Enhancing the MIT First-Year Experience

Fall 2019 Updates

Ian A. Waitz
Vice Chancellor for Undergraduate and Graduate Education

Kate Weishaar
First Year Experience Coordinator, Office of the Vice Chancellor
A step in a longer MIT community discussion

>150 Faculty involved during AY17-18

>40 meetings/presentations during AY18-19
The Vision

The first-year (including the role of the GIRs) is a fundamental, core part of an MIT experience.

Our undergraduate students deserve the best first year experience on the planet.
A Process Grounded in Values

Student-Focused

Data-Informed

Community-Driven

Experiment-Based
Decades of Faculty Calling for Bold Experiments

“We believe that the Institute should boldly undertake new experiments in education and new explorations into the unknown.”

-1949 Committee on Educational Survey (Lewis Committee)

“To enable the future of MIT education, we must engage in bold experiments that will help us learn about both the positive and negative aspects of pedagogical and curricular innovations. This is critical to ensuring MIT’s leadership position at a time of disruptive change.”

- 2014 Institute-wide Task Force on the Future of MIT Education
Goals

1. Further a vibrant community-wide conversation on educational innovation
2. Promote exploration and more informed choice of major
3. Enhance first-year advising
4. Alleviate undue academic pressure
5. Inspire our students and cultivate a lifelong love of learning
Credit for Science Core Affects Number of Science Core GIRs Students Take FY Fall

<table>
<thead>
<tr>
<th>Advanced Credits</th>
<th>Sci core GIRs Taken FY FA17</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (27% of class)</td>
<td></td>
<td>0%</td>
<td>0%</td>
<td>4%</td>
<td>91%</td>
<td>5%</td>
</tr>
<tr>
<td>1 (43% of class)</td>
<td></td>
<td>0%</td>
<td>0%</td>
<td>6%</td>
<td>90%</td>
<td>3%</td>
</tr>
<tr>
<td>2 (17% of class)</td>
<td></td>
<td>0%</td>
<td>3%</td>
<td>36%</td>
<td>62%</td>
<td>0%</td>
</tr>
<tr>
<td>3+ (14% of class)</td>
<td></td>
<td>14%</td>
<td>33%</td>
<td>45%</td>
<td>9%</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2%</td>
<td>5%</td>
<td>16%</td>
<td>74%</td>
<td>3%</td>
</tr>
</tbody>
</table>
Overview of Experiments

Pass/No Record for science core GIRs, revised credit limits, First-Year Discovery Subjects
Phase One
Students can take up to 3 Science Core GIRs P/NR after the first semester

Phase Two
Continue up to three deferred P/NR science core GIR opportunities
Discovery units separate from credit limit
Credit limit adjustments and major advising opportunities to replace ESS
Fall: 48 + 9 Discovery  
Spring: 60 + 9 Discovery

Enable/encourage both “Exploration” and/or “Discovery” in the First Year

Increased confidence and satisfaction in major selection?
Improved First Year student experience?
Improved long-term educational outcomes?
1. Repeat Phase One grading policy (3 science core GIRs P/NR)
2. Fall semester credit limit modifications:
   A. Reduce general credit limit to 48 units
   B. Allow up to 9 additional “Discovery” units not counted against general credit limit for FYD, FAS, UROP subjects generally not eligible to satisfy degree requirements
### Phase Two Spring Credit Limits

<table>
<thead>
<tr>
<th>Phase One - Spring 2019 Units (Typical use)</th>
<th>Phase Two - Spring 2020 Units (Typical use)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit limit = 57</td>
<td>Credit limit = 60</td>
</tr>
<tr>
<td>12 (GIR)</td>
<td>12 (GIR)</td>
</tr>
<tr>
<td>12 (GIR)</td>
<td>12 (GIR/Elective)</td>
</tr>
<tr>
<td>12 (GIR/Elective)</td>
<td>12 (HASS)</td>
</tr>
<tr>
<td>12 (HASS)</td>
<td>12 (Elective/Major)</td>
</tr>
<tr>
<td>9 (Elective)</td>
<td>12 (HASS)</td>
</tr>
<tr>
<td></td>
<td>+9 Up to 9 (Discovery)</td>
</tr>
</tbody>
</table>

1. Repeat Phase One P/NR GIR grading policy
2. Spring semester credit limit modifications:
   A. Increase general credit limit to 60 units
   B. Allow up to 9 additional “Discovery” units
3. Replace Early Sophomore Standing (ESS) with option available to all First Year students to have extra advising in major
What does P/NR mean?

A passing grade on P/NR corresponds to an A, B, or C

The Faculty Rules and Regulations define a C as “Adequate performance, demonstrating an adequate understanding of the subject matter, an ability to handle relatively simple problems, and adequate preparation for moving on to more advanced work in the field.”
Methods

• Formal interview protocols
• Surveys (existing and new)
• Collection of objective data
• Statistical analysis
Data sources

Registration Data
- Discovery and Exploration Subjects
- Science core GIR completion timing
- Distribution of subjects taken
- Science core GIRs on P/NR vs. on grades
- Number/timing of HASS subjects
- Number/timing of subject in declared major
- Add/Drop patterns
- Advanced credit for science core subjects

Choice of Major
- Field of interest on admissions application
- Field declared
- Timing
- Change of major

Surveys
- Surveys duplicating aspects of CUP Study on Undergraduate Majors Selection
- Survey of New Students
- Enrolled Student Survey
- Student Quality of Life Survey

Grades/Performance
- Science core subjects
- Subject with science core as pre-requisites
- HASS subjects
- Overall GPA
- “No Record” rates
- CAP actions

Interviews/Focus Groups
- Students – first-year Fall
- Students – first-year Spring
- Science core instructors and TAs – SP19

Other
- Demographic data including gender, URM status, first-gen status, citizenship, and family income (if reported)
- UROP participation
- Volume data from Student Support Services
- Subject eval data for science core
Changes Observed So Far

- Increased opportunity to explore
- Decrease in major-related stress
  - No change in feeling prepared to choose
- No change in overall GPA
  - Decreases in some science core GIR grades
  - Increase in HASS GIR grades
More Opportunity to Explore

On average for the class as a whole, about 2/3rds of the students took one fewer Science core GIRs in their first year.

**Fall (6.1 unit shift*)**

- 2014-2017: 33.6 units
  - 16.7 Not science core
  - 16.9 Science core
- 2018: 27.4 units
  - 22.8 Not science core
  - 4.6 Science core

**Spring (2.6 unit shift)**

- 2015-2018: 35.5 units
  - 35.5 Not science core
  - 0 Science core
- 2019: 38.1 units
  - 15.4 Not science core
  - 22.7 Science core

Average units taken by first-year students
*FY students took 0.1 fewer units on average in Fall 2018 than previous years
First-year Fall Science Core Enrollments

Experimental policy implemented
What did they explore?

Number of unique subjects = +14% Fall, +7% Spring

Number of first-year students declaring major in school in Spring 2019

<table>
<thead>
<tr>
<th>Major</th>
<th>Sloan</th>
<th>SAP</th>
<th>SHASS</th>
<th>Science</th>
<th>Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>0.5</td>
<td>0.4</td>
<td>1.5</td>
<td>1.5</td>
<td>5.2</td>
</tr>
</tbody>
</table>
| Average increase in non-science core units taken per school by first-years in AY2019*

*Compared to average of previous four first-year classes
Students told us...

“If I didn’t have [the P/NR policy], I probably would not have taken 6.00 last semester, but replaced it with a biology, so that it could still be P/NR. And then I wouldn’t have like realized, through 6.00, that I was not meant to be Course 6. Yeah, it’s been helpful.”

“I probably would have taken my GIRs on P/NR which would have pushed other classes later. And then I might have ended up declaring a different major. And then planning on that major. And then realizing too late, ‘Oh, this isn't actually what I want to do!’, and then having that extra stress of trying to figure out what I want to do.”

Quotations from Spring 2019 interviews of first-year students
## Science Core GIRs Taken FY Fall By Advanced Credit

<table>
<thead>
<tr>
<th>Advanced Credits</th>
<th>Fall 2017</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Fall 2018</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Fall 2019</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>0</td>
<td>0%</td>
<td>0%</td>
<td>4%</td>
<td>91%</td>
<td>5%</td>
<td>0%</td>
<td>2%</td>
<td>31%</td>
<td>67%</td>
<td>1%</td>
<td>0%</td>
<td>1%</td>
<td>32%</td>
<td>66%</td>
<td>1%</td>
</tr>
<tr>
<td>1</td>
<td>0%</td>
<td>0%</td>
<td>6%</td>
<td>90%</td>
<td>3%</td>
<td>1%</td>
<td>2%</td>
<td>44%</td>
<td>53%</td>
<td>0%</td>
<td>1%</td>
<td>4%</td>
<td>50%</td>
<td>46%</td>
<td>0%</td>
</tr>
<tr>
<td>2</td>
<td>0%</td>
<td>3%</td>
<td>36%</td>
<td>62%</td>
<td>0%</td>
<td>1%</td>
<td>17%</td>
<td>50%</td>
<td>32%</td>
<td>0%</td>
<td>5%</td>
<td>20%</td>
<td>47%</td>
<td>28%</td>
<td>0%</td>
</tr>
<tr>
<td>3+</td>
<td>14%</td>
<td>33%</td>
<td>45%</td>
<td>9%</td>
<td>0%</td>
<td>38%</td>
<td>33%</td>
<td>26%</td>
<td>3%</td>
<td>0%</td>
<td>45%</td>
<td>34%</td>
<td>20%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td>2%</td>
<td>5%</td>
<td>16%</td>
<td>74%</td>
<td>3%</td>
<td>6%</td>
<td>10%</td>
<td>39%</td>
<td>44%</td>
<td>0%</td>
<td>9%</td>
<td>11%</td>
<td>38%</td>
<td>41%</td>
<td>0%</td>
</tr>
</tbody>
</table>
# Table: How did Phase 1 students behave along the focused-open spectrum?

<table>
<thead>
<tr>
<th>Category</th>
<th>Focused</th>
<th>Focused/Open</th>
<th>Open</th>
<th>Did not answer survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of fall subjects in Application major</td>
<td>14%</td>
<td>14%</td>
<td>9%</td>
<td>13%</td>
</tr>
<tr>
<td>% of fall subjects matching Early Sophomore major</td>
<td>23%</td>
<td>27%</td>
<td>19%</td>
<td>30%</td>
</tr>
<tr>
<td># Incoming GIRs (avg)</td>
<td>1.6</td>
<td>1.5</td>
<td>1.2</td>
<td>1.4</td>
</tr>
<tr>
<td># Fall GIRs (avg)</td>
<td>2.1</td>
<td>2.2</td>
<td>2.5</td>
<td>2.1</td>
</tr>
<tr>
<td># Fall exploration subjects (avg)</td>
<td>1.1</td>
<td>1.2</td>
<td>1</td>
<td>1.2</td>
</tr>
<tr>
<td># Spring GIRS (avg as of add date)</td>
<td>1</td>
<td>1</td>
<td>1.2</td>
<td>1</td>
</tr>
<tr>
<td># GIRs remaining after FY (avg, estimated)</td>
<td>1.3</td>
<td>1.3</td>
<td>1.1</td>
<td>1.4</td>
</tr>
</tbody>
</table>

“GIR” above means science core GIR
Categories based on SNS 2018 responses
All data are for the first experimental cohort (entered fall 2018)
### How have Phase 2 students behaved so far?

<table>
<thead>
<tr>
<th>Phase 2</th>
<th>% of fall subjects in Application major</th>
<th>Focused</th>
<th>Focused/ Open</th>
<th>Open</th>
<th>Did not answer survey</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>17%</td>
<td>14%</td>
<td>9%</td>
<td>15%</td>
</tr>
<tr>
<td># Incoming GIRs (avg)</td>
<td></td>
<td>1.7</td>
<td>1.4</td>
<td>1.0</td>
<td>1.4</td>
</tr>
<tr>
<td># Fall GIRs (avg)</td>
<td></td>
<td>2.1</td>
<td>2.3</td>
<td>2.5</td>
<td>2.2</td>
</tr>
<tr>
<td>First-Year Discovery Subjects* (avg)</td>
<td></td>
<td>0.4</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>

"GIR" above means science core GIR
Categories based on SNS 2018 and 2019 responses
*Does not include First-Year Advising Seminars (>650 registrants)
FYD Enrollments (as of 5th week)

Total first-year enrollment = 524
• Avg first-year enrollment = 40
• Enrollment range = [2,124]

Drops from 1st week to 5th week
• Maximum = -39%
• Average = -18%

Fall 2019 data courtesy of Registrar’s Office
Students Want Even More Discovery Options

“I would have liked more first-year discovery subjects from which to choose.”

Disagree | Neither agree nor disagree | Agree | Strongly agree
--- | --- | --- | ---
100% | 80% | 60% | 40% | 20% | 0%

First Year Arrival & Orientation Survey, 2019
Drop in Major-related Stress, No Change in Feeling Prepared

"I found the major selection decision-making process stressful."

"I felt prepared to choose my major."

<table>
<thead>
<tr>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>32%</td>
<td>13%</td>
</tr>
<tr>
<td>41%</td>
<td>13%</td>
</tr>
<tr>
<td>13%</td>
<td>3%</td>
</tr>
</tbody>
</table>

2018 data from CUP Choice of Major Survey 5
2019 data from FYX Major Declaration Survey
Many Reasons for Electing P/NR vs. Grades

- Interest or perceived value
- Believe subject will lower GPA
- Believe subject will raise GPA
- Desire to alleviate grade-related stress
- Desire to focus energy elsewhere
- Plan to apply to medical school

Based on Spring 2019 Student Interviews
Students are more likely to use P/NR on subjects unrelated to their major

Percent taking subject P/NR versus how related they believe it is to their major

<table>
<thead>
<tr>
<th>Subject</th>
<th>Not related</th>
<th>Indirectly related</th>
<th>Directly related</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculus II</td>
<td>60%</td>
<td>60%</td>
<td>76%</td>
<td></td>
</tr>
<tr>
<td>(n=114)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics II</td>
<td>60%</td>
<td>60%</td>
<td>86%</td>
<td></td>
</tr>
<tr>
<td>(n=430)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry</td>
<td>63%</td>
<td>37%</td>
<td>76%</td>
<td></td>
</tr>
<tr>
<td>(n=206)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biology</td>
<td>47%</td>
<td>53%</td>
<td>71%</td>
<td></td>
</tr>
<tr>
<td>(n=218)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on FYX Fall 2019 survey, among students who took subject in FY spring and/or are currently taking it.
Even within a major, student perceptions of “related” GIRs can vary (6-2 example)

“For each subject, how does the content relate to your current primary major?”

Based on FYX Fall 2019 survey, only asked of sophomores, and respondents were only asked to rate GIRs they indicated they have taken or are currently taking.
A Note on Comparisons

Within each subject, students self-segregate into grading types (P/NR versus grades) based on a variety of reasons; these reasons may also impact performance.

- Background preparation, overall academic strength, perceived value of/interest in subject

Therefore, we do not compare students on P/NR to students on grades in the same subject. We use well-controlled cohort-wide comparisons of the control group (Class of 2021) to the experimental cohort (Class of 2022).*

* although not a randomized trial, we have seen that the classes are well-balanced
## Changes in Full Year Grades

Full Year GPA Changes (including hidden grades)

<table>
<thead>
<tr>
<th>Category</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>+0.01</td>
</tr>
<tr>
<td>Science core GIRs</td>
<td>-0.05*</td>
</tr>
<tr>
<td>HASS GIRs</td>
<td>+0.07***</td>
</tr>
<tr>
<td>In declared major</td>
<td>+0.03</td>
</tr>
</tbody>
</table>

Sample is undergraduate classes of 2018 through 2022, changes based on regression analysis

*p < 0.05  **p < 0.01  ***p < 0.001
Redistribution of Effort

Performance (GPA) x Workload (Units) ~ Constant

Expected effort in science core GIRs

Science core GIRs

Wellbeing, Extracurriculars, etc.

HASS GIRs

Other

Major Exploration
Changes in GPA by Semester

<table>
<thead>
<tr>
<th></th>
<th>Fall</th>
<th>Spring</th>
<th>Full Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science core GIRs</td>
<td>+0.06*</td>
<td>-0.36***</td>
<td>-0.05*</td>
</tr>
<tr>
<td>HASS GIRs</td>
<td>+0.06**</td>
<td>+0.08**</td>
<td>+0.07***</td>
</tr>
<tr>
<td>Subjects in declared</td>
<td>+0.08</td>
<td>+0.06*</td>
<td>+0.03</td>
</tr>
<tr>
<td>major</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>+0.06**</td>
<td>-0.05*</td>
<td>+0.01</td>
</tr>
</tbody>
</table>

Sample is undergraduate classes of 2018 through 2022, changes based on regression analysis

*p < 0.05  **p < 0.01  ***p < 0.001
# Changes in Spring Science Core Grades

## Individual Subject changes

<table>
<thead>
<tr>
<th>Subject</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics 2</td>
<td>-0.51***</td>
</tr>
<tr>
<td>Other sci. core</td>
<td>No significant change*</td>
</tr>
</tbody>
</table>

## Frequency of “No Record”

<table>
<thead>
<tr>
<th>Subject</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics 2</td>
<td>0.037*** ++</td>
</tr>
<tr>
<td>Chemistry</td>
<td>-0.029**</td>
</tr>
<tr>
<td>Calc 2, Biology</td>
<td>No significant change</td>
</tr>
</tbody>
</table>

Sample is undergraduate classes of 2018 through 2022, changes based on regression analysis.

*p < 0.05  **p < 0.01  ***p < 0.001

+ So far. Almost the entire class has completed Calc1, Calc2, Phys1, Phys2, but about half the class has not completed Biology or Chemistry yet.

++ 3.7% more than the baseline of 2%-4%
Majority of sophomores very positive about experimental grading policy

“In general, how would you describe the experimental grading policy which allows you to designate up to three science core GIRs to be graded on a P/NR basis after the first term?”

<table>
<thead>
<tr>
<th>Rating</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very negative</td>
<td>8.4%</td>
</tr>
<tr>
<td>Neither positive nor negative</td>
<td>11.2%</td>
</tr>
<tr>
<td>Somewhat negative</td>
<td>78.1%</td>
</tr>
<tr>
<td>Somewhat positive</td>
<td></td>
</tr>
<tr>
<td>Very positive</td>
<td></td>
</tr>
</tbody>
</table>

FYX Fall 2019 Survey, sophomore students, n = 644
Major selection – by broad field

Arrows indicate change of at least 1%. Enrollment in joint majors divided between categories.
Concerns Raised

Regardless of whether the experiment exacerbated or alleviated these issues, it has drawn attention to opportunities for improvement.
Questions and Concerns Shared

• Students are exploring by taking subjects without completing the prerequisites
• Students are not completing necessary science core GIRs that are prerequisites for sophomore subjects
• Experiments are too bold or are moving too fast
  • Conversely, change is happening too slowly and should be bolder
• Students are just “getting ahead” rather than exploring
• Students are receiving information (either explicit or implicit) that the GIRs are not valuable
Pre-requisites and Exploration

**Concern:** Students are exploring by taking subjects without completing the prerequisites

**Actions:** Encouraged faculty to enforce prerequisites
New self-service prerequisite reports available on WebSIS
Starting Majors Without Pre-reqs

**Concern:** Students not completing necessary science core GIRs that are prerequisites for sophomore subjects

**Data show:** *Satisfaction of pre-reqs increased for some majors* (e.g. Bio completion for Course 20), *decreased for others* (Calc2 completion for Course 16). All changes were at the level of 6 or fewer students. We are evaluating this further to understand the statistical significance of any changes.

**Actions:** Pre-major advising coordinated through Office of the First Year, clearer roadmaps for majors, strong messaging during orientation to consider prerequisites.
Varying Definitions of “Exploration”

But some instructors view that as just “getting ahead”.

“They were taking classes in their predetermined major and still taking a few science GIRs, but they didn't care about the science GIRs because they were getting pass/no record and so they were focusing on their major. So they weren't using it for exploration, they were using it to get started on their major classes.”

-Science core instructor, spring interviews

Students want to try out their intended major before declaring.

“I wanted to take more Course 6 heavy classes that weren’t necessarily the, I mean the I guess harder classes in terms of Course 6 classes go to see if it was actually something that interested me and if it was something that I wanted to continue pursuing.”

-First-Year Student, fall interviews
Where Do We Go from Here?

Returning to the community to define next steps
Upcoming Data and Questions

• How did the experimental cohort perform in subjects with science core GIRs as prerequisites? How did sophomores perform in science core subjects taken on P/NR this term?

• How do the experimental credit limits impact first-year student grades and stress levels?

• Discovery vs. Exploration vs. Advising: How do students understand the many mechanisms for navigating their MIT world and how can we improve the quality and selection of these offerings?
Decisions Impacting Class of 2024

• Should we return to offering Early Sophomore Standing?

• What should the credit limits look like? Does a separate “discovery limit” provide value?

• Should we continue to offer 3 P/NR slots for science core subjects? Reduce to 2 P/NR slots? Some other variation? Or revert back to 0 P/NR slots?

• Or something else entirely?
Longer Term Efforts

How can we use our First-Year Learning Communities as incubators for educational change?

How can we improve advising and mentoring in the first year?

How can we continue to innovate on the content, structure, and pedagogy of the GIRs?
Many ways you can help

• **Stay engaged** and knowledgeable about the work
• Give us your **feedback** on efforts so far and ideas for the future
• Create or participate in a **first-year discovery subject**
• Use new **advisor training** on MITx to improve your advising skills
• Adopt **evidence-based teaching practices** in intro courses to improve student learning
• Make sure your **department roadmaps and website** have clear information for first-years
• Enforce your **prerequisites** and encourage colleagues to do the same