Science 10 Curricular Competency Learning Guides

For Learning Guides 18, 19, and 20 this year you will be demonstrating what you can do in physics by meeting a wide range of curricular competencies. These guides are designed to give you some flexibility and choice in determining what to learn and how to demonstrate your learning. For each guide you will have work to complete which you will then present to your teacher in the from of a brief interview. At the end of the interview you will either have successfully completed the guide or you will be given feedback on areas to improve, in order to complete the guide. You must complete 3 of the following guides.

Design/Inquiry Lab Guide (Mandatory).

There are 30 curricular competencies in Science 10. Over half of them can be demonstrated through designing and carrying out your own scientific experiment. To complete this guide you must come up with a testable question where you will be attempting to find the relationship between your chosen independent and dependent variables. You must design and carry out a lab procedure and collect relevant data. You must analyze this data to form a reliable conclusion and you must reflect on your data and conclusion to identify any sort of error in your work. Your teacher will be there to assist you in all aspects of this multi week project.

Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal interest (must complete one guide from the list below)

Book Guide:

To complete this guide you must read a book about science and give a report on in. Your report should include your impressions of the book, what it was about, and what you learned from it. **Please clear your book in advance with your teacher. If you read a book without clearing it with your teacher in advance, the badge won't be approved.** Both the school library and the Maple Ridge Public Library have a great selection of science books.

Online Media Guide:

To complete this guide you must read at least 3 different science related articles/blog posts from reputable sources all on a related topic. Your report must include links to each article/blog post and a brief report about each one detailing what it's about and what you learned from it.

Wired's Rhett Allain has lots of great articles that high school students seem to enjoy. Scientific American has a lot of great articles and blogs. For astronomy, the "Bad Astronomy" blog is great. The Science sections at the New York Times, The Atlantic and National Geographic are also worth checking out.

Youtuber Guide:

To complete this guide you must watch at least 3 science related videos, all on a related topic, from the following list of reputable sources: Veritasium, Minute Physics, Minute Earth, Vsauce, Sixty Symbols, PBS Space Time, Kurzgesagt – In a Nutshell and Ted Ed (Science & Tech videos, high school level). For each video you must write a report outlining what the video was about, what you liked about it, and what new science you learned from it. Include a link to the video for each writeup.

Science In Public Guide:

To complete this guide you must physically (or virtually) attend a science related event outside of school in the general community. It could be a science lecture, a science discussion panel, a science competition, a university Open House, a community invasive species clean-up event, etc. Write a report of what the event was about, and what you learned by attending it. Be sure to take a photo/selfie of yourself at the event to prove that you were actually there!

Fermentation Guide:

To complete this guide you must ferment a food product at home and take pictures of yourself doing so. You must also write a brief report on fermentation and the science behind it. Where do the bacteria come from? What do they do? Why isn't it dangerous? You also need to make a link between fermentation and what you learned in our Chemistry unit this year. You could make pickles, kimchi, sauerkraut, kombucha, or even true sourdough bread! You will have to share the products of your fermentation with your classmates. Some basic information on fermentation can be found here or here. Please ensure you are actually doing fermentation, and not just pickling something using vinegar. No vinegar should be added. No yeast should be added.

Gardener Guide:

To complete this guide you must plant a variety of vegetables and/or herbs in a home garden, school, garden, community garden, or indoor/patio garden. Take lots of photos of the various stages of soil preparation, planting seeds, and the various stages of growth of the plants (make sure you're in some of the photos) and include a short writeup for each series of photos. You can even include photos of the meals you made with the plants you've grown! When you submit the badge include a final writeup including what you liked/didn't like about gardening and about what you learned along the way. You also need to make a link between gardening and what you learned in our Biology unit this year (ie. artificial selection).

Select and use appropriate equipment, including digital technologies, to systematically and accurately collect and record data (must complete one guide from the list below)

Smartphone Guide:

To complete this guide you must download and use the Arduino Science Journal app on your smartphone and use it to carry out an experiment to demonstrate your knowledge of science that we have learned this year, or some new learning regarding science. There are many types of sensors built into your phone that Science Journal can access and then measure quantities such as acceleration, temperature, pressure, frequency, amplitude, and magnetic field. Your report should include screenshots from your app along with a description of how you used it in your experiment to demonstrate your understanding. In your experiment be sure to change only one variable (the independent variable) to see how it affects one other variable (the dependent variable) while keeping every other variable constant. Please note, if you used Arduino Science Journal for your design lab, you won't be able to complete this guide. There are other apps you could use instead such as PhyPhox.

PhET Guide:

To complete this guide you must use a science simulation from the University of Colorado's PhET website to demonstrate your knowledge of science that we have learned this year, or some new learning regarding science. Your report should include screenshots and/or video of your simulation in action and a detailed description of how you used it to demonstrate your understanding.

Coding Guide:

To complete this guide you must write code (or modify existing code) to demonstrate your knowledge of science that we have learned this year, or some new learning regarding science. The library has some Arduino devices which you can sign out to make all sorts of cool devices with (lights, speakers, robots that respond to various inputs like motion, sound, temperature, brightness, etc). Wired's Dot Physics has a lot of posts showing how you can use coding for physics problems in Python, VPython, GlowScript, and Trinket as summarized in this post, this post, and in this post. Your report should include screenshots of your code and a description of how you used it to demonstrate your knowledge of science that we have learned this year, or some new learning regarding physics. You should also include a Trinket link so that I can actually run your code.

Video Analysis Guide:

To complete this guide you must film a moving object and analyze it's motion using video analysis on Logger Pro. It could be a video of a ball moving through the air or it could be a video of you playing your favourite sport. Be sure not to move the camera when filming and be sure you are filming the moving object from an angle of 90 degrees and not at any other angle. You can also film it in slow motion if the object is moving really fast. You must have something in your video you know the length of to set a scale so that the software knows how big your object is in real life. In your interview you'll have to show me your video and graphs of things like horizontal and vertical position and horizontal and vertical velocity and explain to me what the graphs tell you about the motion of your object and what you learned. You can also use the "photo distance" function to measure heights and use the velocities to calculate the

gravitational potential energy and kinetic energy of your object at various points. You can download the Windows or Mac version along with the Video Analysis Instructions sheet.

Propose your own guide:

There are other curricular competencies that aren't directly addressed by the choices above. If you would like to design a project/task/action of your choosing that addresses these other guides please see your teacher. Here are some of the competencies that could lend themselves well to interesting student work:

- Assess risks and address ethical, cultural, and/or environmental issues associated with their proposed methods and those of others
- Experience and interpret the local environment
- Apply First Peoples perspectives and knowledge, other ways of knowing, and local knowledge as sources of information
- Demonstrate an awareness of assumptions, question information given, and identify bias in their own work and secondary sources
- Connect scientific explorations to careers in science
- Exercise a healthy, informed skepticism and use scientific knowledge and findings to form their own investigations and to evaluate claims in secondary sources
- Consider social, ethical, and environmental implications of the findings from their own and others' investigations
- Critically analyze the validity of information in secondary sources and evaluate the approaches used to solve problems
- Contribute to care for self, others, community, and world through individual or collaborative approaches
- Contribute to finding solutions to problems at a local and/or global level through inquiry
- Express and reflect on a variety of experiences, perspectives, and worldviews through place