

Redshift Computational Astrophysics Activity

Student Notebook: [Link Here](#)

Teacher Notebook: [\(In progress\)](#)

1. Scope

- a. Purpose
- b. Alignment to NGSS
 - i. Kansas State Science Standard (NGSS adopted)
 - ii. HS-ESS1-2. Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, [motion of distant galaxies](#), and composition of matter in the universe.
 - iii. [Clarification Statement: Emphasis is on the astronomical evidence of the [red shift of light from galaxies as an indication that the universe is currently expanding](#), the cosmic microwave background as the remnant radiation from the Big Bang, and the observed composition of ordinary matter of the universe, primarily found in stars and interstellar gases (from the spectra of electromagnetic radiation from stars), which matches that predicted by the Big Bang theory (3/4 hydrogen and 1/4 helium).]
 - iv.
- c. Purpose of Computation in the Physics/Astrophysics Classroom
 - i. Experimental, theoretical, and computational methods are the three key perspectives in scientific disciplines.
 - ii. Computational methods are broadly applicable to sciences, engineering, mathematics, and related disciplines, and are increasingly relevant to nearly all areas of study.
 - iii. Computational literacy -- coding -- is strongly emphasized and relevant in STEM initiatives.
 - iv. Computational literacy, even a basic understanding, may influence future topics of study, professions, and opportunities.
- d. Student Learning Objectives
 - i. Upon completion of this activity, a student will be able to...
 - ii. Upon completion of this activity, a student will be able to...
 - iii. Upon completion of this activity, a student will be able to...

2. Sequence

- a. Prior Knowledge

- i. Students need to have introductory experience with basic python programming.
 - ii. Students should understand
 - b.
- 3. Assessments
 - a. Formative
 - i. This activity is built as a piece of guided inquiry
 - b. Summative
- 4. References
 - a. [SDSS Sample Activity: "A Simple Hubble Diagram"](#)
 - b. [PNAS Article: Hubble's Diagram and Cosmic Expansion \(2004\)](#)
 - c. PNAS Article: