

QUARKNET: CAREERS IN PHYSICS

WORKSHOP LEADER NOTES

DESCRIPTION

Careers in Physics activity “on careers in physics, particularly those that help solve societal problems.”

BEST PRACTICES

Strategies to Model Good Teaching Practices

- Provide context for the workshop; provide the “big picture” up front.
- Lead as a facilitator rather than a lecturer.
- Focus on habits of mind and on the process of science; teach science as science is done.
- Focus on active engagement over slides.
- Use guided inquiry: Participants practice data collection, organization, interpretation as scientific process.
- Provide opportunities for participants to support their claims with evidence (Claims-Evidence-Reasoning).

Workshop Characteristics

- Workshops include a balance of scientific content and process.
- Workshops have an agenda:
 - Prepare agenda in advance with participants’ prior experience in mind, if possible.
 - Build in agenda flexibility.
 - Leave time for reflection and discussion.
 - Place workshop agenda online.
- Participants are actively engaged.
- Participants work through activities as if they are students first (“student hat”), then talk about teacher strategies and implementation plans (“teacher hat”).
- Activities progress from simple to complex.

Resources for Further Reading:

[*Criteria for Workshop Review*](#) (Young & Associates, 2014)

[*Principles of Effective Professional Development for Mathematics and Science Education: A Synthesis of Standards*](#) (Loucks-Horsley, Susan et al., 1996)

Bibliography

The National Center for Improving Science Education, *Profiling Teacher Development Programs*, Washington, DC, 1993. [Note: Developed for DOE teacher development programs]

National Research Council, *A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*, Washington, DC: The National Academies Press, 2012.

ENDURING UNDERSTANDING

Majoring in physics can enhance career choices.

LEARNING OBJECTIVES

Teachers will know and be able to:

- Use the Profile Matching Matrix to identify *Physicists Career Profiles* that match their values and career goals using their “student hat.”
- Facilitate small group discussions in which students share the physicists with which they are matched, what jobs the physicists hold, and what skills are necessary for that job.
- Explain the significance and meaning of the information in the *Physics Careers and Salaries Presentation*.
- Explain the importance for students to “own” the idea that majoring in physics opens doors to a wide variety of fields.

PRIOR KNOWLEDGE

None required.

BACKGROUND MATERIAL

Information about the STEP UP Careers in Physics curriculum:

<http://stepupphysics.org/careers>

RESOURCES/MATERIALS

Teachers will have access to the following documents:

- [Physics Careers and Salaries Presentation](#)
- Career Goals Pre-Survey (Appendix 1) [PDF](#)
- Profile Matching Matrix (Appendix 2), [PDF](#)
- Physicists Career Profiles ([PDF](#) | [Word Doc](#))
- Internet connectivity to research career choices.
- Personal Career Profile worksheets ([PDF](#) | [Word Doc](#))

Career Exploration Web Sites:

American Physical Society: aps.org/careers

Compadre: careersinphysics.org/facts.cfm

Society of Physics Students: spsnational.org/careerstoobox

American Association of Physics Teachers: aapt.org/resources/Herstories.cfm

Institute of Physics: www.physics.org/careers.asp?contentid=381

U.S. Department of Labor: careeronestop.org/ExploreCareers/explore-careers.aspx

National Career Development Association: ncda.org/aws/NCDA/pt/sp/resources

IMPLEMENTATION

Participants go through the student activity to develop an understanding for the *Careers in Physics* activity. Encourage teachers to approach the activity wearing their “student hat.” At the end of each task, participants put on their “teacher hat” to reflect.

Task 1:

Ask your students to brainstorm the answer to the question “What careers can you pursue with a bachelor’s degree in physics?” Have your students write their ideas, one career each, on sticky notes using all the same color. As the students post their ideas on the board, encourage them to clump together similar careers. Come to closure with this task by drawing your student’s attention to the relatively few categories represented.

Task 2:

This task helps your students think about their personal career goals. Have students complete the Career Goals Pre-Survey to determine areas of interest for their career goals.

Use the instructions in Appendix 2 and the data from the surveys to find physicists with the same values and interests as your students. In small groups of two or three, have your students discuss physicists with which they are matched, what jobs the physicists hold, and what skills are necessary for that job.

Once again, pose the question “What careers can you pursue with a bachelor’s degree in physics?” Have your students use the second color sticky notes to post their answers on the board. There will be a wider array of possible careers posted. Reinforce the idea that a bachelor’s degree in physics opens possible careers by sharing the [Physics Careers and Salaries Presentation](#).

Use the following discussion questions for a class discussion about careers in physics and how their perceptions of physics careers have changed.

- Feelings about job stability?
- Job satisfaction claims compared to people in other fields?
- Using physics skills and knowledge in STEM and non-STEM fields?
- Earning competitive salaries compared to people in other fields?
- Having jobs that can help others?

- Are competitive in admission to medical school or law school compared to people in other fields?

Task 3: Critical Lesson Component

Have your students identify a career in which they are interested. Challenge them to incorporate a physics degree into the pathway to their chosen career. The Personal Career Profile, Appendix 4, provides a template for the key features of students' description of their future careers including physics. Thus, students consider the possibility of a physics degree in a more serious way.

Task 4: Teacher Reflection

End with time for teachers to reflect and develop an implementation plan for their classrooms.

Suggested questions include:

- Do you foresee any challenges in implementing this task with your students?
- How will you overcome these challenges?
- At what point in your school year do you think this task best fits?
- Will you implement the entire activity on the same day? If not, how will you divide the tasks?

ASSESSMENT

This activity lends itself to formative assessment in which the teachers are encouraged to gather after implementing the student activity in their classroom. Return to the questions in the implementation section. Follow up with the following questions:

- What went well during implementation?
- What would you do differently if you do it again with a different group of students?
- Have the students expressed interest in majoring in physics?
- Have the students been more involved and excited about studying physics?
- Do more students share their thoughts and answers with the class?