Guidelines on Learning that Inform Teaching at MIT
The Teaching and Learning Laboratory at MIT

The staff of the Teaching and Learning Lab at MIT is available to assist faculty and graduate student instructors in all aspects of the teaching and learning process.

TLL collaborates with MIT faculty, teaching assistants, and students to promote excellence in teaching and learning throughout the Institute. Our work contributes to MIT’s commitment to educational innovation and its standing as a leader in science and engineering education.

TLL provides a comprehensive range of programs and services to improve the quality of instruction at MIT. We collaborate with faculty, teaching assistants, and other instructional staff in a variety of settings to enhance classroom instruction and create innovative pedagogy and curricula. We work with individuals, faculty and student committees, and entire departments. TLL staff members also teach semester-long courses for graduate students who are interested in teaching at the college level.

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Introduction
The mission of MIT is to advance knowledge and educate students in science, technology, and other areas of scholarship that will best serve the nation and the world in the 21st century. The Institute is committed to generating, disseminating, and preserving knowledge, and to working with others to bring this knowledge to bear on the world’s great challenges.

In its report, the 2006 Task Force on the Undergraduate Educational Commons highlighted five major themes intended to capture the spirit of the education desired MIT:

1. a persistent passion for learning
2. intellectual diversity
3. an innovative approach to core knowledge
4. collaborative learning
5. education for responsible leadership

The goal of this handbook is to support members of the MIT teaching community as they work to foster this spirit of education at MIT.

Overview of the Handbook
The guidelines presented in this handbook are organized in five broad categories:

1. engaging students in learning
2. contextualizing students’ learning experiences
3. creating an inclusive learning and teaching experience
4. designing an engaging, contextualized and inclusive curriculum
5. teaching an engaging, contextualized and inclusive curriculum.

Each guideline is based on a survey of the literature in higher education and student learning. Within each category are relevant quotations from the literature, as well as a more comprehensive reference list. As is true for any research field, there is debate in the literature from which these guidelines have been drawn. The guidelines presented here are in agreement with key concepts that underpin accepted principles of learning. Not every guideline will be relevant and applicable to all learning and teaching situations at MIT.

Additional Information
For additional information about any aspect of the Guidelines on Learning that Inform Teaching, or for any other question regarding teaching and learning at MIT please contact the Teaching and Learning Laboratory at:

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Acknowledgement: This handbook is an adaptation of the University of New South Wales’ – Guidelines on Learning and its associated Toolkit. The UNSW Guidelines and Toolkit were originally conceived by Adrian Lee, then the Pro Vice Chancellor (Education & Quality Improvement) at UNSW and Michele Scoufis, Director of the UNSW Learning and Teaching Unit with considerable help from the UNSW Committee on Education and the Staff of the LTU. The Teaching and Learning Lab at MIT is grateful to the authors and UNSW for allowing TLL to base this handbook on the UNSW Guidelines for Learning, and Toolkit.
Effective learning is supported when students are actively engaged in the learning process.

Analysis of the literature suggests that students must do more than just listen: they must read, write, discuss, or be engaged in solving problems. Most important, to be actively involved, students must engage in higher-order thinking tasks such as analysis, synthesis, and evaluation.


Learning is not a spectator sport. Students do not learn much by just sitting in classes listening to teachers, memorizing pre-packaged assignments, and spitting out answers. They must talk about what they are learning, write about it, relate it to past experiences and apply it to their daily lives. They must make what they learn part of themselves.


Additional references


2. Effective learning is supported by a climate of inquiry where students feel appropriately challenged and activities are linked to research and scholarship.

A frequently stated benefit of research is the enthusiasm for their discipline/research that some lecturers convey when they refer to their own work, and the positive impacts on students’ motivation to learn.


Students asked to perform research activities in their assignments have expressed surprise and excitement at the challenge of doing something different from a conventional assignment; at the same time, they reported that the work was stimulating and enjoyable.


Additional references


Jenkins, A., Designing a Curriculum that Values a Research-based Approach to Student Learning, LTSN Generic Center, York (2002).


3. Activities that are interesting and challenging, but which also create opportunities for students to have fun, can enhance the learning experience.


Additional reference


4. Structured occasions for reflection allow students to explore their experiences, challenge current beliefs, and develop new practices and understandings.

Students require a variety of learning situations and opportunities in order to be aware of and reflect on…variation, and to be able to make fine distinctions about the significant aspects of each new context. By identifying the differences between similar situations, the student is better able to respond appropriately. Such learning experiences are an important preparation for the unpredictable nature of the workplace.


Awareness and reflection are not merely symptoms of developments in learners, they bring about the developments. It is through engaging students in reflecting upon the process and outcomes of their studying that progress is made. Gibbs, G., Teaching Students to Learn: A Student-Centered Approach, The Open University Press, Milton Keynes, p. 91 (1981).

Additional references


Contextualizing students’ learning experiences

chapter II

5. Learning is more effective when students’ prior experience and knowledge are recognized and built on.

Learners construct meaning out of their prior understanding. Any new learning must, in some fashion, connect with what learners already know...learners construct their sense of the world by applying their old understanding to new experiences and ideas.


http://www.carnegiefoundation.org/pub/sub.asp?key=452&subkey=618

Effective teaching supports positive transfer by actively identifying the relevant knowledge and strengths that students bring to a learning situation and building on them.


If I had to reduce all of educational psychology to just one principle, I would say this: the most important single factor influencing learning is what the learner already knows.


Additional references


6. Students become more engaged in the learning process if they can see the relevance of their studies to professional, disciplinary and/or personal contexts.

When our interest is aroused in something, whether it is an academic subject or a hobby, we enjoy working hard at it. We come to feel that we can in some way own it and use it to make sense of the world around us… And this is even more likely if an explanation is added as to why the particular method or fact that has to be learned will be useful in the future.

Learning is essentially a matter of creating meaning from the real activities of daily living. By embedding subject matter in the ongoing experiences of the learners and by creating opportunities for learners to live subject matter in the context of real-world challenges, knowledge is acquired and learning transfers from the classroom to the realm of practice.

7. If dialogue is encouraged between students and teachers and among students (in and out of class), thus creating a community of learners, student motivation and engagement can be increased.

Knowing a few faculty members well enhances students’ intellectual commitment and encourages them to think about their own values and future plans.

Additional references


http://www.newhorizons.org/lifelong/higher_ed/marchese.htm
Unlike a more traditional approach to instruction, learning communities foster the social construction of knowledge, cooperative learning, active learning, an emphasis on integration and synthesis of diverse student perspectives, as well as student-student, student-staff, and staff-staff collaboration.


When asked to rate courses they take, students often give the most rigorous and demanding classes their highest ratings. Yet from the interviews a fascinating observation emerges about certain faculty members whom students identify as having had an especially powerful influence on their thinking and on their lives. The faculty members who had an especially big impact are those who helped students make connections between a serious curriculum, on the one hand, and the students’ personal lives, values, and experiences, on the other.


**Additional references**


8. The educational experiences of all students are enhanced when the diversity of their experiences are acknowledged, valued, and drawn on in learning and teaching approaches and activities.

A racially and ethnically diverse university student body has far-ranging and significant benefits for all students, non-minorities and minorities alike.

http://www.vpcomm.umich.edu/admissions/legal/expert/gurintoc.html

There is considerable evidence that higher education’s effort to address diversity issues on campus and in the curriculum are fostering intellectual development, cultural knowledge, and interracial understanding among college students.


The admission of a more racially/ethnically diverse student body is an important starting point in realizing this vision. Classroom diversity, diversity programming, opportunities for interaction, and learning across diverse groups of students in the college environment now constitute important initiatives to enhance the education of all students. The results of this research not only support the curricular initiatives that introduce diversity into college courses, but also suggest that more attention should be given to the types of experiences student have with diverse peers inside and outside the classroom. Both the theory and findings indicate that individual students benefit when they are engaged with diverse peers; however, as a society we have provided no template for interaction across racial/ethnic groups and such interaction cannot be taken for granted in a college environment. Helping faculty develop a pedagogy that makes the most of the diverse perspectives and student backgrounds in their classrooms can foster active thinking, intellectual engagement, and democratic participation.

9. Students learn in different ways and their learning can be better supported by the use of multiple teaching methods and modes of instruction (visual, auditory, kinaesthetic, and read/write).

There are many roads to learning. People bring different talents and styles of learning to college. Brilliant students in the seminar room may be all thumbs in the lab or art studio. Students rich in hands-on experience may not do so well with theory. Students need the opportunity to show their talents and learn in ways that work for them. Then they can be pushed to learn in new ways that do not come so easily.


A better understanding of learning styles can benefit not only educators, but also their students. Students benefit by using knowledge about their particular learning style to better manage their learning.


http://www.west.asu.edu/nlii/design.htm

[Courses] should take into consideration diverse ways of learning (visual representation, auditory, kinaesthetic) and use diverse methods of reaching varied learners.


http://www.west.asu.edu/nlii/design.htm
Additional references


10. Clearly articulated expectations, goals, learning outcomes, and course requirements increase student motivation and improve learning.

Well-expressed statements of intended learning outcomes help students to identify their own targets, and work systematically towards demonstrating their achievement of these targets.


It is indisputable that, from the students' perspective, clear standards and goals are a vitally important element of an effective educational experience. Lack of clarity on these points is almost always associated with negative evaluations, learning difficulties, and poor performance.


Students need to be on the inside of the logic of the course, believing in its rationale, not tagging along, feeling bewildered and jumping through hoops.


Additional references


11. When students are encouraged to take responsibility for their own learning, they are more likely to develop higher-order thinking skills such as analysis, synthesis, and evaluation.

Students learn well when they take responsibility for their learning.


Self-regulated learners...are distinguished by their view of academic learning as something they do for themselves, rather than something that is done to or for them.


12. Graduate attributes – the qualities and skills the university hopes its students will develop as a result of their university studies – are most effectively acquired in a disciplinary context.

The development, practice and assessment of (graduate attributes) are most effectively achieved within the context of disciplinary knowledge.


http://www.clt.uts.edu.au/ATN.grad.cap.project.index.html

...engineers in 2020 who will remain well grounded in the basics of mathematics and science, and who will expand their vision of design through a solid grounding in the humanities, social sciences, and economics. Emphasis on the creative process will allow more effective leadership in the development and application of next-generation technologies to problems of the future.


http://books.nap.edu/catalog.php?record_id=10999#toc
Additional references


Learning can be enhanced and independent learning skills developed through appropriate use of information and communication technologies. The most effective uses of technology supported teaching are possible when underpinned by student centered teaching practices that encourage students to adopt a deep approach to learning.


Technological resources can ask for different methods of learning through powerful visuals and well-organized print; through direct, vicarious, and virtual experiences; and through tasks requiring analysis, synthesis, and evaluation, with applications to real-life situations. They can encourage self-reflection and self-evaluation. They can drive collaboration and group problem solving. Technologies can help students learn in ways they find most effective and broaden their repertoires for learning. They can supply structure for students who need it and leave assignments more open-ended for students who don’t. …students can move quickly through materials they master easily and go on to more difficult tasks; [or they] can take more time and get more feedback and direct help from teachers and fellow students. Aided by technologies, students with similar motives and talents can work in cohort study groups without constraints of time and place.


Additional references


http://www.tltgroup.org/resources/flashlight/askingrightquestion.htm
Learning cooperatively with peers – rather than in an individualistic or competitive way – may help students to develop interpersonal, professional, and cognitive skills to a higher level.

Learning is enhanced when it is more like a team effort than a solo race. Good learning, like good work, is collaborative and social, not competitive and isolated. Working with others often increases involvement in learning. Sharing one’s own ideas and responding to others’ reactions sharpens thinking and deepens understanding.


The critical attributes of cooperative learning, a more structured form of collaborative learning, are: positive interdependence, individual accountability, appropriate grouping, group processing, and social skills. The teacher serves as a facilitator, rather than as an authority figure. Cooperative-learning techniques supplement, rather than replace, traditional approaches in the classroom, but their adoption requires a student-centered, noncompetitive approach to learning.


The research on cooperative learning is extensive and compelling. Based on this research record, with its theoretical foundation, the confidence that college instructors have in the effectiveness of cooperative-learning procedures should be elevated. Furthermore, the research on cooperative learning has a validity and broad applicability rarely found in the educational literature. It has been conducted over eight decades by numerous researchers with markedly different orientations working in a variety of different colleges and countries.


Additional references


Effective learning is facilitated by assessment practices and other student learning activities that are designed to support the achievement of desired learning outcomes.

The key is that the components in the teaching system, especially the teaching methods used and the assessment tasks, are aligned to the learning activities assumed in the intended outcomes. The learner is in a sense “trapped”, and finds it difficult to escape without learning what is intended and should be learned.


Assessment directly contributes to learning both by clarifying what is desirable or required and by closing a feedback loop between students’ learning efforts and their achievements. Telling students what is required will assist them to direct their learning efforts.


To improve their effectiveness, teachers need first to make their goals and objectives explicit and then to get specific, comprehensible feedback on the extent to which they are achieving those goals and objectives... thoughtful assessment methods can reinforce student learning in three ways: by focusing student attention on the most important elements of the course; by providing additional practice in valuable learning and thinking skills; and by training students to become more self-aware, self-assessing, independent learners.


Additional references


Guidelines on Learning

Studies of adaptive expertise, learning, transfer, and early development show that feedback is extremely important (see Chapters 2, 3, and 4). Students’ thinking must be made visible (through discussions, papers, or tests), and feedback must be provided. Given the goal of learning with understanding, assessments and feedback must focus on understanding, and not only on memory for procedures or facts. Opportunities for feedback should occur continuously, but not intrusively, as a part of instruction. Effective teachers continually attempt to learn about their students’ thinking and understanding.


Additional references


16. Meaningful and timely feedback to students improves learning.

Knowing what you know and don’t know focuses learning. Students need appropriate feedback on performance to benefit from courses. When getting started, students need help in assessing existing knowledge and competence. In classes, students need frequent opportunities to perform and receive suggestions for improvement. At various points during college, and at the end, students need chances to reflect on what they have learned, what they still need to know, and how to assess themselves.

