The Task Force on the Undergraduate Educational Commons

Faculty-Student Town Meeting
May 10, 2006
Purpose of the Task Force

The Task Force has been conducting a fundamental, comprehensive review of the common educational experience of our undergraduates.
“Working Principles for an MIT Education”

- A set of themes that helped frame our review of the GIRs:
  - A persistent passion for learning;
  - Intellectual diversity;
  - An innovative approach to core knowledge;
  - Collaborative learning;
  - Education for responsible leadership.
Major Recommendations in these Areas:

- Advising and Mentoring;
- International Experiences;
- Teaching and Learning;
- The Role of the Faculty in the Commons;
- Faculty Governance;
- The General Institute Requirements.
Task Force consensus on the GIRs

- The present structure of the GIRs is basically sound, but the content can be broadened.

- It is not possible to provide all the desirable educational experiences in four years.

- The GIRs should introduce the fundamental modes of analysis that we want our students to acquire.

- The goals of the various components of an MIT education should be made more explicit to students and faculty.
Goals for the First Year Experience

- Increase freshman motivation and enthusiasm;
- Improve teaching and learning by emphasizing active learning and project-based pedagogies;
- Increase choice and flexibility for students;
- Provide opportunities to explore potential majors.
The Science-Math-Engineering Core: Recommendations

- Maintain the rigor and basic unified experience of the current Science Core;

- Expand the educational scope of the core and student choice -- but do not increase the number of requirements;

- Signal the importance of the essential modes of analysis;

- Increase the excitement/stimulation of the first year through new approaches to learning, especially project-based experiences.
The Science-Math-Engineering Core:

- Six core + 2 REST = 8 subjects (Lab Requirement is eliminated);
- Design challenge: how to organize these 8 subjects into a menu that broadens the present core, taking departmental programs into account;
- Each category would have a (very) small number of subjects;
- Introduce category of Computation and Engineering;
- Provide the possibility of project-based core subjects as an option.
- Strong oversight and assessment.
New Science-Math-Engineering Core

SCIENCE/MATHEMATICS/ENGINEERING REQUIREMENT (8 subjects)

<table>
<thead>
<tr>
<th>Required Subjects</th>
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Distribution Subjects:
1 from each of 5 categories of the 6 below

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<th>Mathematics</th>
<th>Physical Sciences</th>
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<th>Life Sciences</th>
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<td>Differential Equations, Linear Algebra, Probability and Statistics.....</td>
<td>Electricity and Magnetism, Physics of...</td>
<td>Solid-State Chemistry, Intro to Chemical Science</td>
<td>Molecular Biology, Biology of...</td>
<td>Algorithmic Reasoning, Principles of Engineering</td>
<td>Project-Based Subjects in Engineering, Science and/or Design</td>
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The Science-Math-Engineering Core: Project-based Experiences

- Provide students the opportunity to contribute to the definition of complex problems and to explore strategies for addressing them;
- Require extended study, reflection and refinement, and multiple modes of inquiry;
- Emphasize synthesis of ideas and techniques, especially the study of real-world problems to motivate the acquisition of disciplinary knowledge;
- Emphasize the design process and iteration;
- Enable creativity and communication skills;
- Integrate and motivate knowledge from other core subjects.
The Science-Math-Engineering Core: Computation and Engineering

- Subjects that focus on the modes of thought and problem-solving tools associated with computational modes of analysis and the engineering method;
- **Computation subjects**: to explore the role of algorithmic and data abstractions and the use of imperative knowledge in designing computational solutions to theoretical and practical problems.
  - Not simply introductions to programming languages
  - 6.001 may serve as a model, but others will be developed.
- **Engineering subjects**: to provide students with an appreciation of the trans-disciplinary principles of engineering and their use in problem-solving:
  - Use of abstraction
  - Processes of design and synthesis
  - Complexities of large systems in the context of modern technological society
Humanities, Arts, and Social Sciences: Recommendations I

- Subject of an intense review by a Task Force-empanelled subcommittee that included the HASS Overview Committee (HOC);
- Maintain distinctive features and successes of current requirement:
  - Strong signal to the outside world;
  - High-quality teaching across a wide variety of fields;
  - Flexibility in pursuing passions, based on personal interest, professional ambitions, or both;
  - Close collaboration between faculty and students.
Strengthen impact of the requirement on the overall experience of students:

- Concentrate energy and attention on “big ideas” and fundamental knowledge in early years at MIT;
- Reduce complexity of requirement, to encourage intellectual engagement and discourage gaming;
- Reduce barriers to collaboration, within the humanities, arts, and social sciences, and between HASS and other areas at MIT.
New Humanities, Arts, and Social Sciences Requirement

**HUMANITIES, ARTS AND SOCIAL SCIENCES REQUIREMENT (8 subjects)**

### Required Subjects
- Freshman Experience
- Expository Writing (if needed)

### Foundational electives in HASS (1 subject from 2 out of 3 categories)

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### Advanced Subjects
- Concentration
- HASS Electives
The HASS Requirement: Proposed

- Freshman/Sophomore years: Foundational Subjects (3)
- Junior/Senior years: Concentration Subjects (3-4)
- 1-2 elective subjects
- Communication Requirement (CI-H) may be integrated into foundational subjects.
The HASS Requirement: Proposed

- Foundational Phase
  - “Freshman Experience” subjects (1)
    - 10-16 subjects that emphasize “big ideas,” normally taken in the first semester;
    - Writing, understanding, digesting “raw inputs,” developing arguments, using libraries.
  - Freshman Communication
    - Freshman Essay Evaluation or expository writing
  - Foundational Electives
    - Entry-level distribution subjects

- Concentration Phase
  - Tighten-up current practices
  - Better defined, more transparent, more demanding.
How “Freshman Experience” Classes are Distinct from the Other Foundational Electives

- **Goals of both types of classes:**
  - Introduce each student to major issues in culture/society and to major disciplinary approaches to them;
  - Writing and oral communication;
  - Develop skills in understanding and interpreting “unmediated materials;”
  - Prepare students for deeper, more focused study.

- **Special goals of Freshman Experiences subjects:**
  - Big ideas, e.g., poverty, revolutions, democracy, globalization;
  - A more common experience for freshmen.
New GIRs: Full Model

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MIT SB Degree Programs: Rules

- **The GIRs**
  - 17 subjects;
  - 8 HASS subjects;
  - 6 Science and Math
  - Institute Lab
  - 2 REST subjects;

- **Departmental Programs**
  - 11 subjects (132 units)
  - 12.5 allowed by CoC in special cases (150 units)
  - 3-subject overlap with GIRs allows up to maximum of 15.5 subjects
  - 180-198 units, including 48 unrestricted electives

32-34 subject programs
MIT SB Degree Programs

- Many science majors and most engineering degree programs are at the limit of what is allowed by the Faculty Rules;
- Most major programs in Science and Engineering depend on what is required under the current Science, Lab, and REST requirements;
- With our recommendations, SB degree programs will grow;
  - Implications for unrestricted elective time;
  - Importance of the creation of more flexible degree programs in majors that exceed the current rules.
Example: Chemistry

- Current Program:
  - 6 Sci and Math (5.111)
  - 1 Inst Lab (5.311)
  - 2 REST (5.12)
  - 13 subjects required by department (including 5.111, 5.12, 5.311)
    - Minus overlap = 10
  - Plus 8 HASS
  - Plus 5 Unrest Electives
  - Total Program = 32 subjects

- Future Program:
  - 8 Sci-Math-Eng
  - 14 subjects required by department (8.02 would be required in addition to current program)
    - Minus 5.111 and 8.02 (current allowed overlap)
    - = 12 subjects
  - Plus 8 HASS
  - Plus 5 Unrest Electives
  - Total Program = 33 subjects
Example: Chemical Engineering

- **Current Program:**
  - 6 Sci and Math
  - 1 Inst Lab (5.310)
  - 2 REST (5.60 & 18.03)
  - 15.5 subjects required by department
    - minus 5.60, 18.03 & 5.310 (allowed overlap)
    - = 12.5 subjects
  - Plus 8 HASS
  - Plus 4 Unrest Electives
  - Total Program = 33.5 subjects

- **Future Program:**
  - 8 Sci-Math-Eng
  - 17.5 subjects required by department (7.01 and 5.11 would be required in addition to current program)
    - Minus 7.01, 5.11x and 18.03 (current allowed overlap)
    - = 14.5 subjects
  - Plus 8 HASS
  - Plus 4 Unrest Electives
  - Total Program = 34.5 subjects
Example: Biological Engineering

- **Current Program:**
  - 6 Sci and Math
  - 1 Inst Lab (BE109)
  - 2 REST (5.12 & 18.03)
  - 15 subjects required by department
    - minus 5.12, 18.03 & BE109 (allowed overlap)
    - 12 subjects
  - Plus 8 HASS
  - Plus 4 Unrest Electives
  - Total Program = 33 subjects

- **Future Program:**
  - 8 Sci-Math-Eng
  - 18 subjects required by department (7.01, 8.02 and 5.11x would be required in the program in addition to current subjects)
    - minus 3 of 7.01, 5.11x, 8.02 and 18.03 (current rules allow overlap of 3)
    - 15 subjects
  - Plus 8 HASS
  - Plus 4 Unrest Electives
  - Total Program = 34 or 35 subjects (depending on how many subjects large programs may require)
Questions

- In large departmental programs, how many subjects should departments be allowed to specify (that is, overlap with the GIRs)?
- Should the size of the minimum unrestricted electives be reduced to 36 units (from 48)?
- Should more flexible degree programs (a la 2A and 8B) be offered as attractive alternatives to these very large programs?
Next Steps for the Task Force

- d’Arbeloff Grants: Call for proposals generated enthusiastic response from faculty across MIT:
  - *Six Project-based initiatives have been funded for Spring 2007*
  - *Three pilots for new HASS subjects*

- Final report ready by late August;
- Recommendations to the Faculty in early Fall;
- Task Force will recommend formation of a faculty implementation group (working closely with CUP).
Implications of Recommendations

- **Resources:**
  - What resources will MIT have to provide?
  - What resources will be needed by departments?

- **Sustainability:**
  - How will we be able to sustain the changes?
  - Recommendations cannot be unfunded mandates;
  - Zero-sum game
    - MIT will not be able to introduce new subjects and expect current faculty to handle it all;
    - What do we stop doing?
    - What do we improve?
Infrastructure Concerns

- Student Information System;
- Classrooms (e.g., for project-based classes, HASS FreshX, etc.);
- Scheduling (e.g., dedicated time slot for new FreshX classes).
Opinions or Suggestions?
edcommons@mit.edu
Task Force on the Undergraduate Educational Commons

Perspectives from the Student Advisory Committee
Teaching and Learning (SAC)

- Quality and style really matter;
- Strongly endorse TF recommendations;
- More can be done to engage students;
- Consistently excellent instruction in Science Core is needed;
- Greater variety in assigned work (not just p-sets);
- A more ‘holistic’ approach to the first year.
Advising and Mentoring (SAC)

- Advising quality is a major concern to students;
- Should be part of teaching record and tenure decisions;
- Strongly endorse Task Force recommendations;
- In agreement with SAC and UA-SCEP;
- Some students want a more accountable system.
International Experiences (SAC)

- Generally very valuable for students;
- Provide contrast to and perspective on MIT;
- Should be a realistic option for all students;
- Strongly endorse Task Force recommendations;
- Need more encouragement from departments;
- Students feel constrained by their major programs.
New Sci-Math-Eng Core (SAC)

- Balance flexibility and common experience;
- Strongly endorse project-based experiences -- should be encouraged for all students;
- Better to cut departmental requirements than constrain choice in first year;
- Faculty should encourage exploration.
HASS (SAC)

- Endorse elimination of HASS-D Requirement;
- Varied reactions to “Freshman Experience”
  - Huge opportunity, but loss of flexibility;
- Concerns about Foundational Electives (similar to HASS-D)
The MIT Learning Culture (SAC)

- Intellectual passion;
- Culture of busyness;
- Role of the Commons;
- We want your thoughts! Email edcomm-request@mit.edu;
- Join on-line discussions this summer;
- Come to forums in the Fall!