to your attainment of this skill.

Tell it: Draft a bullet point related to this skill.

Refine the language: Rework your bullet point, focusing on *what you know how to do* and *how well you know how to do it*. You may want to do a few drafts and get feedback from others on which is most clear, concise, and meaningful.

Show it: Write down a few anecdotes that demonstrate your related skills.

My Skills Summary (Start on page 35)

Skill:	Story:
Skill:	Story:
Skill:	Story:
Skill:	Story:
Skill:	Story:
Skill:	Story: