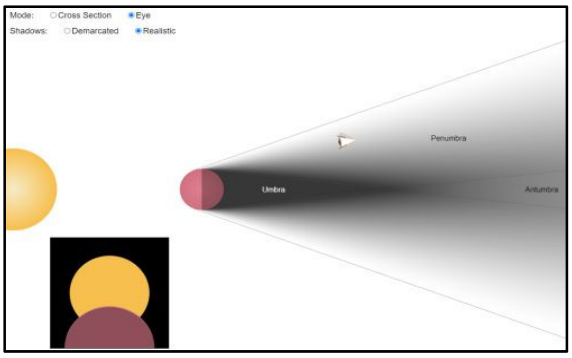
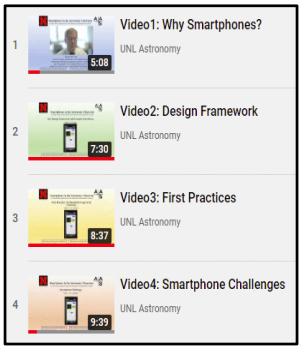
Web Resources for Teaching Astronomy – https://astro.unl.edu

All materials are aimed at the 100-level general education college course but have considerable utility in upper-level college and high school courses. All materials can be used freely for non-profit educational purposes. This front page describes newer active projects, while the back page describes the current delivery of older projects.

Smartphone Simulations – These simulations are intended for introductory college astronomy courses for usage on student devices in the classroom. They should work on all devices and thus certainly have other uses. A special design framework was necessary for delivery on smartphones. Questions that are easily assigned are embedded in each simulation to guide student experimentation.



The Labeled Shadow Diagram of the Eclipse Explorer (a suite of five eclipse simulations)



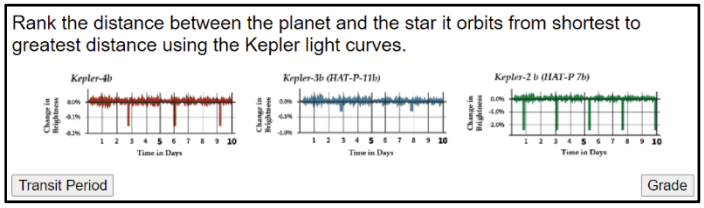
Four videos covering the pedagogy of smartphones

YouTube at:

The AAS Smartphones in the Astronomy Classroom Series covers the motivations, design, relevant pedagogy, and challenges associated with teaching with smartphone simulations. The videos are available as .mp4 files and iSpring presentations and also on

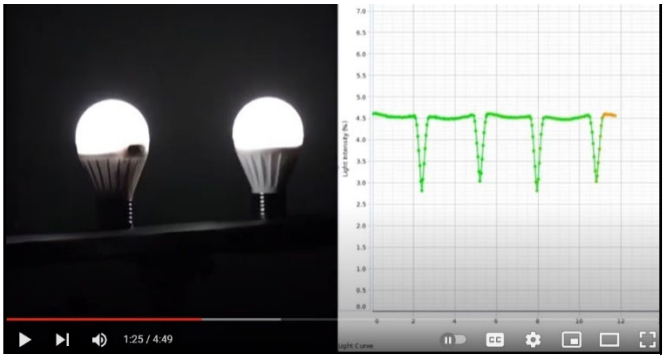
https://www.youtube.com/playlist?list=PL_bGkNDHTZQACcjvNrVNOZc2B0clZGE4_

HTML5 Ranking Tasks – a series of RTs is under development that work well on smartphones. Note that there is an online editor for creating these formative assessment tools without programming.



A task requiring ranking extrasolar planet properties inferred from their Kepler light curves

Astronomy Demonstration Videos – a series of short videos of demonstrations commonly performed in introductory astronomy classes. They are available here as embedded videos on the YouTube UNL Astronomy channel and as .mp4 files for download. Most videos contain an embedded peer instruction question and many have accompanying follow-up worksheets. There are presently 42 ADVs available.



Screenshot of the Eclipsing Binary Stars Video

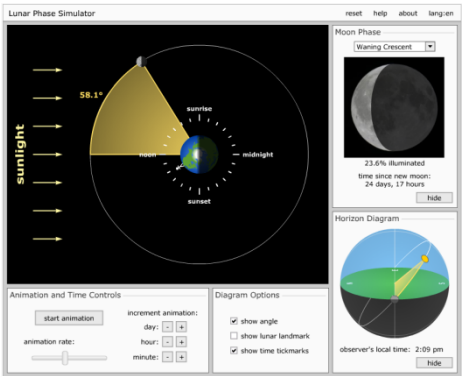
The three packages described below are older projects that were originally written in Flash. Since Flash is no longer supported on the internet, they are delivered in two new formats:

- **Native Apps** – These must be installed on either Win or Mac computers. However, they are a 100% successful implementation of the original code. They do not run over the internet, nor do they work on iPads or Chromebooks.
- **Legacy** – Here the three packages are supported by the Flash emulator Ruffle. Ruffle's handling of Flash is successful about 85% of the time (and it often tells you in advance when there are unsupported features). However, Ruffle is still being developed and it is likely there will be improvements in the future. The Ruffle supported software runs over the internet and does work on iPads and Chromebooks.

Over 100 simulations from the following projects are collected on the https://astro.unl.edu/animationsLinks.html page and can be used in a browser thanks to the Ruffle emulator.

The Nebraska Astronomy Applet Project: Full-featured simulations and supporting materials appropriate for use in computer labs, homework, or classroom demonstrations. All student guides are available in Microsoft Word format. Modules are online for the following topics:

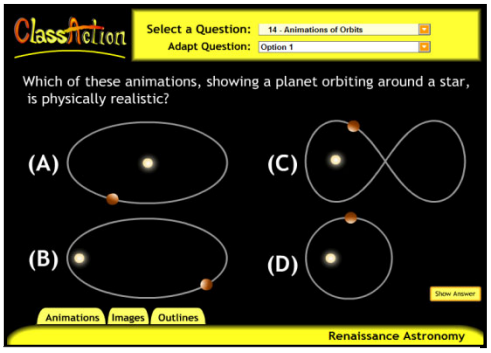
- Basic Coordinates & Seasons
- The Rotating Sky
- The Motion of the Sun
- Lunar Phases
- Planetary Orbit Simulator
- Eclipsing Binary Simulator
- Solar System Models
- HR Diagram Simulator
- Blackbody Curves & UBV Filters
- Hydrogen Energy Levels
- ExtraSolar Planets
- Atmospheric Retention
- Variable Star Photometry
- Cosmic Distance Ladder
- Habitable Zones



Lunar Phase Simulator

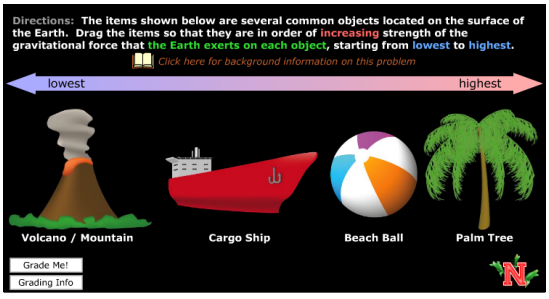
The ClassAction Project: A computer database of questions and feedback resources for think-pair-share. Voting can be done with a personal response system, index cards, or fingers. Instructors have total flexibility in choosing questions and feedback tools based on the needs of their class.

- Nearly 500 questions spanning 21 topic areas in astronomy
- Questions are strongly based on images, diagrams, and animations
- Questions are permutable − easily cast into alternate forms
- Over 100 simulations are available for feedback



ClassAction Question over Orbits from the Renaissance Astronomy Module

Animated Ranking and Sorting Tasks These animations ask students to manipulate (either order or categorize) icons that can represent astronomical objects, characteristics, events, and concepts. Students are then graded, provided feedback, given access to background information, and allowed to take another randomized version of the task.



A Simple Ranking Task on Gravity

We gratefully acknowledge the support of the National Science Foundation that made the five major projects possible – as well as the American Astronomical Society for the smartphone pedagogy video series and the NASA Nebraska Space Grant for the Ranking Task editor.