

Strategic Advisory Group on Education (SAGE) Executive Summary of Recommendations

1. Create and foster a culture of excellence in teaching

- 1.1 Rigorously *implement the new criteria for academic promotion* at HMS, and engage senior leadership at HMS (including Quad- and hospital-based Department Chairs) in valuing and rewarding teaching through direct connection to academic promotion and compensation.
- 1.2 Create a unified *HMS Academy Center for Teaching, Learning and Assessment* focused on needs of graduate and medical education and postgraduate training. Working with the Program in Graduate Education, the Program in Medical Education, the Clinical and Translational Research Education Program, and other HMS educational programs, the Center should:
 - 1.2.1 *Engage course directors* in assessing and supporting faculty involvement in teaching, and provide *evaluation and feedback* to teachers, courses, and educational programs.
 - 1.2.2 Develop programs for faculty that *“teach teachers how to teach”* and *encourage educational innovation*.
 - 1.2.3 Create a new program in *education research* to improve HMS education programs and endorse and support faculty careers in medical and graduate education.
 - 1.2.4 Develop a coordinated *“resident-as-teacher”* program that encompasses the HMS teaching hospitals.

2. Enhance the training of scholarly physicians and physician-investigators

- 2.1 Reduce the *debt burden* on medical students through increases in financial aid and targeted loan forgiveness programs, with additional strategies to be identified by a new *task force on medical student debt* involving staff from Harvard Institutional Research and the HMS Financial Aid Office, as well as faculty leaders.
- 2.2 Establish a *Scholarly Project requirement* for HMS medical students across the broad range of academic activities of the HMS faculty, and engage the Masters and affiliated faculty of the HMS Academic Societies in leadership of three Areas of Concentration: Biology in Medicine; Patient-Oriented Research; and Medicine in Society.
- 2.3 Significantly expand the size and scope of the *MD-PhD programs*.
- 2.4 Create a *New Pathway Investigator Program* to engage a larger number and broader range of research-oriented students; this program would lead to the *MMSc degree* for students who pursue research full-time for at least 1 year, and who fulfill course requirements and submit an approved masters thesis.
- 2.5 Reinforce the existing *HST MD program* and enhance the engagement of HST’s strong pool of research-oriented students in the HMS community and the MD-PhD program, while sustaining the program’s ties to the MIT community and developing new points of connection with HMS.
- 2.6 Add an emphasis on programs and priorities in discovery-based learning to the *medical student admissions* process in order to identify and recruit students with a passion for creating new knowledge.
- 2.7 Enhance student scholarly engagement in *specific priority areas*, including biomedical investigation, healthcare disparities, global health, and others.

3. Enhance training of biomedical scientists and educators by creating a Program in Graduate Education to support initiatives in curriculum design, faculty development, and educational innovation

- 3.1 Create an appropriate infrastructure within the Division of Medical Sciences to support an *HMS Program in Graduate Education* responsible for coordination and oversight of graduate program curriculum, graduate faculty development, graduate student affairs and diversity, graduate course support and student services, postdoctoral career development, and other functions.
- 3.2 Establish a program-wide *Graduate Curriculum Committee* to identify and remediate gaps in graduate curriculum.
- 3.3 Create a *Society of Curriculum Fellows* for support of graduate and medical programs and curricula and for mentoring of postdoctoral trainees interested in pursuing education as a career goal.

- 3.4 Establish a *Standing Committee on Interdisciplinary Degrees in the Life Sciences* to coordinate graduate programs across Harvard University and establish *partnerships with GSAS programs* that enhance career development of graduate students.
- 4. Foster a culture of excellence in the practice of clinical medicine, and enhance clinical training by assessment and evaluation of current educational programs and by development of novel approaches to medical and postgraduate education**
- 4.1 Perform comprehensive and on-going *evaluation* of aggregate and individual medical student outcomes that are based on the attainment of *core competencies*.
- 4.2 Develop an HMS program to support a research infrastructure for *innovation* in medical education.
- 4.3 Improve *communication* between HMS and teaching hospital-based clinical trainees and faculty with respect to their training experiences and academic career development, e.g., in medical simulation, medical information technology, and immersive education.
- 4.4 Enhance *communication* and horizontal integration in the *core clerkships* across clinical training sites through the engagement of PCE directors and leading clinicians from the HMS teaching hospitals.
- 4.5 Expand the capacity of HMS to *serve as a resource for GME directors* and program directors at Harvard teaching hospitals in development of curricula and assessment tools to insure that students and clinical trainees achieve competencies necessary for the delivery of high-quality care.
- 5. Increase diversity in all aspects of HMS education**
- 5.1 Consider setting *benchmarks* for increasing the numbers of women and under-represented minorities within the student, trainee, and faculty populations.
- 5.2 *Collect and analyze data* to understand the basis for attrition of women and minority students and trainees during the progression of their academic careers at HMS.
- 5.3 Identify and implement *strategies* to recruit, promote, and retain women and under-represented minorities at all levels, with a particular focus on enhancing diversity in the *senior faculty ranks and in leadership positions*.
- 6. Provide a continuum of education across HMS, Harvard University, and the HMS teaching hospitals in basic, clinical, and translational research training**
- 6.1 Expand opportunities and break down barriers to allow all Harvard students and trainees to enroll in *courses throughout the University*, and to allow all Harvard faculty to teach across the various schools and institutions throughout the University.
- 6.2 Enhance coordination of the continuum of education and of existing and future HMS Masters Programs through the *Harvard Clinical and Translational Science Center*
- 6.3 Expand support programs for *postdoctoral trainees* in coordination with HMS affiliates, including career guidance, community building, and scientific writing.
- 6.4 Increase engagement of HMS in all aspects of *global and community health*, including local and distance education programs.
- 6.5 Create *HMS-based inter-school programs in global health and social medicine* with HSPH, KSG, HBS, and other Harvard schools, potentially leading to the *MMSc degree* in these areas.
- 6.6 Develop *collaborative educational and research programs* with international partners to develop leadership in global health issues, and rigorously assess the educational and research content of current and future international programs.
- 6.7 Support *educational infrastructure* needs and make investments that will enable HMS to become a leader in the *development, application, and assessment of new medical education technologies*. Infrastructure needs include modernization of the TMEC and Armenise Amphitheaters and an increase in the number of classrooms. State-of-the-art educational programs for graduate students and medical students include development of simulation technologies, construction of electronic cross-campus classrooms, and expansion of a Harvard-wide electronic information portal for educational opportunities throughout Harvard and beyond.

WHITE PAPER: STRATEGIES FOR HMS EDUCATION
Prepared by the Strategic Advisory Group on Education (SAGE)
March 9, 2008

HARVARD MEDICAL SCHOOL MISSION STATEMENT ON EDUCATION:

“To engage and inspire a diverse community – including creative and inquiring students, trainees, and faculty at Harvard Medical School, the Harvard teaching hospitals, and other schools and institutions at Harvard and beyond – dedicated to reducing the burden of suffering from illness by providing knowledge and understanding, cultivating skill and compassion, fostering scholarship and leadership, and stimulating discovery and life-long learning in human biology and disease.”

Summary

Harvard Medical School attracts outstanding students and trainees, who are taught by a large and highly skilled cohort of exceptionally dedicated faculty. The students, trainees, faculty and educational opportunities at HMS enjoy an outstanding reputation, yet HMS faces many challenges in sustaining and enhancing the quality of its educational programs. For example, many leading teachers at HMS and the teaching hospitals are increasingly pressured to divert their effort to other activities in research and/or patient care. In addition, some educational programs at HMS and the teaching hospitals are not optimally configured to identify, recruit, train, and inspire leaders in medicine and medical science. There is a growing need for educational programs at HMS to become more responsive to advances in biomedicine and to trends in global health. At the same time, medical student debt impacts on our students' career choices and hampers our efforts to sustain a diverse academic community. The NIH funding crisis is constraining the options of students and faculty alike, yet there is broad agreement that discovery-based learning should be more effectively integrated into HMS medical education. These factors conspire to undermine the sustenance of a culture of excellence in teaching at HMS.

The recently initiated Medical Education Reform at HMS has made progress in renewing the commitment of its faculty to medical education, and HMS is currently implementing several exciting new programs. In contrast, HMS graduate education has not been reviewed recently. Additionally, the role of HMS within the broader context of Harvard University and the HMS teaching hospitals has only recently been brought into focus with the preparation of the CTSA application. Thus, there is room for development of new educational programs, along with a mandate for ongoing analysis of current programs. The Strategic Advisory Group on Education has considered the areas in which HMS should develop new initiatives and/or modify current programs, and is aware that it will be necessary to partner with the HMS and Harvard University Development Offices to identify fund-raising strategies that will support these goals:

- 1. Create and foster a culture of excellence in teaching** by rigorously *implementing the new criteria for academic promotion* at HMS; *engaging senior leadership* in support of teaching; creating a unified HMS *Academy Center for Teaching, Learning and Assessment* that is broadly engaged in medical, graduate and postgraduate education; and developing a coordinated *“resident-as-teacher” program* that encompasses the HMS teaching hospitals.
- 2. Enhance the training of scholarly physicians and physician-investigators** by *reducing the debt burden on medical students*; requiring medical students to pursue an *in-depth scholarly project* with active engagement of the HMS Academic Societies (described in detail in **Appendix 1**); expanding the *MD-PhD programs*; creating a *New Pathway Investigator Program* that could lead to the *MMSc degree*; reinforcing the *HST MD program*; emphasizing these new programs in *medical student admissions*; and enhancing scholarly engagement in *specific priority areas*.
- 3. Enhance training of biomedical scientists** by creating a *Program in Graduate Education* to support initiatives in curriculum design, faculty development, course logistics, and educational innovation; establishing a program-wide *Graduate Curriculum Committee* to identify and

remediate gaps in graduate curriculum; creating a *Society of Curriculum Fellows* supporting graduate and medical education programs; and establishing a *Standing Committee on Interdisciplinary Degrees in the Life Sciences* to coordinate graduate programs across Harvard University.

4. **Enhance clinical training and foster a culture of excellence in the practice of clinical medicine** by performing comprehensive *evaluation* of medical student outcomes; developing a program for *innovation* in medical education research; improving *coordination* between HMS and hospital-based clinical teaching; enhancing *communication* and integration in *core clerkships*; and providing *GME directors* and program directors with core resources.
5. **Increase diversity in all aspects of HMS education** by setting *benchmarks* for increasing the numbers of women and under-represented minority students, trainees, and faculty; implementing *strategies to recruit, promote, and retain* women and under-represented minorities; and enhancing diversity in the *senior faculty ranks and in leadership positions*.
6. **Provide a continuum of education** across HMS and Harvard University by breaking down barriers to allow students and trainees to enroll in *courses throughout the University*; enhancing the continuum of education through the *Harvard Clinical and Translational Science Center*; expanding programs and support for *postdoctoral trainees*; increasing the engagement of HMS in *global and community health*; creating *HMS-based inter-School programs* in global health and social medicine; developing *collaborative educational and research programs* with international partners; and supporting critical *educational infrastructure* needs and the development, application and assessment of *new educational technologies*.

RECOMMENDATION #1: Create and foster a culture of excellence in teaching

Recommendation 1.1: Rigorously implement the [new criteria for academic promotion at HMS](#), and engage senior leadership at HMS (including Quad- and hospital-based Department Chairs) in valuing and rewarding teaching through direct connection to academic promotion and compensation.

Background and rationale. Harvard Medical School has a longstanding policy that all members of its faculty are expected to teach. This policy has been codified in various forms, most notably in the “50-hour rule”, which states that the minimum teaching expectation for each faculty member is one hour per week. In addition, the recently revised criteria for faculty appointment and promotion at Harvard Medical School and the Harvard School of Dental Medicine include Teaching and Educational Leadership as one of three possible “Areas of Excellence”. It is important to note that faculty whose principal areas of excellence lie in “Investigation” or “Clinical Expertise” will typically be assessed on the basis of their engagement and skill in teaching, and not necessarily in their scholarship in medical education *per se*. The new criteria state that *all* candidates for appointment and promotion will be evaluated for their contributions to teaching and education.

Despite these policies, there remains a sense among HMS department chairs and leaders in both medical and graduate education that it is difficult to recruit the best faculty to devote substantial amounts of time to teaching medical and graduate students at HMS. Professors Elio Raviola and Charles Hatem have prepared a detailed, compelling, and cogent analysis of the recent and current state of faculty engagement in teaching at HMS (see **Appendix 2**). As Professors Raviola and Hatem note, faculty are under increasing pressures to generate and maintain funding for their research, maintain their research productivity, fulfill their clinical and administrative responsibilities, and serve as “good citizens” of their departments and units at HMS and the teaching hospitals. Teaching of medical and graduate students has become a low priority for many faculty members, partly as a response to these pressures, and much of the teaching falls disproportionately on a relatively small number of faculty members. The committee feels it is of paramount importance to make graduate and medical education the highest priority at HMS. At the same time, the committee

wishes to make a very strong statement about the importance of undergraduate education, graduate medical education, postdoctoral training, and other educational missions of the School.

To support and encourage both faculty members who already devote a substantial portion of their time to teaching, as well as faculty members who would like to devote more time to teaching, we strongly recommend that Harvard Medical School establish and nurture a “culture of excellence in teaching and learning” at HMS and the affiliated institutions. Teaching and learning are lifelong activities that form the bedrock of our academic institutions.

Recommendations. As a world leader in academic medicine and biomedical science, Harvard Medical School has the responsibility to prioritize teaching and educational leadership and educational innovation on a par with investigation and clinical expertise as core activities of its faculty. The new HMS/HSDM criteria for faculty appointment and promotion provide an important next step towards this goal; however, they will not be sufficient to transform the culture at HMS.

The SAGE recommends the following guidelines in order to establish and nurture a culture of excellence in teaching and learning at HMS and the teaching hospitals:

- Strictly adhere to the new HMS/HSDM criteria for faculty appointment and promotion.
- Set clear expectations with Department chairs and academic leaders to develop and enforce explicit standards and goals for faculty teaching, advising, and mentoring of students and trainees at all levels of their education, with accountability to be maintained and reviewed regularly at the highest levels at HMS.
- Provide Department chairs with timely and cogent evaluations of the quality of teaching provided by their faculty members. These should include both student comments and expert evaluations provided by course directors. Additional methods and tools for evaluation of teaching will need to be developed and deployed.
- Strongly encourage an expanded educational role for senior faculty, including both direct interactions with students and trainees and increased mentoring of junior faculty.
- Create and nurture communities of students and faculty around common areas of interest in medicine and biomedical science.
- Provide incentives to support educational innovation, such as Academy fellowships, GSAS Innovation Awards, potential University-wide awards to support innovation in interdisciplinary teaching, Curriculum Fellowships, etc.
- Increase the responsibility of department chairs to involve their faculty in teaching medical students and graduate students through various mechanisms such as promotion and resource allocation. For example, design a compensation mechanism to provide junior research faculty with additional resources commensurate with their teaching effort. A review of the structure of departmental compensation policies for teaching may be needed, and additional resources may be required.

We also recommend exploring the formation of a broadly-charged HMS Working Group on Education. Among other functions, this group could plan and implement mechanisms to establish and maintain the “culture of excellence in teaching and learning” at Harvard Medical School. Members of the Working Group could include senior administrators at HMS and the affiliated institutions, medical and graduate (PhD and Masters) program directors, postdoctoral training directors (including residency and clinical fellowship directors as well as research fellowship directors), undergraduate program directors, faculty, students, representatives from the Bok and HMS Centers for Teaching and Learning, and other individual leaders in education. This Working Group will design a structure that permits identification of the broad concerns that transcend diverse educational constituencies, while providing the flexibility to respond to program-specific issues.

Recommendation 1.2: Create a unified HMS Academy Center for Teaching, Learning and Assessment focused on the needs of graduate education, medical education, and postgraduate training. Working with the Program in Graduate Education, the Program in Medical Education, the Clinical and Translational Research Education Program, and other HMS educational programs, the Center should:

- 1.2.1 **Engage course directors** in assessing and supporting faculty involvement in teaching, and provide *evaluation and feedback* to teachers, courses, and educational programs.
- 1.2.2 **Develop programs for faculty** that “*teach teachers how to teach*” and *encourage educational innovation*.
- 1.2.3 **Create a new program in education research** to improve HMS education programs and endorse and support faculty careers in medical and graduate education.

Background and rationale. HMS is presently in the process of redefining the scope and structure of the [HMS Academy](#), an organization that was established to identify and honor master teachers and thereby help to restore the central role of teaching at HMS and in the medical profession. The Academy has provided a forum for recognition and support of clinical education. However, the SAGE believes that the original goal of the HMS Academy as an honorific organization may have led to the disenfranchisement of individuals who had contributed to teaching for many years; we feel that this feature of the Academy should be revised or abandoned. At the same time, the spirit of the Academy and its role in supporting education should be sustained, and broadened to include graduate student as well as postgraduate education. The creation of the Harvard CTSC also provides a programmatic context for support of these integrated educational initiatives.

The *Harvard Medical School Academy* [Center for Teaching and Learning](#) (CTL) was founded over the past two years under the auspices of the HMS Academy. At the time of the founding of the Academy, there was an Office of Educational Development (OED) that had been designed to work with faculty who taught medical students. As the OED no longer exists, tasks relating to faculty development now fall under the CTL, while those relating to evaluation and assessment are now housed in the [Center for Evaluation](#) directed by Edward Krupat. The CTL focuses on both theoretical and practical approaches to teaching and learning. The main goals of the CTL are to serve the needs of the teaching faculty and inculcate skills for teaching medical students. There are five faculty members on staff: Charles Hatem (Director); Antoinette Peters (Co-Director); and three faculty consultants. These individuals work closely with the Center for Evaluation to present student evaluation data to the course directors so that they can identify those instructors who are doing an excellent job as well as those who seem to be struggling. The CTL then helps course directors work with faculty who have received poor evaluations.

As currently configured, the CTL is focused almost entirely on the education of Harvard medical students. In particular, the CTL works primarily with the directors of core PME courses, although any faculty member engaged in medical education can go to the center for support. Additionally, all new tutors for medical student classes are observed by CTL staff at least once. However, the CTL has neither the staff nor the expertise to support educational programs for graduate students, postdoctoral fellows, or clinical trainees. Another major limitation to the work of the CTL is that no specific budget currently exists for the Center.

Recommendations. In order to implement the recommendations put forth in Recommendation 3.1 (consolidating and enhancing support for the curriculum design, faculty development, and educational innovation functions of the Program in Graduate Education), we recommend that the Academy Center for Teaching and Learning be reconfigured and expanded, and provided with adequate resources to fulfill a broader mission. *The new Center should support graduate as well as medical education, with one or more positions dedicated specifically to support graduate education.* Consideration should also be given to supporting postdoctoral and postgraduate medical education within the same Center. Furthermore, the existing Center for Evaluation could be reconfigured to support graduate as well as medical education, and its functions could be combined with those of the new Center for Teaching and Learning and housed within one *HMS Academy Center for*

Teaching, Learning, and Assessment. The configuration of this integrated Center should permit the issues and structures that are specific to individual educational programs to be addressed; thus, the existing Program in Medical Education and the new Program in Graduate Education (see Recommendation 3.1, below) would exist as in(ter)dependent entities, but each would have representation in the integrated HMS Academy Center for Teaching, Learning, and Assessment.

Among other functions, the HMS Academy Center for Teaching, Learning, and Assessment should:

- Oversee and assist faculty in their teaching roles, with the intent of fostering excellence, scholarship and innovation.
- Create a robust infrastructure for research in medical and graduate education. This should include the adoption of educational technologies that can enhance faculty development in teaching.
- Provide a forum and platform for the exchange of ideas among teachers and enhanced interaction among educators at all levels.
- Assist in the rigorous assessment of teachers, courses, curricula, and educational programs.

One potential model for the new Center could be the Harvard University [Bok Center for Teaching and Learning](#), which supports junior and senior faculty, graduate students, curriculum fellows, non-ladder faculty, and others involved in teaching Harvard undergraduates. Activities of the Bok Center include educational consultations, ESL training, coordinating educational conferences and seminars, and educational research (please see **Appendix 3** for more details on the Bok Center).

We recommend that the Working Group on Education should plan the detailed structure and function of the new HMS Academy Center for Teaching, Learning, and Assessment within the context of the new HMS Program in Graduate Education and in coordination with the existing HMS Program in Medical Education. The Working Group should also consider the potential advantages to housing support for postdoctoral education in the same Center. The Working Group should consider using the activities and methodologies of the Harvard University Bok Center for Teaching and Learning as a model. Finally, the Working Group should consider the synergies that could derive from housing teaching/learning and assessment in the same center. As noted above, the existing Center for Evaluation could be reconfigured to support graduate as well as medical education, and its functions could be combined with those of the new Center for Teaching and Learning within one Center for Teaching, Learning, and Assessment.

1.2.4 Develop a coordinated “resident-as-teacher” program that encompasses the HMS teaching hospitals.

Background and rationale. A significant number of HMS medical students pursue postgraduate clinical training at the Harvard teaching hospitals, where they in turn become teachers of HMS students during clinical rotations. Residents perform a substantial amount of the clinical teaching for medical students in the hospitals during the clinical years. Students deeply value resident teaching, and residents understand that acquiring outstanding teaching skills is integral to their academic career development. Nonetheless, residents, especially non-HMS graduates, often have little identity with the medical school, and many never feel that they are part of the HMS community. Many residents have never been to the school campus, and may have a limited understanding of the learning goals of students on the diverse teaching hospital rotations. Residents vary greatly in their teaching skills and experiences, and would benefit from directed learning experiences to enhance this critical component of their postgraduate training.

It is therefore critical to develop mechanisms whereby HMS medical students can learn the teaching skills they will need when they become residents, and to train the residents currently teaching medical students. Only modest programs exist now to introduce HMS students to teaching skills. Moreover, teaching peers in the tutorial setting can be distinct from many teaching activities expected of the students in the hospital setting, such as delivering lectures to their medical teams. Most HMS students will enjoy careers in academic medicine where teaching/communication skills are highly valued, and patient education is a logical and practical initial education topic for students.

Recommendations. The SAGE supports the creation of a new curriculum in teaching for HMS students and clinical trainees. Convening a working group from across the hospitals and medical school could facilitate the planning and implementation of such a curriculum. The benefits of this curriculum would be twofold: 1) providing teaching skills to medical students and residents would improve the culture of teaching during their clinical training and facilitate their academic career development; and 2) a curriculum to support resident teaching skills would foster the integration of residents and hospital-based trainees into the HMS community. Such a program could also provide a link to the educational components of the Clinical and Translational Science Center, which is described in detail in the Harvard CTSA application (see **Appendix 4**) and in sections below.

RECOMMENDATION #2: Enhance the training of scholarly physicians and physician-investigators

Recommendation 2.1: Reduce the debt burden on medical students through increases in financial aid and targeted loan forgiveness programs, with additional strategies to be identified by a new task force on medical student debt involving staff from Harvard Institutional Research and the HMS Financial Aid Office, as well as faculty leaders.

Background and rationale. It has been suggested that economic constraints associated with medical education significantly impact the career choices of medical students, and may have an important impact on the pathways of aspiring scholarly physicians and physician-investigators (see articles on Student Debt posted on the [SAGE Wiki](#), password required). Mechanisms that reduce the economic burden would likely lower the barriers to students' engagement in priority areas, including biomedical research and global health. Thus, mechanisms that both leverage economic incentives as well as support scholarship and experiential discovery-based learning opportunities are likely to have significant impact. Additionally, it has been proposed that HMS reduce barriers to entry for low- and middle-income applicants, who make up a significant proportion of accepted students who choose not to matriculate.

Recommendations. A detailed plan is beyond the scope of the SAGE (see Appendix 5, which is still being drafted at this time), yet we recognize that student debt is a critically important factor in our students' career choices. As we seek to engage the broadest range of students as scholarly physicians and physician-investigators, attempts to ameliorate debt as a factor in career choice become paramount. Possible approaches include increases in financial aid to all students and/or the expansion of directed loan forgiveness programs. To identify the most effective strategies, we recommend the formation of an expert group with representatives from Harvard Institutional Research, HMS Financial Aid, and HMS faculty leaders to study possible solutions, including:

- Reducing the parental contribution for low- to middle-income students
- Lowering the Unit Loan package
- Reducing the Calculated Parent Contribution for Middle- to Upper-Middle Income Families
- Increasing support to loan forgiveness programs for students who pursue careers in targeted fields
- Guaranteeing support for students pursuing a 5th year plan of study (i.e., a year of research)

Recommendation 2.2: Establish a Scholarly Project requirement for HMS medical students across the broad range of academic activities of the HMS faculty, and engage the Masters and affiliated faculty of the HMS Academic Societies in leadership of three Areas of Concentration: Biology in Medicine; Patient-Oriented Research; and Medicine in Society.

The SAGE proposes that HMS implements a longitudinal **scholarly project requirement for medical students (Appendix 1)**, requiring a minimum of 4-6 months to complete a "research rotation" as a core component of medical education. Research in all areas of medicine will be

encouraged as part of the scholarly project, and students will be provided with maximal flexibility to become engaged in discovery. Some students may elect to pursue only the minimum 4-month scholarly project requirement by writing up their work from a summer service-learning project. Other students may choose to become involved in the New Pathway Investigator Program (see Recommendation 2.4 below) and pursue in-depth research projects leading to the MMSc degree. Still other students may seek to expand their experiences in discovery by joining (in “cycle 2”) the MD-PhD program. The hallmarks of this requirement are its flexibility and its potential to stimulate life-long learning by bringing faculty and students together in in-depth scholarship as an intrinsic feature of their medical education.

Scholarship will be encouraged across the broad range of academic engagement of the HMS faculty, and will be grouped into three different “areas of concentration”: **Biology in Medicine**, concentrating on basic biomedical research; **Patient-Oriented Research**; and **Medicine in Society**, which refers broadly to all aspects of medical humanities, policy, social aspects of global health, etc. Many students will pursue hypothesis-driven research studies, but other students will pursue service-learning projects and other non-hypothesis driven projects, including work in medical humanities. Students may be allowed to “opt-out” of the requirement, but only for compelling reasons. At the very least, pursuit of an in-depth scholarly project will enable medical students to work in close partnership with HMS faculty and to become exposed to the role of discovery in medicine, and thereby to empower all medical students to become more effective life-long learners. This “research rotation” is not viewed as providing definitive training in research, which mandates a much longer period of engagement. However, the hope is that for some students, this “research rotation” will provide a starting point that will lead to a more intense and prolonged engagement in medical discovery. Therefore, it is important that the implementation of this requirement is coupled with the development of the **New Pathway Investigator Program** (described below in Section 2.4 and in Appendix 1), and with the reduction of the barriers to “second-cycle” entry into the MD-PhD program.

The HMS Academic Societies and the hospital-based advisors in the CTSC will become engaged in providing guidance and organizing students’ engagement in their Scholarly Projects. Additional administrative and advising resources exist within the current [Office for Enrichment Programs](#), in the [PASTEUR](#) program, and in other programs throughout HMS. However, it will also be necessary for HMS to increase the number of advisors and mentors available to the medical students in order to facilitate successful student engagement. The Masters of the Academic Societies will play a central role in organizing and leading an effective advising structure for the Concentrations and the New Pathway Investigator Program. Mentoring and advising students through their scholarly projects will be considered to represent educational contributions, and the new HMS promotion criteria should be modified to reflect this.

Both the Scholarly Project requirement and the New Pathway Investigator Program are described in more detail in the “Proposal for Scholarly Projects in Areas of Concentration as Required Components of the Curriculum Leading to the MD Degree at Harvard Medical School, and Description of a New Pathway Investigator Program to Enhance Engagement of Medical Students in Research”, attached as Appendix 1 to this Report.

Recommendation 2.3: Significantly expand the size and scope of the MD-PhD programs.

M.D.-Ph.D. programs are highly effective at preparing their graduates to build independent research careers (see “Data on MD/PhD graduates with NIH grants” on the [SAGE Wiki](#)). It has been argued by some that these joint degree programs may delay the time at which trainees make the transition to independence, and may potentially be a source of unanticipated gender discrimination. *Current data provided by the NIH do not support this claim* (see data in the spreadsheet “Time to degree for MD-PhD Students 1968-2001” as well as the presentation “Demographics of the Physician-Scientist workforce in 2007”, both of which are posted on the [SAGE Wiki](#)). Rather, NIH-derived data clearly indicate that the extended training associated with these programs does not come at the cost of efficiency and does not delay transition to independence. HMS/HST M.D.-Ph.D. graduates are

largely (80-90%) engaged in academic pursuits, with only 10% entering private practice. A substantial fraction of the graduates have also assumed major leadership positions.

The [HMS MD-PhD](#) programs in the basic and social sciences admit 10-12 students per year. The number of incoming students in the HMS MD-PhD program is a fraction of the class size at other competing institutions (University of Pennsylvania, Washington University, Duke, Johns Hopkins; see the data posted on the [SAGE Wiki](#) in the document “Size of MD/PhD Programs at Harvard and Peer Medical Schools”). Many of the students we cannot accept into the MD-PhD program are also our top candidates for admission at HMS, and are offered admission here in either HMS or HST. Unfortunately, most of this group is lost to M.D.-Ph.D. programs at other schools. The overall “yield” of accepted applicants who end up matriculating at HMS is ~70%; importantly, **nearly one-half of all the applicants who turn down HMS to go to other medical schools do so because HMS is unable to offer these students MSTP funding for the MD-PhD program** (see the analysis of “Reasons admitted students decline, 2005-2007” on the [SAGE Wiki](#)). Bringing these talented students to HMS would exert a major positive influence on the scientific and overall culture at HMS, including both the HST and NP MD programs.

The top candidates for the HMS MD-PhD program are characterized by exceptional academic performance, outstanding supporting references, near-perfect grades in rigorous curricula at top-tier institutions, and exceptional research accomplishments. During the ranking process, the M.D.-Ph.D. admissions committee finds that 20-25 of the top-tier candidates are virtually indistinguishable with regard to their competitiveness for acceptance. **With sufficient funding, the program could easily support a doubling in size based on the quality of this applicant pool.** Thus, HMS regularly loses a number of highly attractive academically oriented applicants each year to our competitors. With NIH funding presently in a “status quo” (at best) status, the likelihood is small that HMS can increase its formal MSTP program. There are also few sources of potential external funding for students oriented towards an MD/PhD in the social sciences (i.e. anthropology, bioethics, history of medicine, medical economics, etc.) – an area that Dr. Allan Brandt, former director of the social sciences track of the M.D.-Ph.D. program, has championed and one in which HMS is receiving an increasing amount of interest from applicants. Students in the basic sciences MD-PhD program receive funding to cover tuition costs and a modest annual stipend to offset living expenses. Students in the social sciences program currently receive a stipend to pay for tuition only, and do not receive additional support for living expenses. Funds for both programs are derived from a variety of sources, including the MSTP grant, student fellowships and targeted donations from individuals and nearby institutions, as well as from HMS.

Although a majority of MD-PhD students begin the program as MSTP-funded students, a second cohort (referred to as “second cycle” students) starts in the MD-only track and becomes affiliated with the MD-PhD program later in their medical school years when they decide to pursue dual degree training. Although the education these students receive is commensurate with that of other MD-PhD students, they are at a financial disadvantage because of debts incurred to pay for medical school. The MD-PhD program funds many of these students for the last two years of medical school *via* a second cycle admissions process, but it cannot guarantee funding to all of them. Consequently, indebtedness may skew their decisions about future study and career choice.

On the basis of these and other considerations, we recommend expansion of the M.D.-Ph.D. program to a size that will permit HMS/HST to recruit and accept all or nearly all of the fully qualified applicants. The expectation is that this number will be in the range of 20-25 entering students per year. HMS should consider mechanisms to increase the number of funded MD-PhD students independent of the NIH MSTP grant, with potential sources of such monies being the Harvard University endowment, large foundations, or private philanthropy. Dr. Robert Mayer, Dean of Admissions at HMS, has suggested that the creation of endowed M.D.-Ph.D. positions would very likely be an attractive investment for certain donors, as has been demonstrated by other M.D.-Ph.D. programs nationally. These positions would also expand eligibility for the program to non-US citizens – a subgroup that comprise a significant number of our recent competitive candidates, but who cannot be funded through the MSTP grant. This proposed expansion, along with a redefinition

of criteria for “need-based” scholarships, would likely boost the HMS admissions yield to over 80 percent.

Recommendation 2.4: Create a New Pathway Investigator Program (described in detail in Appendix 1) to engage a larger number and broader range of research-oriented students; this program would lead to the MSc degree for students who pursue research full-time for at least 1 year, and who fulfill course requirements and submit an approved masters thesis.

Nearly one-half of all HMS New Pathway medical students already take 5 years or longer to graduate, and a significant proportion of these students do so in order to engage in research activities (see Graduating Student Questionnaire data on the [SAGE Wiki](#)). It will be vital to create new opportunities and incentives for this substantial pool of New Pathway students to develop their interests in research.

To encourage and support the many HMS students who would like to extend their in-depth research experience for a full year or more but do not wish to make the more prolonged commitment required for the PhD degree, and to offer a route for extending the depth of other students’ engagement in their scholarly projects, *the committee recommends the creation of a **New Pathway Investigator Program (NPIP)**, which will encourage students to expand their involvement in scholarship and investigation while at HMS.* This New Pathway Investigator Program will support, instruct and reward students who wish to pursue an engagement in research of at least one year (full time) during medical school, opening up pathways to academic careers and leadership positions for the broader community of students who do not pursue a PhD and whose interests lie outside the quantitative arena that is embraced within HST. The relationship between the NPIP and the required Scholarly Project is discussed at greater detail in **Appendix 1**. Faculty leadership of the NPIP could be under the purview of the HMS Academic Societies, which would coordinate the NPIP advising system.

The potential scope for the students’ engagements in their Scholarly Project will be expanded by creation of the “New Pathway Investigator Program” (NPIP), which will serve to encourage students to expand their involvement in scholarship and investigation while at HMS. There are a number of steps that HMS can take to encourage students to participate in the NPIP. Engagement with the NPIP would begin at the time of student recruitment, and would continue from matriculation through graduation (and beyond). A NPIP para-curriculum will be created – for some students, this will be embedded in activities such as the CTSC colloquium series – and this para-curriculum will be linked to the students’ scholarly project. HMS will also provide an incentive structure for encouraging student research while at HMS. First, students who pursue a fifth year of study through the NPIP will be given the opportunity to fulfill coursework and thesis requirements for a **Masters in Medical Science** degree. (HMS is already approved by Harvard University to grant the MSc degree.) Second, we propose supporting students engaged in this fifth year through a funded Research Assistant program to encourage student participation (as in HST). Foundation funds, as well as merit scholarships from HMS and support from HMS-affiliated institutions, will be sought as part of a larger community effort to achieve debt relief and recruit/retain our best students – especially minority students and women. These new funds should be used to support these efforts along with endowment funds already committed to medical student research. HMS should also endeavor to encourage cross-enrollment of HST MD students, HMS MD students, and PhD students at HMS/MIT through an increased number of common course offerings and other activities.

Survey responses from NP students at program entry reveal that more than half of these students intend to incorporate research at some level into their career plans (Graduating Student Questionnaire data on the [SAGE Wiki](#)). Although follow-up data on the “yield” of physician investigators is not available, a few observations are relevant. HMS graduates a significant number of individuals who will lead NIH-funded research programs within 10-12 years of graduation, and NP graduates hold a substantial proportion of those grants. Appreciating that not all research is equal, and that NIH grant-holding is not a perfect outcome to measure, it is probably still safe to assume that at least as many physician-investigators are emerging from NP as HST, although the proportion is higher for HST. Anecdotally, investigators initially trained in the NP appear to engage in more

translational and clinical research than the more basic-oriented graduates of the HST and MD/PhD programs.

In an era when many "roadmaps" are pointing toward a collaborative multidisciplinary approach to medical research, it is critically important to re-invigorate, re-emphasize, and grow the production of NP investigators who will flourish in this type of research environment. This approach to problem-solving will appeal to a specific cadre of MD-PhD students recruited as part of an expansion of this program, as well as the broader community of students who do not pursue a PhD and whose interests lie outside the quantitative arena that is embraced within HST. The career paths of these students may well involve a year of basic research during medical school and typically follow a trajectory that takes them through residency programs and into fellowships that prepare them further for a career in clinical/translational investigation.

There are a number of steps that HMS can take to encourage students to participate in the NPIP. For example, HMS should:

- Clearly articulate the intention to bring individuals well-suited for the NPIP program to HMS as part of the recruitment process. Recruitment of students for the NPIP would begin well before admissions. Although students will be asked to self-identify with the NPIP upon their arrival, the program would leave open the potential for fluid entry and exit as students' interests evolve.
- Identify these students at matriculation, and design a para-curriculum for them. Such a curriculum could be embedded within the CTSC and linked to the "scholarly project." Exposure to the NPIP could be front-loaded during orientation week and include activities such as research fairs and Soma Weiss day.
- Create an exciting para-curriculum that would entice other NP students to join.
- Encourage early associations with appropriate role model investigators. These individuals could be largely in hospital divisions and the CTSC. An articulated specific goal could be to capture an increased number of extramurally funded fellowships, such as HHMI and Duke Foundation awards.
- Provide space for the NPIP contiguous with the MD-PhD program in order to maximize interactions between HMS and HST medical students who have a broad engagement in discovery during their training.
- Provide incentive structures for encouraging student research while at HMS. These approaches include:
 - An in-depth research experience as prerequisite for graduation (described above).
 - An optional fifth year of research funded (with partial or total support from HMS) at a reasonable stipend level, which could lead to the MMSC degree.
 - Jointly funded merit scholarships from HMS and appropriately matched Harvard-affiliated institutions as part of an effort to achieve debt relief and recruit/retain our best students and to increase diversity of the Harvard medical community.
 - Cross-enrollment of HST MD students, HMS MD students, and PhD students at HMS/MIT through an increased number of common course offerings and other activities.
- Develop and provide cutting-edge educational technologies (e.g., simulation experiences, web-based teaching modules) that will stimulate students' curiosity and enhance learning.

Recommendation 2.5: Reinforce the existing HST MD program and enhance the engagement of HST's strong pool of research-oriented students in the HMS community and the MD-PhD program, while sustaining the program's ties to the MIT community and developing new points of connection with HMS.

The [HST MD program](#) is a joint program through Harvard and MIT that educates 30 MD students per year at HMS plus a cohort of PhD and Masters Degree students at MIT (the program is succinctly described in a document "Summary and facts about the HST program" posted on the [SAGE Wiki](#)). A central mission of the program is to educate and inspire students to become successful and leading physician scientists. The HST Program orients its course of study toward

students with a declared interest in biomedical research and a strong background in the physical or biological sciences. The Program utilizes a rigorous and quantitative curriculum that incorporates the fundamental principles of molecular biology, biotechnology, engineering and physical sciences. The scientific rigor of this program (especially its emphasis on fundamental mathematical and physical principles) work as powerful recruiting tools to bring the most exceptional and scientifically promising MD and MD-PhD candidates to Harvard. Additionally, these candidates consistently indicate that access to MIT, as well as Harvard, is a critical positive determinant that influences their decision to matriculate. Data from an analysis of HST graduates indicates that the HST program is highly effective in meeting its mission to train successful physician-scientists.

One facet of the curriculum that may help achieve this outcome is the process of writing a scholarly thesis, which has always been required for graduation from HST. In this sense, the proposal for requiring a scholarly project in the New Pathway (described above) will bring key elements responsible for the success of the HST program to the New Pathway. Conversely, there may be aspects of the New Pathway program that could serve to inform and guide elements of the HST program's MD curriculum (e.g., an expansion of tutorial-based pedagogic approaches). **We propose forming a working group to review the HST curriculum and explore how synergies with the New Pathway curriculum could be identified and implemented.**

Recommendation 2.6: Add an emphasis on programs and priorities in discovery-based learning to the *medical student admissions* process in order to identify and recruit students with a passion for creating new knowledge.

HMS is working to establish and disseminate a new set of admissions criteria that will adjust science requirements to reflect advances in biochemistry and genetics and their relevance to modern medicine (a presentation on HMS Admissions is posted on the [SAGE Wiki](#)). In implementing these new requirements, it will be important to maintain the current diversity within the incoming classes. It will also remain essential to increase the probability that accepted applicants will become leaders and scholars. Within this diverse student community, it will remain essential to attract and inspire students with a long-term interest in incorporating scholarship, discovery and life-long learning into their careers. A model for the development of revised admissions criteria could be based on the new criteria for academic promotion of HMS faculty, which emphasize deep scholarship but give consideration to other supporting and diverse activities. The HMS admissions committees should be engaged in the considerations that the new emphasis on discovery-based learning brings to the recruitment and selection of prospective HMS students.

The SAGE recommends the development of presentations and web-based content that clearly elaborate the various opportunities for scholarly training at HMS. These materials should include clear statements of admissions standards and expectations. They should also communicate the expectation that successful applicants will have challenged themselves at levels commensurate with the opportunities available to them, and that HMS appreciates that these opportunities are not equal among undergraduate institutions. Once developed, these presentations should be broadly disseminated via the Internet and through campus visits by a team of delegates of the various HMS scholarly programs, including representatives of the HST program, the NPIP, and the MD-PhD program.

Recommendation 2.7: Enhance student scholarly engagement in *specific priority areas*, including biomedical investigation, healthcare disparities, global health, and others.

The SAGE supports the concept that HMS identify and target specific priority areas in which to engage our students. The goal is to strategically enhance career development pathways and educational experiences. The creation of HST, the MD/PhD, and MD/MBA programs are current examples of such strategies, and the creation of the New Pathway Investigator Program is another. These programs have a common theme and structure: students self-declare their interest and intentions before matriculation, and then experts in these areas participate in the admissions process as well as the ongoing educational experience. A community of students is thereby recruited and nurtured. In our existing longstanding programs, the track record is excellent. While

these programs may well be suited to encompass new focused priorities in health disparities, biomedical research, and global health (or other areas as they develop in the future), other models and priorities are important to consider as well.

RECOMMENDATION #3: Enhance training of biomedical scientists and educators by creating a *Program in Graduate Education* to support initiatives in curriculum design, faculty development, and educational innovation

***Recommendation 3.1:* Create an appropriate infrastructure within the Division of Medical Sciences to support an *HMS Program in Graduate Education* responsible for coordination and oversight of graduate program curriculum, graduate faculty development, graduate student affairs and diversity, graduate course support and student services, postdoctoral career development, and other functions.**

***Recommendation 3.2:* Establish a program-wide *Graduate Curriculum Committee* to identify and remediate gaps in graduate curriculum.**

Background and rationale. The Strategic Advisory Group on Education has identified a number of strengths in the graduate programs at HMS. Currently, HMS administers seven outstanding PhD programs through the [Division of Medical Sciences](#) (Biological and Biomedical Sciences, Immunology, Neurobiology, and Virology) and as University-wide programs (Biophysics, Chemical Biology, Systems Biology). The Division of Medical Sciences and the individual graduate programs provide infrastructure for student admissions, faculty recruitment, required and elective curricula, paracurricular activities and student affairs, and program development. The graduate programs provide about the right balance of small and large programs, community building, academic rigor, autonomy, and flexibility. Furthermore, the large faculty at HMS allows many different graduate program models to flourish—the successful programs attract students, faculty, and training grants, while the unsuccessful programs eventually disappear.

The SAGE has also identified some gaps in graduate education at HMS. These gaps include:

- There is no central infrastructure to coordinate and support student admissions, faculty recruitment, required and elective curricula, paracurricular activities and student affairs, and program development among the various graduate programs.
- There is variability in the value of the curriculum committees among the various graduate programs. Curriculum committees are most useful for coordination, brainstorming, and finding and plugging holes in the curriculum, but the graduate program curriculum committees do not always function optimally for these purposes.
- There is no central mechanism to ensure that important topics in interdisciplinary biomedical science are well represented in the graduate curriculum. For example, all of the graduate programs would benefit from increased availability and quality of courses in the quantitative aspects of biology.
- There is no central mechanism to plan for the future of graduate education at HMS. For example, it is currently difficult to address important questions such as the optimal ratio of students to faculty in the graduate programs, taking into consideration the quality and community of the student body, the foreign and domestic applicant pools, and the potential impact of University-wide initiatives (such as the Harvard proposal to fund all G1 students in the life sciences from a central pool of funds) on HMS graduate education.
- There is a lack of coordination and variability in educational resource support for the graduate courses at HMS—room scheduling, course website support, logistical support, etc.
- There is marked variability in compensation for teaching fellows among the graduate programs.

Recommendations. To address these gaps, we recommend the creation of a *HMS Program in Graduate Education* that supports initiatives in curriculum design, faculty development, and educational innovation. The Program in Graduate Education would not replace the existing graduate programs, and we would suggest that it could be housed within the existing Division of Medical Sciences. Rather, the Program in Graduate Education would coordinate and oversee the

individual programs to create a more cohesive and supportive environment for students, faculty, curricula, and programs. In one model, the members of a Program in Graduate Education steering committee could include the graduate program directors, the preclinical chairs, and key administrators from the graduate school. This steering committee could oversee the work of a Graduate Curriculum Committee, as well as a postdoctoral training committee, an office for graduate student affairs and diversity, an office for graduate course support and student services, and other committees and offices as needed.

We recommend the formation of a Working Group on Graduate Education to plan the detailed structure and function of the HMS Program in Graduate Education. Members of the Working Group should include senior HMS administrators, graduate program directors, postdoctoral training directors, faculty, students, curriculum fellows (see below), representatives from the [Harvard Integrated Life Sciences Program](#) and the Harvard University [Bok Center for Teaching and Learning](#), and others.

Recommendation 3.3: Create a Society of Curriculum Fellows for support of graduate and medical programs and curricula and for mentoring of postdoctoral trainees interested in pursuing education as a major career goal.

Background and rationale. The Curriculum Fellowship Program is a recent arrival at HMS. Curriculum Fellow positions have been created both in HMS departments and in HMS graduate programs. There are presently positions for five Curriculum Fellows: in Cell Biology, Integrative Developmental Biology, Human Biology and Translational Medicine, Biological Chemistry and Molecular Pharmacology, and Genetics, but within the next year the community is expected to grow to ten or more. The current Curriculum Fellows are all PhD's in a biomedical field, and several have had postdoctoral training in biomedical research as well. The HMS Curriculum Fellow positions have been created as time-limited postdoctoral fellowships in biomedical education, with the intention that the fellows will transition to faculty positions after completion of the Curriculum Fellowship Program. The HMS Curriculum Fellowship Program has some parallels to the Life Sciences Preceptor Program in the Faculty of Arts and Sciences at Harvard University.

The roles of the HMS Curriculum Fellows are to: (1) support the current graduate curriculum; (2) develop new graduate curriculum; and (3) create an integrated educational community for their department or program. Some Curriculum Fellows support and develop medical courses as well as graduate courses at HMS, and thereby help to link medical and graduate education.

One major limitation in the current Curriculum Fellowship Program is that there is no committee or structure that connects the Fellows from the various HMS departments and programs. The Fellows have recently organized a monthly series of meetings among themselves, but they have no organization or training to support their combined activities. The Curriculum Fellows have expressed a strong interest to create a community of educators. They have sound backgrounds in biomedical research, but they would benefit from mentoring on teaching methods as well as training on how to do educational research. Although each of the current Fellows has a mentor, that mentor is trained in a biomedical field, not in education.

Recommendations. To enhance support for the curriculum design and educational innovation functions of the Program in Graduate Education, and to establish a structure dedicated to mentoring postdoctoral trainees interested in pursuing education as a major career goal, we recommend the creation of a *HMS Society of Curriculum Fellows*. The Society of Curriculum Fellows should reside within the Program in Graduate Education and should have close ties to the HMS Academy Center for Teaching, Learning, and Assessment. Within the Society of Curriculum Fellows, support should be provided for curriculum design, course development, educational innovation, and educational scholarship. In the latter context, the Society should actively seek the engagement of faculty from throughout Harvard University who are interested in mentoring and advising trainees on educational research activities.

We recommend that the Working Group on Graduate Education should plan the detailed structure and function of the new Society of Curriculum Fellows within the context of the new HMS Program in Graduate Education and in coordination with the existing HMS Program in Medical Education and the reconfigured and expanded HMS Academy Center for Teaching, Learning, and Assessment. In considering various models for the Society of Curriculum Fellows, the Working Group should take advantage of lessons learned from existing centers and programs at Harvard, including the Bok Center for Teaching and Learning and the Life Sciences Preceptor Program.

Recommendation 3.4. Establish a Standing Committee on Interdisciplinary Degrees in the Life Sciences to coordinate graduate programs across Harvard University, and establish partnerships with GSAS programs that enhance career development of graduate students.

There are important challenges in organizing graduate programs across the university. We divide the challenges and opportunities into four categories—student concerns; faculty considerations; institutional implications; and national challenges—and we offer potential solutions for some of the challenges. It is evident, however, that the corresponding solutions are not so easily identified for many of the challenges.

To address Harvard-specific challenges and opportunities in the configuration of interdisciplinary degree programs that cross faculties and disciplines across the University, we propose the creation of a **Standing Committee on Interdisciplinary Degrees in the Life Sciences (SCIDLS)**. This Standing Committee could be organized through [HILS](#) and include representation from the Deans and Faculties of GSAS and HMS, members of the HILS Coordinating Committee, and [HUSEC](#). The Standing Committee would be charged to identify and implement solutions for many of the challenges outlined below.

There is also an **important national challenge** that could be addressed by the Standing Committee together with the Deans. This national challenge involves identifying, developing and supporting graduate and postgraduate training programs that cut across the narrow scope and disease-specific mandate of most of the institutional training grant programs administered by the individual institutes at NIH. Effectively addressing this challenge will require action by Harvard at a national level.

Student concerns

Challenges: Student concerns regarding interdisciplinary graduate programs span three areas: logistical concerns, funding concerns and teaching concerns. In particular, it will be important to address the following concerns:

- The difficulty of attending classes and seminars across Harvard's campuses.
- The incompatibility of intranet sites across the University.
- The availability of funding for graduate students in pre-dissertation years.
- The availability of stipend support and guidance for undergraduates in the Life Sciences.
- The lack of uniformity in policies regarding teaching requirements and compensation for graduate students across departments and programs.
- Lack of formal support for career guidance.

Recommendations:

- Create virtual cross-campus classrooms on all campuses.
- Coordinate Harvard IT connections and School websites, in particular between HMS and FAS.
- Normalize funding mechanisms across departments and Schools, including compensation for teaching fellows in different programs and support for faculty teaching across faculty lines.
- Sustain university-based financial support for all first-year graduate students in the life sciences with the involvement of HUSEC, SCIDLS and senior University leadership.
- Partner with the NIH to expand programs for multidisciplinary training grants.
- Expand the Office for Career Services at FAS to support career guidance for DMS students.

Faculty considerations (see Appendix 7)

Challenges: In encouraging interdisciplinary graduate programs across the University, implications on the involved faculty must be taken into account. These include: (1) the variable teaching expectations of faculty in different programs; (2) the differential compensation scales and sources for salary support, especially between Quadrangle- and hospital-based faculty (this is particularly challenging because of the diversity of revenue streams that are used for faculty salary support); (3) sabbatical policies and the allocation of unrestricted research funds and; and (4) faculty development and mentoring for faculty with joint appointments.

Recommendations: The SAGE recommends that SCIDLS be tasked with consulting the HMS and FAS Deans to clarify teaching expectations within and between Harvard Schools; and with discussing the differences in sabbatical policies and the allocation of unrestricted and restricted research funds, with a particular focus on the differences between FAS and DMS and Quadrangle- and hospital-based faculty. Additionally, the Advisory group recommends that an ombudsperson, who is also a member of SCIDLS, should be identified and charged with faculty development. Finally, the group recommends that senior faculty with multidisciplinary interests are identified and approached to serve as mentors for junior faculty – especially those with joint appointments.

Institutional implications

Challenges: Harvard is a complex organization that is not conducive to creating integrative programs or policies. Thus, institutional implications that must be taken into consideration include the following: how to coordinate curriculum planning within multidisciplinary programs; how to map undergraduate concentrations onto graduate programs; how to plan joint degree programs given the plethora of inter-faculty programs (including HST, SEAS, MSI, HBTM, BBS, SCRB and others); how to appropriately develop, design and fund new space and infrastructure; and how to coordinate strategies between HUSEC and HILS.

Recommendations: To address some of the above-mentioned challenges and implications, the Advisory group recommends the following:

- Help coordinate curriculum planning by charging HILS with the coordination of the Life Sciences curriculum across the University.
- Engage HMS faculty in FAS undergraduate curriculum planning, and engage FAS faculty in design of HMS-based courses.
- Create SCIDLS with representation from stakeholders of HST, SEAS, MSI, HBTM, BBS, SCRB.
- Develop new research space and core facilities with the engagement of HUSEC with FAS and HMS Deans, and as appropriate, with the Provost's and President's offices for space planning.
- Continue strategic planning by University leadership to facilitate multidisciplinary research and teaching in Allston, adding a liaison from SCIDLS.
- Continue close collaboration between HUSEC and HILS through appointment of selected faculty to both committees (as is being done).

National challenges

Challenges: NIH training grant programs generally mandate a focus on Institute- or disease-specific research topics, and fail to provide a model for interdisciplinary research. This also undermines our current approach to graduate student funding in DMS, in which incoming students in BBS (our largest program) are supported by a training grant for their first two years, and may or may not pursue classes or dissertation research in the specific topic area of their "assigned" training grant. This has undermined both discipline-specific as well as multidisciplinary program development at DMS, and has made our training grant applications much less competitive. It is also important to take into account the paucity of federal training grants and research funds. This is a profound challenge, which will involve continued advocacy for our students on a national level in the areas of diversity, training grant funding, career planning, and advising in later graduate school years.

Recommendations:

- Partner with NIH to expand from NIGMS to other NIH institutes the NIGMS model of “Molecular Medicine Training Grants”.
- Prepare new training grants to support extant and new multidisciplinary programs at HMS.

RECOMMENDATION #4: Foster a culture of excellence in the practice of clinical medicine, and enhance clinical training by assessment and evaluation of current educational programs and by development of novel approaches to medical and postgraduate education

Recommendation 4.1: Perform comprehensive and on-going *evaluation* of aggregate and individual medical student outcomes that are based on the attainment of *core competencies*.

Recommendation 4.2: Develop an HMS program to support a research infrastructure for *innovation* in medical education.

Recommendation 4.3: Improve *coordination* between HMS and teaching hospital-based clinical trainees and faculty with respect to their training experiences and academic career development. Areas in which HMS and the teaching hospitals could develop more broadly based partnerships are medical simulation, medical information technologies, and immersive education.

Recommendation 4.4: Enhance *communication* and horizontal integration in the *core clerkships* across clinical training sites through the engagement of PCE directors, course directors, chief residents, and leading clinicians from the HMS teaching hospitals.

Recommendation 4.5: Expand HMS’ capacity to *provide support and guidance to GME directors* and program directors at the Harvard teaching hospitals in the development of curricula and assessment tools to insure that students and clinical trainees are achieving the competencies necessary for the delivery of high-quality care.

Background and rationale: Since the Flexner report in the early part of the 20th century, the training of physicians has emphasized the acquisition of knowledge of basic and clinical science. In recent years, however, there has been increasing recognition that “scientific knowledge” is but one of many competencies that must be achieved to deliver high quality, compassionate care. From the development of critical thinking and clinical reasoning skills, to the refinement of communication capabilities, to the awareness of the cultural context of disease and therapeutics, Harvard Medical School must take a leadership role in defining the pedagogical methods to achieve and assess these competencies in our students and residents. Since Flexner, educational venues have remained mostly unchanged, and nearly all formal teaching experiences transpire in established formats: lectures, small group discussions, analyses of written material, and clinical clerkships. New approaches and technologies – including medical simulation, immersive education, and medical information technologies – are being broadly implemented at HMS and elsewhere. HMS is poised to take a leadership position in developing and evaluating these and other new fields of endeavor and innovation that may have a transformative impact on the future of medical education.

The Harvard Medical School clinical faculty is on the front lines of patient care each day. They must remain committed to the reduction of medical error, the development and implementation of “best practices” in the evaluation and treatment of their patients, and the processes embodied in the concept of continuous quality improvement – all of which are to be delivered with skill and compassion. Furthermore, the faculty should be actively involved in the training of students, residents, and fellows working in the Harvard affiliated hospitals to inculcate these principles of care in the physicians of tomorrow.

There is a critical need for more comprehensive and on-going evaluation of aggregate and individual student outcomes. Better communication and coordination between HMS and hospital-based clinical trainees and faculty is needed to provide improved clinical training experiences, academic career development and access to mentors and preceptors for scholarly activities. There is a major challenge in facilitating communication and horizontal integration in the core clerkships across sites

and a need for faculty development in providing effective feedback and evaluation. To reinvigorate HMS' leadership in clinical education, a new program in medical education research would advance the field, improve our educational programs and endorse and support faculty careers in medical education (see Section 1.2.3).

A key goal of Recommendation 4 is to *ensure uniformly outstanding educational experiences for students in clinical training at the teaching hospitals. We must also ensure that medical students learn how to provide exemplary clinical care with skill and compassion.* To accomplish these goals we must continually assess and evaluate current educational programs, and develop and implement novel approaches to medical, graduate and postgraduate education.

In order to ensure outstanding educational experiences for medical students, it is necessary to a) periodically evaluate and refine the curriculum; b) provide students with constructive feedback during their clerkships; and c) ensure that students learn to critically read the medical literature. Because the students train at several different hospitals, the clinical clerkship experiences should reflect a coordinated approach that emphasizes clear and uniform learning objectives for both faculty and student, shared best practices in meeting these educational goals, development of common assessment tools and documentation, measurement of the student's attainment of core competencies, and provision of increased and more effective feedback and evaluation and facilitation of the development and assessment of new teaching technologies, such as medical simulation and immersive education. Clerkship directors would benefit from the results of a more rigorous assessment of their students' clinical training experiences as well as the additional training and support that could be realized through their active involvement with the new integrated Center for Teaching, Learning, and Assessment (see Section 1.2 above). An enhanced integration between clinical clerkships and the HMS Academic Societies might be realized by the Societies' engaging PCE site directors, who could serve as a clinical liaison in communicating HMS' expectations in a clerkship-specific manner to the faculty, fellows and residents (including Chief Residents) who are engaged in hospital-based training of students. Other educational innovations might include the development, application, and assessment of simulation-based and immersive learning approaches, as well as new medical information technologies (see Appendix 6).

An additional challenge is emerging in the evolving balance of teaching responsibilities between residents and faculty members, and the roles for resident-led education are changing in a reactive and sometimes confusing manner. Although residents perform a substantial amount of the clinical teaching for medical students in the hospitals during the clinical years, most residents have had no formal training in teaching strategies, and there is no uniformity in their teaching skills or ability. However, despite their lack of formal training, students deeply value resident teaching, and residents understand that acquiring outstanding teaching skills is integral to their academic career development. In addition, the current trends towards an emphasis on evidence-based medicine in the clerkships and residency have inadvertently compromised the more traditional focus on the students' acquiring a deep understanding of pathophysiology and pharmacology. Compounding these issues is the fact that residents – especially non-HMS graduates – often have little identity with the medical school, with many never feeling part of the HMS community, and many residents have never even been to the HMS campus. Thus, it is important to find ways to improve the mechanisms through which residents are better able to understand their roles as clinical teachers, develop excellent teaching skills, become more fully integrated into the HMS community, and find more substantive connections with the background and expectations of their students.

It is important for Harvard Medical School to have a robust methodology in place to measure and evaluate students, teachers, and curriculum. For example, a new medical curriculum has been implemented, and we must evaluate the outcomes for students in this curriculum and compare them to the outcomes of students who were educated prior to the implementation of the new curriculum. Additionally, there is a need to move from comparative measures to outcome measures in the rigorous evaluation of the clinical training experiences and individual student performance. At present, however, the clinical curriculum is not competency-based, making it difficult to obtain outcome measures. The sole quantitative metric for medical student clinical competency is an

OSCE early in the student's 4th year. No interval assessments of student attainment of core competencies have been introduced to the Principal Clinical Experience. Additionally, the Center for Evaluation and Assessment is currently under-resourced to implement more outcome measures, or to extensively track and analyze longitudinal data and outcome measures.

Recommendations:

- Create, within the newly integrated Center for Teaching, Learning, and Assessment (described in Section 1.2 above), an expanded office of assessment and evaluation at HMS. It is necessary to bolster the current level of support for the Center for Evaluation, which is understaffed and under-resourced. There is already a high level of inherent assessment built into all the old and new clinical clerkships and initiatives in the new curriculum, but the capacity for evaluation is stretched too thin, and will need additional resources as the program is incorporated into an integrated Center. To enhance the quality of the clinical training, a more comprehensive evaluation is needed of the many recent curricular changes and their impact on educational objectives. In addition to aggregate outcomes, this invigorated and integrated Center will also become engaged in longitudinal assessment of individual students during their PCE year.
- Faculty development programs are needed to improve the faculty's ability to provide trainees with more effective feedback and evaluation. A "hub and spokes" organizational model should be considered for the Academy Center for Teaching, Learning, and Assessment (see Recommendation 1.2 above) as this structure would provide a mechanism to organize faculty development with central functions at HMS and with outreach to the clinical faculty at the teaching hospitals. Several other areas of faculty development could be similarly addressed, including mentoring and the teaching of bedside diagnosis and clinical decision-making.
- Establish through the integrated Academy Center for Teaching, Learning and Assessment – perhaps in conjunction with the undergraduate campus or Graduate School of Education – an HMS-based program in medical education research for innovation and to provide core methodological and statistical support to interested faculty medical educators.
- Develop a broadened program for implementation and assessment of new pedagogic approaches to medical education, such as medical simulation (see Appendix 6), immersive education and medical information technologies, with plans to explore these and other novel methods and new technologies for the education of medical students and clinical trainees.
- In the existing clerkship and PCE committees, target topics across clerkship experiences that can be enhanced with a common approach, such as feedback and evaluation, assessment of competencies (common assessment tools and documentation), training and support for clerkship directors (joint recruitment with clinical department chairs), enhanced integration between clinical clerkships and HMS Societies for upper-level students, improved interactions between PCE and clerkship directors, and common development and implementation of the non-experiential learning components of the clerkships.
- Enhance communication between HMS and the hospital-based educators by providing a clinical liaison (e.g., the PCE directors) who would be responsible for communicating the clinical teaching roles and responsibilities in each student clerkship to residents, fellows and faculty. The chief residents in various specialties could also be engaged to play important roles in bridging the communication gap between HMS and the hospital training experiences for students.
- Create programs to strengthen an HMS identity and sense of community for hospital-based trainees and faculty, possibly by enhancing the engagement of the HMS Academic Societies with hospital-based clinical faculty and chief residents.
- Create programs to nurture both clinical *and* scientific critical thinking that engage both hospital-affiliated and quadrangle-based faculty by expanding existing interdisciplinary seminar series (e.g., the Medical Physiology Seminars at BIDMC) that integrate problem-based analyses of clinical situations with molecular approaches to pathophysiology.
- Provide support at HMS to coordinate Harvard-wide resources for clinical trainees, possibly through creating a GME Committee. HMS should engage GME and PCE directors at the

teaching hospitals to coordinate efforts in educational innovation and communicate changes in the core medical curriculum. HMS should support a modest level of centralized functions for clinical trainees, such as a welcome reception for residents, and forums for residents and faculty on shared core competencies. HMS, while recognizing that the primary responsibility for GME programs rests with the individual hospitals, acknowledges that all residents and fellows hold Harvard appointments as “clinical fellows” and that the medical school should help play a role in their development as physicians and teachers.

RECOMMENDATION #5: Increase diversity in all aspects of HMS education

Background and rationale: Although HMS has had some success in recruiting under-represented minority medical students, the school has done less well at retaining these students as clinical trainees in HMS teaching hospitals, and poorer still in bringing these trainees onto the Harvard faculty. In graduate programs, students from under-represented minorities make up a small proportion of the applicant pool, and there is little data on the “yield” of minority graduate student candidates. Attempts to diversify the faculty have been less successful; the faculty at large remains less diverse than the student body, the “Quad-based” faculty particularly so. Over the past decade HMS has undertaken several reviews of its approach to faculty diversity. These programs have helped recruit residents and junior faculty into the affiliated hospitals, which also have independent and robust programs to foster diversity of their faculty. However, recruitment and retention of under-represented minorities in Quad-based programs remains poor.

Recommendations: In order to increase diversity in all aspects of HMS education, the SAGE proposes that HMS:

- 5.1: Consider setting *benchmarks* for increasing the numbers of women and under-represented minorities within the student, trainee, and faculty populations.
- 5.2: *Collect and analyze data* to help identify the factors that lead to the attrition of women and under-represented minority trainees between medical/graduate school and post-graduate training, and between completion of clinical or research training and appointment to the HMS faculty.
- 5.3: Identify and implement *strategies* to recruit, promote, and retain women and under-represented minorities at all levels, with a particular focus on enhancing diversity in the *senior faculty ranks and in leadership positions*.

RECOMMENDATION #6: Provide a continuum of education across Harvard Medical School, Harvard University, and the HMS teaching hospitals in basic, clinical, and translational research training

Recommendation 6.1. Expand opportunities and break down barriers to allow all Harvard students and trainees to enroll in courses throughout the University, and to allow all Harvard faculty to teach across the various schools and institutions throughout the University.

Background and rationale. Students and faculty at Harvard Medical School are increasingly engaged in programs involving their counterparts in the Faculty of Arts and Sciences and at most Schools across the Harvard University Campuses. Longstanding cross-campus departments and programs such as Biophysics and Neurosciences have more recently been joined by the Departments of Systems Biology and Stem Cell and Regenerative Biology. Students and faculty at Harvard College are excited about the prospect of increasing the number of HMS faculty who teach in Cambridge. The new undergraduate [Life Sciences courses](#) are very popular, and interest in them is growing each semester. Many of these courses are integrative and case-based, and the Harvard College students are very interested to learn science in this manner. In addition, since these Life Sciences courses often have a medical focus, HMS faculty are ideally suited to teach them. Conversely, there are many medical and graduate students at the Longwood campus who are

interested in courses in the life sciences that are offered in Cambridge by FAS faculty. Many FAS faculty do not feel equipped to teach the more advanced life sciences courses, especially those courses based on medical case studies. Clearly, there are opportunities and needs for broadened engagement of faculty on both campuses with students on both campuses.

Over the past several years, HMS has quietly encouraged faculty to teach in several initiatives at Harvard College, including the [freshman seminar program](#), the [biochemical sciences tutor program](#), and as directors of several undergraduate and graduate courses. However, HMS has not made a formal statement that teaching at Harvard College is valued. This omission is reflected in the new HMS/HSDM appointment and promotion criteria, where teaching of medical and graduate students is specifically noted, but there is no mention of teaching undergraduates. HMS faculty are increasingly involved in teaching at the Harvard Business School, and programs in global health and social medicine are increasingly involving students and faculty at the Kennedy School of Government and the Harvard School of Public Health. The newly formed School of Engineering and Applied Sciences (SEAS) provides a cornerstone for the new HMS efforts in expansion of biomedical engineering, but at SEAS as elsewhere, there are important barriers to the involvement of students and faculty in pursuing common interests in education. The challenges of “Teaching across faculty lines” have been addressed in a document issued by President Derek Bok in 2006 (Appendix 7).

There appear to be two major categories of obstacles to expanding the involvement of HMS faculty in teaching across the University. First, such logistical obstacles as time for teaching, distance and travel time, and information about teaching opportunities are problematic. Second, there is the larger problem that HMS has not yet developed a “culture of teaching.” Within the second category of obstacles is the uncertainty about the value (departmental and institutional “credit”) HMS places on teaching Harvard undergraduates.

Recommendations. HMS should make a strong statement encouraging increased involvement of HMS faculty in teaching across the University, with a particular focus on the potential for enhancing programs in undergraduate education. Importantly, these initiatives cannot come at the expense of HMS-based educational programs for the local core constituencies of medical and graduate students and postdoctoral trainees. Rather, the “culture of teaching and learning” at HMS needs to change so that, at all levels, more faculty members become involved in substantial teaching, and their teaching is more highly valued and rewarded.

The Working Group on the Continuum of Education would be the appropriate body to consider mechanisms to facilitate and implement increased teaching by HMS faculty members across the University, including Harvard College undergraduates. Potential areas of focus could include:

- Construction of cross-campus classrooms suitable for delivery of joint courses between the Cambridge and Longwood campuses. Because of the intricacies of fostering discussion when students and faculty are not in the same room, it is essential that technology for these classrooms is state-of-the-art (see documents reviewing the considerations of HMS-FAS cross-campus classrooms posted on the [SAGE Wiki](#)). The technology must go beyond normal teleconferencing technology and allow for real-time audio and visual mixing, as well as the sharing of documents, data and programs. It will also be necessary for an AV technician to attend all classes in order to streamline this process. The new Northwest Building in Cambridge will have the appropriate technology to implement these cross-campus classes. This should also be an important part of the development of Allston. A room in the Countway Library is already equipped in this manner, and is currently being used to deliver a Longwood/Cambridge-based course for graduate and undergraduate students. However, to implement this recommendation in an optimal manner, HMS will need to develop new classrooms with optimal cross-campus capabilities as well as other advanced educational technologies.
- Consideration of explicit policies to value and reward undergraduate teaching by HMS faculty members, in the context of broader discussions about establishing and nurturing the culture

of teaching and learning at HMS. It is the unanimous and strong opinion of the Strategic Advisory Group on Education that teaching undergraduates, like teaching medical and graduate students, should be much more highly valued than it currently is at HMS, and that faculty should receive “credit” for undergraduate teaching as they do for medical and graduate student teaching. For clinical faculty, this “credit” may need to include compensation for time taken out of their clinical practice. One underlying question is whether teaching undergraduates should be valued as highly as teaching medical and graduate students. The question of whether teaching undergraduates should be formally included in the new HMS/HSDM appointment and promotion criteria will need to be considered carefully by the Working Group on the Continuum of Education.

- Design of courses that are suitable both for advanced Harvard College undergraduates and for Harvard graduate students in Cambridge and at HMS. Some such courses could include hands-on experience courses or “boot camp”-type courses over the summer or during the January term, which may fit into the schedules of HMS faculty members better than fall or spring half-courses.
- Exploration of means to coordinate the medical student and graduate student course calendars to permit cross-registration in courses across HMS and the University.

Recommendation 6.2: Enhance coordination of the continuum of education and of existing and future Harvard Medical School Masters Programs through the Harvard Clinical and Translational Science Center.

Background and rationale. The Strategic Advisory Group on Education has reviewed the existing and planned Harvard programs in clinical and translational sciences, and we append the Education and Training section of the Harvard Clinical and Translational Science Award (CTSA) application to this report (Appendix 4). In brief, this application proposes the creation of a Clinical and Translational Research Education Program (CTREP) within the Harvard Clinical and Translational Science Center (CTSC). CTREP would be organized through an Education and Training Executive Committee (ETEC) that would bring together (i) directors of the various clinical and translational research education programs throughout the Harvard system and (ii) directors of clinical and translational studies at HMS and the academic health centers who could guide trainees in those programs to the optimal research training opportunities. In the aggregate, the research education programs encompassed within CTREP would involve Harvard College undergraduates, HMS medical and graduate students, HMS clinical and research fellows, and HMS junior faculty.

Recommendations. As described in the appended Education and Training section of the Harvard CTSA application, we strongly recommend making research education opportunities and laboratory and clinical research opportunities throughout the University available to all interested trainees at all levels from undergraduates through faculty. This important goal will be facilitated by the creation of the proposed infrastructure for the CTSC research education programs, including the CTREP and ETEC functions summarized above and the CTSC CONNECTS web portal that will support the CTREP program directors.

We also recommend expanding the capacity at HMS for graduate (PhD) and Masters (post-MD) students to take greater advantage of each others’ courses and to work productively together in those courses—for example, in small-group projects with both cohorts of students represented in each small group. These types of educational activities have been welcomed by both groups of students when they have been made available, but course scheduling and other logistical obstacles have unfortunately prevented wide application of these opportunities to date.

Recommendation 6.3: Expand support programs for *postdoctoral trainees* in coordination with HMS affiliates, including career guidance, community building, and scientific writing, and open the [Harvard Office of Career Services](#) to HMS postdoctoral trainees and graduate students.

Background and rationale. Until recently, the prevailing institutional attitude at HMS and the affiliated institutions has been that postdoctoral trainees should focus exclusively on their research and that the principal investigators are solely responsible for training their own postdoctoral fellows. Consequently, there has been little oversight of postdoctoral training at HMS, and postdoctoral trainees have had educational experiences at HMS that vary from outstanding to poor. This situation has stymied development of initiatives to assist postdoctoral fellows in career development.

The postdoctoral offices at HMS/HSDM and the academic health centers have begun to address these issues. The HMS/HSDM postdoctoral office is currently developing a core curriculum for postdoctoral trainees. The core curriculum is in the process of being completed and will hopefully be launched in the fall of 2008. This curriculum is currently envisioned to include six modules on the following topics:

- Academic job search essentials
- “Beyond the Bench” career development
- Lab management essentials
- Finding funding/grant writing
- Communicating science (i.e., writing articles, giving presentations, going through the grant and manuscript revision process)
- Ethics and research compliance

The postdoctoral offices have also begun to consider the implementation of additional career- and professional-development opportunities for postdoctoral trainees, such as formalized offer letters, standardized benefits packages, and ESL courses. In the past, it has been noted that demand starts high for ESL courses but then dwindles throughout the term. Nonetheless, because ESL courses can be of great benefit to both the postdoctoral trainees and their faculty mentors, such courses need to be available. Currently, postdoctoral trainees are able to take ESL courses through the Harvard Extension School using the employee tuition assistance program.

Recommendations. First, Harvard Medical School should make a strong statement on the importance of career- and professional-development for postdoctoral trainees. Both postdoctoral trainees and faculty would benefit from the development of written policies standardizing Harvard Medical School postdoctoral offer letters and benefits. A core curriculum for postdoctoral trainees should be developed, and some components of the core curriculum should be mandatory.

Second, Harvard Medical School should work with Harvard University to open the Harvard Office of Career Services to postdoctoral trainees and graduate students at HMS. This collaboration could involve sharing of resources and/or opening of a satellite office at the Longwood campus.

Third, resources should be made available to help postdoctoral trainees become better teachers. Not only do many postdoctoral fellows enjoy teaching, but teaching experience also helps them on the job market. Postdoctoral fellows who teach in Cambridge are often provided with training through the Bok Center, but such opportunities and resources should be enhanced and developed at HMS as well. The Working Group on the Continuum of Education should discuss with the Working Group on Graduate Education ways in which this recommendation can be implemented.

Fourth, we do not recommend that the HMS postdoctoral office should take over postdoctoral affairs at the affiliated hospitals. While postdoctoral trainees at the hospitals receive appointments from HMS, they are not paid through HMS. Additionally, many of the affiliated hospitals already have good, or developing, internal postdoctoral offices. Finally, there are simply too many postdoctoral trainees at the hospitals for one office to oversee. Rather, HMS should take a leading role in developing programs for postdoctoral trainees that the hospitals can use as potential models for their own programs.

Fifth, HMS should provide sufficient funding for the HMS postdoctoral office to establish and retain staffing at an adequate level. It has been the experience at local institutions (e.g., [Brigham](#)

[and Women's Hospital Office for Postdoctoral and Research Careers](#)) that the postdoctoral office did not become effective until it was given adequate resources to carry out its mission.

Recommendation 6.4: Increase engagement of HMS in all aspects of *global and community health*, including local and distance education programs.

Recommendation 6.5: Create *HMS-based inter-school programs* in global health and social medicine with HSPH, KSG, HBS (and others), potentially leading to the *MMSc degree* in global health and social medicine.

Recommendation 6.6: Develop *collaborative educational and research programs* with international partners to develop leadership in global health issues, and rigorously assess the educational and research content of current and future international programs.

Background and rationale: In the process of creating the Medicine in Society Concentration (see Appendix 1), the SAGE proposes to integrate and oversee the educational activities at HMS and its teaching hospitals that involve international students, scholars, and visiting faculty. Academic leaders in global health at HMS should do more to encourage the professional growth of interested and capable international scientists and clinicians. Although the current system at HMS is often ad hoc and poorly coordinated, an example of a well-designed and robust program for international exchange is the new HMS-Portugal Alliance in Biomedical Research and Education. In general, more administrative resources should be provided to HMS faculty willing to engage in international educational activities. Specific emphasis should be placed on creating more substantive opportunities for international colleagues to pursue courses of academic study at HMS and its teaching hospitals. A complementary goal is to foster *collaborative educational and research programs* with international partners to enhance global health and develop leadership in global health issues at HMS and with international (and community) partners.

Recommendations: The SAGE concurs with the Strategic Planning Group for Global Health in its recommendations for enhanced programs for education in global health. *Recommendations from the Global Health Strategic Planning Group are extracted and/or paraphrased in the paragraphs below.* Both the SAGE and the Global Health Strategic Planning Group strongly advocate for more integration and expansion of the educational activities at HMS that broadly relate to global health for medical students, graduate students, and clinical fellows. Examples of such activity might include:

- Through the Medicine in Society Concentration, and in collaboration with the [Department of Global Health and Social Medicine](#), establish a *central global health clearinghouse* at HMS for all research projects and global health experiences for trainees with an emphasis on quality control in terms of site and mentor selection. An accountable administrative entity could verify and validate student activities abroad, and a primary goal might include formalizing and streamlining processes for advising students and faculty. This advising structure would be a key activity of the Director of the Medicine in Society concentration and affiliated advisers. To encourage as much academic rigor as possible in student experiences abroad, the Medicine in Society concentration will review and update the scholarly requirements for all HMS-sponsored student activities involving travel to international sites as part of the scholarly project requirement.
- Provide *free web-based content from HMS* courses and curriculum – including CME and related resources – to the world. The SAGE strongly encourages the rapid investment in and upgrading of available information technologies and support systems in order to effectively establish direct, consistent, and coordinated communication with current and possible international and community collaborators and students across the educational and research spectrum. It will be necessary to identify the resources that are needed to realize this goal.
- As part of the Medicine in Society concentration, establish an *advanced curriculum for interested students and trainees* that offers a more comprehensive examination of global health issues across the biological, clinical, translational, and social sciences. This curriculum might take the form of more detailed courses in 1) biological science of infectious disease; 2) social science methodologies used to examine the distribution and utilization of

health care in regions facing severe resource constraints; 3) policy analysis of large-scale multi-lateral initiatives to reduce the burden of infectious diseases, 4) ethical analysis of strategies to conduct research on vulnerable global populations and/or strategies to deliver cost-effective health care to the world's most impoverished populations. Faculty members with relevant expertise would be invited to participate in curriculum development and would be credited for the same. This advanced curriculum could serve as a foundational course for more in-depth scholarly study at the advanced degree level (MMSc/MPH/MBA/PhD).

- The *New Pathway Investigator Program* will include a “global health track” for medical students involving (1) selective course work in an advanced global health curriculum, (2) identification of faculty mentors at an early stage who can supervise substantial field-site study during medical school, and (3) a scholarly thesis in basic, clinical, translational, or social science on a topic in global health. As described under the “New Pathway Investigator Program” above, these activities could lead to a MMSc degree in Global Health. HMS should take a leadership position at the national level in designing and validating such a new track.
- In conjunction with the teaching hospitals, HMS should encourage further development of a “global health track” for its graduate medical students. This track could be modeled on the exemplary [BWH Global Health Equity Program](#) and/or similar tracks now offered at competitive institutions such as UCSF, the University of Washington, and the University of Pennsylvania.
- Create a Global Health Scholars Program that would attract applicant students, fellows, and faculty from abroad who seek to acquire skill in research that they can then take back to their home countries. Such scholars could be selected based on the merit of their proposed course of study, and be paired prior to arrival with faculty mentors in the biological, clinical, translational, or social sciences depending upon their field of interest.
- Create or expand “short-course” field-based educational programs that take advantage of existing or newly created collaborations in partnering countries/institutions. HMS faculty should be encouraged to and supported for travel to academically resource-poor settings in order to conduct intensive courses (on basic science, research methodologies, clinical practice, health care disparities research, research ethics, etc.) for interested local scientists, clinicians, and students. A model for such programs could be extracted from the highly successful “nanocourses” developed in the BBS graduate program.
- Establish new academic career paradigms and/or identifying creative ways to support faculty who are interested in working full-time or substantially part-time overseas, when such faculty are able to continue to substantially contribute to the academic mission of the Medical School. The Subcommittee also recommends finding new ways to support faculty interested in sabbaticals to gain expertise in global-health related research.

Recommendation 6.7: Support educational infrastructure needs and make investments that will enable HMS to become a leader in the development, application, and assessment of new medical education technologies. Infrastructure needs include modernization of the TMEC and Armenise Amphitheaters and an increase in the number of classrooms. State-of-the-art educational programs for graduate students and medical students include development of simulation technologies, construction of electronic cross-campus classrooms, and expansion of a Harvard-wide electronic information portal for educational opportunities throughout Harvard and beyond.

Background and rationale. Optimal delivery of educational opportunities to Harvard medical students, graduate students, undergraduate students, postdoctoral trainees, and junior faculty will require the development and implementation of new educational infrastructure throughout Harvard Medical School, the HMS-affiliated institutions, and Harvard University. The number of classrooms is insufficient to support any programmatic expansion, and the technologies available in current classrooms are outdated. Significant investments are required to enable HMS to become a leader in the *development, application, and assessment of new medical education technologies*.

Recommendations. HMS needs to explore in greater depth the types of classroom(s) and other resources that would optimize the ability of HMS faculty to teach undergraduate and graduate students in Cambridge as well as medical students and advanced trainees and junior faculty throughout the Harvard system. The School should consider topics such as teaching in large- and small-group settings, the optimal number of rooms, and the technological capabilities of the rooms, among other considerations, up to and including the possibility of creating a new education center at HMS with expanded and technologically enhanced classroom spaces (see cost analysis and design considerations for state-of-the-art electronic classrooms posted on the [SAGE Wiki](#)).

At a minimum, greater availability of state-of-the-art, cross-campus classrooms would greatly facilitate the ability of HMS faculty to teach undergraduate and graduate students in Cambridge. HMS and Harvard University should work together to develop classrooms to facilitate cross-campus teaching. These classrooms need to be outfitted beyond the normal teleconferencing technology to allow real discourse and discussion, in real time, across the two classrooms. Additionally, an experienced AV technician needs to be present in each class, in order to provide real-time audio- and video-streaming and make the process as seamless as possible.

Second, educational calendars and schedules should be reconciled to the maximum possible extent in order to allow undergraduate students, medical students, PhD students, and Masters students to take greater advantage of each others' courses and to work productively together. As noted above, one successful model of joint course work could involve small-group projects in which several different cohorts of students (e.g., PhD students and post-MD Masters students) are represented in each small group.

Third, research education opportunities and laboratory/clinical research opportunities throughout the University should be made transparent to all interested trainees at all levels from undergraduates through faculty. The electronic CONNECTS infrastructure being developed through the Harvard Clinical and Translational Science Center (see Appendix 4) should facilitate this and should be supported by HMS. In addition, the multiple electronic formats and platforms currently used to support course and program websites throughout the Harvard system should be made more accessible (ideally, transparent) to one another, so that students and advisors can consider the full range of Harvard educational offerings as they are planning their academic programs. Electronic connectivity to enable simulcasting of lectures and seminars, video capturing of nanocourses, etc. should be encouraged and supported. Venues for high tech videoconferencing should include the Cannon Room and Folin-Wu Room in Building C; TMEC 227; and the TMEC Amphitheater.

Finally, a thorough rehabilitation and modernization of the Tosteson Medical Education Center should be undertaken. Many of the classrooms in this prime teaching venue require extensive physical renovation, and the educational technologies available in nearly all of these rooms are quite outdated. Considerable investment will be required to transform the TMEC into a state-of-the-art education center, and the development, implementation, and assessment of medical simulation and other educational technologies must be viewed as a priority. Both the TMEC Amphitheatre and the Armenise Auditorium are in need of significant renovation and technological updating. Currently, the scheduling of medical student and graduate student classes is problematic because there are not enough classrooms; a thorough assessment of the number of classrooms needed for medical and graduate education should be undertaken, and plans made for the development of additional teaching space. State-of-the-art educational programs for graduate students and medical students include development of simulation technologies; construction of electronic cross-campus classrooms; and expansion of a Harvard-wide electronic information portal for educational opportunities throughout Harvard and beyond.

The SAGE proposes partnering with the HMS and Harvard University Development Offices to identify *fund-raising strategies* that will support these goals, including but not limited to:

- Costs of the implementation of the Scholarly Project Requirement and the New Pathway Investigator Program
- Costs of expanding the MD-PhD program
- Moneys needed for medical student debt relief
- Expenses for improvements to educational infrastructure
- Costs of developing and supporting a new integrated Center for Teaching, Learning and Assessment, as well as costs for establishing the Program in Graduate Education.
- Expenses of expanding educational programs in global health and social medicine.

Members of the Strategic Advisory Group for Education

Lead: Thomas Michel

Co-Lead: Orah Platt

Subcommittee 1: “Education of physician-investigators and scholarly physicians, including the structure and role of the MD education programs and the MD-PhD programs”

Co-chairs: Stephen Blacklow and David E. Cohen

Members: Nancy Oriol, Orah Platt, Mark Zeidel

Subcommittee 2: “Bringing HMS Education to the world, including continuing medical education, and bringing the world to HMS”

Co-chairs: Sanjiv Chopra and Jim Kim

Members: Denny Ausiello, David Cardozo, Nancy Kane.

Subcommittee 3: “The continuum of education across the university, including basic, clinical, and translational research training”

Chair: David Golan

Members: Bruce Bean, Julie Buring, Connie Cepko, Randy King, David Knipe, Robert Lue, Terry Maratos-Flier, Davie Van Vactor, Fred Winston

Subcommittee 4: “Education at the HMS-affiliated hospitals, including medical student education and residency training”

Chair: Bruce Levy

Members: Gene Beresin, Jules Dienstag, Richard Schwartzstein, Gordon Strewler, Debra Weinstein

Subcommittee 5: “Mentoring and faculty development of educators, and enhancement of a culture of teaching at HMS”

Chair: Elio Raviola

Members: Dan Federman, Charles Hatem, Peter Howley, Haiden Huskamp, Tom Roberts

APPENDICES (available on request):

Appendix 1: In-depth scholarly project/NPIP proposal

Appendix 2: Elio Raviola's analysis of teaching at HMS

Appendix 3: David Golan's description of the Bok Center

Appendix 4: Education section of the CTSA application

Appendix 5: Nina Zipser and Lisa Mincieli's description of approaches to debt relief (in preparation)

Appendix 6: James Gordon paper on medical simulation

Appendix 7: Derek Bok's 2006 document on "Teaching across faculty lines"

Appendix 8: Nancy Oriol paper on immersive education

Many other relevant documents are posted on the [SAGE Wiki](https://wiki.med.harvard.edu/StrategicPlanning/EducationTeam), which can be found at <https://wiki.med.harvard.edu/StrategicPlanning/EducationTeam>, or by clicking on the hyperlinks embedded in the text.