# Statement of Rationale

*PHS-030, Physics for Future Presidents*

Student instruction will take place in the form of lectures, in class activities and participation and reading. In addition, students will be assigned different types of activities that will be used as assessment. Here I relate each learning criterion to a specific activity as requested.

**Commented [BC1]:** As stated in the syllabus, participation is a portion of the grade.

**Commented [BC2]:** See the syllabus for definitions of each type of activity.

One of the intentional philosophies of this course is to provide a broad range of instructional and assessment tools. As a result, there are cases where a given student learning outcome or GE criteria can be met in several different ways. In this document I will give the most detail on some of the most obvious connections, but briefly point out additional ways a given criterion could be met.

**Student Learning Outcome**: Use the general principles of the scientific method to explain the structure and interactions of matter to explain common technologies and issues in the modern world, and to interpret claims in the context of the scientific method.

**Commented [BC3]:** Each student learning outcome is copied from the syllabus. Examples of assessment methods are also stated in the syllabus. I expand on how each activity will support the each learning criterion.

- Physical Sciences Criteria (1): identify the basic properties and principles of matter
    - Assignments and exams. Questions given on assignments or exams will require the ability to explain different properties of matter. The questions could be in the style of what has been done for this course in the past at other institutions. Some example questions in the style of what I envision can be found in the course website from pervious courses here, which is an example of identifying a basic property of matter.
- Physical Sciences Criteria (2): identify the creative and systematic aspects of scientific method and give examples of the power of theory and prediction with the framework of empirical/experimental modes of inquiry;
    - Response essays: these essays will have students respond to articles chosen by the instructor. In these responses students will have to explain the relevant science including the predictions and empirical results. Students also have the ability to pick articles that emphasize creativity.
    - Team project, see below.

  SLO: Exams will require students to explain the structure and interactions of matter as well as the impact of scientific principles on technology.

**Commented [BC4]:** 5. At room temperature, the spe of molecules is about
( ) 9.8 meters/sec
( ) 1000 feet per second
( ) 8 kilometers per second
( ) 11 kilometers per second
https://muller.lbl.gov/teaching/Physics10/old_exams/spring_2007/Midterm1_Spring2007.pdf

**Student Learning Outcome**: Find and summarize data and models from scientific literature as well as the impact on your community.

- Quantitative and analytical reasoning criteria (1): compute and interpret numeric data, summative statistics and/or graphical representations;
    - Team Project: the project will encourage students to identify a question and find the answer to that question. Several examples are given in the syllabus. The project will have students systematically investigate a problem. One aspect of the project is to interpret data including graphs and statistical summaries.
- Quantitative and analytical reasoning criteria (2) reflect on the strengths and weaknesses of particular quantitative models or methods as tools in the natural and social sciences;
    - Assignments: students will have to perform simple calculations or explain physical phenomena. As a (hypothetical) example, a student may be asked to compute the

number of solar panels needed to supply energy in the future, given a model of energy consumption needs in the future.
    - Team Project: Also applicable as students (depending on choice of project) will have to explain the relationship between data and specific models, such as the model of solar radiation related to solar energy (see solar energy example) or climate change.
- Quantitative and analytical reasoning criteria (3) be able to interpret, reflect on, and use quantitative models and data in public, vocational, and/or private decision making.
    - Exams will assess knowledge of reading and in class lectures to discuss particular models and methods. As a concrete example, a portion of the course will be on climate change (see work by Swanson in the syllabus) that outlines climate *models* and the impact on society that come with clear decisions at a public level. Another example comes from the effects of radioactivity.
- Physical Sciences Criteria (4): demonstrate sufficient comprehension of science to read intelligently about and express informed opinions on science-related issues that affect individuals and society.
    - Physics in the News: students will learn about current topics in science and articulate an informed response. This activity will have some overlap with physical sciences criteria (2), where it will be necessary to explain which aspects of an article are predictions and that are empirical results.

  SLO: One way this outcome will be met is with the team project, where students will propose and execute a small research project. The project will require them to find data and summarize the data.

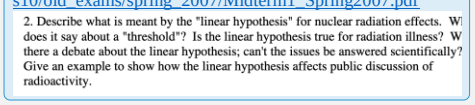
**Student Learning Outcome**: Articulate a Christian response to issues related to the interplay between science & society or scientific observations and faith.

- Physical Sciences Criteria (3): articulate a model of the relationship between faith and science both historically and in the current culture.
    - Response essays: At least one of the response essays or essay prompts will specifically ask students to outline the relationship of faith to the specific science topic they are responding to.
    - Exams**:** The course includes reading content on interplay between physics and faith. The exams will include questions related to these reading assignments.

  SLO: Writing a response essay will enable students to articulate a response and model of faith & science.

**Commented [BC5]:** Not that I would necessarily use this particular example, but here is an example of a projection: https://www.eia.gov/todayinenergy/detail.php?id=41433

**Commented [BC6]:** https://muller.lbl.gov/teaching/Physics10/old_exams/spring_2007/Midterm1_Spring2007.pdf


2. Describe what is meant by the "linear hypothesis" for nuclear radiation effects. Wl does it say about a "threshold"? Is the linear hypothesis true for radiation illness? W there a debate about the linear hypothesis; can't the issues be answered scientifically? Give an example to show how the linear hypothesis affects public discussion of radioactivity.