

Interdisciplinarity: An Introductionⁱ

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This article addresses the concept of interdisciplinarity and the role of interdisciplinary studies in Truman State University's Liberal Studies Program (LSP). It is intended primarily for students in Junior-level Interdisciplinary Writing Enhanced Seminars (JINS).

In the article I offer a definition of interdisciplinary analysis and examine its pivotal role in a liberal arts and sciences curriculum; provide a brief history of interdisciplinary study as a part of the curriculum at Truman, focusing on the JINS course and its role in the LSP; and give students some suggestions on how to get started with interdisciplinary analysis and writing. Each of the inset boxes found throughout the article summarizes a highly successful interdisciplinary analysis carried out by a Truman student, chosen from the 2000 LAS Portfolio submissions. Together, they demonstrate a variety of ways in which interdisciplinary analysis might be conducted.

Rather than being a definitive statement on interdisciplinarity, this article is meant primarily to generate thought and discussion. I hope that discussion of this article will help Truman students and faculty begin to develop shared understandings and a common language for discussing interdisciplinarity and evaluating its place in our liberal arts and sciences curriculum.

What is "Interdisciplinarity"?

"interdisciplinary studies may be defined as a process of answering a question, solving a problem, or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline or profession."¹

"Optical Theories and the Development of Linear Perspective in Fifteenth-Century Italian Renaissance Art"

Disciplines used: History, Art History, Optics, and Geometry

In this paper, a senior History and Art History major discusses how theories of optics—the science of sight—influenced how Renaissance artists represented the natural world in their artwork. The author writes, "Prior to the *quattrocento*, or fifteenth century, most European artists represented elements of the natural world in a more rigid and stylized fashion, with no codified system of reproducing perspective or proportion." In 1435, Alberti published his treatise on linear perspective, which drew on geometry-based theories of optics, and gave painters a new way to realistically represent the natural world on a two-dimensional surface. The author concludes, "With the rediscovery of Ptolemy's cartography, Alhazen's optics, and Euclid's geometry, Alberti was able to provide a scientific and reproducible system for artists to represent the natural world in a convincing manner."

¹ Klein, Julie Thompson and William H. Newell. "Advancing Interdisciplinary Studies." Pp. 3-22 in *Interdisciplinarity: Essays from the Literature*, William H. Newell, editor. New York: College Entrance Examination Board, 1998: 3.

"Pacific Salmon vs. Hydropower Dams"

Disciplines used: History, Geography, Biology, and Environmental Studies

In this paper, a senior Biology major examines the economic and environmental impacts of hydropower dams in the Columbia/Snake river basin. The author writes, "Historically, the Columbia River in the Pacific Northwest was the most prolific salmon-producing river in the world." The author notes that dam construction has resulted in an 80 percent reduction of the salmon population. The author says, "Salmon are adapted to the cool, clear, rapidly moving waters of the Columbia River and its tributaries. The addition of dams has converted this area into a long series of warmer, sediment-filled, and sluggish lakes"—physically blocking movement of fish and contributing to disease in salmon. However, "Dams continue to provide cheap electricity, flood control, increased navigation, irrigation, and recreational areas to millions of people in the region." After discussing current plans to modify four dams on the Snake River, the author concludes that while complete removal of all dams is not feasible, some modification may be necessary.

We live in a complex world. We constantly draw on and integrate diverse information from our education and experiences to make decisions, interpret phenomena, and generally make sense of this world. This informal process represents a sort of interdisciplinary analysis. Interdisciplinary analysis in a more formal setting, such as the JINS course, involves drawing on the specialized knowledge, concepts, or tools of academic disciplines and integrating these pieces to create new knowledge or deeper understanding.

Over the past one hundred years, higher education has relied on academic disciplines to generate new knowledge and provide a process by which it becomes accepted. This discipline-based model has become dominant in most universities, controlling the resources that go into teaching, research, and outreach activities. This model capitalizes on the benefits of specialization—allowing specialists within a discipline to refine theories, methods, and technologies and push outward the bounds of knowledge within that field. Interdisciplinary analysis builds on, rather than supplants the strengths of the disciplinary model.

The interdisciplinary scholar draws on appropriate disciplinary insights and reconfigures them in novel ways to address the question at hand. In the JINS course, students will experience—practice, if you will—the activities of the interdisciplinary scholar. Hopefully students will acquire the "habit" of interdisciplinary analysis and apply it in settings beyond the JINS course.

However, simply drawing on the concepts or methodologies of multiple disciplines does not automatically constitute interdisciplinary analysis. Marilyn Stember contrasts the terms "intradisciplinary", "crossdisciplinary", "multidisciplinary", "interdisciplinary", and "transdisciplinary" in a way that illustrates this point. Intradisciplinary analysis involves work within a single discipline, such as the biologist investigating cell structure of a particular organism. Crossdisciplinary activity views one discipline from the perspective of another, such as a Physics 100 lab in which principles of physics are used to understand acoustics of music.

Multidisciplinary analysis draws on the knowledge of several disciplines, each of which provides a different perspective on a problem or issue. Nationally, Women's Studies and African/African-American Studies programs are often based on a multidisciplinary model. For example, Truman's Women's Studies Minor allows students to choose classes from a number of disciplines, including English, History, Sociology, Art, Theatre, Communications, and Philosophy and Religion. In multidisciplinary analysis, each discipline makes a contribution to the overall understanding of the issue, but in a primarily additive fashion. Students must then make the connections between the various disciplinary contributions.

Interdisciplinary analysis requires integration of knowledge from the disciplines being brought to bear on an issue. Disciplinary knowledge, concepts, tools, and rules of investigation are considered, contrasted, and combined in such a way that the resulting understanding is greater than simply the sum of its disciplinary parts. However, the focus on integration should not imply

that the outcome of interdisciplinary analysis will always be a neat, tidy solution in which all contradictions between the alternative disciplines are resolved. Interdisciplinary study may indeed be "messy". However, contradictory conclusions and accompanying tensions between disciplines may not only provide a fuller understanding, but could be seen as a healthy symptom of interdisciplinarity. Analysis which works through these tensions and contradictions between disciplinary systems of knowledge with the goal of synthesis—the creation of new knowledge—often characterizes the richest interdisciplinary work.

Transdisciplinary analysis, in Stember's words, is "concerned with the unity of intellectual frameworks beyond the disciplinary perspectives."² It may deal with philosophical

"Composition II Term Paper on Architecture"

Disciplines used: Architecture, Educational Psychology

This senior author examines, "...how teaching philosophy may influence the design of a school, and how the design may affect teaching styles in the future." The author notes how the dominant teaching philosophies at the beginning of the 20th century, which cast the teacher as the unquestioned authority, influenced school and classroom design: "As indicated by these traditional approaches, in the early to mid 1900s, teaching consisted of a single teacher lecturing 20 to 30 students (Gross, 20). Students were seated in methodical rows and tried to soak up as much information as possible." Then, "After this educational reform began to set in, in the mid 1950s, school design changed drastically." To examine the relationship between teaching style and school design, the author compares the old Kirksville High School, constructed in 1914, and the new one, built in 1960. The author evaluates the design of the two schools and interviews teachers who have taught in one or both schools.

² Stember, Marilyn. "Advancing the Social Sciences Through the Interdisciplinary Enterprise." Pp. 337-350 in *Interdisciplinarity: Essays from the Literature*, William H. Newell, editor. New York: College Entrance Examination Board, 1998: 341.

**"Caravaggism and Science in the
Candlelight Art of the
Seventeenth Century"**

Disciplines used: History and Science

This junior History and Art History major examines candlelight artists of the 17th century—those who focused on paintings representing the shadow and darkness of candlelight. The author points out, "Even though economic incentives promoted the production of night scenes and candlelight images, the development of artistic styles and scientific thought more directly impacted candlelight's emergence in seventeenth-century art... The widespread influence of Caravaggio's tenebrism along with the many scientific break-throughs in the theory of light and optics inspired the generation of Dutch and French painters in the first half of the seventeenth century to develop the complex style of candlelight painting." The author discusses two important "bridges between science and art" in the seventeenth century, which made candlelight painting possible: Kepler's treatises on diffusion and refraction of light, and his discussion of the camera obscura.

questions about the nature of reality and the nature of knowledge systems that transcend disciplines. Although the broader philosophical issues of transdisciplinary analysis invite our attention, JINS courses focus on interdisciplinary learning. Interdisciplinary analysis, which involves integration and synthesis, builds on the intradisciplinary, cross-disciplinary, and multidisciplinary analyses practiced in LSP and major courses.

When faculty members discuss interdisciplinary analysis, they frequently ask, "How different (or disparate) do the disciplines have to be for a project to count as interdisciplinary?" Unfortunately, there is no pat answer to this question. A discipline is held together by a shared epistemology—assumptions about the nature of knowledge and acceptable ways of generating or accumulating knowledge. That is, practitioners within a discipline share basic assumptions about the nature of the world, beliefs about what constitutes an interesting question for study, methods for generating and analyzing information, and rules about what constitutes evidence or "proof". On the basis of epistemological

proximity, disciplines often cluster into three categories: the natural sciences (e.g. biology, chemistry, physics), the social sciences (e.g. anthropology, economics, sociology), and the humanities (e.g. literature, music, visual arts). Professional programs (e.g. Education, Business and Accountancy, Communication Disorders, Nursing, and Health and Exercise Science) generally operate on a multidisciplinary model, drawing on ways of knowing from the sciences, social sciences, and humanities.

The interdisciplinary scholar may draw from two or more disciplines that share similar epistemologies (e.g. economics and sociology) or from disciplines whose epistemologies differ markedly (e.g. biology and sociology). In discussions at Truman, faculty members have often given highest praise for interdisciplinary thinking that combines disciplines that are more disparate or different from one another to achieve new insight. These faculty members may find interdisciplinarity to be more readily apparent in an analysis using physics and history than in

one using anthropology and sociology, disciplines which already share many epistemological assumptions.

However, the key feature of successful interdisciplinary practice is not the disparity of the chosen disciplines. What demonstrates real interdisciplinary thinking is the use of each discipline as a valid source of knowledge in its own right and a valuable contribution to the discussion at hand. Novice interdisciplinary thinkers might simply tag on content or terminology from a disparate discipline to an analysis carried out in a primarily *intradisciplinary* fashion. Successful interdisciplinary thinkers not only generate new knowledge through integration and synthesis as they explore the issue or topic at hand. They also acquire a fuller appreciation for the epistemological similarities and distinctions between and among the disciplines.

Why Bother with Interdisciplinary Analysis?

The definition of interdisciplinary studies offered by Klein and Newell suggests one reason for engaging in interdisciplinary analysis: there are real-world issues and "problems" that are broader than any single discipline and can be fruitfully examined in an interdisciplinary framework. For example, understanding and addressing the problem of air pollution from waste incineration facilities might necessitate drawing on chemistry to analyze the pollutants being emitted and their effect in the atmosphere, biology to evaluate impact on affected natural systems, economic theory to weigh the costs and benefits of various regulatory approaches, and sociology to understand public risk perception and response to the facilities. An interdisciplinary analysis could be used to integrate this disciplinary knowledge in order to formulate and evaluate public policy options.

In addition to this "problem-solving" orientation, achieving deeper understanding can be an important motivation for interdisciplinary analysis. For example, drawing on and integrating

"Psychoanalysis of Vincent Van Gogh"

Disciplines used: Art History and Psychology

This junior psychology major uses psychoanalysis to examine the life and work of Van Gogh. The author notes that psychoanalysis has often been used to interpret artists and their work. The author writes, "Although the answers that lie buried behind his paintings may never be confirmed, psychoanalysis is a way to tie his life to his work, and expand on how they interact and overlap. To psychoanalyze Van Gogh, one must first look at the processes of past psychoanalysts, and from there form a series of steps that will link the artist's life to his use of color, technique, subject matter, and other common trends." The author examines how changes in Van Gogh's use of color over time were tied to the progression of his mental illness and depression; how his "brush strokes are also psychoanalytically representational of his madness"; and how "the subject matter that emerged on Van Gogh's canvases are also connected to his mental instability." The author concludes, "Both unconsciously and consciously, Van Gogh gave the world himself through his artwork. His childhood, his relationships, his feelings, his emotion, and his torment of mental illness are all revealed through his painting."

the tools and insights of history, art, and literature can enable the scholar to develop a more complete "portrait" of a historical person or event.

Finally, the most important and overarching motivation for engaging in interdisciplinary analysis in the JINS course is to give students practice doing something that they will need to do in their professional careers and personal lives. The professional may be called on to prepare a report that requires him or her to draw on existing knowledge from several fields without becoming an expert in any one of those fields; the individual, as a participating member of a democratic society, may have to evaluate "expert claims" being made by competing interest groups in order to reach a voting decision. In either case, the practice of interdisciplinary analysis would be helpful in assembling and evaluating the necessary information. In the past, students have been left on their own to make these interconnections between disciplinary knowledge bases. The JINS course provides students a chance to practice the art of interdisciplinary analysis.

The "JINS" Course and the LSP³

Members of the Truman community have long been interested in cultivating the practice of interdisciplinary thinking by students. The LAS Portfolio reading, as part of the overall assessment process, gave faculty members the opportunity to see interdisciplinary work being carried out by students from a variety of disciplines. The portfolio submissions also suggested a need for more systematic preparation for students in the practice of interdisciplinary thinking. The mission change of the University in 1985, from a regional state university to Missouri's public liberal arts institution, provided further impetus for more formal attention to interdisciplinary study in the undergraduate curriculum. The University community adopted a Five-Year Plan to direct institutional changes to accomplish the new mission. External review teams evaluating progress toward meeting this plan identified a need for more explicit opportunities in the curriculum to make interdisciplinary connections and round out the liberal arts experience.

Truman faculty and administrators responded by developing and adopting a Liberal Studies Program (LSP) which includes a Junior Level Interdisciplinary Seminar (JINS) course. The JINS course is positioned at the Junior level so that students will have fulfilled many of the "Modes of Inquiry" requirements in the LSP, encountering, in the process, a variety of disciplinary approaches to knowledge generation and evaluation. In the JINS course, students will build on and integrate the insights of these various disciplines, as well as the subject matter, concepts, or methods of their major discipline. The JINS course is, in many ways, the centerpiece of the LSP and the linchpin between breadth of knowledge (the liberal arts) and depth of knowledge (the major).

Getting Started with Interdisciplinary Analysis

Teachers of JINS courses ask students to demonstrate interdisciplinary analysis skills through a variety of assignments. Although assignments will vary, as each JINS course is independently developed and taught by an individual or faculty team, these simple suggestions may help students select a topic of study or approach an assigned topic in an interdisciplinary fashion.

³ Based on Dennis Leavens, "A Brief History of the Incorporation of JINS into the LSP".

- Select a topic of interest to you, that you won't mind investing a significant amount of time and effort into researching and learning more about.
- Try to identify a problem, question, issue, or phenomenon that is complex enough so that it would be difficult to address with the tools of only one discipline, one which lends itself to being studied or understood from multiple perspectives.
- Then, focus your research on a manageable portion of that issue or problem. As with any research effort, the real art of topic selection for this project is to strike a balance between sufficient complexity on one hand (to be conducive to interdisciplinary analysis) and sufficient focus on the other hand (to make the project manageable and the results meaningful).
- If feasible, select a topic and approach that allows you to use your "home discipline" (major) or at least draws on a discipline that is a core support area for your major (as Economics is a support discipline for Business Administration). This will give you a good starting point and base of knowledge for analyzing your topic and make it easier to bring another discipline to bear on the topic. You can do great interdisciplinary work without learning two disciplines from scratch.
- On the other hand, don't be afraid to "stretch" or take a risk in your selection of topic and disciplines. You may not want to select two disciplines in which you have never had coursework as the bases for your analysis, but certainly selecting a topic or one discipline that you have interest in but don't know much about can make your project more intriguing.
- Examine the fundamentals of your chosen disciplines and the way those disciplines' practitioners would approach a topic such as the one you've chosen. What are the basic assumptions that the disciplines make about the world?; about human nature?
- What methodologies are commonly used in the disciplines you have chosen? What implications do these methodologies have for the types of investigation carried out by practitioners of this discipline? What types and sources of data are used in the disciplinary approaches chosen?
- Are there areas of disagreement or conflict between the different approaches being used? Or are there major areas of agreement or complementarity in how the disciplines approach the subject? Examining and highlighting these areas of intersection between the different approaches can bring the interdisciplinary potential of your topic to light.

Additional Reading

The Book of "Fours". The collection of student papers from which the summaries used in this article are drawn. Available in Pickler Memorial Library.

Newell, William H. *Interdisciplinarity: Essays from the Literature*. New York: College Entrance Examination Board (1998). Also available in PML.

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