Overcoming barriers, finding solutions, creating incentives and rewards

- **Culture Change**
  - **Acceptance of nonacademic careers as valuable**
  - **Success is not just replicating self**
- **Education**
  - **Discovery & exploration of alternative careers, skills needed in changing world**
  - **Teaching methods/course changes, programmatic activities to develop skills**
- **Collaboration**
  - **Involve employers –who hires your students?**
  - **Business schools – in house & online**
  - **Career services – university & professional society resources**
  - **Toastmasters, public speaking, etc.**

Common Advice

- Patience, patience, patience – process takes time. Take it slow and spend the time to get faculty buy-in.

- Be patient, but insistent that changes can improve our programs and be beneficial to our students. In times of budget problems, these kinds of changes can be program savers.

- Open dialogue and communication is key.

- Large faculty – use core group but get faculty buy-in first and keep updated.

- Find a champion!

- Bring in outside speakers that inspire faculty to change .

- Make sure that there is some mechanisms in place for driving and enforcing your proposed changes.

- Leverage institutional processes and resources.

- Before you start, figure out how to overcome entrenched ideas regarding what constitutes a "real" Ph.D. or M.S.

Issues to resolve

- **Resources – financial and space needs**
  - Time and support to develop and pilot new instructional approaches
  - Space redesigned from lecture-based to interactive classes
  - Technology infrastructure
  - Performance-based incentives to change
  - Investment in professional development activities

 *Supplemental funding for PIs from NSF and other federal government agencies available to fund internships*

- **Rewards & incentives**
  - Release time, awards, advancement
  - Recognize "change" efforts in annual performance evaluations and tenure and promotion
  - Professional development; short courses

- **Different incoming student backgrounds & quantitative preparation**

Proposed Incentives
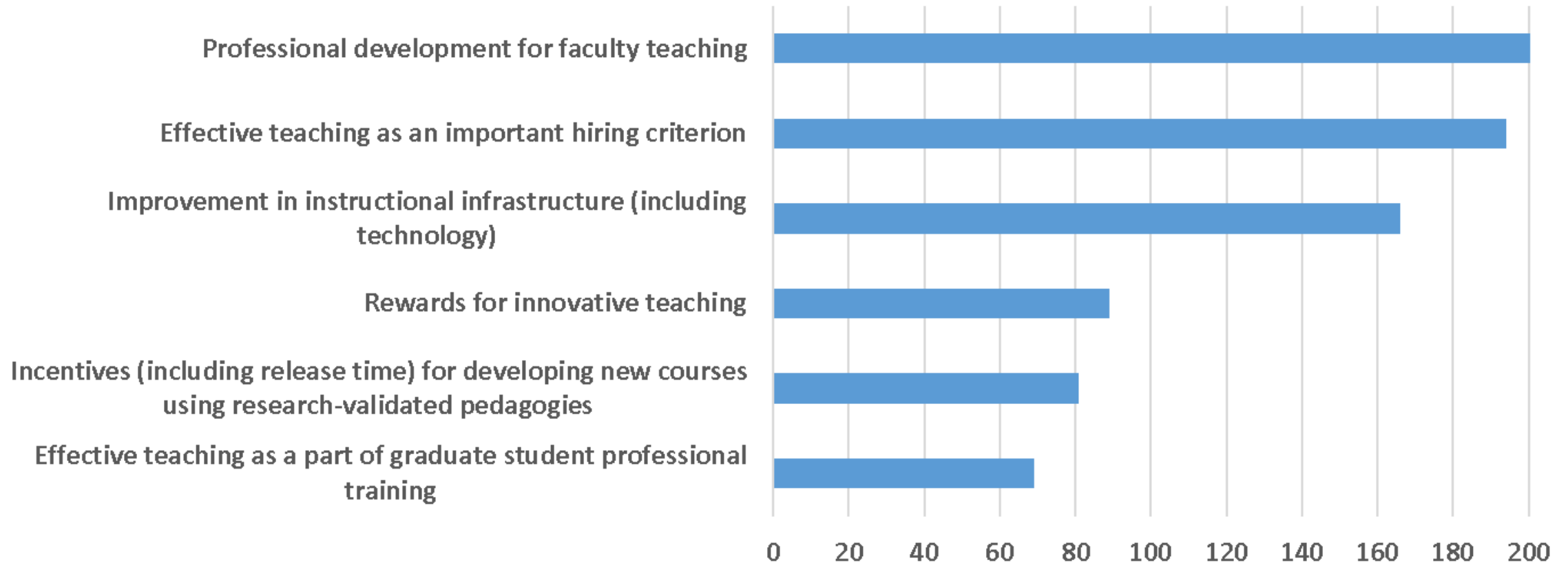
Out of 354 departments

Important to Consider

Evaluate where skills learned – course vs experiences

- **Decide what kind of skills**
    - need to be framed in course or other formal setting - - i.e. can't be captured in an experience
    - are learned in process of conducting research
    - best learned through "experiences" (i.e. teamwork, leadership, etc.) but not well suited for 'courses
    - best learned through co-curricular activities
        - Conference presentations, writing scholarly papers, public outreach experiences, etc.
- **Use of team-based cross-disciplinary, longer-term projects or case studies for student groups to work on together. (e.g. Imperial Barrel)**

Potential adoptions to suggest

- Introduce some Agile methods (project management methodology) in the lab or student cohorts build exposure to a common business process

- Require reading of key outside publications, like The Economist for exposure

- Exposure and use of remote communications (web meetings, sharing across distant team members)

- Virtual mentoring – AGU partnering with other societies to provide mentors from outside of academia

- Get students to boil down their research reason to something relevant to a local level, such as to a congressperson and their constituency

- Integrate writing/communications/project management into all classes in graduate programs to help develop these skills and reinforce them during their studies

- Build opportunities for students to have to communicate with outside layperson groups, such as seniors groups, etc. to ensure they can discuss the research in an accessible manner and relevance.

- Build exposure opportunities, such as having visiting talks by individuals from outside areas, such as from the business school

- Have students write proposals (GSA research grants, GRFP, etc.) or help with NSF/NOAA, NASA proposals to understand something about budgets