Chapter 9 • • • • • • • • •

Teaching Research across Disciplines: Interdisciplinarity and Information Literacy

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> The human mind does not think in disciplines.
> *~Renate Holub*

Introduction

As this volume shows, interdisciplinarity is an increasingly large part of twenty-first-century universities at both the faculty and undergraduate levels. Researchers in fields from the sciences to the social sciences and the arts and humanities are making use of theories, methods, and sources from other fields to enrich their own understanding and to grapple with problems that are simply too complex to understand with the tools of a single discipline.[1] Beyond the explicitly interdisciplinary fields such as area studies, ethnic studies, gender and women's studies, and environmental and resources studies, interdisciplinary approaches are used in such traditional disciplines as literature, history, anthropology, political science, public policy, and public health.

Interdisciplinary research is more challenging than researching in a single discipline because of the fragmentation of scholarly information and the difficulty of gaining sufficient understanding of the methods, tools, and theories of multiple disciplines. Librarians who provide research instruction for students doing interdisciplinary assignments need to develop a specific skill set for this work. This chapter is intended for librarians asking themselves, "How should I teach interdisciplinary research to maximize critical thinking and information literacy?"

Theories of Interdisciplinary Research

Definitions of Interdisciplinary Research

A favorite activity of interdisciplinary scholars is attempting to define interdisciplinarity and to parse the different degrees of disciplinary in-

tegration among types of interdisciplinarity.[2] At the undergraduate level, the usual model involves a single student using methodologies from multiple disciplines to investigate a social phenomenon or problem.

Lisa Lattuca, a prominent scholar of interdisciplinarity, and her colleagues identify different types of interdisciplinary teaching:

- Disciplinary courses informed by other discipline(s)
- Courses that link disciplines
- Courses that cross disciplines
- Courses without a compelling disciplinary basis[3]

What all definitions share, however, is the idea that interdisciplinarity attempts to integrate insights from multiple disciplines to address a compelling problem that defies explanation by a single discipline.

Goals of Interdisciplinary Research

Several writers have developed schema that include goals for undergraduate interdisciplinary research. In *Interdisciplinary Writing Assessment Profiles,* Wolfe and Haynes put forward a rubric for student interdisciplinary writing that provides specific criteria that librarians can teach to.[4] A sample from this work demonstrates how germane the library research session is to excellence in interdisciplinary writing:

1. The problem or issue under investigation has been clearly stated.
2. The scope of the problem is clearly defined.
3. "Textual" evidence is cited to support major assertions.
4. Theory or theoretical principles are used to support major assertions.
5. Primary sources are included.
6. Sources include more than 25 percent recent publications, dated within the last five years of the project's completion.
7. A range of (more than one) perspectives from within the (at least one) discipline are included.
8. Identifies how at least one term is used differently in different disciplines within the context of the problem.
9. Identifies how different disciplinary terms are used to describe similar concepts.

In *Interdisciplinary Research: Process and Theory*, Allen Repko devotes considerable attention to the goals of interdisciplinary research for students.[5] His definition of research is broad, including library research as only one step in the process. Repko's goals overlap considerably with the ACRL *Information Literacy Competency Standards for Higher Education*[6] (henceforth, "ACRL *Standards*"). Table 9.1 highlights points of similarity between Repko's Integrated Model of the Interdisciplinary Research Process[7] and the ACRL *Standards*.

Table 9.1. Comparison of Interdisciplinary Research Model with ACRL *Standards*

Integrated Model of the Interdisciplinary Research Process	**ACRL Information Literacy Competency Standards**
A. Drawing on interdisciplinary insights	**The information literate student…**
1. Define the problem or state the focus question	…determines the nature and extent of the information needed [Standard 1].
2. Justify using an interdisciplinary approach	
3. Identify relevant disciplines	… determines the nature and extent of the information needed [Standard 1].
4. Conduct a literature search	… accesses needed information effectively and efficiently [Standard 2].
5. Develop adequacy in each relevant discipline	… accesses needed information effectively and efficiently [Standard 2].
6. Analyze the problem and evaluate each insight into it	… evaluates information and its sources critically and incorporates selected information into his knowledge base [Standard 3].
B. Integrating insights and producing an interdisciplinary understanding	**The information literate student …**
7. Identify conflicts between insights and their sources	… uses information effectively to accomplish a specific purpose [Standard 4].
8. Create or discover common ground	… uses information effectively to accomplish a specific purpose [Standard 4].
9. Integrate insights	… evaluates information and its sources critically and incorporates selected information into his knowledge base [Standard 3].
10. Produce an interdisciplinary understanding of the problem	… uses information effectively to accomplish a specific purpose [Standard 4].

Like the criteria mentioned in Wolfe and Haynes, some of the stages of Repko's model map closely to topics that librarians usually address in library instruction for any students. From Repko's model, "Define the problem or state the focus question," and "Conduct a literature search," would typically be addressed in any library research session. Likewise, the first seven 'interdisciplinary' writing skills identified by Wolfe and Haynes correlate well with the usual content of library instruction sessions.

Repko and Wolfe and Haynes also point out content specific to interdisciplinary research that librarians do not always address, for instance Repko's "Identify relevant disciplines" and the final two criteria from Wolfe and Haynes ("Identifies how at least one term is used differently in different disciplines within the context of the problem" and "Identifies how different disciplinary terms are used to describe similar concepts.") Just as in the ACRL Standards, other research expectations mentioned by these writers would normally be the responsibility of faculty to teach, rather than the librarian.

Elements of Disciplines

Students of interdisciplinary topics need to know what a discipline is. According to Tanya Augsburg, the author of an influential textbook on interdisciplinarity, a discipline is distinguished by fifteen elements:

- Basic concepts | Leading theories
- Modes of inquiry (or Research methods)
- What counts as a problem
- Observational categories
- Representational techniques
- Types of explanation
- Standards of proof
- Ideals/ethics/objectives
- Assumptions and world views
- Disciplinary perspective
- Seminal texts/books
- Major thinkers
- Major practitioners

- Professional academic associations
- Leading academic journals[8]

Without the footing in a discipline that knowledge of at least some of these elements provides, students cannot hope to do more than superficial research, which is the major criticism of interdisciplinary research. While librarians and faculty are familiar enough with the structure of academic disciplines and publishing to be aware that every discipline has such elements, students are novices and need to become aware of these elements to get their research off to a good start. We can be fairly certain that most students could not list more than a few of these defining elements for a single discipline, much less for each discipline they might try to incorporate into their research. Explicit awareness of the common features of disciplines will help students compare and contrast material from different disciplines more effectively. Though neither faculty nor librarians could know the names of leading journals, thinkers, theories, and methodologies in all fields, librarians can teach students effective strategies to find this information.

In *Creating Interdisciplinarity*, Lisa Lattuca claims, "One of the most distinctive and binding aspects of a disciplinary community is the language it employs."[9] In fact many scholars describe the process of learning to do research in multiple disciplines as "becoming bilingual." Augsburg neglects to include disciplinary language as a defining element (though is it included in other elements), a serious omission, since knowledge of discipline-specific terminologies, both language used by practitioners and controlled vocabularies used in library catalogs and databases, is essential to every effective researcher.

Developing effective search terminology is particularly challenging for interdisciplinary students.[10] Undergraduates typically start searching using the first words that come into their minds and use the simplest keyword search options. These strategies exacerbate the problem of too many or irrelevant search results, leading to frustration and poor research. It is both difficult and important for the librarian to teach students the use of controlled vocabularies in databases and catalogs where possible. Different tools, of course, use different vocabularies, or none at all: LCSH, self-defined descriptors, or thesauri created by disciplinary authorities, such as professional organi-

zations. The possibility that similar concepts or problems are assigned different terminology in different disciplines is also confusing. Students also need to learn strategies for narrowing searches in databases without field-delimited searching, such as the basic or keyword search function in many databases and Google Scholar.

Academic librarians wisely place disciplinary language as among the most important elements for students to learn, something essential to doing effective research. For students, academic research requires learning more than two research "languages," because not only must they learn multiple disciplinary terminologies, but also the language of library research.[11] This creates an added impediment to student interdisciplinary research.

Disciplinary Adequacy

Scholars of interdisciplinary studies agree that no individual can attain mastery of all relevant disciplines, and some argue that it is beside the point to even wish to. In some conceptions of interdisciplinarity, research is done by groups of specialists or scholars, each of whom does have mastery over a discipline or subspecialty. Other scholars and undergraduate students more commonly undertake individual research projects and aim simply for "adequacy" with the relevant disciplines.

Possibly the most challenging part of interdisciplinary research is learning to frame questions. Student researchers need both to frame questions in ways appropriate to the disciplines they are working with and to synthesize these in interdisciplinary ways.[12] As novice researchers, students also have problems with topic selection because "what faculty would regard as the 'holes' in the literature that a research question might address, are not obvious to [students]."[13] While students can find models in the disciplinary literature for appropriate questions, it is more difficult to conceive of interdisciplinary questions. Repko mentions three criteria for good interdisciplinary questions:

- They should be open-ended and too complex to be addressed by a single discipline.
- They must be researchable.
- They must be verified using appropriate research methods.[14]

It will be helpful for students to keep these criteria in mind as they do their research, since the quality of research will clearly affect the nature of questions students can answer.

For interdisciplinary students to achieve disciplinary adequacy, they need to learn at least the basic assumptions, methodologies, theories, and so forth discussed by Augsburg. In most programs of interdisciplinary studies, students select courses over a period of years that focus on "a unifying problem, issue, theme or topic called an 'Area of Concentration'"[15] so by the time they start writing their senior theses, they have been introduced to the basics of social science disciplines. However, students taking a single interdisciplinary class will not have had this preparation and will have to acquire adequacy in multiple disciplines quickly, making this an important goal of library instruction.

Interdisciplinary Research and Learning

Interdisciplinary research projects are the quintessential "student-centered learning environments" referred to in the ACRL *Standards*. When students investigate topics using their own unique choices of disciplinary methodologies, librarians have the perfect opportunity to use "problem-based learning, evidence-based learning, and inquiry learning … thereby increasing their [i.e., students'] responsibility for their own learning."[16] For example, since interfaces, terminology, and other features of research tools differ, understanding the underlying similarities is difficult for students. As instructors, librarians need to find ways to use these differences as teaching opportunities.

According to learning theory, moderate mental conflict or confusion stimulates the assimilation of new ideas as people struggle to resolve their confusion. Some scholars theorize that interdisciplinary research is thus more conducive to developing critical-thinking skills than is research founded in a single discipline.[17] Repko quotes Myers and Haynes as saying that interdisciplinary students engage in more reflection than other students, which stimulates learning,[18] but Lattuca et al. argue that it is the combination of interdisciplinarity and constructivist pedagogy, or active learning techniques, that results in greatest student learning.[19] Librarians should capitalize on the innate conflict between different disciplines to cultivate opportunities for

learning, using active learning techniques when possible to allow students to construct their own understandings.

Educating Ourselves

When working with faculty in preparation for an instruction session, the librarian would do well to determine out how much disciplinary integration is expected of students and how the faculty will assess whether and to what degree integration has been achieved. In addition, reading even one or two texts on the philosophy of interdisciplinary research will enable librarians to better understand the goals of the faculty and better design instructional experiences and materials to meet these goals. Tanya Augsburg, Lisa Lattuca, and Allen Repko all provide excellent overviews.

Librarians embarking on teaching interdisciplinary research may want to familiarize themselves with ACRL standards produced for specific disciplines. As of this writing, ACRL's websites list these specific standards:

- Anthropology and Sociology—http://www.ala.org/acrl/standards/anthro_soc_standards
- Psychology—http://www.ala.org/acrl/standards/psych_info_lit
- Science and Engineering/Technology—http://www.ala.org/acrl/standards/infolitscitech
- Political Science—http://www.ala.org/ala/mgrps/divs/acrl/standards/PoliSciGuide.pdf
- Literatures in English—http://www.ala.org/acrl/standards/researchcompetenciesles

These standards give examples of the tools, methodologies, and fundamental texts of the discipline that can be useful for the librarian as well as students. An ACRL wiki gives information on standards for additional disciplines.[20]

Librarians have good reason to feel confident in their skills and problem-solving abilities when collaborating with faculty and students in interdisciplinary research since general reference and instruction librarians are used to "living without the comfort of expertise."[21] The frequency with which academic librarians are required to research in unfamiliar fields and with unfamiliar academic terminology makes

them more conversant with the problems of students beginning interdisciplinary research than are most faculty.

Instructional Strategies

Identifying Relevant Disciplines

We have seen that interdisciplinary research requires knowledge of disciplines. Since many library databases are discipline-oriented and library websites often rely on disciplines as an organizing principle for finding databases, library instructors need to steer students to useful databases by helping them choose disciplines relevant to their topics. While there are a number of excellent, large multidisciplinary databases (JSTOR, Web of Science, EBSCO's Academic Search products, CSA Illumina, and ProQuest's Research Library among them) that should be searched, they often will not suffice for difficult, obscure, or more advanced research topics. Beyond the multidisciplinary databases, which not all libraries license, the disciplinary databases loom as terra incognita for most students, yet in-depth research may require students to use these narrower, and often more difficult, tools.

The library instruction session may be the only opportunity students have to consider the gaps in their disciplinary mental maps. A good warm-up activity in class is to ask students to brainstorm a list of all disciplines that might be relevant to their topic or problem; this could be an individual exercise or done as a class with a sample topic. Usually students have no difficulty identifying which disciplines could be relevant once the idea is presented to them.

Another good introductory activity is to ask students if they are familiar with the research methodologies of the disciplines they plan to use, or the major theories, or the types of evidence that are valid. If they are not, ask them to spend five minutes trying to find that information and then discussing what they did and how it worked. While most will not be able to answer those questions, simply raising them alerts students to the gaps in their knowledge. This is where instruction in Augsburg's elements of disciplines will show its value. It can be most effective to start instruction by making students aware of holes in their own knowledge.

Continuing in this vein, the librarian can ask students to browse the library's list of databases organized by subject. After students have

determined the disciplines they plan to use, have them select the databases they think would be best for their topic and ask them to note why they chose each. Class discussion of the selected databases can help point out that even databases in the same discipline will contain different kinds of information: scholarly, news, professional or popular, secondary, primary, and so forth. This is a way to open students' minds to different sources of information and to explore library resources beyond the tools they typically use. This common active learning strategy is effective because it teaches students how to find additional resources they may need as they consider using alternate disciplines in their work. To make this information stick, recommend that students note the names of the databases they plan to use, since they will not otherwise remember them. It is also a good practice to explain the difference between the vendor name, which is much more visible, and the database name.

In an instruction session for a whole class, it is helpful for the librarian to know the students' topics ahead of time in order to consider which disciplines are most relevant and which databases will be most useful to demonstrate or have students work with. Students with related topics can divide up the work of exploring the relevant databases and share their insights with each other or to the whole in class in a small-group exercise.

Reference Tools

A common mistake when exploring a new discipline is in reading one's first article or book and assuming that it represents the mainstream viewpoint of that discipline. When instructing students to search for books and articles on their topics, one goal should be to enable them to identify fundamental works and major theories, helping them achieve disciplinary adequacy. This instruction is not typically necessary for undergraduates in traditional disciplinary fields, but it is essential for interdisciplinary students. Some useful exercises [or approaches] include the following:

- Use a subject-specific encyclopedia or reference work. Important writers and significant concepts or theories will have individual entries as well as bibliographies. It's helpful to mention that these kinds of sources are often faster than web searching and are more authoritative.

- Find published topical and disciplinary bibliographies. Interdisciplinary students find bibliographies useful as an efficient way to find the seminal works in a field quickly. Beware of bibliographies published on the Web unless the author has verifiable expertise in the field.
- Search for review articles on the discipline.
- Check for book titles or significant authors in a catalog. Seminal works can sometimes be identified by the multiple editions published repeatedly over many years. Seminal authors' names may appear as both author and subject.
- Find the number of times an item has been cited. Google Scholar is a good beginner's tool for this, and more familiar to students than the traditional citation indexes and databases, which, however, are more comprehensive.
- Suggest students ask the faculty member for advice on significant works or writers. The personal referral is faculty members' own preferred method of finding sources in unfamiliar disciplines.

It is also worth pointing out to faculty and students how useful *Wikipedia* can be as a starting place for learning about a discipline. A convenient time to do this is while conducting a library session in an electronic classroom, where students don't have immediate access to the reference collection. Here are a few ideas for using *Wikipedia* in an academic setting:

Direct students to a Wikipedia article in the scholarly style; the one on Max Weber (viewed on March 12, 2011) is a good example:

1. Have students use the View History link to see the pattern of edits to the article, when they were done, who did them, and so forth, for a sense of areas of dissent and controversy in the article.
2. Have students try to find an article cited in the References section of the *Wikipedia* article. Negotiating broken and erroneous links is part of the learning experience, as is finding a Google Book preview and its link Find in a Library.
3. Point out the footnotes. Some *Wikipedia* articles are actually copied from encyclopedias (which may be out of date) with or without credit.

4. Plagiarism activity: Have students explain why there are footnotes for paraphrases and nondirect quotes in the Max Weber article.

Search Strategies

After students have informed themselves about the disciplines they will use, they can start to research their topics. As students interrogate sources from several disciplines, the problem of finding too many potential sources grows exponentially. Interdisciplinary students, even more than other students, are liable to identify more books, articles, and other research materials than they can effectively read or use. For them particularly, the problem is one of selection of the most relevant sources, rather than discovery. For this reason, helping interdisciplinary students formulate sufficiently narrow searches is essential to their success and their time management.

Active learning strategies are central to teaching interdisciplinary research, as we have shown, because no lecture can cover the plethora of potential research tools. Students must learn to teach themselves how to proceed in their research. Books and articles that present ingenious and effective ideas for in-class learning activities constitute a literature in itself, too large to cite here. But without trying to summarize specific teaching techniques, it is safe to say that activities should focus on the principles and methods of narrowing searches and evaluating sources for relevance and disciplinary orientation, even if that means less time is spent on identifying the greatest number of databases or tools.

Using Sources

How should students know what types of information will be valid for their research, given the differences in research questions and in how disciplines use evidence?

The previous work students have done in learning about disciplines should prepare them to assess the validity of evidence. Library instruction should also provide guidance on understanding the validity research results for different disciplines. For example, when teaching the use of multidisciplinary databases like JSTOR, ask students to determine the disciplinary orientation of a particular article. Pointing out clues in the bibliographic and metadata, such as the title of the journal, the depart-

mental affiliation of the authors, descriptors and subject headings, the abstract, and the article's research methodology helps students see that they need not read every article to decide if it is useful.

The work of Joseph Bizup is very useful when helping students select, read, and consider how to use sources. Bizup created a research model called BEAM,[22] an acronym derived from Background, Exhibit, Argument, and Method. Bizup suggests that *any* source can be used in one of four ways in scholarly writing: "*Background* for materials a writer relies on for general information or for factual evidence; *Exhibit* for materials a writer analyzes or interprets; *Argument* for materials whose claims a writer engages; and *Method* for materials from which a writer takes a governing concept or derives a manner of working."

Bizup notes that traditional designation of sources as primary, secondary, or tertiary can confuse students: "A reference librarian at my institution noted that students often become perplexed when they learn that materials considered primary in one discipline may be considered secondary in another. They become perplexed when classifications they had taken as absolute turn out to be context-dependent."[23]

Using the BEAM framework is an effective means of helping students sort out the most useful materials from the mass of search results by guiding their reading of sources from the start towards how they will use the sources in their writing. Because the terms in BEAM are discipline-neutral, they encourage students to use sources in whatever way is required by the particular disciplinary methodology or combination of methodologies they may be using at the time:

> BEAM has a number of other advantages as well. First, it is more ecumenical than the standard nomenclature, not only because it emphasizes function but also because its terms possess a grammatical flexibility the standard terms lack. Like the standard terms, the terms in BEAM can be used as adjectives to modify some general noun like *source* or *research*, but they can also be used as nouns themselves. Therefore, while both nomenclatures suit disciplines such as history or English, BEAM also suits disciplines in which researchers do not customarily refer to their materials as *sources*. BEAM is clearly applicable to literary criticism, but it can also be applied to primary work in the sciences.[24]

Conclusion

Interdisciplinary research assignments demand library instruction that emphasizes the teaching of research concepts rather than the use of specific databases or tools. Interdisciplinary faculty do not necessarily have well-developed mental models of student research goals, since their own research typically focuses on no more than a few disciplines with which they are extremely familiar. The instruction librarian may well be the first to try to make these goals explicit to faculty and to students. To the degree that librarians familiarize themselves with the elements of, and information literacy standards for, specific disciplines, with the goals of interdisciplinary research, and with the expectations of faculty for students to integrate the insights of multiple disciplines in their research, librarians will better be able to design library instruction sessions that equip students to meet those expectations.

Academic librarians are well positioned to support interdisciplinary research for undergraduate students. Experienced instruction librarians using the principles of information literacy are already teaching in ways that support interdisciplinary research. By understanding the types of evidence and research questions appropriate to the relevant disciplines and employing pedagogy that elicits higher-level thinking skills, librarians can design instructional material and experiences that focus on concepts rather than tools and that highlight the differences between disciplines.

Librarians must discuss carefully with faculty members the nature and extent of interdisciplinarity expected of students and how that will be assessed. Library instruction is an opportunity to clarify and make explicit for students the nature of scholarly research in different disciplines and how to succeed in achieving a truly interdisciplinary understanding of a complex problem while becoming competent researchers.

Notes

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