

Instruction Program for the Engineering and Science Libraries

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Instruction Program for the Engineering and Science Libraries

MISSION STATEMENT:

The Instruction Program in the Engineering and Science Libraries supports the mission of the MIT Libraries to develop “strategies and systems that promote discovery and facilitate worldwide scholarly communication”¹. Engineering and Science Libraries staff will accomplish this by working with faculty and others to provide the MIT community with the skills they need for scholarly research and communication at MIT and beyond.²

CONTEXT:

- The Engineering and Science Libraries (ESL) provide services and resources to support more than 70% of the MIT community. The ESL instruction program will shape how we guide our users in making effective use of scientific and engineering information and how we teach about the world of scholarly communication in science and engineering disciplines.
- Our goal in providing instructional programs is both to raise awareness of the vast array of resources available and guide our users in becoming more effective and efficient users of research-related information, enabling them to become better researchers in their fields of study.
- Electronic resources are increasingly preferred by users of science and engineering information. Advances in web searching have created alternative search paths outside library-provided resources and further complicate the process of choosing where to begin a search.
- Evaluating the resources found and determining their worth in scholarly research are skills many students in our community lack, as evidenced by anecdotal conversations with our faculty.
- Instruction efforts should respond to the variety of learning styles and techniques used by our community, whether instruction is virtual or in person.
- Limitations on time and resources are a continuing struggle for library staff in this endeavor. It will take cooperation of all ESL staff for this program to succeed. We will need to choose our focus wisely and target those areas where we feel we can be most effective.
- We want to reassure our users that they do not have to know everything. We want to provide them with clear expectations of what they can expect from us and what we should be able to expect from them.
- This plan must be sustainable. Strategies should be created to address sustainability, such as “train the trainers” programs.

¹ MIT Libraries Mission Statement, October 2003

² ACRL Information Literacy Standards for Higher Education - <http://www.ala.org/ala/acrl/acrlstandards/informationliteracycompetency.htm>

Information Literacy Standards for Science and Technology (ALA/ACRL/STS) - <http://www.ala.org/ala/acrl/acrlstandards/infolitscitech.htm>

USER POPULATIONS SERVED BY THE ENGINEERING AND SCIENCE LIBRARIES:

- **Undergraduate students:**

Including students majoring in the School of Engineering (approximately 1700 students or 43% of the total), the School of Science (approximately 870 students or 25% of the total), and students taking General Institute Requirements in science, mathematics and engineering.

- **Graduate students:**

Including students enrolled in the School of Engineering (approximately 2700 students or 45% of the total) and the School of Science (approximately 1100 students or 18% of the total).

- **Faculty and Instructors:**

Including the School of Engineering (approximately 350 members or 35% of the total) and the School of Science (approximately 270 members or 28% of the total).

- **Post-doctoral and related researchers:**

Including staff employed by the Schools of Engineering and Science, and many interdisciplinary centers and laboratories across campus (approximately 1000 total).

- **Administrative staff:**

Including staff employed by the Schools of Engineering and Science, and many interdisciplinary centers and laboratories across campus

Statistics provided by the Office of the Provost Institutional Research.³

³ <http://web.mit.edu/ir/pop/index.html>

SKILLS AND KNOWLEDGE NEEDED:

Members of the community served by ESL need to develop skills and knowledge in several key areas: these areas can be grouped into four (sometimes overlapping) themes. Different levels of knowledge in each of these themes would be expected at different stages of a scholarly career. After the ESL instruction program has been in place for two years, we will use what we have learned to determine what levels of knowledge are necessary for success at each stage. See Appendix I for more details.

- Discovery – the art of gathering and finding information
 - Tools
 - Techniques
 - Services
 - The Information Universe/Big Picture
- Evaluation
- Management
- Communication

CURRENT STATUS OF INSTRUCTION IN ESL:

Instruction efforts for the Engineering and Science Libraries have grown over the past few years.

The following table represents the total number of sessions and attendees for ESL in the past three years, as reported to the Association of Research Libraries (ARL). However, these numbers include special events, orientations, and other activities that are not considered "instruction" for the purposes of this document:

<u>YEAR</u>	<u>SESSIONS</u>	<u>ATTENDEES</u>
2002/03	137	4022
2003/04	182	3920
2004/05	150	4206

- **Undergraduate students:**

Subject specialists, working with faculty, have been able to include information seeking skills into course curricula or into one-shot sessions taught by a librarian. Successful courses include (but are not limited to) 9.00, 12.000, 2.009, 5.32, and 10.26 (see Appendix II for a full list of courses with ESL involvement). The Engineering and Science Libraries have increased instruction involvement in some academic courses such as Course 2 (Mechanical Engineering), 5 (Chemistry), and 10 (Chemical Engineering) while other departments have relatively little library contact. Collaborating with our colleagues in the Humanities Library, we have begun teaching in writing courses such as Writing for the Environment (21W.730). These efforts are a great foundation and have been influential in the formation of the ESL program. In addition, some undergraduates attend open workshops or seminars, but the primary audience for these is graduate students.

The following table represents the growth in both ESL library sessions (course integrated, course related, seminars, or workshops) and undergraduate attendance for the last two years:

<u>TOTALS</u>	<u>SESSIONS</u>	<u>ATTENDEES</u>
2003/04	41	566
2004/05	69	1084

- **Graduate students:**

During IAP, workshops and seminars are offered which are focused on particular tools or skills that are needed. Seminars have also been developed for finding chemical information, and more recently, biological information. We have had various degrees of success with this approach. Efforts are underway to address the interdisciplinary needs of our students and researchers, especially related to business information. A refocus on skills rather than tools has been reflected in our programs of lunch-time workshops. These workshops are open to the entire MIT community, but are attended primarily by graduate students and researchers/post docs.

The following table represents the growth of ESL library sessions (course integrated, course related, seminars, or workshops) and graduate student attendance for the last two years:

<u>TOTALS</u>	<u>SESSIONS</u>	<u>ATTENDEES</u>
2003/04	29	360
2004/05	37	564

Numbers for open workshops are attributed to graduate student attendance since the majority of attendees are graduate students.

- **Faculty and Instructors:**
Instruction for faculty has not been a focus of our efforts to date, though some faculty members attend our workshops and seminars.
- **Post-doctoral and related researchers:**
An independent seminar geared toward this community was offered during IAP 2005, though not sponsored by the Engineering and Science Libraries. Researchers have taken advantage of open workshops and seminars, along with graduate students.
- **Administrative staff:**
An attempt was made several years ago in Chemical Engineering and Materials Science and Engineering to reach the administrative assistants in those departments. This effort was supported by the departments that they served, but was less successful due to the demands placed on these staff.

In the majority of instruction sessions, skills such as choosing the best database for a subject area, searching for information, accessing publications or documents, and evaluating information are covered. These are important skills and appropriate for the time allotted for instruction, especially within a course. We need to build on this foundation of knowledge, emphasizing the complex world of information and how these skills can translate into other subject areas. Establishing a more cohesive program will address this.

To guide our students, staff, and faculty that we do not encounter at these sessions, we depend on our subject pages, database cheat sheets, course web pages, and other web pages. Usability studies have shown that many library users are unaware of these tools. However they are important tools for users and also for library staff who can consult them when working with users.

STRATEGIES AND GOALS:

Due to the expressed desire of faculty and the needs of the undergraduate community, ESL will place an emphasis on serving the information skills development of undergraduate students in our instruction program. Programming for graduate students, faculty and other communities will be expanded in future years, while we maintain the current level of service provided. See Appendix III, Methods for Providing Instruction. The following goals and strategies have been identified for each of our primary user groups.

Undergraduates:

- **First Year Students:**

The following strategies and goals will be used to ensure that first year students gain awareness of the information universe and the Libraries early on in the academic career in order to provide a framework to build on as they progress in the Institute.

Strategies:

- ESL will become involved in supporting core courses which fulfill the General Institute Requirement for Science. These courses may fluctuate as the Task Force on the Undergraduate Commons (<http://web.mit.edu/committees/edcommons/>) continues and completes its work. For example:

3.091 – Introduction to Solid State Chemistry

Use this opportunity to experiment with scalability and assessment on a large scale. If successful, use this course as a marketing tool to reach 5.111 or 5.112 (the other courses that fulfill the Chemistry requirement) and/or other large core courses in Physics and Biology.

- ESL will also maintain involvement in courses that fulfill other General Institute Requirements or provide opportunities to work closely with first year students. For example:

9.00 – Introduction to Psychology

Continue collaborating with the Humanities Library on this course, including evaluating student bibliographies to determine the effectiveness of the instruction.

12.000/ 1.016 – Terrascope

Continue coordinating efforts for this multidisciplinary and highly visible course. Coordinate assessment with the faculty for this course, e.g. collecting bibliographies

- ESL will continue collaborations with Humanities Library staff on writing courses with science and technology components (Writing the Environment, etc).

Goal:

Within three years, ESL will interact (through these and other first year courses) with 80% of students in their first year of study. Also within three years, efforts

will have been made to seek library involvement in all Science and Engineering required courses (General Institute Requirements). Involvement may be through participation in a course, or conversations with the faculty teaching these courses.

- **Second year students to graduation:**

The following strategies and goals will be used to support students as they develop and hone information seeking and using skills within their major course of study in order to effectively contribute to the world of scholarly communication and academic research.

Strategies:

- Investigate required courses within departmental majors, especially capstone or design courses.
- Target courses that fulfill the communication requirement (Communication Intensive courses in their Major or CI-M courses).
- Investigate the Undergraduate Research Opportunities Program (UROP) and thesis preparation courses as another means to reach undergraduates.
- Develop talking points for specialists to take to meetings with faculty.
- Build upon past successes:

2.009 – Product Engineering Process

Continue collaborating with Mechanical Engineering faculty and librarians at Dewey Library on this course. There is a trend for developing more service learning or problem based learning courses such as this. Continuing our involvement in these courses will have a greater impact on the students as librarians are more involved in the course throughout the semester.

5.32 – Intermediate Chemical Experimentation

Resume involvement in this course, collaborating with Chemistry faculty. Look at ways to assess the effectiveness of our involvement.

10.26 – Chemical Engineering Projects Laboratory

Continue providing workshops for this course, which address the needs of the groups assigned to work together on projects.

Goal:

Within three years, each ESL subject liaison will develop strategies for how to teach within their departments or subject areas. This may include a list of courses to target, methods of reaching students remotely via online resources, people in the department to contact, etc. Subject liaisons and their supervisors will create milestones to ensure momentum in this effort.

Graduate Students and Researchers:

The following strategies and goals will be used to provide opportunities for graduate students and researchers to learn the tools and hone the skills necessary to find

information in their field and to become experts in their field of research by the time they leave MIT.

Strategies:

Though these are different user communities, their research needs are very similar. Much of the instruction and outreach to these groups is done by the subject specialists in the specific research areas, although research is becoming much more interdisciplinary. We have started offering seminars and workshops to address interdisciplinary research needs, such as Company Research for Engineers and Scientists, and Bioinformatics. These broader, non-subject specific classes can be taught by many members staff and are not dependent on the subject expertise of librarians.

- Expand orientation activities to departments and/or research laboratories. Currently many librarians are invited to orientation activities but for very limited time.
 - Investigate who the contacts/key people are in each department.
 - Begin conversations with these people to schedule instruction sessions or workshops, or learn about other opportunities to reach incoming students.
- Continue holding workshops and seminars on finding information for a particular research area or topic, including expanding the offerings during IAP.
 - These workshops/seminars may include interdisciplinary topics such as company research, marketing, or policy, where collaboration with colleagues in the Dewey Library will be necessary.
 - Stress how to find information or use different technologies upon leaving MIT, such as using RSS feeds to keep current or which databases are freely available.
- Continue support of bibliographic management tools such as EndNote or RefWorks. Graduate students and researchers are heavy users of bibliographic management tools. Providing limited support for these tools will help introduce users to other library tools and establish the libraries as a place to turn to for help.
- Investigate various ways to work with graduate students as they progress in their research. Some examples would be thesis preparation courses, journal clubs, and approaching a laboratory or research group to address their individual information needs.
- Identify graduate courses with specific information needs, such as 6.777. Integrate information skills into course assignments.
- Collaborate with Teaching Assistants (TA's), teaching them the information skills necessary to support the courses they are involved in so they can advise undergraduates in these skills.

Goal:

Continue supporting this community with workshops and seminars as done in previous years. In the second year of this program (2006-07 academic year), recommend goals for this community.

Faculty and Administrative staff:

Faculty and administrative staff have attended workshops sponsored by ESL. We need to continue to cultivate this way of reaching the faculty, as it has proven to lead to other instructional opportunities (invitations to teach for a specific research group, teach a specific undergrad course, etc.). One-on-one sessions or individual meetings seem to be most effective with this group, and we will continue to support this activity.

ASSESSMENT

Assessment is a common challenge in library instruction. We often do not have the luxury of pre/post testing or talking to our students beyond the 50 minutes allotted to an instruction session. Evaluation forms have been used in the past for workshops, seminars, and courses such as 9.00, but they have provided us with minimal information. If evaluation forms are to be used, they will need to be reworked to include useful information for the instructor and administered after the students have had a chance to use the skills they have learned to reflect on the impact. Collecting email addresses on a sign-up sheet may be a way to solicit this type of feedback.

A more effective way to determine if students are learning is to collaborate with faculty on their homework assignments and evaluating the results. Steps have been taken toward this in 9.00, 6.UAT, 6.121 and similar courses, though the approaches used (reading and evaluating student bibliographies) is time consuming. A more scalable approach is needed for this type of assessment. Faculty anecdotes in courses like 12.000 have encouraged us to believe that we are making a difference, but this difference has not been measurable. Since faculty members are our primary clients in course collaborations, their feedback and perceptions are vital to our assessment. A more systematic way of collecting this type of information is needed.

Surveys and focus groups may also help determine what the information needs of our community are, and how to best address those needs.

As we continue experimenting with new ways of teaching and reaching our community, we need to assess the work (time, effort, cost) that is done and compare it with the benefits of our efforts to the community. For example, we began offering seminars in chemistry and expanded the seminar series to biological information. For some sessions, a great deal of preparation went into the seminar and fewer than 5 people attended. This led us to try different times, locations, and teaching styles. We will continue to be flexible, and will only continue providing sessions that have been shown to have a positive impact for library staff and our user community.

See Appendix IV, Methods for Assessment of Instruction.

Goal:

Continue experimenting with ways to gather data, determining what data is needed for assessment, and being creative in our methods for determining success. Once adequate data is collected, use this data to adapt and evolve our program, improving its impact and success.

RESOURCES

The ESL Instruction Coordinator will oversee the development of this program and related scripts, handouts, tutorials, assessment, etc. An advisory group, similar to the ESL Instruction Task Force which helped create this document, is recommended to support the Instruction Coordinator. This advisory group will be formed by the Instruction Coordinator in consultation with the Head of ESL and will have rotating membership.

Much of our outreach and instruction is dependent upon the subject specialist for that department. For this program to be successful, support for the subject specialist and the sustainability of large instructional projects need to be addressed periodically. A greater emphasis was placed on instruction in the recent Libraries Strategic Plan, which speaks to the importance of information instruction on campus, but not to the level of support expected of the staff. The amount of time spent on preparing for instruction will need to be monitored in some quantifiable way, perhaps as part of the assessment process.

Library staff development is also essential to this program. In order for this program to be efficient and effective, all library staff, not just librarians, should be encouraged to participate. Regular instruction meetings, “how to teach” workshops, and team teaching or shadowing an instructor will help library staff become more comfortable with teaching. As the ESL moves towards the one service desk model as proposed by the Implementation Plan for a New Service Model, it is realistic to expect we can dedicate more staff time to these initiatives. ESL Managers will need to work with the staff in their reporting lines to ensure the staff feel adequately supported in their instructional roles and are able to achieve the goals outlined in this document.

Finally, we need to develop a strategy in which library staff work directly with faculty who in turn will teach students about information seeking and scholarly communication issues. This is an important strategy not only because it supports the sustainability of our program, but faculty are in a much better position than librarians to incorporate and embed teaching these skills into their own curriculum. Faculty-delivered information instruction is considered one of the most effective ways of reaching students (see Appendix III). Many MIT faculty are also exceptional teachers, and we can learn techniques and approaches from them that can be adopted in our own teaching.

Goals:

Contribute to a “teach the teacher” program in which library staff educate faculty on information seeking and scholarly communication issues. The faculty would then teach their students these skills, with library staff used in an advisory capacity. This goal may be reached by a system-wide program (to be developed).

Support and encourage peer-coaching or team teaching initiatives that are developed system-wide. Continue to take advantage of any instructional support already in place, such as the Instruction Toolkit (<http://macfadden.mit.edu/instruction/toolkit/>).

APPENDIX I – SKILLS AND KNOWLEDGE NEEDED

DISCOVERY – the art of gathering and finding information

TOOLS – knowledge of:

- Databases, catalogs
- Collections: print and other
- Depositories, open source information
- GIS, visualization tools, informatics, data sets
- Technologies, like RSS, Wikis, Alerting services, and other new technologies as they develop

TECHNIQUES –

- Searching methods, be effective and efficient
- Controlled vocabulary vs. natural language
- Ability to find information in other fields, what principles can be used in any field
- Records - find a citation, read the article, track forward and backward in time, what a reference is
- Review articles to learn about your topic, get a good list of references to start with

SERVICES –

- Library services, such as circulation, Interlibrary Borrowing, etc.
- Subject Specialists

The **INFORMATION UNIVERSE/ BIG PICTURE** – Understand:

- Content of an academic library, what's there and how to get what isn't there.
- Different forms of science and technology publications - materials types such as technical reports, conference articles vs journal articles vs preprints
- How information sources work within their discipline
- Multidisciplinary influences on the information in a field
- Primary, secondary, tertiary sources
- Information timeline - when to use articles, when to use books
- How to formulate a meaningful question, awareness of the real information need
- How to keep current in a field and up to date in information tools for a subject

EVALUATION

- Identify authoritative sources
- Peer reviewed journals vs magazines, why peer review is important
- What constitutes authority?
- Choosing the appropriate database for your information need

MANAGEMENT

- Citing and acknowledgement of work – building the reputation of authors
- Citing properly, quoting properly, plagiarism

COMMUNICATION

- Intellectual property, copyright
- How to make information and research accessible to others, i.e. choosing where to publish: highly cited/impact, timeliness, reputation among peers, networking opportunities (conferences), open access journals
- DSpace and other depositories as a place to contribute
- Implications of licensing. How to manage or find information when you leave MIT
- How fast the information world is changing, knowing how to keep up – ways to survey the literature to generate ideas and assure your idea is original

APPENDIX II – COURSE INTEGRATED INSTRUCTION FOR ESL

2003/04

Undergraduate	1.016 - Earth Systems Engineering and Science 1.018J/7.30J - Fundamentals of Ecology 2.009 - Product Engineering Processes 5.22J/10.02J/BE.105J - Biotechnology and engineering 5.32 - Intermediate Chemical Experimentation 9.00 - Introduction to Psychology 10.26 - Chemical Engineering Project Lab 12.000 - Solving Complex Problems 21W.732 - Age of Data 21W.730 - Expository Writing: Writing the Environment HST S11 - Art and Science of Medicine
Graduate	6.777 - Design and Fabrication of Microelectromechanical Devices ESD.84 - Data Research for Engineering Systems Graduate Program in Science Writing

2004/05

Undergraduate	1.016 - Earth Systems Engineering and Science 1.018J/7.30J - Fundamentals of Ecology 2.009 - Product Engineering Processes 3.039 - Solid State Chemistry Virtual Laboratory 5.32 - Intermediate Chemical Experimentation 6.UAT - Preparation for the undergraduate advanced project 6.121 - Project Lab 9.00 - Introduction to Psychology 10.26 & 10.29 - Chemical Engineering Project Lab and Biological Engineering Projects Laboratory 12.000 - Solving Complex Problems 16.621 - Experimental projects 21W.732 - Age of Data 21W.730 - Expository Writing: Writing the Environment HST S11 - Art and Science of Medicine SP. 717 - D-Lab: Development, Design & Dissemination
Graduate	6.777/2.751 - Design and Fabrication of Microelectromechanical Devices ESD.84 - Data Research for Engineering Systems Graduate Program in Science Writing

APPENDIX III - METHODS FOR PROVIDING INSTRUCTION

(in order of greatest impact to the community)

Though one-on-one instruction has a substantial impact and often leads to other instructional opportunities, these interactions are counted as reference consultations and are not included in this list.

Method of delivery	Characteristics and impact
Curriculum integration	Designing courses that integrate information skills throughout the curriculum.
Training Faculty or Instructors	Faculty teach their students the skills necessary for their course or research.
Course integrated instruction	Collaborating with a faculty member on a specific course.
Special workshop	Demonstrating how to master a specific skill.
Independent seminars	
User aids in print and online	Course web pages, database cheat sheets, subject guides.
Tutorials	In print and online
Other technologies as yet to be explored	blogs, course management systems

APPENDIX IV – METHODS OF ASSESSMENT FOR INSTRUCTION

Evaluation forms:

Sample forms can be found on the libraries server Turnpike: **\\Turnpike\ps lib\Shared Documents\Instruction Resources\Evaluations and surveys**

A sample of an online form:

<http://libraries.mit.edu/guides/courses/fall2003/9.00/evaluation.html>

Talk to your faculty collaborator about adding a library or information seeking question to the MIT Course Evaluation form.

Reviewing bibliographies:

If bibliographies are turned in as part of an assignment, ask the faculty member if you could review a sample and comment on them. Look for types of sources used, whether the sources are scholarly, if they are all online, etc. Meet with the faculty member to discuss your findings. If you repeat your involvement in future semesters, compare results.

Surveys:

Maintain a list of attendees of your instruction session. After some time has passed, send the attendees a survey of the session pertaining to how it has helped them with their research (not an evaluation of teaching skills).

Add questions pertaining to instruction to surveys administered by MIT administrative offices, such as the Alumni survey or the graduate student survey.

Use of pre/post tests:

Develop a short quiz on information research skills. Students will take this quiz before any instruction is given. After the instruction session, and preferably after the students have had time to apply their information research skills, administer the same test. Compare the results to determine the level of learning that took place.

Faculty feedback:

Meet with your faculty member (or TA's) after your session to solicit feedback. Use this feedback as a means to improve your interaction with the students, and help to educate the faculty member on library related issues.