Institute-wide Task Force on the Future of MIT Education

Final Report

July 28, 2014

Table of Contents

INTRODUCTION

On November 21, 2013, the Institute-wide Task Force on the Future of MIT Education released its preliminary report. Building on MIT's rich history of educational innovation, the preliminary report explored a breadth of possibilities to consider in reimagining the Institute's future. Now in this final report, the Task Force offers a series of recommendations for how MIT can continue to transform education for future generations of learners.

Higher education is at an inflection point. The public conversation about escalating higher-education costs and their impact on access for students from all socioeconomic levels is ever present. At the same time, there is a great hunger for education and there is a great demand for online learning worldwide. The Institute's role in education no longer stops at the borders of our campus, but extends to a global community of learners. MIT is in a unique position to contribute to this dialogue in a meaningful way. The Institute has historic opportunities to reach more people, to infuse the magic of MIT into online and blended learning[1] environments, to reshape residential MIT education leveraging the opportunities of the digital education revolution, and to impact lives and society in ways not previously thought possible.

As with the preliminary report, this final report reflects the collaborative efforts of faculty, students, and staff who brought their experiences and knowledge to bear on this work. With the continued guidance of Corporation and alumni advisory groups and input from the broader MIT community through extensive surveys and discussions, this report also reflects MIT's continued dedication to reinventing MIT education together as a community.

MIT has a long history of pedagogical boldness balanced with deep introspection. The Institute's very existence is based on a grand and daring experiment in teaching. It is a hands-on, science-based, problem-focused engineering education that continues to define MIT's educational model to this day. Founding President William Barton Rogers' espousal of experimental and experiential learning in 1861 contrasted sharply with the tried and true method of rote memorization that had come to define a scientific education by the mid-19th century. This new brand of learning added context and utility to engineering learning. It also made the MIT model the global standard. This early experiential learning reflected the emerging constructivist theory of Jean Piaget, which argues that the interaction between experiences and ideas helps learners create their own knowledge. Renowned MIT professor Seymour Papert built on this theory to define constructionism, which expresses that people learn most effectively when building things and sharing them in communities. Regardless of the label, MIT's commitment to hands-on learning is still evident today. In weighing the importance of MIT values and principles, faculty responding to a survey ranked hands-on experience second only to a commitment to excellence, and students ranked it as the most important (Appendix 3).

MIT's first comprehensive assessment of the state of education at the Institute was a multi-year effort that culminated with the publication of the 1949 report of the Committee on Educational Survey (the "Lewis Commission").[2] As noted in the report's introduction, "the committee was

---

[1] Blended learning is a formal education program in which a student learns at least in part through online delivery of content and instruction with some element of student control over time, place, path or pace. "Blended Learning," *Wikipedia*, last modified July 21, 2014, http://en.wikipedia.org/wiki/Blended_learning.

[2] http://libraries.mit.edu/archives/mithistory/pdf/lewis.pdf

instructed to reexamine the principles of education that had served as a guide to academic policy at MIT for almost ninety years, and to determine whether they are applicable to the conditions of a new era emerging from social upheaval and the disasters of war." In setting forth a series of principles and values that have guided MIT in the years since the report's publication, its authors assert, "We believe that the Institute should boldly undertake new experiments in education and new explorations into the unknown."

The authors described a dilemma that continues to face MIT and that remains as relevant today as it was in 1949. The report asks: "Why, then, was there felt a need of critical appraisal at a time when the Institute was conspicuously healthy and vigorous?" The answer in 1949 was no different than it is in 2014: To remain on the cutting edge of research and education, and to maintain its position as one of the world's premier research institutions, MIT must continually evaluate its strengths and weaknesses with regard to the shifting global, technological, economic, and political landscape.

Almost 50 years later, MIT's 15th president, Charles M. Vest, appointed the Presidential Task Force on Student Life and Learning to undertake a review of the Institute's educational mission and its implementation.[3] At that time, in 1996, MIT reached another crossroads and faced a shifting landscape at the dawn of the information revolution. In its 1998 report, the Task Force made a number of recommendations that have helped to shape the General Institute Requirements (GIRs), advising, the first-year experience, teaching, and undergraduate research over the 16 years since the report's release.

Then, in 2003, President Vest established a Presidential Task Force on the Undergraduate Educational Commons to undertake a fundamental, comprehensive review of the common educational undergraduate experience.[4] The Task Force evaluated MIT's role in the face of fundamental changes in science and technology, as well as in MIT's interactions with the world and the shifting demographics of the MIT undergraduate student body. The report, published in 2006, offered recommendations to strengthen the GIRs, identified opportunities for increased international exposure for students, and urged the expansion of MIT's capacity for educational excellence through greater attention to diversity efforts, the improvement of classroom spaces, and improved instruction.

The Institute-wide Task Force on the Future of MIT Education builds on the important work of these previous efforts and it continues MIT's history of critically analyzing its educational model.

The collective effort of the past year has been significant; however, it represents only the beginning of our collaborations. Tremendous opportunities lie before us, but much remains to be done.

The 16 recommendations presented in this report lay the groundwork for MIT to build on the momentum of the Task Force, to refine and realize the vision for the future of education at MIT, and to respond to the aspirations of the world for lifelong learning. They represent exhilarating opportunities to promote educational connections across the Institute, transform pedagogy

---

[3] http://web.mit.edu/committees/sll/tf.html

[4] http://web.mit.edu/committees/edcommons/documents/tf_full_report.pdf

through bold but thoughtful experimentation, extend MIT's impact to the world, broaden access to high-quality education, and improve affordability for future generations of learners.

In order to achieve the Task Force's vision, MIT will need to be receptive to new opportunities and approaches. The Institute will need to seriously re-examine the GIRs in the context of online and blended learning models. It will need to acknowledge the demand for increased flexibility in the curriculum and in the time it takes to complete a degree (time to degree). Additionally, MIT will need to extend the pedagogical innovation in residential education to a global audience so that the Institute can reach more people, harness the knowledge of a global community of learners who possess different perspectives, and leverage this expertise in pursuing some of the world's most challenging problems. MIT will need to pursue new sources of revenue so that it can continue to invest in its world-class teaching and research infrastructure, and remain competitive in recruiting top talent. The Institute must also remove barriers to access and improve the affordability of an MIT education.

LAYING A FOUNDATION FOR THE FUTURE

There is a tension between a desire to preserve many of the qualities that define an MIT education and a push to make grand, sweeping changes to MIT's very core. The Task Force recognizes this tension and envisions a future that includes a wide array of options where traditional plans may be offered alongside new paths, and where online tools enable modular and flexible learning opportunities that enrich the overall MIT educational experience. The magic of an MIT education is found in the serendipitous interactions of talented individuals, brought together as a meritocracy, with a sense of community and innovative spirit. By reaching new audiences and sharing the "magic of MIT," we can strengthen the residential learning experience while maintaining the attributes, values, and principles that are the hallmarks of an MIT education.

More and more, technology is allowing us to customize our environments, our schedules, and our engagement. Parts of MIT are seeing a growing demand for more flexible degrees. Flexibility brings to our students options—options to reduce or extend their time to degree, options to spend a year off-campus to undertake research or get relevant professional experience in the middle of their studies, options to engage more deeply in teaching and other service opportunities, and options to take classes online over the summer and streamline their programs. The challenge is to use our principles and values to guide us in establishing specific educational outcomes and the qualitative MIT culture to which we aspire.

The world has changed dramatically in the past decades. In order to keep pace with the rate and scope of change in the educational sector and with the demand for access to quality education around the world, we need to create an ecosystem for ongoing research, learning, and innovation about the future of education. Evolving MIT education in a rapidly changing world is both a paramount responsibility and a formidable task. The Institute has been presented with exciting possibilities, but it will require an unwavering commitment to continuing our work if we hope to achieve our vision for the future of MIT education.

To this end, the Task Force makes a number of recommendations:

Recommendation 1: *The Task Force recommends that MIT establish an Initiative for Educational Innovation to build on the momentum of the Task Force, enable bold experimentation, and realize the future the Task Force has imagined for education on campus and beyond.*

The questions posed by the Task Force and the recommendations offered in the following pages have potentially far-reaching consequences. We need to create an ecosystem that promotes educational connections across the Institute and provides an educational innovation hub, or a "sandbox," for conducting the experiments envisioned by the Task Force. We also need to thoughtfully assess the experiments we conduct and take great care in stewarding the campus for future generations of learners.

As a hub for learning research at MIT, it is envisioned that the initiative will have significant faculty involvement and be appropriately funded to enable its work. It will be an opportunity to promote conversations across the Institute—not just about curriculum, technology, and policy, but more generally about *teaching*. It will also be responsible for developing and managing academic programs in education involving both traditional and online methodologies. These programs might include an undergraduate minor in education, a graduate teaching minor, and new undergraduate and graduate teaching opportunities. In addition, it is envisioned that the initiative will play an important role in advocacy with an opportunity to impact national policy. In order to succeed, the initiative must be well integrated with the MIT governance structure and have strong connections with the Committee on the Undergraduate Program (CUP), the Committee on Graduate Programs (CGP), and the Committee on Curricula (CoC), the Office of the Dean for Undergraduate Education (DUE), and the Office of the Dean for Graduate Education (ODGE).

Under the auspices of the initiative and in concert with the existing faculty governance process, MIT will be enabled to engage in bold experiments in the MIT undergraduate and graduate programs, including experiments in existing GIR subjects. The Institute will be able to experiment with offering summer classes for credit with a focus on blended and online pedagogies and with building the capacity needed to extend online offerings and modular approaches.

TRANSFORMING PEDAGOGY

The Task Force makes the following five recommendations to transform pedagogy at MIT.

Recommendation 2: *The Task Force recommends that the new Initiative for Educational Innovation engage in bold experiments to catalyze ongoing research, learning, and innovation about the future of MIT residential education.*

One major role of the new Initiative for Educational Innovation is to engage in bold experiments in MIT educational programs. The Task Force sees a number of opportunities to advance experiments in both undergraduate and graduate education. The following three opportunities are highlighted as specific recommendations to be conducted under the auspices of the initiative and in concert with the existing faculty governance process:

a. **Engage in bold experiments in the MIT undergraduate program**. 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. It is also a way to experiment with approaches that may both enhance students' learning and render an MIT education more affordable. These experiments must be constructed in an informed way, conducted in concert with the existing faculty governance structure, and coupled with careful assessment components, thus enabling us to reinforce lessons learned and to effect sustained improvement.

The Task Force recommends that these experiments include, but not be limited to, the following elements:

- Infusing greater flexibility into the core undergraduate curriculum, including the GIRs;

- Expanding the use of diverse pedagogies such as project-based and blended learning models;

- Introducing modularity into the curriculum and understanding the effectiveness of doing so; and

- Studying new approaches to the assessment of students.

Proposed experiments go well beyond the use of online technologies in residential and global education, and may include collaborations with other institutions with which MIT has close ties. For example, MIT's unique educational relationship with the Singapore University of Technology and Design provides a potential opportunity for collaborative innovation and experimentation beyond the boundaries of the MIT campus.

The Task Force makes the specific observation that in the past decades, the world has changed considerably, and these changes have outpaced changes in the MIT GIRs. For example, computational thinking has become central to many fields, the ability to analyze and visualize data has become indispensable, and entirely new methods of fabrication at a variety of scales have emerged, creating a demand for new knowledge and skills.

In this changed world we must ask:

- Are the GIRs adequately preparing undergraduates to face the world?

- Are the GIRs serving our educational needs now and into the future?

- Can we find ways to maintain the advantages of MIT's common core while increasing flexibility, especially in the face of the growing interdisciplinary nature of MIT majors?

- Does modularity combined with blended learning models offer a solution that can balance this tension?

The Task Force is neither suggesting specific classes for inclusion in the GIRs, nor proposing an entirely redesigned set of GIRs, but it is strongly advocating that the faculty engage in

bold experiments and seriously re-examine the GIRs, particularly in the context of the new opportunities offered by online and blended learning models. Having the common GIR core is part of the magic of MIT, and retaining a common core is critical, but the Task Force recommends experimentation to help reconsider the mix of the common core requirements. Controlled experimentation can inform a discussion about change and help the Institute move forward in a constructive way. The recommended educational innovation infrastructure, working in collaboration with CUP and CoC, can enable experiments that go beyond the constraints of the current GIRs, and that inform answers to the questions posed above.

b.   **Offer summer classes for credit**. The summer provides opportunities for experimentation with pedagogies such as intensive face-to-face interactions, blended learning models, modularity, and project-based learning. It is an opportunity to create a culture of peer-based learning in collaboration with faculty and to further promote MIT's culture of tinkering, designing, co-creating, and remixing—all of which may be more difficult to achieve during the academic year. Under the auspices of the educational initiative, MIT can conduct summer experiments that explore, assess, and catalyze new pedagogies.

Both undergraduate and graduate classes can be offered for credit either in blended formats or online during the summer. The ability to take classes during the summer for credit will provide students with schedule flexibility that may enable more of them to spend a semester away from MIT pursuing academic experiences that broaden their educational experiences. The Task Force acknowledges the 2014 Report of the *MITx* Subcommittee of the Faculty Policy Committee, which offers guidance on assigning credit for online classes.[5] To ensure academic integrity, the report recommends that online activity be reflected in the three-category subject designation[6], that a mechanism to test proficiency be in place for awarding transfer credit for edX classes, and that letter grades not be granted until learning platforms become more robust.

The Task Force recognizes that there is a danger that some students may wish to take summer classes as a way to squeeze even more into their time at MIT at the expense of deep learning and with the risk of additional stress. The Task Force cautions against this behavior. It also cautions against creating an environment that makes it more difficult for students to spend time engaging in activities such as internships, Undergraduate Research Opportunities Program (UROP) experiences, and thesis work that contribute in important ways to their professional development.

During the summer 2014 term, MIT is offering a small number of classes for credit on an experimental basis. The summer@ future program was triggered by Task Force discussions. It represents another step in the exploration of opportunities to enhance the residential learning experience with online educational materials and blended learning models. There was an exceptional response to the program, with 129 students (113 undergraduates and 16 graduate students) participating (Appendix 4).

---

[5] http://web.mit.edu/faculty/reports/pdf/MITx2014.pdf

[6] The three categories of time distribution of a subject that, when totaled, represent the total credit hours awarded for it: (1) recitation and lecture, (2) laboratory, design, or fieldwork, and (3) and preparation.

c. **Create an ecosystem that promotes educational connections across the Institute**. The educational initiative will serve to create an ecosystem that promotes educational connections, and that builds a culture of inter-School synergy. Doing so will help provide contextualization to students, and preserve the value of different perspectives while reinforcing connections and relevance. The Task Force hypothesizes that better connections will help improve learning. For example, strengthened connections between the School of Humanities, Arts and Social Sciences (SHASS) and the Schools of Engineering (SOE) and Science (SOS) could be explored as a mechanism to improve communication skills for MIT engineering and science majors. Likewise, better connections between the Department of Mathematics and SOE could be explored to improve the technical depth of learning in some engineering subjects.

In order to create an environment for faculty "connectors," the initiative should incentivize faculty to collaborate in education across departments with the provision of teaching resources. It should support projects and experiments that map connections in topics and outcomes across the curriculum, that employ online resources to facilitate connections, and that exploit opportunities to use modular approaches to increase flexibility. These types of experiments will enable the study of the benefits of connecting content in new ways.

Recommendation 3: The Task Force recommends that MIT build on the success of freshman learning communities and consider future expansions of the cohort-based freshman learning community model.

MIT has a successful history of conducting experiments in freshman learning communities. Online and blended learning models offer new opportunities to further these experiments and offer the possibility to radically transform the undergraduate experience. One of the risks of the online learning model is isolation. Experimenting with these pedagogies within the context of a cohesive learning community is one way to mitigate this risk. Advising, mentoring, and student-faculty interaction continue to be of critical importance to learning and to future success, and must be emphasized in the face of increased online learning components in our MIT residential education.[7]

The Institute can build on the successes of existing MIT freshman learning communities, while learning more about the elements of those successes and their attributes, both favorable and unfavorable, and drawing lessons from the various ways in which students learn. The Task Force recommends the expansion of existing learning communities, or the introduction of new learning communities to explore new opportunities.

For example, one possibility is a freshman cohort where students take some of their GIRs in a blended format with a flipped classroom using the edX/*MITx* platform. This might be combined with a more modular curricular structure and with intensive faculty advising and mentoring. Another possibility is a freshman learning community that places emphasis on hands-on experiential learning and maker skills, tailored to reinforce the freshman GIRs and the connections among them.

---

[7] "Great Jobs, Great Lives," The 2014 Gallup-Purdue Index Report, Page 10.

The Task Force notes that the four existing freshman learning communities—the Experimental Study Group (ESG), Concourse, Media Arts and Sciences, and Terrascope—currently have to comply with the GIRs. ESG began in 1969 as a more personalized approach to teaching, and set a precedent in providing a level of flexibility for both subject matter content and pace of completion. As future experiments in freshman learning are envisioned, additional flexibility might include the possibility of new or different GIR cores as described in recommendation 2a. All experiments must include a significant assessment component to ensure that appropriate lessons are drawn from these experiences.

Recommendation 4: *The Task Force recommends that the Institute use online and blended learning to strengthen the teaching of communications.*

The ability to communicate effectively is a critical transferrable skill, and student surveys show that MIT trails our peer institutions in students' self-reported gains in communication skills during college.[8] Given the science, technology, engineering, and mathematics (STEM) focus of most MIT students, this is a difficult issue. Implementation of the communication-intensive (CI) component of the communication requirement (CR) around 2001, which requires undergraduates to take at least one CI class per year, has begun to make a difference. Comparing the 2002 and 2014 Senior Survey results, the number of students reporting that their ability to write effectively had not improved during college decreased from 48% to 12%. Similarly, those reporting no improvement in their oral communication skills decreased from 39% to 6%. While this is a positive trend, online technologies may provide opportunities for further improvement.

MIT should develop materials that describe best practices for teaching effective communication skills, as well as online modules on written and oral communication for use in communication-intensive subjects within the major department (CI-M). The Institute should implement mechanisms to support faculty time for cross-departmental faculty engagement and continuing education on communication skills. Blended learning models for CI subjects in the humanities (CI-H) and CI-M that incorporate smaller student-faculty ratios in face-to-face settings should be explored.

Recommendation 5: *The Task Force recommends that MIT create an Undergraduate Service Opportunities Program (USOP).*

Engaging MIT students in the world provides valuable contextualization for their residential learning experience by allowing them the opportunity to work on serious issues that challenge society, yet to do so in a guided way with an intellectual component. Many MIT students already engage in service activities, but often these engagements are disconnected from the rest of their educational experience. There are already excellent service-related programs on campus, such as D-Lab, that can serve as a starting point from which to build. Additionally, the Public Service Center, which provides excellent guidance, should be better resourced.

---

[8] "2011 MIT Enrolled Student Survey," Office of the Provost, Institutional Research.

In the same way that UROP has become (and should continue to be) an enormously valuable part of MIT's undergraduate program, the introduction of a formal, Undergraduate Service Opportunities Program (USOP) can help students make service a meaningful part of their educational program and give them the opportunity to work closely with a faculty mentor. The Task Force recommends that the USOP experience not be required of all students, but that it could be taken for credit. USOP experiences could be combined with global teaching opportunities, such as providing local mentorship for globally offered *MITx* classes. The program could also include a social entrepreneurship aspect.

There may also be ways to involve graduate students in USOP or in a corresponding Graduate Service Opportunities Program (GSOP). Encouraging graduate students to engage in the world more broadly through service could be combined with online learning opportunities described in recommendation 6.

Recommendation 6: *The Task Force recommends that the Institute explore online and blended learning models to improve graduate curriculum accessibility.*

As noted above, the Task Force sees a number of opportunities to advance experiments in graduate education. Graduate students need improved access to advanced graduate classes to enable their research. Improved access relates to timeliness: Students need to be able to learn subject matter on demand when needed to support their research progress. Improved access relates to course packaging: In many cases, a full 12-unit graduate class may be accessible only to a small number of students, while smaller modules of material may be relevant and useful for a larger audience.

By offering online on-demand modules, departments may be able to exploit efficiencies and better manage faculty teaching loads. This may also provide an opportunity for graduate students and postdoctoral researchers to participate in the co-creation and testing of these digital learning modules, which is an experience of potential value for those pursuing academic careers. These on-demand modules may target upper-level graduate material that might otherwise be taught infrequently. There may also be opportunities to collaborate with peer institutions to target graduate material not offered at MIT, and both asynchronous and synchronous learning environments could be offered online.

EXTENDING MIT'S EDUCATIONAL IMPACT

The Task Force makes the following five recommendations to extend MIT's educational impact to the world.

Recommendation 7: *The Task Force recommends that this commitment to pedagogical innovation for the residential campus be extended to the world to set the tone for a new generation of learners, teachers, and institutions.*

MITx and edX have created an unprecedented opportunity for MIT to reach a global audience. However, this opportunity comes with a responsibility: if MIT is reconsidering the way in

which it addresses residential learning, it is important that it also convey these ideas, rather than old ideas, to learners and educators around the world.

As described previously, practical application has been central to the MIT way of learning. Research continues to reaffirm the invaluable roles of both active learning and hands-on learning in assimilating, contextualizing, and reinforcing the key learning objectives of a learning module. For example, recent studies have shown that active learning has a significant impact on learning outcomes, and that traditional lectures need to be re-examined for their lack of effectiveness.[9]

As MIT improves its methods for educating its students, it is incumbent upon the Institute to convey these ideas and results to the world. OpenCourseWare Educator, which is already a successful venue for disseminating MIT's pedagogical approaches, could become a powerful channel for sharing latest results as MIT embarks on its journey towards a future model of learning. In this context, the following opportunities have been identified by the Task Force.

a. **Exploration of modularity based on learning objectives and measurable outcomes.** In January 2014 Harvard and MIT released a report summarizing an analysis of the data collected during the first year of open online classes.[10] Modularity refers to breaking a subject into learning units or modules, which can be studied in sequence or separately. The finding that drew the most attention is the low rate at which students who enroll in an *MITx* or HarvardX class complete it. The first 17 HarvardX and *MITx* classes recorded 841,687 registrations, of which only 43,196 (5.1%) earned a certificate of completion.

While the completion rate is low, other data from the report suggests that students are focused more on learning certain elements of a class and less on completing what has traditionally been considered a module or unit of learning. For instance, in addition to those who completed a course through *MITx* or HarvardX, 35,937 registrants explored half or more of the units in a course, and 469,702 viewed some but less than half of the units of a course.

The way in which students are accessing material points to the need for the modularization of online classes whenever possible. The very notion of a "class" may be outdated. This in many ways mirrors the preferences of students on campus. The unbundling of classes also reflects a larger trend in society—a number of other media offerings have become available in modules, whether it is a song from an album, an article in a newspaper, or a chapter from a textbook. Modularity also enables "just-in-time" delivery of instruction, further enabling project-based learning on campus and for students worldwide.

The fall 2013 survey of faculty and instructors found that while faculty report that they seldom convert their classes into smaller units (less than 10% to date), they feel that many of their classes (25%) could benefit from a more modular approach.[11] Similarly, in a survey

---

[9] http://www.pnas.org/content/early/2014/05/08/1319030111.full.pdf+html

[10] http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2381263.

[11] http://web.mit.edu/ir/surveys/pdf/FutureEduFaculty-Overall.pdf

of students, approximately 40% of respondents report that they have taken MIT classes that they feel would benefit from modularization (Appendix 3).[12]

Aside from the likelihood of reduced attrition, modularity has the added benefit of allowing instructors to develop online material in a more incremental manner. Whereas it can take months to produce a full *MITx* class, a module could be created in a matter of weeks and could be used as a foundation for a variety of disciplines. The Institute also has a significant opportunity to reuse modules across courses.

Not only could modules be reused across departments and Schools, but also across institutions. As edX continues to add institutions from around the world, new opportunities for synergies are emerging. Much like a playlist on iTunes, a student could pick and choose the elements of a calculus or a biology course offered across the edX platform to meet his or her needs, but for most effective learning, modular units must be integrated into the whole. Thus, while the effort to study and complete a module may be more accessible, the effort to integrate the information into a complete class remains significant but may be facilitated by incremental learning.

To achieve this kind of fluidity and malleability in learning, the Task Force recommends exploring options for establishing a module repository. To support student selection of modules, there must be some mechanism for storing and curating the content. Whether through tags or filters, a simple but effective repository would allow students and educators to identify and utilize the modules that best meet their needs. *MITx* and OCW must work together to frame and enable such a vision.

b.   **Further exploration of the role of game-based learning**. The impact of gaming in engaging students is only beginning to be understood. As gaming continues to permeate popular culture, so too does an increased acceptance of game-based learning. Through the Scheller Teacher Education Program, MIT is testing new methods to support instruction through gaming. Through further exploration, MIT can modernize its tools for a new generation of learners.

In the short term, the Task Force recommends studying how game-based learning can be applied to existing classes as a case study and even to develop *MITx* courses focused on game-based learning content. In the long-term, the Task Force recommends incorporating game-based techniques into some residential MIT classes.

c.   **Partnering with other colleges and universities to encourage blended learning using *MITx* content.** EdX has enjoyed great success in its collaborations with colleges and universities around the country. In fall 2012, a lecturer at San Jose State University used the 6.002x materials on the edX platform to teach Introduction to Circuit Analysis. The class viewed *MITx* video lectures and completed *MITx* problem sets. The lecturer spent a short time in class facilitating questions and answers, and then devoted the remainder of the class to peer and team instruction and problem-solving. Pass rates increased from 55%

---

[12] http://web.mit.edu/ir/surveys/pdf/FutureEduStudent-Overall.pdf

of students in conventional classes to 91% of students in the blended class.[13] Similar to the "Intel Inside" campaign of the 1990s, in which Intel provided the processors for consumer computers, "*MITx* inside" might serve as the foundation for classes being taught in a blended fashion at colleges and universities around the world. In this model, MIT would provide *MITx* content to colleges or universities; those colleges or universities would then use *MITx* as a basis for the tailored educational experience that they develop to meet their students' needs.

In the short-term, the Task Force recommends the following:

- Seek partner universities that can license *MITx* modules;
- Develop new models of blended learning and activities to combine with digital learning;
- Seek blended learning opportunities at other universities where *MITx* material could be used to "flip" the classroom locally. Collaborate with universities to share results and set up mutually beneficial experiments;
- Offer pedagogical advice to participating schools; and
- Consider needs-based pricing or a fund to provide access to *MITx* materials to a wide range of partners across the world.

The unbundling enabled by *MITx* and edX also creates the possibility of smaller institutions. Consider a town with an industry in metallurgy. Online content, combined with blended learning, could enable small, specialized colleges in that town that focus on metallurgy. The Task Force recommends exploring "micro-institutions" of this nature in the future.

d. **Using open problems to seed global discussions**. Problem-based learning is at the heart of an MIT education. While understanding the foundation and principles of a particular discipline is essential, the Task Force feels that the investment of students in learning is most successful when they apply their learning to real-world problems. Many such problems do not have clearly defined solutions and they enable a continuing conversation that also often spans departmental silos. The Task Force recommends encouraging departments to develop classes or series defined by the challenges they seek to address. For instance, one might imagine an *MITx* series on air pollution. Within that series, a student would find a number of classes—including air purification, urban planning, politics, and poverty—that are intended to aid the understanding and examination of air pollution from a variety of perspectives. This might require a student to work on projects with students from different corners of the world who may already be addressing the nuances of air pollution in their individual communities. This connection will help create a global community of thought and practice around global challenges, and a cadre of sophisticated problem solvers.

---

13 https://www.edx.org/blog/san-jose-state-university-edx-expand#.U6hq3hYgF8Y.

e. **Developing a strategy for increasing the diversity of *MITx* learners**. While *MITx* has successfully reached a new audience of learners, the audience is primarily male and educated (Figures 1 and 2).

Figure 1. Gender of *MITx* participants through June 13, 2014
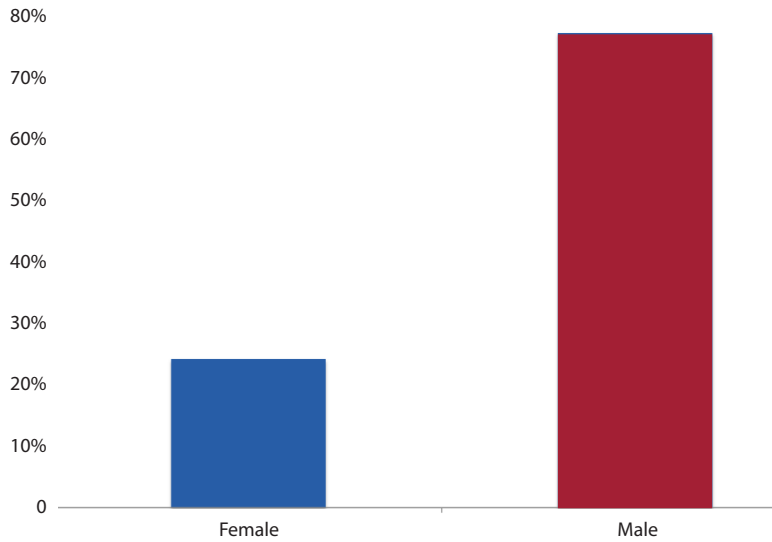
Source: MIT Office of Institutional Research

Figure 2. Educational level of *MITx* participants through June 13, 2014
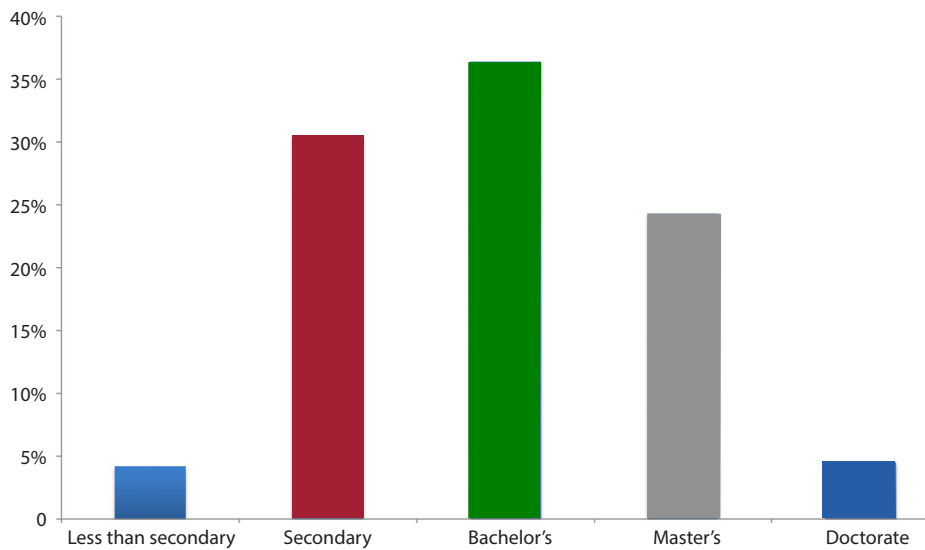
Source: MIT Office of Institutional Research

The Task Force recommends defining a strategy to reach more women and students of all nationalities, racial and ethnic groups, and socioeconomic circumstances. The Task Force recommends further analysis and consideration of the issues that might serve as obstacles to reaching a more diverse audience. Clearly, there are political, technological, and financial barriers throughout the world that will make it difficult for *MITx* to reach certain audiences, but what steps might MIT take to more effectively reach those who might hunger for an education but not have access to one?

In the short term, the Task Force recommends ensuring that *MITx* classes represent the great diversity of MIT faculty and student interests and backgrounds. In the long term, MIT should design a system of accountability to ensure that its outreach strategy is continuously practiced and revised. For *MITx* to have the impact that MIT imagines, barriers to access must be further evaluated and addressed.

Recommendation 8: *The Task Force recommends supporting efforts to create a lasting community and knowledge base for* MITx *learners.*

There are currently over 1,000 local edX communities listed on the social networking site meetup.com.[14] While that community has developed organically, it represents a significant opportunity to leverage broad interest and engagement to crowd-source solutions to problems via a kind of innovation network. By supporting a lasting community of students who become experts on a particular topic, new opportunities for meaningful peer-to-peer instruction will also emerge.

In the long term, MIT might look to develop a "Wikipedia-like" knowledge base that gathers the best community resources to share ideas and best practices. Also, MIT might consider international competitions and other recognitions to engage the world community. From the $100K Entrepreneurship Competition to the Clean Energy Prize, MIT has successfully developed a robust infrastructure of problem-based competitions that generate world-altering ideas and products. Imagine if those competitions were expanded to include *MITx* learners all over the world. There is great potential to engage students who possess different expertise and different perspectives in pursuing answers to some of the world's most challenging problems.

Recommendation 9: *The Task Force recommends that MIT define a K-12 strategy through a special interest group under the auspices of the Initiative for Educational Innovation.*

From the Edgerton Center to the Scheller Teacher Education Program to the Lemelson-MIT Program's InvenTeams initiative, MIT offers over 80 K-12 educational programs. However, in true MIT fashion, the programs have developed in a grassroots fashion over time, and have sought and received little coordination. There is also widespread interest within MIT from students, faculty, and staff, and from MIT alumni, to engage with K-12 students. With such broad K-12 programming, and a high demand for an MIT-style education, the Task Force recommends defining a K-12 strategy through a special-interest group.

---

[14] http://www.meetup.com/edX-Communities/

Approaching K-12 outreach in a more strategic way has a number of benefits. In addition to providing new opportunities to experience MIT educational programming, MIT would be better positioned to improve the diversity of its applicant pool and to reach students who might otherwise disengage from learning. MIT has a long history of successfully partnering with high schools to reach students as they begin to think about applying for college. By defining a strategy to reach younger students, the Task Force believes that the benefits for both the students and for MIT are potentially significant. Along these lines, the Task Force recommends conducting pilots and experiments. It also recommends considering strategies and initiatives for teacher education.

In the long term, and depending on the outcome of the K-12 experiments, the Task Force recommends developing a framework for engaging the K-12 community in the United States and around the world.

Recommendation 10: *The Task Force recommends that the Institute create new opportunities for engagement between the MIT community and the world.*

As noted previously, there are over 1,000 local edX communities around the world. While the formation of these communities provides great value to the groups of learners, in-person exposure to MIT faculty, students, and alumni could prove mutually beneficial.

Part of the great appeal of *MITx* is its potential to create new opportunities for global interaction for MIT students. MIT enjoys a number of successful programs that connect its students with research and innovation around the world. For instance, the MIT International Science and Technology Initiatives (MISTI) program matches hundreds of MIT students annually with global internships and research opportunities. In the summer of 2013, 10 MIT students who received MISTI training visited four countries and acted as *MITx* ambassadors during their MISTI internships. They met with *MITx* learners in their host countries to provide tutoring and a visible connection to MIT.

The Task Force recommends building on the success of this experiment by formalizing a MISTIx program in which engagement with the *MITx* community becomes an important part of a student's MISTI experience.

The Task Force encourages student engagement in *MITx* course authorship and tutorship. MIT has long enjoyed a successful Undergraduate Research Opportunities Program that places undergraduate students in labs and centers to gain first-hand and meaningful experience working with faculty members on their research. There is similar potential for students to gain valuable teaching experience by partnering with a faculty member in designing *MITx* content.

The Task Force also recommends encouraging faculty to participate in global education through open problems, crowd-sourced content and local *MITx* gatherings. While the Task Force recognizes the value to MIT students in spending time with global *MITx* communities while traveling abroad, there is similar potential for faculty to engage with global communities. By engaging directly with *MITx* students around the world, faculty would be able to develop new avenues for understanding the world's challenges and identifying talent for meaningful

collaboration. Likewise, *MITx* learners would benefit from the opportunity to work directly with MIT faculty, in essence bringing MIT to them.

MIT alumni can also play an important role as coaches and mentors. In an experiment with the city of Chicago, called ChicagoX, MIT alumni acted as mentors to students in Chicago who took a computer science course offered by *MITx*. Positioning alumni to provide in-person guidance to *MITx* learners not only enhances the online learning experience, but also creates a tangible connection to MIT for students who might someday apply to MIT.

Recommendation 11: *The Task Force recommends that MIT move forward to consider the types of certifications that can be supported through* MITx *and edX, and develop pricing methodologies and revenue-sharing arrangements for agreed-upon certifications.*

Increasingly, employers are focusing on certifying an employee's or potential employee's competencies rather than relying on his or her formal degree. Badging is another new trend in certification—a badge is essentially recognition for a smaller module of learning. These new ways of thinking about certification tie in with the opportunities created by *MITx*. While learning for personal improvement is valuable, there is untapped potential to explore new opportunities to certify that learning. This might take several forms, three of which the Task Force believes are ready for immediate attention and expansion.

First, *MITx* has developed the concept of XSeries, in which a student earns a certificate for passing a series of courses in a specific subject. This new model allows departments to better understand and meet student needs and to reimagine the structure of a course and its place in a larger context of a discipline.

MITx has announced three XSeries certificates, one each in Aerodynamics, Foundations of Computer Science, and Supply Chain Management. The XSeries is comprised of a set number of courses designed to help students to understand and apply new concepts. In Foundations of Computer Science, for instance, students enroll in seven modules (each roughly half of a regular MIT course) that introduce key concepts of computer science and computational thinking. From programming to Java to digital circuits, the XSeries provides a solid basis for understanding computer science. The first XSeries certificates were awarded in July 2014.

The Task Force urges each MIT department to think in terms of XSeries instead of individual courses when developing content for edX. This should be combined with thinking about modules instead of whole courses for reasons discussed earlier.

In the long term, the Task Force envisions opportunities for XSeries to develop into something akin to an *MITx* minor, major, or even an *MITx* or edX degree in recognition of more comprehensive learning.

Second, the Task Force recommends pursuing the development of new professional and executive education courses. In March 2014, MIT Professional Education offered MIT's first online professional course. The course, Tackling the Challenges of Big Data, aimed at technical

professionals and executives, was the first of a line of professional programs delivered via edX.[15] The course served as a training opportunity for working professionals and represents MIT's initial foray into online professional education.

Third, the Task Force recommends experimenting with merging education options for MIT and *MITx* courses. Through programs like MISTI, there are new opportunities for MIT students to leave campus and gain real-world experience by interacting with *MITx* learners in their local communities. The reverse could be true for *MITx* learners. Imagine a student in Brazil who has gained an understanding of quantum physics through *MITx* but who otherwise has had no MIT connection. After reaching a certain point in her online studies, perhaps that student could be invited to MIT to participate in on-campus interactive learning opportunities with other *MITx* students from around the world. In fact, such a program is being piloted as a follow up to 15.391x in the summer of 2014.

While improved opportunities for learning drive each of these recommendations, certification represents an important opportunity for revenue generation. This revenue can be used to subsidize MIT's investment in online education.

ENABLING THE FUTURE OF MIT EDUCATION

MIT faculty, researchers, and graduates contribute to the world in extraordinary ways, and an MIT residential education remains highly sought after despite perceived barriers of cost. MIT is able to admit only a fraction of the exceptional students who wish to come to campus. Undergraduate applications have tripled since the early 1990s to approximately 19,000, while admissions have been relatively flat at about 1,550. Undergraduate selectivity has also increased dramatically over the past 20 years among the top higher education institutions.

The Institute is committed to making a rich educational experience affordable and to providing those who are admitted with the aid needed to complete their MIT degrees. In order to fulfill this commitment, the Institute must pursue opportunities to bolster the current financial model and strengthen MIT's ability to support future generations of students. In working to enhance the sustainability of the MIT financial model, it is important to understand the drivers of cost.

The Drivers of Cost of an MIT Residential Education

In a market that focuses on excellence, MIT incurs high costs. These costs result from the Institute's need to attract and retain the best faculty and the brightest students, to provide premier research and educational facilities, and to perform the unparalleled research that is integral to the research university model. Providing the facilities required for our exceptional faculty, students, and researchers to advance research discovery and innovation is inherently expensive (Figure 3). Nevertheless, we will need to continue to invest in our world-class teaching and research infrastructure and remain competitive in recruiting top talent if we are to maintain our preeminence.

---

[15] http://web.mit.edu/professional/onlinex-programs/courses/tackling_the_challenges_of_big_data.html

This investment pays off in terms of educational outcomes. The MIT model produces outstanding students and advances knowledge in remarkable ways. MIT contributes significantly to educating some of the brightest engineers, scientists, and businesspeople of our time. Moreover, graduates from MIT perform exceedingly well in their life pursuits. These outcomes not only influence the formation of companies, job creation, patents, and inventions, but also advance the boundaries of science and engineering.

Figure 3. Campus operating revenues and expenses, FY1981–FY2013

Compound Annualized Growth

	1981–2013		2001–2013	
	Nominal	Real	Nominal	Real
Operating revenue	6.2%	3.0%	6.0%	3.6%
Operating expenses	5.8%	2.6%	5.4%	3.0%

Campus Revenues $2,248

Campus Expenses $2,001

$1,477

$1,192

$1,188

$1,406

$877

$876

Millions (US$)

Note: Excludes Lincoln Laboratory, Singapore-MIT Alliance for Research and Technology, and the Broad Institute. Real revenue and expenses are adjusted based on CPI-U.
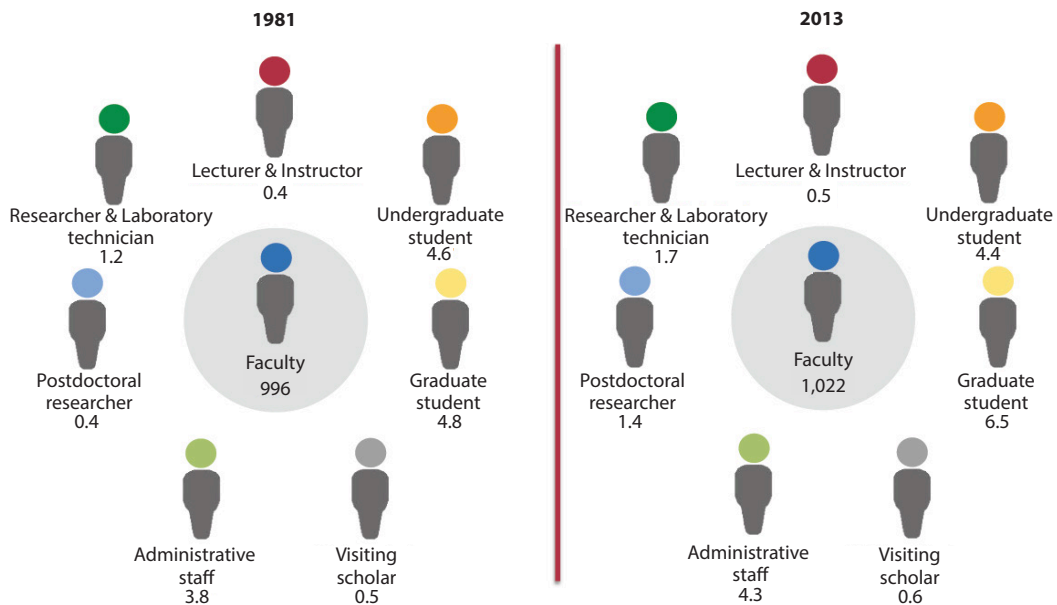
Source: Report of the Treasurer 1981, 1991, 2001–2013

In 1981, campus revenues and expenses, measured in 2013 dollars, were about $877 million and $876 million respectively. Looking at the time frame since 2001, after adjusting for inflation, campus expenses including research grew at a real rate of 3% compounded annually. Over the same period, revenue growth, especially from investments and fundraising, enabled the Institute to support these costs. During the period of 1981 through 2013, the mix of expenses has remained relatively constant, with the percentage of expenses associated with compensating people approximately half of total expenses. MIT's expanding research program has enabled dramatic growth in the number of graduate students and postdoctoral trainees engaged on campus.

The Evolving Campus Population

The number of MIT faculty has remained relatively constant over the past 30 years, with 996 faculty members in 1981 and 1,022 in 2013 (Figure 4). The ratio of undergraduate students to faculty was 4.6 to 1 in 1981 and only slightly lower at 4.4 to 1 in 2013. However, the numbers of graduate students, research staff, and postdoctoral trainees at MIT have all grown significantly as a result of the substantial growth in research funding over this same time period. The numbers of faculty and undergraduates have been centrally controlled, while the numbers of graduate students admitted and research staff and postdoctoral trainees hired have been determined at the departmental level. These changes in population on campus have evolved based on individual unit decisions with little opportunity for strategic integration.

Figure 4. How we have evolved: Headcount 1981 vs. 2013, students and staff per faculty member

1981

Lecturer & Instructor
0.4

Researcher & Laboratory technician
1.2

Undergraduate student
4.6

Postdoctoral researcher
0.4

Faculty
996

Graduate student
4.8

Administrative staff
3.8

Visiting scholar
0.5

2013

Lecturer & Instructor
0.5

Researcher & Laboratory technician
1.7

Undergraduate student
4.4

Postdoctoral researcher
1.4

Faculty
1,022

Graduate student
6.5

Administrative staff
4.3

Visiting scholar
0.6

Note: Excludes the Broad Institute, MIT Federal Credit Union staff, retired faculty, affiliates, and visiting students. In FY2013, there were 752 visiting students, 1,025 affiliates, and 239 retired faculty on campus. Figures for FY1981 are unavailable.

As described above, we are unable to meet the demand for high-quality residential education due to the high cost of the residential experience. Through online and blended learning environments, MIT can reach more learners, but it must address concerns about the impact on faculty teaching loads, and experiment with possibilities to leverage faculty time. Online experiences present new opportunities for envisioning educational roles for the future. For example, the roles of *MITx* instructor and *MITx* student may exist in 2020. As the Institute continues its work to reinvent MIT education, this model can be used to project how potential experiments might impact the campus population (Figure 5).

**Figure 5. The campus populations, 1981–2013**
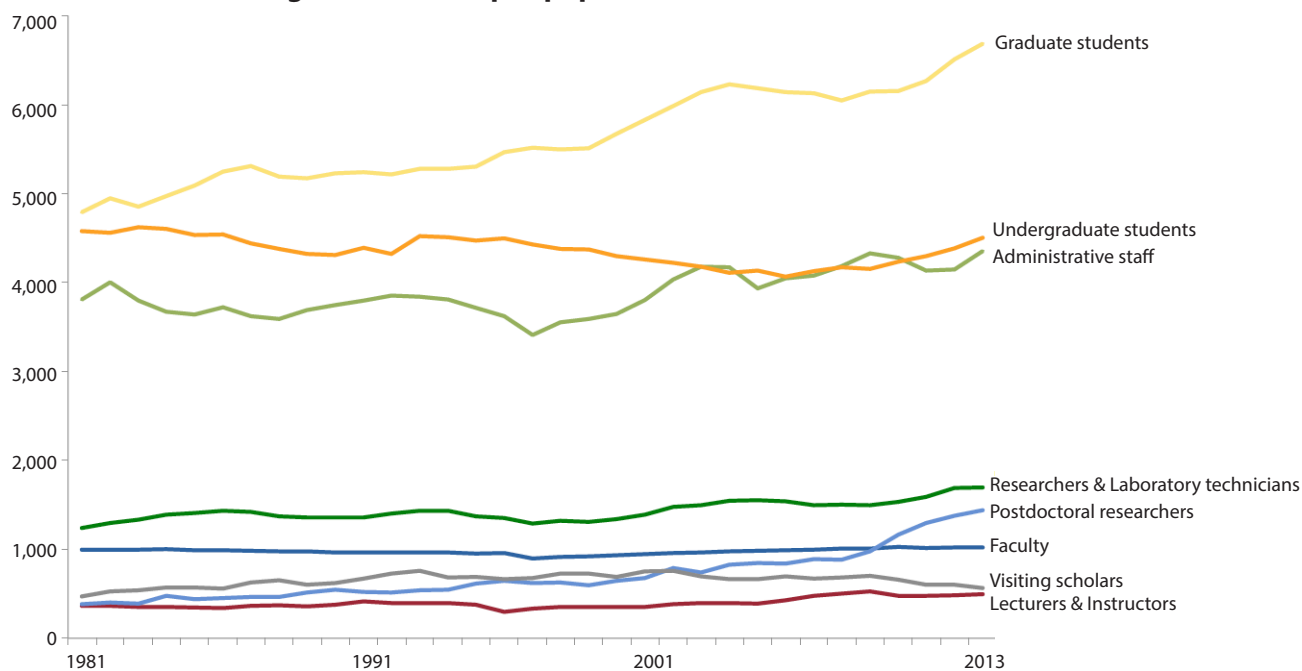
Note: Excludes the Broad Institute, MIT Federal Credit Union staff, retired faculty, visiting students, and affiliates.

MIT's expanding research program has enabled dramatic growth in the number of graduate students and postdoctoral trainees engaged on campus. Between 1981 and 2013, the number of graduate students grew from 4,780 to 6,643, yet the number of undergraduates remains similar in 2013 to its earlier 1981 level of about 4,500 students. The number of postdoctoral researchers more than tripled during this same time period from 398 in 1981 to 1,430 in 2013. Approximately half of the growth in research and laboratory technical staff has been within the life science areas.

Growth in administrative staff in recent years can be attributed to increases in the following areas: local administration to support research activities; staff to support the growth in educational programs and expanded international reach of the Sloan School of Management and the Office of Digital Learning *MITx* online learning activities; staffing for Resource Development as MIT prepares for its fundraising campaign; and facilities staff to maintain the expanding MIT campus required to support the growing campus population.

Since 1981, the net assignable square feet (NASF) of space on campus has grown by 42% to 8,179,000 NASF (Figure 6). This expansion has been necessary to enable the Institute's growing research enterprise, which is so integral to graduate education in science and engineering. Research expenditures on campus more than tripled from $184 million in 1981 to $662 million in fiscal 2013. This growth in research funding enabled the expansion of graduate education and significant growth in the number of graduate students and postdoctoral trainees on campus. In order to accommodate the growing campus population, laboratory space grew by almost 32%, space for student life and housing by close to 43%, and office space—much of which is used for conducting and supporting research—by about 51%.

**Figure 6. The growth of campus infrastructure,
net assignable square feet of space, 1981–2013**
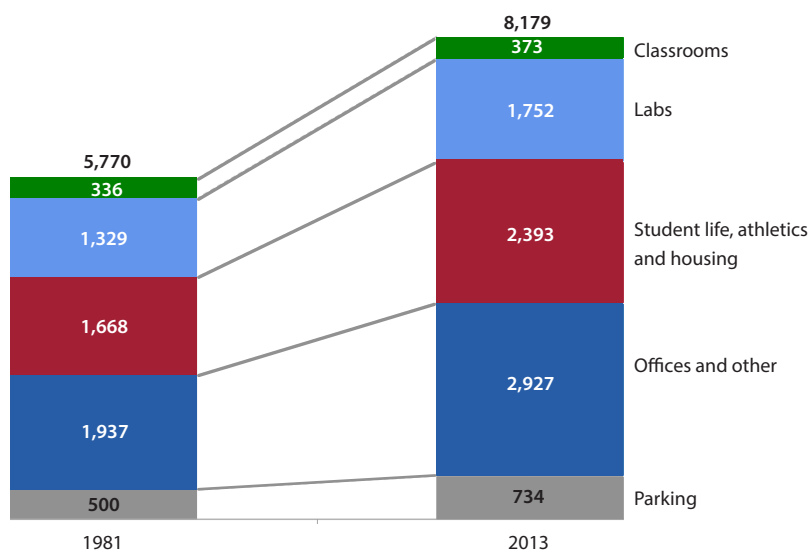
Source: Space Accounting System. 2013 Net assignable square feet.

MIT's average operating cost per NASF (based on actual expenses) has been below market rate. This is largely due to the age of the campus and the associated deferred maintenance. MIT is now engaged in a program of capital renewal to bring older structures to a higher standard, as well as an enhanced maintenance program to help the newest and newly renovated facilities retain their capacity to further MIT's mission. While this will increase the average operating cost per square foot, primarily due to depreciation resulting from the renewal program, this will result in more efficient buildings due to the benefits of modern and sustainable construction techniques. In addition, the increased complexity of the facilities required to support MIT's advanced research enterprise continues to impact the cost of constructing new buildings.

Based on our residential education model, costs will continue to rise, but the way MIT prices education may change, and the mix of revenue sources to support education will continue to evolve.

The Evolving Campus Revenue Mix

The campus revenue mix has evolved over many decades as the Institute has adapted to external influences. In 1981, research funding comprised 56% of revenue. Today, while research expenditures have grown significantly, their percentage of campus revenue has dropped to 29%. Declining federal funding for research and diminishing family resources to support the cost of education have been balanced with increased revenues from investments and donations, with investment income growing from 10% of the total in 1981 to 27% today.

Figure 7. Evolution of campus revenue mix, FY1981–FY2013
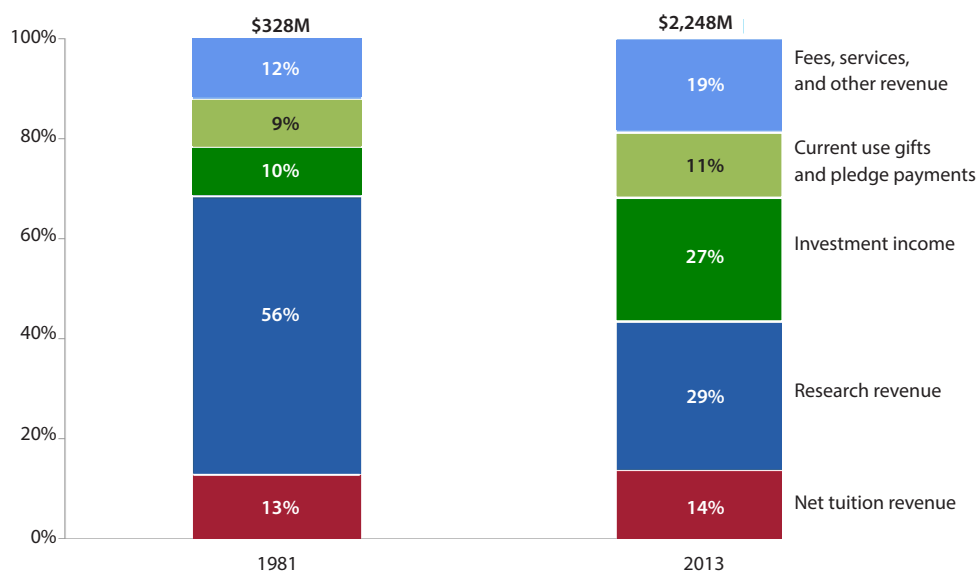
Note: Excludes Lincoln Laboratory, the Broad Institute, and Singapore-MIT Alliance for Research and Technology.

Source: Report of the Treasurer

The generosity of MIT alumni and the many friends of the Institute enables affordability for today's students. We are largely dependent on an inter-generational transfer of wealth to guarantee the experience of residential education for both today's students and future generations. While the model of supporting today's students with alumni gifts is not threatened over the near term, we may be unable to sustain the same rate of growth in the future as we have in the past. For this reason, it would be prudent to actively explore opportunities to capture new revenue streams to complement the current model.

Preserving and enhancing MIT's exceptional research and educational environment will require both a strengthening of existing income sources and consideration of new revenue opportunities. Two current sources of Institutional support—government research funding and tuition—are under pressure. There is a growing interest among policy makers and the public in slowing the growth of gross tuition prices and in raising financial aid. It may be possible to increase the revenues generated from other existing sources of funds by both raising the level of development activity to support increases in charitable gifts and expanding the scope of institutional and corporate partnerships.

Opportunities to expand professional and executive education offerings and to extend online classes and materials present new and exciting possibilities to reach more learners with a very high quality education at lower cost. MIT's ability to capture these opportunities depends greatly on finding ways to provide the faculty with the time needed to devote to these pursuits.

The Task Force makes the following five recommendations to enable the future of MIT education.

Recommendation 12: *The Task Force recommends that MIT strengthen its commitment to access and affordability.*

Concerns about the rising cost of higher education and the impact on access for students from all socioeconomic levels are valid. While it is true that higher education is expensive, MIT remains committed to need-blind admissions for undergraduates and to providing those who are admitted with the aid needed to complete their MIT degrees. In fall 2013, while MIT's tuition rate with fees was $43,498, the average net tuition paid by undergraduates was half that amount, or $22,208, because of MIT's need-based undergraduate scholarship program. This demonstrates MIT's commitment to making an MIT education as affordable as possible for students from all socioeconomic backgrounds. However, MIT needs to do even more. The Institute must continue to improve affordability.

But improving affordability alone will not solve the issue of access. In addition to making residential education more affordable, we have to reach more students. In 2013, MIT received over 43,000 total student applications for undergraduate and graduate school combined, and only 10% gained admission to their program of choice. Undergraduate applications topped 19,000, and only 8.2% were admitted. For the upcoming 2015 academic year only 7.9% of applicants were admitted. Clearly, there is a vast unmet need for access to high-quality education.

The Task Force encourages MIT to evaluate possibilities to achieve increases in undergraduate class size so that more students can experience the rich magic of an MIT residential education. Over time, it is possible that experiments with flexibility in time to degree might present opportunities to relieve housing pressures, which is one of the primary barriers to increasing class size. The Task Force recognizes that some faculty growth may be required to accommodate the needs of a growing student body; however, new types of supporting roles might also help to leverage faculty time.

Recommendation 13: *The Task Force recommends that the Institute expand fundraising activities to embrace a broader MIT community.*

The MIT model is sustainable because of the tremendous impact MIT has on its students, and the commitment of our alumni to supporting future generations of learners. We cannot assume that this culture of philanthropy and willingness to give back will continue to grow at the same rate seen in previous generations. The Institute needs to appropriately recognize and more deeply engage different sectors of a broader MIT community and beyond if we are to further improve affordability for students of all socioeconomic levels and ensure access for a greater number of students.

In addition to the Institute's undergraduate and graduate student bodies, there is a growing community of postdoctoral researchers—1,459 last fall. Some spend as many as five years on campus and continue on to extremely successful careers. With *MITx*, we are creating a new form of affiliation, one that may even have a residential component. With expanding professional and executive education programs, we have a growing number of accomplished professionals

affiliated with the Institute. MIT's Alumni Association should explore how to best recognize and engage those who complete certificates and online programs, and those who participate in professional and executive education programs. The Institute should strongly embrace its community of postdoctoral researchers and executive education students, and steward these communities for lifelong value and learning and for the benefit of MIT.

Recommendation 14: *The Task Force recommends that MIT charge an ad hoc working group to further evaluate revenue opportunities surrounding technology licensing and venture funding.*

The group would analyze entrepreneurial finance initiatives currently underway at MIT, practices at other universities, and gaps in capital markets for MIT-related start-up businesses. The recommendations of this working group can provide a starting point for further enhancement of the innovation ecosystem at MIT.

a.   **Technology licensing**. MIT's Technology Licensing Office (TLO) is often cited as a leader among peer institutions. However, the TLO's current mission does not include generating revenue for the Institute. It may be possible to increase the TLO's financial contribution to MIT without sacrificing the extent to which it supports commercial investment in the development of inventions and discoveries flowing from research at MIT.

The Task Force considered opportunities to build infrastructure that would support inventors as they seek to translate their fundamental discoveries into production-ready products. This would involve complementing MIT's current research strength with an additional development component. Creating such infrastructure might lead to greater revenues from commercialization, but it could also involve tilting the direction of faculty and student research activity in ways that would be inconsistent with other parts of MIT's mission. Given the current portfolio of technologies that have been, and are being, developed at MIT, there do not seem to be substantial opportunities for further revenue generation from technology licensing without significant changes to the culture, practice, and direction of faculty and student research. However, if the target is modest rather than significant revenue generation, there are a number of strategies that MIT could pursue to enhance the revenue stream from technology licensing.

This is an opportune time to consider these opportunities as MIT seeks to enhance its ability to innovate through the recent launch of the MIT Innovation Initiative.

b.   **Venture capital**. There have been suggestions that MIT create a venture fund to invest in the development of promising new technologies invented by students and faculty, and there are various proposals to expand MIT-based venture funding in some way. Proponents view these proposals as a natural way for MIT to capture some of the returns associated with its innovative faculty and students and as a potential way to fill in gaps in the venture funding space by enhancing funding access for MIT affiliates. Opponents are concerned about the inherent conflict of interest in MIT's funding its own faculty and students. They worry that this activity would distract from MIT's main focus and conflict with its central mission of education and research.

The working group should study the range of structures that could be used to support the entrepreneurial ventures of both faculty and students, and investigate the potential financial, cultural, educational, and philanthropic impact of these different structures. The group should solicit views of relevant MIT stakeholders and make a recommendation to the Academic Council regarding the possible establishment of an MIT venture fund for supporting student and faculty start-up companies.

Recommendation 15: *The Task Force recommends that the Institute establish a working group on spaces for future student life and learning to bring together stakeholders from around campus to envision, plan, and create spaces for the future of MIT education.*

The newly formed working group would build on the work of the Working Group on the Future of Campus Teaching and Learning Spaces chaired by Professor John Brisson in 2011–2012. The charge to that group conveyed that "…MIT has a historic opportunity to take bold steps in redefining its physical infrastructure for teaching and learning consistent with its mission, strategic goals, values and culture." This historic opportunity is further strengthened today by the momentous rise of digital learning, on campus and beyond, enabling learning anywhere at any time, combining online activities with in-person interactions and hands-on experiences, and inspiring the Institute to imagine what MIT's facilities for the future could be.

The Task Force can envision academic villages that provide environments for enhanced interactions to occur both inside and outside of the classroom and laboratory settings. The Task Force can also imagine a system of maker spaces strategically located around campus, further enhancing the experiential learning so integral to an MIT education. These maker spaces would complement the state-of-the-art maker space facility now being planned to support innovation and entrepreneurship activities.

The community-wide working group would bring together key individuals from the chancellor's areas, the Schools, Libraries, Campus Planning, Information Systems and Technology, and MIT's academic computing environment Athena. This working group would further study these concepts and additional opportunities to open up grand spaces on campus that would accommodate new methods of teaching and learning. The group would work within the framework of the Institute's capital planning governance structure under the auspices of the Building Committee.

Charge to the Working Group on Spaces for Future Student Life and Learning:

- Holistically assess campus needs for teaching and learning spaces including classrooms, library, performing arts, and "sandbox" spaces;

- Examine campus needs for common spaces, including informal gathering spaces, meeting and conference spaces;

- Agree on a vision for teaching, learning, and common spaces that are well integrated with the campus;

- Recommend a prioritized plan for creating these spaces and making the vision for spaces for future student life and learning a reality; and

- In this way ensure that our campus of the future is comprised of the spaces needed to enable the next generation of student life and learning.

Recommendation 16: *The Task Force recommends that MIT bolster infrastructure for Executive and Professional Education to reduce barriers to offering programs and engage more faculty to broaden program delivery.*

MIT offers education programs aimed at satisfying targeted needs of professionals and companies. The Sloan School of Management Executive Education Program and the School of Engineering Professional Education Program each target different audiences. The Sloan program is geared toward senior leadership and executives, and Professional Education is tailored for technical managers and professionals. While MIT's existing programs are clearly successful, they are limited by several factors: the number of participating faculty, Institute supplemental compensation regulations, restricted classroom and hotel facilities, and reputational considerations. The Executive Education and Professional Education Programs generally operate independently of each other, with some duplication and overlap and some confusion for potential enrollees.

There are a number of opportunities to coordinate existing programs on campus and to systematize pricing, as well as to enhance infrastructure support, encourage faculty involvement, and link these initiatives with the edX platform. This could potentially involve the creation of an organization to coordinate marketing, infrastructure, resources, and activities for program delivery. Such a structure might reduce overlaps and confusion for prospective enrollees. The new organization could also interface with global corporations that would benefit from MIT coursework for their educational and training needs. There are also a number of opportunities to extend MIT's offerings in the area of executive education, and edX has begun to explore offering such programs through the Office of Digital Learning.

To move toward a specific recommendation in this field, MIT should support and expand conversations to agree to a standard methodology for compensating planners, developers, instructors, hosting departments, and the Institute for offerings that are delivered by the existing programs. This would provide a framework for new programs to be offered by other units at the Institute. There are multiple markets for such content, including MIT alumni, corporations that might customize content for their employees, and broad professional communities interested in fields where MIT has particular expertise.

The business models of edX and *MITx* already intersect with these initiatives. Online professional and executive education will require a substantial investment of both time and resources to create content, and clear guidelines are needed about how any revenue will be divided. Developing a firm foundation for pricing and certification in the executive education and professional education markets will be invaluable as edX and related online activities expand.

IMAGINING THE FUTURE OF MIT EDUCATION

In preparing this report, the Task Force has focused on action. What goals might we imagine for the Institute and what concrete steps might we recommend to achieve these goals? But what will an MIT education of the future look like if we are successful in reaching our aspirations of transforming pedagogy, extending MIT's educational impact to the world, and lowering barriers to access?

The Task Force envisions a future in which MIT's impact is even greater than it is today. It is a future in which the magic of MIT not only extends beyond the boundaries of our campus, but also creates opportunities to harness the knowledge of a global community to address the world's great challenges. It is a future in which enhanced programs in service and teaching empower MIT students to make meaningful and lasting contributions to the world.

We imagine a future that extends MIT's capacity to reach a global audience of learners—more undergraduate students in our residential program, more professionals through expanded offerings in our executive and professional education programs, and more learners worldwide taking online classes through *MITx* and edX.

We see a future in which the MIT residential education model is not threatened, but rather strengthened, as the Institute is guided by our core values and principles. We see a future in which new online educational tools enrich the interactions between faculty and students by maximizing time for hands-on learning, making the role of instructor more important than ever.

By pursuing the Task Force's recommendations—by creating the spaces that will enable the next generation of student life and learning, supporting the faculty with new instructional roles, introducing flexibility to the curriculum and in time to degree, modularizing course content, and embracing a broader MIT community—the magic of MIT will shine even more brightly.

We may not be able to achieve all of these aspirations over the short term, or even over the longer term, but by taking the next steps outlined in this report, the Institute will be able to build on the momentum of the Task Force and continue to lay the groundwork for the future.