**ENGAGING SCIENCE FACULTY IN PROGRAM ASSESSMENT: Planting Seeds and Cultivating Growth**

**BS Astrophysics & BA Astronomy**
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**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Orbital motion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect</td>
<td>Iron</td>
</tr>
<tr>
<td>Motion</td>
<td>Basic Usage</td>
</tr>
<tr>
<td>Energy</td>
<td>General 2-body problem. Perturbations; secular evolution.</td>
</tr>
<tr>
<td>Reaction</td>
<td>Mastery</td>
</tr>
<tr>
<td>Product</td>
<td>Non-Keplerian potentials; orbital invariants</td>
</tr>
</tbody>
</table>

**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.

**Signature Assignments**
Identifying a few key types of tasks in which students build proficiency over several semesters. Common rubrics help 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.

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

**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

**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.