

Undergraduate Student Working Group Report

Generalities

Many science students are in for a shock when they come to Harvard. Used to being the best, they have to confront the reality that half of them will end up in the lower half of the class. This has at least two effects on the choice of concentration. After seeing the imagined "competition", students may conclude that they are not good enough to compete in a scientific field at all and settle for something that they perceive to be easier to succeed at. Even if they get beyond this and realize that they can do it, they may not want to continue if they cannot be what they are used to - the best. The point to emphasize is that men and women may react differently to these pressures. From our conversations in the Think Tanks*, it seems that women are more likely to internalize these pressures, interpreting their experiences to mean that they are not good enough to do science.

Classes & Grading

- The **Pass/Fail Option**: If all courses taken during the freshmen year were pass/fail, students might be more willing to explore different academic options. We might also think about coupling this with a corresponding change in the teaching of freshmen. Suppose the course staff was required to write a paragraph on each freshman student's performance. This could serve as a useful advising tool, and also might make it easier for students to ask for letters later on.
- **Grading** should be based on more than exams and problem sets; it should reflect the diverse interests of students and provide different ways for them to display their knowledge. Examples of different kinds of assignments include research presentations and more conceptual problems emphasizing the logic of the subject.
- **"Scientific Tools" Course**: This would be a course that covers topics such as programming, electronics, and machining; it would essentially teach the skills that any experimentalist – in biology, chemistry, or physics – would need to know.
- Have **smaller** and more **interdisciplinary course offerings** in the sciences for freshmen. MIT, for instance, offers small introductory courses on "Solving complex problems" in different fields of science.
 - One might be able to accomplish something like this by making freshmen seminars a mandatory requirement.
- **Introductory-level Courses**: The atmosphere in these courses can be more welcoming if professors encourage participation and questions. Furthermore, the quality of teaching in the sections should be better.
- Offer **review sessions** at the start of introductory courses. Students come into the introductory courses with many different kinds of preparation. It is not practical to address all these issues in lecture. But it could be done in section-sized meetings at the beginning of the class. For example, at the start of a physics mechanics class, a section on "mathematical tools" might be helpful. Or, for math classes, a review session on proofs.

* Think Tanks were open sessions to which all undergraduates were invited to brainstorm about what Harvard could do to improve science for undergraduates and thus help to increase the number of women and minorities in science.

- Courses should offer **sections with several different styles** to accommodate the different learning styles of different students. For example, some sections might focus more on traditional problem solving while others might emphasize concepts.
- It is beneficial for students to receive feedback on their work before the midterm exam. For example, one might consider offering a **diagnostic quiz** in courses such as Math 23. Such quizzes would be opportunities to make sure that the students understand the material. CA's in Math 23 can contact students and provide individualized feedback after the quiz. This kind of feedback would be especially helpful for freshmen.
- **Same-sex study groups** may be beneficial. But study groups can be difficult to form unless students have a specific place to meet and work on problems. The Leverett dining hall on Wednesday nights serves this purpose for several physics courses.

Teaching

- More **women role models**: This can be achieved by increasing the number of tenured women in the sciences. Increasing the number of women teaching fellows in introductory-level courses might also help.
- Encourage women in upper-level science classes to **tutor**. The BSC should encourage their tutors to work with groups, not just individuals, and the BSC should clearly advertise this possibility. It appears that the terminology used by the Bureau is confusing and it is not completely clear whether this kind of tutoring is even possible.
- **Teaching fellow training**: A revamped program that offers smaller sessions for TF training.
 - Teaching fellows should be encouraged to use the Bok Center.
 - A support system for teaching fellows: If a teaching fellow is encountering difficulties, he/she might be paired with a more experienced teaching fellow. The mentor might co-teach a few sections and be available for advice.
- **For Professors**:
 - Should be required to do teaching training and should be encouraged to have their lectures videotaped.
 - Should have accessible office hours. Offering to meet "by appointment" is not as effective because students often do not feel comfortable contacting the professor.
 - Teaching quality could use improvement. It might help to have an advisory board where students can give feedback. At Brown, for instance, undergraduates are on the tenure committee.

Advising, Networking, & Mentoring

- Advising is very important but it is not always positive. **Negative experiences with advisors** can cause women to drop out of science.

- An **undergraduate lounge** in each science department would provide a social space for concentrators to gather to work on problem sets. This would encourage collaboration and help students to meet fellow classmates.
- The **concentration peer-advising website** is a good idea, but needs to be better advertised. To get the word out to the freshmen, proctors can make announcements. In addition, the program can be expanded to offer rewards for mentoring and to have social events.
 - To reach the freshmen, one might consider sending peer advisors from each department to attend freshmen prefect study breaks.
 - It might be important for the peer advisors to hold special meetings after the first few tests of introductory-level science courses.
- Incoming freshmen women should immediately be assigned **advisors** in their field of interest.
- **Orientation program:** Maybe offer a program (either at the start or end of freshmen year) that includes lab tours, meetings with professors and advisors, and social events for freshmen women interesting in concentrating in the sciences.
- Offer **Question Centers** for all the sciences, not just physics and math.
- The **Freshman Advising in the Science Center** the week before classes is very useful. If possible it should be expanded and made a little better organized and less hectic. Stronger mechanisms should be found to encourage freshman to attend.
- It would be beneficial for each department to have **weekly advising office hours**, where the most effective faculty advisors can answer students' questions. This would be easy to open-up to freshmen; each department can send **individualized** e-mails inviting freshmen to attend.
- Each science department should have an active **undergraduate organization** that can plan social and advising events. It would also be beneficial if the different clubs (i.e., Society of Physics Students, Chemistry Club) were in communication so that they could coordinate social events.

Research

- Institute a **centralized office** that helps people to locate labs to work in. This resource would list faculty and specific projects that are being offered in labs around campus. In addition...
 - There should be **increased funding** for students doing research.
 - There should be affordable, on-campus housing available for students doing **summer research** on campus. Housing student researchers on campus and opening up one or more of the House dining halls (many of which are closed all summer) could create a unique community of students that would be very attractive. Also, it would be beneficial to provide safe evening transportation (possibly through HUPD) to laboratory jobs. This might also be a very useful recruiting tool for students interested in the sciences.
 - The program can also help students to find internships in **industrial laboratories**. In general, there is a need for a more centralized application process for these types of jobs. To emphasize the diversity of careers open to scientists, this program can invite speakers and can organize visits to local companies (i.e., biotech start-up companies).

A potential model: MIT's Undergraduate Research Opportunity Program