

COURSE RE(DESIGN) ACADEMY: REDESIGNING AN INTRODUCTORY ASTRONOMY COURSE WITH OPEN RESOURCES

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STARTING GOAL

How can I re-design a General Education Astronomy course (ASTR 111-112: Introductory Astronomy, The Solar System), taught in an Active Learning Technology classroom, using **open educational resources (OER)** instead of a good but expensive book and its interactive homework system?



COURSE RE-DESIGN ACADEMY (CRA)

Since the Center for Teaching and Learning Excellence (now Stearns Center for Teaching and Learning) organized a re-designing course academy with emphasis on active learning, I thought it would be the ideal starting point for my summer project.



The full course comprised an on-line component, which could be completed over a period of a few weeks, and an intensive face-to-face workshop over two days. I personally found the course very beneficial and useful. From the suggested readings, the constructive discussions, and group exercises I learned the importance of establishing proper **student learning outcomes (SLOs)** and develop and align **Learning Support Tasks (LSTs)** and assessments. Overall, I found the course very beneficial and I strongly recommended it to anyone who plans to (re)design a course.

Based on this course and my previous teaching experience, I decided to develop a student-centered course where lower-level cognitive activities are completed out of class, and the class time is dedicated to collaborative and higher-level cognitive activities.

EXAMPLE FROM CRA

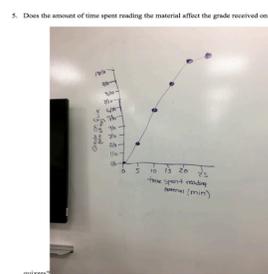
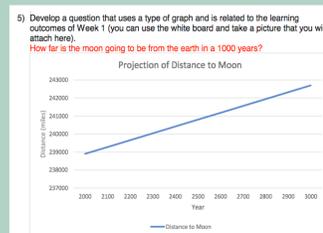
Here is an example of SLO – LST - assessment alignment developed during the course and now applied to my astronomy course.

Student Learning Outcome(s) (course level)	Significant, Graded Assessment Tasks	Smaller and/or Formative Assessment Tasks	Learning Support Tasks
<p>1. What will your students be able to do?</p>	<p>2. Projects, exams, major assignments evaluated for course grades</p>	<p>3. Homework, small assignments, in-class work. Will students receive feedback from the instructor or peers? Have their work evaluated by key criteria? Be evaluated mostly on a completion basis?</p>	<p>4. Proposed learning support activities should support all of the SLO(s).</p>
<p>SLO #1 here: Explain and compare different coordinate systems.</p>	<p>Write a comparison between 2 coordinate systems assigned to your group and include a picture illustrating them.</p> <p>Weekly homework quiz.</p> <p>Monthly test.</p>		<p>In pairs, summarize and illustrate the main characteristics of:</p> <ul style="list-style-type: none"> a) X and y coordinates (Cartesian system) b) Altitude and azimuth (Horizontal system) <p>Or</p> <ul style="list-style-type: none"> c) Longitude and latitude (Geographical system) d) Right ascension and declination (Equatorial system) <p>Explain to another group at your table your 2 coordinate systems.</p> <p>Compare and differentiate the different coordinate systems.</p>
<p>SLO #2 here: Analyze common misconceptions about seasons and explain their actual cause.</p>	<p>Submit a question (and relative answer) in the form: "What if ...?" where you investigate a new scenario in terms of axis tilt and/or variable distance from the Sun.</p> <p>Weekly homework quiz.</p>		<p>In pairs, complete a lecture tutorial on seasons.</p> <p>Explain your answers to the class (groups randomly selected).</p>



EXAMPLE OF CLASS ACTIVITY

Every week, one of the activities deals with the SLOs of the previous week. In the one illustrated below, the students had to develop a question about one of the Week 1 SLOs of their choice and include a graph.



Et voilà`



RECIPE TO REDISIGN A COURSE WITH OER

1) Look for adequate OER for the course (in my case a book, Astronomy OpenStax, and a video series, Crash Course Astronomy).



2) For each week of the course, select the main learning objectives that must be mastered by the students.

3) For each learning objective, devise the weekly student learning outcomes, which must be relevant and generally described by an action verb.

Module 2: Science and pseudoscience

Build Content Assessments Tools Partner Content

Week 2 overview

Learning Outcomes Week 2:

At the end of Week 2, students should be able to:

1. describe the main characteristics of science;
2. distinguish between science and pseudoscience (e.g., astronomy vs. astrology);
3. describe early findings of ancient astronomy;
4. compare and differentiate geocentric and heliocentric models of the solar system;
5. use and interpret different types of graphs.

Readings & videos:

- OpenStax:
 - 2.2: Ancient astronomy (p.42);
 - 2.3: Astrology and astronomy (p.49)
 - 2.4: The birth of modern astronomy (p.54)
- Link: How science really works
- Video: Introduction to astronomy: Crash Course Astronomy #1

Homework written assignment Quiz2 (due Thursday Sept 7th at 3:00 pm)

4) For the SLOs, develop learning support tasks, possibly based on collaborative work and requiring higher thinking skills.

5) For the SLOs, develop graded assessment tasks, starting with low-stake collaborative tasks (where the students can make mistakes without consequences) and then evolve into more formal assessments.

Clarifying Activity

Availability: Item is not available.

1. Without any on-line resource, individually think about Week 1, summarize what you have learned, and write down any question you still have.
2. In pairs/groups of 3, try to answer your respective questions.
3. As a table, discuss the group questions. If there is any unanswered question, write it down on the white board.

Tuesday Week 2 Dropbox

Availability: Item is not available.

Based on the graph reading and interpretation document, answer the following questions in your own words:

- 1) Why are graphs important in science and in other fields?
- 2) What types of graphs are present in the document you read?
- 3) Describe the meaning of "slope"?
- 4) Explain the meaning of the sentence "correlation does not necessarily imply causation" and provide 2 examples: one where the correlation between two quantities implies causation (i.e., the dependent variable y varies because the independent variable x changes), and one where the correlation is only occurring by chance.
- 5) Develop a question that uses a type of graph and is related to the learning outcomes of Week 1.

6) Develop meaningful homework assignments, which make the text relevant and allow the students to tests their understanding and obtain feedback on weekly basis.

