Engaging science faculty in program assessment:
Planting Seeds and Cultivating Growth

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Approved in August 2014, the undergraduate Astro- program is staffed by the ~30 research faculty at the Institute for Astronomy in Manoa. The combined majors currently include 16 women and 20 men, with an additional 13 students pursuing a minor.

Skill Map example

3. Physical laws in Astronomy -

Demonstrate an appreciation of the universality of physical laws and apply these laws to explain phenomena i the universe

Subject	Intro
Orbital motion	Kepl versi Circu negli
Continuum mechanics	Hydr atmc
Matter & Radiation	Stefa laws of Int matt
Nuclear Reactions	alpha Fusic

Subject	Orbital motion
Introduction	Kepler's Laws. Newton's version of Kepler's 3rd law. Circular orbits with a negligible mass.
Basic Usage	General 2-body problem. Perturbations; secular evolution.
Mastery	Non-Keplerian potentials; orbital invariants

Student Learning Objectives

A top-level curriculum map was written as part of the program proposal. Via faculty interviews, we are filling in the **progression of skills and knowledge**.

Curriculum Alignment

We aim to have each **instructor "hand-off"** to the next, along with course planning sessions to help all faculty build a sense of where their course's role.

Post-class debriefing / Pre-class briefing

Instructors discuss student performance and difficulties in course transitions; this drives revision of earlier courses.

- ✓ **ASTR 241 ↔ ASTR 242**
- ❑ ASTR 210, 242 ↔ ASTR 300
- ✓ **ASTR 300 ↔ ASTR 301**
- ❑ ASTR 301 ↔ ASTR 494

Writing Rubric

Instructors for ASTR 300L, 301, and 494 are testing and refining a rubric to guide student growth in:

- Control of syntax and mechanics
- Communication tools, such as tables, lists, and figures
- Content
- Reasoning

Signature Assignments

Identifying a few key types of tasks in which students build proficiency over several semesters. **Common rubrics** helps students understand what skills they should develop.

Course Design

Work with faculty to define course goals, write summative assessments, backwards design, and implement active learning and formative assessments. Iteratively refine by **analyzing outcomes**.

Item Analysis

Early stages of mapping exam questions to learning objectives, e.g.:

In the absence of read noise, what is the error on the measured number of photons, N?
SLO 2: "Be able to formulate scientific problems in mathematical terms and apply analytical and numerical methods towards its solution."
Requires knowledge of counting (Poisson) statistics, be able to calculate the square-root of a number

Engaging faculty

- Honor faculty time and expertise
- Take advantage of casual encounters
- Redirect faculty frustrations into professional development experiences