

Michael Carter

## Ways of Knowing, Doing, and Writing in the Disciplines

---

One way of helping faculty understand the integral role of writing in their various disciplines is to present disciplines as ways of doing, which links way, of knowing and writing in the disciplines. Ways of doing identified by faculty are used to describe broader generic and disciplinary structures, metagenres, and metadisciplines.

---

Those of us who work in writing in the disciplines (WID) are aware of a disjunction between the way we conceive the relationship between writing and knowing in the disciplines and the way so many faculty across our colleges and universities conceive that relationship. This disjunction may be quickly summed up as the division between writing *in* the disciplines and writing *outside* the disciplines. According to David R. Russell, writing outside the disciplines may be explained in part by the seeming "transparency" of writing: because professors typically learn to write in their disciplines not by any direct instruction but by a process of slow acculturation through various apprenticeship discourses, they are unable to see that writing itself is specific to the discipline. Consequently, faculty in the disciplines continue to conceive of writing as generalizable to all disciplines and therefore distinct from disciplinary knowledge, to be learned as a general skill outside the disciplines (*Writing* 14-20, "Writing Across" 55-56).

It's little "*wonder*," then, that so many faculty in the disciplines complain about being asked to become "writing teachers," arguing that incorporating writing into their classrooms will result in an unaccertnble sacrifice of course content. In a model of education undrrstood as the *delivery* of specialized disciplinary knowledge, writing is considered outside the disciplines, the province of English teachers, and thus unable to play an important role *in* the disciplines.

The assumptions behind writing outside the disciplines are deeply ingrained in the very concept of the university, based on a particular understanding of the disciplines that has its roots in the transition to the modern American

The assumptions behind writing outside the disciplines are deeply ingrained in the very concept of the university, based on a particular understanding of the disciplines that has its roots in the transition to the modern American university in the last quarter ohhe nineteenth century.

university in the last quarter of the nineteenth century. Under the influence of the German system of higher education, which was founded on *Wissenschaft* or scholarly knowledge, American professors embraced "pure science" as the defining characteristic of the university. an emphasis on rigorous research, typically empirical, and publication in scholarly journals. Unlike the older U.S. college sys-

tem, in which education was unified, with all students following the same course of study taught by generalists who could, and often did, shift from one course to another, the new university came to be divided into highly specialized domains of knowledge, each with its own learned societies and journals (Brubacher and Rudy 368; Lucas 179-80; Russell, *Writing* 46-51; Veysey 121-28, 159-73). This movement toward disciplinary specialization was coincident with the demise of rhetoric as a generally required course and the *rise* of freshman composition as the specific treatment for the poor writing skills of entering students (Connors 3-8; Russell, *Writing* 51-63). This conception of the disciplines as domains of specialized content knowledge, reinforced by the assumption that a writing course outside the disciplines could somehow improve students' writing in the disciplines, has led, as Russell has suggested, to a specialized conception of disciplinary knowledge combined with a generalized conception of writing.

In sharp contrast to writing outside *the* disciplines, writing in the disciplines is founded on an integrative relationship between writing and knowing. Its roots lie in rhetoric, in which invention has historically played a critical role in both recovering knowledge and generating new knowledge (McKeon; Miller, "The Aristotelian"). The rediscovery of invention in composition (Lauer;

Rohman; Young et al) and the rhetoric-as-epistemic movement (Leff; Scott. "On Viewing," "On Viewing, , Ten Years Later") provided support for the idea of writing as a way of knowing and learning (Berthoff; Emig; Flower and Hayes; Odell; Reither). WID developed as a response to the recognition that different disciplines are characterized by distinct ways of writing and knowing (Bazerman "The Second"; Jones and Comprone; Kirscht et al; McLeod). Thus, a specialized conception of disciplinary knowledge is integrated with a specialized conception of writing.

One way of understanding the distinction I am drawing between writing outside and writing in the disciplines is the difference between knowledge and knowing, that is, disciplines as repositories and delivery systems for relatively static content knowledge versus disciplines as active ways of knowing. Some psychologists describe this distinction as declarative or conceptual knowledge on the one hand and procedural or process knowledge on the other, the difference between knowing that and knowing how (e.g. Anderson). Because the organizing principle of knowledge in the disciplines is typically perceived as conceptual knowledge, faculty and students tend to understand learning in a discipline as a process of obtaining, at least in short-term memory, the particular knowledge base of the discipline. The focus of WID, in contrast, tends to be on procedural knowledge. 'writing as a way of knowing in a discipline.

**One way of understanding the distinction I am drawing between writing outside and writing in the disciplines is the difference between knowledge and knowing, that is, disciplines as repositories and delivery systems for relatively static content knowledge versus disciplines as active ways of knowing.**

Thus, the problem for WID professionals is how to bridge the gap between writing in and writing outside the disciplines, the knowing that and the knowing how. This is not a problem that can be solved by reference to our own discipline's understanding of the relationship between writing and knowing. Rather, we need to be able to conceptualize writing in the disciplines in a way that is grounded in the disciplines themselves, a viable alternative to an understanding of writing as universally generalizable. To address that need, I will draw on the idea of disciplinary ways of doing as a link between ways of writing and ways of knowing in the disciplines (e.g., Herrington; Russell, "Writing to Learn to Do"). In bridging the conceptual gap between knowing and writing in the disciplines, the concept of ways of doing offers the possibility for bridging the outside/in gap as well.

First, I will explore the ties that link ways of knowing, doing, and writing in the disciplines and describe a procedure we have used on our campus to guide faculty in identifying ways of doing in their disciplines. This process helps faculty understand their disciplines as ways of knowing, not just domains of declarative knowledge, and thus to see more readily how writing is related to

knowing. Next, I will place these ways of knowing, doing, and writing in the context of North American genre theory, particularly as applied by Carolyn R. Miller, Charles Bazerman, and Russell, This genre theory is useful not only because it establishes a direct connection between writing and doing and thus knowing but also because it

This process helps faculty understand their disciplines as ways of knowing, not just domains of declarative knowledge, and thus to see more readily how writing is related to knowing.

points to certain patterns in ways of doing across the disciplines. An advantage of being able to discern these patterns, what I call metagenres and metadisciplines, is that they provide a foundation WID professionals can use for working more effectively with faculty. I illustrate these patterns by drawing on ways of doing and writing identified by faculty at my university. Finally, I place this project within a critique of the modern university and its disciplinary structures of knowledge and consider the idea of knowing, doing, and writing in the disciplines as a basis for postdisciplinary inquiry.

### Ways of Knowing, Doing, and Writing In the Disciplines

Because doing plays a central role in this conception of writing in the disciplines, it may be helpful to understand disciplinary ways of doing and the connection to knowing and writing by looking at an illustration of a concrete form of doing: laboratory experiments. A lab experiment is designed to engage students in a particular way of doing by which they will learn about the scientific concept of the lab and also how to apply an empirical mode of reasoning about the physical world. Thus, the lab experience is a way of doing that is directed toward a way knowing. It is primarily in writing the lab report, however, that doing becomes knowing. More than merely evidence of having completed the lab and having found the right answers, the lab report frames the doing as a scientific way of knowing, introduction, methods, results, discussion; establishing a hypothesis, testing the hypothesis, accumulating evidence related to the hypothesis, determining whether or not the hypothesis is accepted and why. It provides an opportunity for students to reflect on the relationship between the lab and the scientific concept of the lab and to frame the doing of the lab in the structure of scientific reasoning. This example of a concrete way

of doing illustrates the potential relationship that exists among ways of knowing and writing in more abstract ways of doing in the university. From this perspective, writing may be understood as a metadoing: particular kinds of writing are ways of doing that instantiate particular kinds of doing by giving shape to particular ways of knowing in the disciplines,

It is this relationship among knowing, doing, and writing that is concealed by the disciplinary focus on conceptual knowledge. Doing is the middle term that links writing and knowing in the disciplines. Thus, the challenge in reframing the disciplines as ways of knowing, doing, and writing is to find a means of describing in convincing terms the ways of doing that characterize the disciplines, convincing, that is, to faculty and students in the disciplines. But how do we find such descriptions of the disciplines?

One way is to ask faculty. At my university, we are in the eighth year of an extensive assessment effort based on identifying and measuring outcomes for all the undergraduate programs on campus. This effort is a response both to a mandate from our regional accrediting agency and to a broad recognition that improvement of academic programs requires serious program assessment. Outcomes-based assessment is the process of describing and measuring for each program the skills, knowledge, and other attributes students are expected to demonstrate by the time they graduate. An outcome is what students should be able to do; thus, outcomes describe ways of doing, the procedural knowledge of the disciplines. Faculty are asked first to describe what they expect their majors to be able to do; second to identify what data they will gather, typically students' written work, for determining how well the program has enabled students to achieve the expectations; and third to create and apply a plan for assessing the outcomes. These assessment plans have provided a window onto the ways of doing and associated ways of writing in the disciplines,

Our assessment initiative began by focusing on writing and speaking outcomes and was later melded with a university-wide curriculum assessment initiative. Thus, our Campus Writing and Speaking Program has played an important role in this process, creating an intensive course of action for working with departmental committees to generate outcomes-assessment plans, involving program faculty in the following steps:

- Brainstorming core program values
- Drafting and revising disciplinary outcomes based on those values
- Getting full faculty approval of outcomes

Brainstorming assessment tools for outcomes

Drafting and revising assessment procedure

Getting full faculty approval of assessment procedure

(For a detailed description of this process see Carter.)

In the appendix are two examples, from zoology and psychology, of program outcomes. Notice that each example consists of general goals and specific outcomes, what students are expected to be able to do, along with activities that could be used for teaching and assessing the outcomes. Outcomes, then, are typically written in a way that is both teachable and measurable, to guide

**Outcomes, then, are typically written in a way that is both teachable and measurable, to guide teachers in helping students achieve the outcome and to provide implicit criteria that can be used for assessing the extent to which programs have enabled their students to achieve the outcome.**

teachers in helping students achieve the outcome and to provide implicit criteria that can be used for assessing the extent to which programs have enabled their students to achieve the outcome. Outcomes are demonstrable, that is, they describe what faculty expect their majors to be able to do, ways of doing that are important to the discipline. In the rest of the assessment plans, not included here, faculty identify particular kinds of writing and other learning experiences appropriate to as-

sessing the outcomes. The purpose is to provide faculty with data for making decisions for improving their programs.

The examples illustrate the role of doing in establishing a connection between knowing and writing. For example, the outcomes statement for zoology points to two key disciplinary ways of doing, number 1, being able to engage in scientific inquiry, and number 3, being able to solve problems in zoology. These two ways of doing indicate two important ways of knowing that define the discipline: someone with a degree in zoology should know how to effectively apply scientific reasoning to zoological phenomena and how to solve problems in zoology (the latter a reflection of the large number of majors specializing in fisheries and wildlife management and environmental studies). The kinds of writing that faculty associated with these two sets of outcomes suggest the specialized nature of the outcomes; lab reports, scientific papers, posters, management plans, project proposals, environmental impact statements.

The other three sets of outcomes are more general, not so clearly related to disciplinary ways of doing; being able to generalize information from one context to a related context; to analyze, synthesize, and critique literature in

the field; and to write for nonscientific audiences. I would argue that these ways of knowing and doing are more general to the academy. The kinds of writing faculty identified with these outcomes seem to support that argument: homework problems, case studies, essay test questions, literature reviews, annotated bibliographies, critical analyses, articles for newsletters, editorials, summaries-genres that cut across a wide range of disciplines.

Perhaps the most important aspect of the procedure for creating program outcomes is that it is faculty themselves who identify what they expect of their graduates. It is only after these ways of doing have been identified that they are linked to ways of writing, and then

not for the sake of writing but for the sake of teaching and assessing the stated outcomes. The disciplinary ways of doing that faculty identify provide a direct link between ways of knowing and ways of writing in the disciplines.

Doing enacts the knowing through students' writing, and the writing gives shape to the ways of knowing and doing in a discipline. So instead of focusing only on the conceptual knowledge that has traditionally defined the disciplines, faculty are encouraged to focus also on what their students should be able to do, represented largely in their writing. Having faculty identify disciplinary ways of doing and then assess them through students' writing is a step toward situating writing in, not outside, the disciplines.

**Perhaps the most important aspect of the procedure for creating program outcomes is that it is faculty themselves who identify what they expect of their graduates.**

## Genres and Metagenres

We can easily recognize the lab report I used as an example in the previous section as an academic genre typical of scientific disciplines. It is a response to a particular learning situation marked by a particular way of knowing and doing. But it is also possible to see the lab report as one genre within a broader category of ways of knowing and doing in the disciplines, similar learning situations that call for responses similar to the lab report. The assessment plans, when looked at together, revealed several of these categories of procedural knowledge.

Though declarative knowledge is typically specific to individual disciplines and even to sub-disciplines, the procedural knowledge that faculty described tended to be more generic. And because individual academic programs also identified kinds of writing to be used both to teach and assess the outcomes, these patterns of doing were also linked explicitly to written genres. To emphasize the close connection between these disciplinary patterns of doing and

particular kinds of writing--that is, each way of doing instantiated in written genres--I call these general ways of doing metagenres.<sup>1</sup>

In her seminal "Genre as Social Action," Carolyn R. Miller defines *genre* as a typified response to recurrent rhetorical situations. In a later piece, Miller extends her earlier description of genre as "a cultural artifact" to explore the connection between genre and cultures. Genre, she says, occupies a middle position between microlevel and macrolevel forms of analysis, providing a link between particular linguistic processes and particular cultures that both constitute and are constituted by these processes ("Rhetorical Community" 68-69). Using the analogy of an anthropologist extrapolating an ancient culture from found artifacts, Miller says that a set of genres "adumbrates a relationship between material particulars, instantiations of a genre in individual acts, and systems of value and signification" in cultures (70).

Another approach to a macrolevel understanding of genre is Bazerman's concept of system of genres, "a complex web of interrelated genres where each participant makes a recognizable act or move in some recognizable genre, which then maybe followed by a certain range of appropriate generic responses by others" ("Systems" 96-97). The particular setting that Bazerman investigates is the patent office and the sequence of individual genres that comprise the process of patent applications. Systems of genres provide a concept for understanding the way interrelated genres constitute specific networks of social action. Whereas Bazerman highlights the sequential nature of genres within a system of genres, John Swales points out that in the literature, *genre system* has been applied to a spectrum of meanings, from established sequences in which genres are typically performed to a loose collection of genres related to each other by a common enterprise (63-64).

Russell builds on the work of Miller and Bazerman in his treatment of genre systems. Drawing on activity theory, Russell situates his understanding of genre within the context of activity systems, structures of human behavior--such as families, religious groups, disciplines, and schools--by which individuals and groups use any number of a variety of means to advance a shared activity ("Rethinking" 510). [In activity theory, a written genre may be understood as texts that "are all used to operationalize the same recurring, typified actions of an activity system" (518). Russell uses the idea of genre system as a way of conceptualizing the way various related written genres act within a complex activity system as instruments both to stabilize and to create opportunities to change those activity systems (519-24).



Miller, Bazerman, and Russell address three common themes. First, they define genre as social action, ways of doing and writing by which individual linguistic acts on the *microlevel* constitute social formations on the *macrolevel*. Second, they establish the concept of genre set as a collection of related genres. Third, they use the genre set to indicate the *role* that related genres play in constituting complex social formations. Thus, a genre set may be understood as occupying a level somewhere between the individual genre and the social formation,

As an upper midlevel entity, the genre set is the basis for my use of *metagenre*, which carries a more particular usage than the loose sense of *genre set* and less of the connotation of a sequence associated with *system of genres*. *Metagenre* signifies a higher category, a genre of genres. Miller's definition of genre as a typified response to a recurrent rhetorical situation directs our attention to certain patterns in the social action of language, patterns of recurring situations and of similar responses to those situations. A metagenre, then, directs our attention to broader patterns of language as social action, similar *kinds* of typified responses to related recurrent situations. And just as the genre is a dynamic concept, representing a response to a rhetorical situation that both defines and is defined by the situation, a metagenre is also dynamic. In the terminology I've been using thus far, a metagenre indicates a structure of similar ways of doing that point to similar ways of writing and knowing. For example, the lab report may be seen as one of a collection of possible responses to learning situations that call for empirical inquiry, a collection that includes the scientific paper, poster, and project proposal (three of the genres listed by the zoology faculty members for their outcome 1).

Moreover, the idea that genre sets constitute complex social formations is the basis for the concept of the metadiscipline. Together, the genres that compose a metagenre point to a social formation composed of individual disciplines that emphasize the way of doing defined by the metagenre. A metadiscipline, then, is a higher category of disciplines. These broader structures direct our attention away from the specialized conceptual knowledge of individual disciplines, knowledge that is of less significance when diverse disciplines are grouped together, and toward the ways of knowing, doing, and writing common to the disciplines in a metadiscipline.

Thus, the concept of disciplinary ways of knowing, doing, and writing may be understood from three points of view associated with the three themes from Miller, Bazerman, and Russell. The first is the individual discipline. The

understanding of genre as social action suggests the strong connection between doing and writing identified by faculty in the disciplines. The ways of doing in the outcomes statements point explicitly to ways of writing and implicitly to ways of knowing. The second point of view is the metagenre. The idea of genre set implies categories of knowing, doing, and writing that cut across disciplines but may be inflected differently in different disciplines and in different contexts. These patterns emerge out of the outcomes identified by faculty in a wide range of disciplines. The third point of view is the metadiscipline. The concept of a relationship between genre sets and complex social formations suggests that disciplines themselves may be grouped according to common ways of knowing, doing, and writing. Each of these three perspectives emphasizes the critical role of writing in the disciplines. In the next two sections, I will explore the concepts of metagenres and metadisciplines.

### Four Metagenres

The outcomes statements created by faculty showed that certain ways of doing were repeated in general terms across a variety of disciplines; responses to

academic learning situations that call for problem solving, for empirical inquiry, for research from sources, and for performance. These metagenres are based on assessment plans from fifty-one programs from all nine undergraduate colleges at my university. I am also drawing, to a much less extent, on notes taken as I have worked with faculty committees and on other conversations I have had with faculty, which allow me to place the outcomes in the context of intentions expressed by faculty. I cannot claim that these

Because the data set is limited to programs at my own university (a large, Southern, land-grant institution), the metagenres I survey here may not be generalizable to other institutions. But I believe that what may be generalizable is the idea of academic metagenres and its role in highlighting the critical place of writing in the disciplines,

are the only metagenres represented in the data, but these four serve the purpose of illustrating the concept and its application to the academy. And because the data set is limited to programs at my own university (a large, Southern, land-grant institution), the metagenres I survey here may not be generalizable to other institutions. But I believe that what may be generalizable is the idea of academic metagenres and their role in highlighting the critical place of writing in the disciplines.

For each of the four metagenres, I will describe the ways of doing identified by faculty in selected programs, the generic learning situation that de-

finer the metagenre, and the genres that compose the typified responses to *the* generic learning situation.

### *Responses to Academic Situations That Call for Problem Solving*

Not surprising for a land-grant university with strong engineering and other pre-professional programs, problem solving is the dominant metagenre in the data set. The first example of problem solving as a way of doing comes from the food science program.

Food science majors should be able to do *the* following:

- a. identify, define, and analyze a problem: what it is that generates the problem, what is given, what is unknown, and what are the criteria for viable solutions to the problem
- b. determine what information is appropriate to solving the problem and then find it, assess its authority and validity, and use it effectively
- c. integrate and apply basic science and mathematics as well as food sciences to the solution of problems in food systems
- d. offer a range of potential viable solutions to the problem
- e. evaluate the solutions according to the established criteria, choose the most viable solution, and make a convincing case for that solution.

The second example is from textiles engineering. Engineering programs have been directed to create and evaluate program outcomes by the Accreditation Board of Engineering and Technology (ABET), ABET specifies a series of outcomes that programs are able to define for themselves, Program Outcome 3c is generally considered the problem-solving outcome. typically the focus of capstone design courses: "an ability to design a system, component, or process to meet desired needs." Faculty in textiles engineering defined their expectations for students as follows (see appendix for full version):

To demonstrate that graduates have an ability to design a system, component, or process to meet desired needs, they should show that they have a mastery of the design process and that they can apply that process effectively in generating and presenting a design in textiles engineering:

- a. *problem definition*: establishing a problem or need, identifying customer and project requirements, performing market and technical analyses
- b. *conceptualization*: converting customer and project requirements to product specifications, generating multiple product options

- c. *concept selection*: comparing product options to product specifications. selecting optimal product option(s)
- d. *concept refinement*: creating and testing prototypes or models; analyzing technical, economic, and environmental viability of design based on prototype or model; selling the product

The descriptions of problem solving in food science and textiles engineering point to a common learning situation and response to that situation. Faculty members create an occasion for students to learn the problem-solving skills appropriate to their fields by applying those skills in situations similar to those students would encounter in their professions. The responses to this common learning situation generally call [or students to define a problem, establish parameters for a solution to the problem, generate possible solutions, and identify and justify a recommended solution to the problem.

The metagenre of problem solving is composed of genres named by faculty that share all or most of these features of a typified response to the situation across different disciplines. In Russell's terminology, these genres share the same broad motive, or purpose, which links them in an overall genre system that includes these genres:

- business plans
- feasibility reports
- management plans
- marketing plans
- reports to management
- project reports
- project proposals
- technical memoranda
- technical reports

### ***Responses to Academic Situations that Call for Empirical Inquiry***

Empirical inquiry is a way of doing that consists of answering questions by drawing conclusions from systematic investigation based on empirical data. Two examples of empirical inquiry come from microbiology and political science,

### Microbiology

Microbiology students should be able to:

- a. ask pertinent questions about microbiology, formulate hypotheses based on those questions, and design experiments to test those hypotheses
- b. apply deliberate and thorough observation skills to conduct experiments and collect data
- c. organize and summarize data and present them in a way that is accurate and comprehensible in both verbal and graphical forms
- d. interpret data and draw conclusions that allow the students to support or refute hypotheses and make a case for alternative hypotheses.

### Political Science

Upon graduation, political science majors should demonstrate an ability to understand and produce quality political science research. Specifically, students should be able to show that they can:

- a. identify important research questions
- b. identify an existing theory in political science appropriate to the investigation
- c. create hypotheses
- d. test hypotheses using rigorous empiricism
- e. apply appropriate methodologies to collected data
- f. explain acquired information in the context of existing knowledge in the field

Looking at metagenres allows us to see similarities among ways of doing across disciplines that are traditionally considered distinct, in this case the natural and social sciences. The similar outcomes in microbiology and political science suggest a common learning situation, one created by faculty to enable students to learn how to apply the empirical research paradigm. Though the research conventions of microbiology and political science differ in significant ways, the faculty in both fields point to similar ways of doing: identifying questions related to the field, establishing a hypothesis for answers to the questions, testing the hypothesis by gathering data based on observations, and drawing conclusions about the hypothesis from the data. The responses to this situation are generally the same. It is not an accident that the outcomes in microbiology correspond to the parts of a scientific report—introduction, methods, results, and discussion. Faculty in political science expect their students to follow a similar model for reporting research. It is the classic way of responding to situations that call for empirical research.

The metagenre of empirical inquiry includes genres such as these:

- laboratory report
- poster
- poster presentation
- research proposal
- research report
- scientific article
- scientific presentation

### ***Responses to Academic Situations That Call for Research from Sources***

The two primary distinguishing characteristics of this metagenre are (1) the kind of research that is done, that is, not based on data gathered from independent observations but largely on sources that have their origins elsewhere; and (2) the goal of the research, which typically does not have extrinsic value, such as solving practical problems or investigating hypotheses, but value that is intrinsic to the discipline (more on this below). One example of a way of doing in this metagenre is from history.

#### **History**

History majors should be able to:

- a. pose an interesting research question about history
- b. locate relevant primary and secondary sources for investigating a research question
- c. critically evaluate primary and secondary sources in terms of credibility, authenticity, interpretive stance, audience, potential biases, and value for answering the research question
- d. marshal the evidence from the research to support a historical argument for an answer to a research question.

Another example is from a program in multidisciplinary studies, in which students are expected to bring more than one discipline to bear on their research projects.

### Multidisciplinary Studies

Students should be able to develop and apply research skills needed for multidisciplinary projects. Specifically, students should be able to demonstrate that they can:

- a. take an interest or problem not contained by a single discipline and mold it into a question that will allow them to explore that interest or problem
- b. choose and apply appropriate research methodologies from more than one discipline to address the research question and generate new questions
- c. integrate research findings from more than one discipline to form and support a sound argument
- d. satisfactorily complete a project that integrates what they have learned in their courses in response to a research question.

This metagenetic learning situation and response to the situation *are* more complex than those in the previous metagenres. It is a situation that calls for the very familiar genre of the research paper, which involves a similar way of doing, posing a question, gathering information from resources to answer the question, and making a persuasive case for the answer. However, unlike the other metagenres I have described, the similarity in ways of doing tends to mask the different ways of knowing in the various disciplines.

As I discussed the research paper with faculty in different disciplines, I noticed that they typically described the goals of assigning students to do research in terms that were peculiar to the discipline. Faculty from fields stressing problem solving and empirical research didn't do this; not only were the ways of doing relatively generic across disciplines but also the ways of knowing linked to those ways of doing. It was simply assumed that students in the sciences should know and be able to apply the scientific method or social science methodologies, just as it was assumed that students in engineering and food science should know basic problem solving skills. In each instance, learning the ways of doing was considered an end in itself, a way of knowing essential to the discipline.

But faculty from disciplines that stress research from sources tend to describe that research not as an end in itself but as a means to an end defined by the individual discipline, a specialized way of knowing. Though the means, i.e., the techniques of doing this kind of research, are clearly metagenetic, the ends expressed by faculty in different disciplines were distinct. In literature,

for example, the goal is to enable students to read and understand literature from historical, cultural, and theoretical perspectives. It is not just reading literature but learning to write about reading in a way that shapes the act of reading, a way of knowing that marks a literature major. Faculty in religious studies identified the agenda underlying research paper assignments in their field as enabling students to think about religion as a scholarly enterprise. Since most of their students become religious studies majors because they are religious people, the faculty engage them in research in order to guide them in understanding religion itself as more than a confessing experience, a subject of scholarly inquiry to be studied from critical, textual, and historical perspectives. Multidisciplinary studies uses research projects as a way of meeting its goal of encouraging majors to conceive of academic inquiry differently, shifting from seeing a question from the perspective of one discipline to seeing it from the perspective of more than one discipline. In each of these cases, the faculty members use the metageneric research from sources not as an end in itself, that is, not so that students will become experts in doing research, but as a means to a specifically disciplinary end, a distinctive way of knowing that characterizes the discipline.

The genres identified by faculty include the historical narrative from sources, literary criticism, paper, research paper, and research project. The first two are clearly disciplinary genres, but the last three terms, which were used most often, best capture the ambiguous nature of the genres that comprise this metagenre, particularly their lack of correspondence to disciplinary or professional genres in a field, which characterized the previous two metagenres. As such, these may be understood as quintessential *academic* genres, writing that is used to promote certain ways of knowing and doing without much pretense to practical application beyond the classroom.

### *Responses to Academic Situations That Call for Performance*

The label for this metagenre is intended to denote both the act and the resulting object of a performance, but particularly the primacy of the object as evidence of success in learning to perform the act, the doing of performance. At my university, the disciplines that rely most heavily on this metagenre are in the College of Design. In its assessment guidelines, the college says that its instructional focus is less on conceptual knowledge than on an "enduring understanding, on issues that are at the core of the discipline. These issues are best assessed through *performance* and *artifacts* that are direct evidence of that performance" (emphasis theirs).



Indeed, the outcomes [or departments in the College of Design are labeled as "curriculum performance standards;" such as this example from the program in art and design:

- a. Understanding of basic design principles, concepts, media, and formats in various fine arts disciplines
- b. Mastery of basic foundation techniques, particularly as related to specific fine arts fields
- c. The ability to conceive, design, and create works in one or more specific fine arts fields
- d. Working knowledge of various production methods and their relationship to conceptualization, development, and completion of works of art
- e. Understanding the similarities, differences, and relationships among the *various* fine arts areas

It's interesting to note that these are not really *standards* for the performance itself, that is, criteria for directly evaluating either the artistic act or the tic object. Rather, they are an attempt to define the *characteristics* of what the assessment guidelines call an "enduring understanding" of the discipline of art and design, an understanding that the artifacts indicate. The artifacts-works of art created by students-represent a certain quality of the *act* of creating the art which itself suggests the students' achievement of the department's outcomes listed above,<sup>2</sup>

These outcomes, then, differ in one key regard from the others presented here. Instead of describing explicit ways of doing that point toward implicit ways of knowing, in this case the ways of knowing are made explicit and the way of doing implicit. The stress on "enduring knowledge" highlights ways of knowing in contrast to declarative knowledge. It is knowledge that is enacted in performance, generating an artifact that is itself "direct evidence of that performance:"

This indirect depiction of a way of doing by the qualities of what is produced by the student may also be found in a discipline outside the College of Design. Here is the primary outcome for the program in rhetoric, writing, and language, which focuses mainly on professional writing, such as Technical communication and journalism,

Students in rhetoric, writing, and language;

- a. possess a repertoire of writing skills and a familiarity with the conventions governing written discourse in a variety of situations and can apply those skills and conventions creatively and effectively
- b. are proficient in designing, writing, and editing documents for various audiences and purposes
- c. possess the collaborative skills that allow them to work productively with other writers or specialists to produce *effective* texts and presentations.

Notice that, as in art and design, it is not a particular way of doing that is described here but a *set* of characteristics of the doer assumed to be represented in the object of the doing. The doing itself is left implicit.

Performance describes a learning situation in which teachers provide opportunities for their students to develop the enduring knowledge necessary for creating the artifacts that are the central focus of students' intended careers. Two features distinguish this learning situation from the previous three. One *is* that the artifact-what is produced-takes on a heightened status. By way of contrast, faculty and students in engineering understand that the primary locus of engineering lies in solving engineering problems and not in the technical report, which they tend to see as a means of detailing what they did to solve the problem and of recommending solutions. However, designers, artists, journalists, and technical writers see the primary locus of their work as in the artifact itself. The other feature is that these learning situations are opportunities for students to engage in ways of doing that may not lend themselves to explicit description and thus are marked indirectly by qualities of the doer to be represented in the artifact. The learning, then, becomes more of an acquisition of ways of doing than of direct instruction (Krashen). This acquisition tends to occur through the act of creating artifacts that are then critiqued in a way that guides students in the development of enduring ways of knowing. The learning situations are designed to *help* students acquire the qualities and characteristics that indicate enduring knowledge.

Though the art and design outcomes do not list specific genres, they do refer several times to various "fine arts;" presumably drawing, sculpture, painting, multimedia, etc. In rhetoric, writing, and language, the focus is mainly on written performance, including such genres listed by the faculty as documentation, editorials, feature articles, news stories, proposals, and technical reports, but also certain media such as PowerPoint presentations and websites.

The concept of metagenre, based on the idea of genre set in Miller, Bazerman, and Russell, is beneficial not only because it emphasizes the importance of writing in the disciplines but also because it provides a structure WID professionals can use to work with faculty in the disciplines. By highlighting generic patterns of knowing, doing, and writing both within and across disciplines, metagenres underline the critical role that writing can play in helping students participate fully in their disciplines. Learning in the disciplines is much more than banking away conceptual knowledge. WID professionals can use the metagenre to help faculty in the disciplines recognize the broader ways of doing in their own disciplines and to understand how different individual genres can be used as tools for teaching disciplinary ways of doing, a shift in focus from the isolated genre to the metagenre. Enabling faculty to see the broader learning situations of the disciplines may provide the basis for helping them use the various individual genres in a metagenre more strategically throughout the curriculum.

#### **Four Metadisciplines**

Earlier, I pointed out that Miller, Bazerman, and Russell observe a relationship between a set of genres and a social formation that defines and is defined by the set. In contrast to a focus on individual genres, these scholars make the case that looking at the interrelationship among genres that collectively contribute to "operationalizing," as Russell puts it ("Rethinking" 518), complex social formations helps us understand those social formations and the way they are constituted by genres. Here, I am applying that perspective to the genre *sets* in the academy associated with metagenres. These metagenres highlight broader patterns of disciplinary ways of knowing, doing, and writing that may be thought of as metadisciplines: collections of disciplines that share an emphasis on certain metagenres and are constituted by the various genres within each metagenre.

In my work in helping faculty identify outcomes, it was usually clear where that emphasis lay, from the position an outcome was given in the outcomes statement or from conversations with faculty. However, metadisciplines are not necessarily *exclusive*; disciplines may belong to more than one metadiscipline. For example, zoology faculty placed empirical research first among its outcomes, as may be expected of a scientific field. But it also included a problem-solving outcome that the faculty evidently believed was of near if not equal importance, a reflection, as I noted above, of the program's

focus on preprofessional majors in fisheries and wildlife and environmental studies. In most other cases, though, faculty seemed to value one disciplinary way of doing above others. The composition of metagenres I describe here is not **intended** to be definitive or generalizable to other institutions. It is a reflection of the data set from my own university and of my own interpretation of disciplinary outcomes statements. It is, thus, an illustration of one way of understanding the pattern of metadisciplines at a university.

Having faculty in the disciplines identify ways of doing and associated ways of writing reveals the extent to which writing is critical to the ways of knowing valued in the disciplines. Broadening the focus to metadisciplines enables WID professionals to identify the larger structures that form the academy and the role that writing plays in constituting those structures. Looking at the academy from the perspective of metadisciplines also tends to further

Having faculty in the disciplines identify ways of doing and associated ways of writing reveals the extent to which writing is critical to the ways of knowing valued in the disciplines,

complicate the assumption that disciplines are defined exclusively or even primarily by content knowledge. At the center of each metadiscipline is a way of doing shared by its constituent disciplines despite their differences in content knowledge. Thus, this broader view tends to reduce the emphasis on disciplines as domains of declarative knowl-

edge and highlight the disciplines as ways of doing. And in doing so, it also highlights the integral place of writing in the disciplines. In instantiating the shared ways of doing, writing enacts metadisciplinary ways of knowing. For each of the metadisciplines I describe here, I will list some of the disciplines in my data set that comprise it and identify disciplinary variations I observed.

The genres that comprise the metagenre of problem solving point toward a collection of disciplines that emphasize problem solving as their primary disciplinary way of doing. Disciplines in this metadiscipline include accounting, agricultural and resource economics, animal science, business management, various **engineering** majors, food science, forestry management, mathematics, pulp and paper science, and psychology. An interesting inclusion in this list is psychology, which, as a social science, would seem to be more appropriately placed with other science programs in empirical inquiry. But as the psychology outcomes indicate, the faculty in that program emphasize students' ability to solve problems, a function of the department's focus on applied psychology.

Variations within the category delineate the different ways in which problem solving is applied in different disciplines within this metadiscipline. First,

there are those that stress solving problems by designing a product. Design plays a critical role in engineering, as most engineering programs *have* a senior design course that acts as a bridge to entering the profession. These courses are usually based on a problem-solving process that leads to a tangible product, an airplane design, a model of a roadway, a piece of machinery, etc. A second variation within this category is disciplines that emphasize the application of specialized knowledge in science or mathematics to solving problems related to the field. Instead of designing a product, food science students, as the outcome above shows, are expected to solve problems by applying what *they've* learned in their courses as well as in further research in chemistry, microbiology, nutrition, and other sciences. The last variation is problem solving that focuses on gathering information from sources, a way of doing similar to the third metagenre but performed in the context of solving practical problems in a field. An example is agricultural and resource economics, in *which* students are taught how to find, evaluate, and apply standard economic data to the problems peculiar to that field.

Metadisciplines that share an emphasis on empirical inquiry tend to reside in the sciences, both natural and social, such as anthropology, biology, chemistry, geology, microbiology, political science, and sociology. I have noticed three variations within this metadiscipline. First are those programs that stress hypothetical inquiry, as seen in the examples from microbiology and political science. This kind of doing is typical of what most people associate *with* science—research that is driven by a hypothesis and is designed to test the hypothesis. But there is another variation that is not hypothetical, which I call descriptive empirical inquiry. For example, I found that most of the lab reports written by geology students are simply descriptions of, say, minerals according to the standard parameters of mineral identification. Faculty noted that much of the professional literature in geology is also descriptive, such as surveying a geological site and the specimens found there. Finally, there is a variation that emphasizes abstract knowledge of methods of inquiry *over* the actual practice of inquiry. The outcomes statement in anthropology indicates that, although empirical research is critical to the field, students are not actually asked to "do" anthropology. Faculty in that program *say* it is too difficult and time-consuming for undergraduates to pursue. Thus, the primary genre for teaching students empirical research appropriate to the field is the project proposal.

The metadiscipline composed of disciplines that emphasize research from sources includes history, literature, multidisciplinary studies, philosophy, reli-

gious studies, and women and gender studies—generally disciplines in the humanities. As I noted earlier, these disciplines are characterized by a general way of doing but distinct ways of knowing. The primary variation (within this metadiscipline accords with the distinct ways of knowing in each discipline.

Performance includes architecture, art and design, graphic design, industrial design, landscape architecture, and language, writing, and rhetoric. It may seem that fields such as industrial design would be better placed in the metadiscipline of problem solving. However, a member of that department said that students don't engage directly in problem solving until graduate school. As undergraduates, the focus of their studies is on learning how to manage the techniques and materials of industrial design, acquiring the "enduring knowledge" of the field they can call upon later for solving problems. My university does not offer a bachelor's degree in music, dance, or theater, but I suspect that these disciplines would also fall within the performance category.

The preponderance of nonwritten performances in art and design and similar programs may seem removed from WID. How could we possibly enhance the work of faculty and students in these fields? However, there is one language-based genre that is crucial to the success of design students, though it never appears explicitly as a program outcome. The assessment document for the College of Design identifies three forms of data for measuring students' achievement of the outcomes—the artifact, a portfolio of artifacts, and the critique. It is the critique that faculty point to as playing an especially important role in evaluating design students, from the very first class to the doctoral defense. Usually oral, though sometimes written, the "crit" involves a presentation of a student's artifact or portfolio that includes an overview of the work, the process and materials involved, and the effectiveness of it in terms of the intended audience or application. This genre typically allows for critiques by faculty and sometimes by other students in response to the student's work.

The critique, then, is itself a performance, or perhaps more accurately a performance about a performance (the artifact or portfolio). It appears to play a significant role, along with the artifact, both in teaching and evaluating enduring knowledge. Learning to manage this genre effectively can have a major impact on a student's success in design, not only in school but also later as a design professional. However, because the critique tends to be an "invisible" genre, there is typically little or no formal instruction and evaluation of the critique itself. WID professionals, perhaps with the aid of colleagues in communication across the curriculum, may be able to work with faculty and stu-

dents to make the genre more visible, subject to productive instruction and evaluation. Indeed, the critique could also be applied as an effective educational genre in other performance-based curricula.

I suspect that the perspective of the academy provided by metadisciplines would *have* more immediate value for WID professionals than for faculty in the disciplines. Faculty focused on their own programs may not find that the concept resonates with their needs. For WID faculty, *however*, the ability to perceive the broader disciplinary formations and to understand the way genres shape and are shaped by those formations offers a rich conception of the integration of writing in the disciplines. This conception also may have practical value. For example, it may be possible to offer workshops for faculty from disciplines within the same metadiscipline in which we help them to see the generic ways of doing and knowing that link their disciplines and then to discover collectively how those ways of doing and knowing are instantiated in writing. In such situations, faculty could learn much about the discourses in their own fields by discovering with each other the similarities and differences of those discourses in other fields.

The metadisciplinary perspective also allows WID professionals to become more aware of the variations within a metagenre among different disciplines, an awareness that may provide a basis for working more effectively with faculty in a single discipline. For instance, understanding the often-hidden agendas behind the standard research paper may be useful as we work with faculty and students in metadisciplines that stress research from sources. The similarities in the ways of doing research from sources may obscure the complex disciplinary goal structures behind the research paper. It is important, then, to explore the ways of knowing expected by faculty as well as the more familiar ways of doing. As a rule, the goal is not simply to write a research paper for the sake of learning to manage research from sources but to use the *process* of doing and writing research to shape a disciplinary way of knowing.

A greater awareness of the importance of ways of knowing in the fields allows us to take a more perceptive approach to helping faculty create appropriate learning situations for their students.

**As a rule, the goal is not simply to write a research paper for the sake of learning to manage research from sources but to use the process of doing and writing research to shape a disciplinary way of knowing. A greater awareness of the importance of ways of knowing in the fields allows us to take a more perceptive approach to helping faculty create appropriate learning situations for their students.**

## Conclusion

I began this paper by pointing to the disjunction between writing in and writing outside the disciplines, a result, as Russell suggests, of the tendency of faculty to understand disciplines as domains of specialized knowledge and writing as general across disciplines (*Writing* 14-20, "Writing Across" 55-56). One approach to bridging the gap marked by that disjunction is to focus on ways of doing in the disciplines, a focus that highlights disciplinary ways of knowing and thus offers an alternative to the dominion of declarative knowledge. Doing is the key to connecting knowing and writing in the disciplines. North American genre theory provides a theoretical foundation for conceptualizing the relationship between doing and writing and extending that relationship to metagenres and metadisciplines.

An emphasis on disciplinary ways of doing may allow us to address what Russell refers to as the transparency of writing in the disciplines (*Writing* 14-20, "Writing Across" 55-56). The process described here of encouraging faculty to identify ways of doing and specific ways of writing and assessing the writing, usually with rubrics they have designed, seems to make writing more opaque. Faculty come to understand that what counts as good writing is writing that meets the expectations of faculty in their disciplines. It's also beneficial that all this takes place on their own turf. It is not the writing professional who is telling them what counts as good writing in their fields. The faculty

**Faculty come to understand that what counts as good writing is writing that meets the expectations of faculty in their disciplines. It's also beneficial that all this takes place on their own turf. It is not the writing professional who is telling them what counts as good writing in their fields. The faculty themselves are the experts.**

themselves are the experts. And as experts, they also take responsibility for students' writing in their disciplines. Thus, instead of perceiving of WID as asking them to become "writing teachers," they can see that their responsibility for teaching the ways of knowing and doing in their disciplines also extends to writing, which is not separate from but essential to their disciplines. The WID professional becomes an agent for helping faculty

achieve their expectations for what students should be able to do.

At my university, we were able to take advantage of outcomes-based program assessment, which initiated and formalized the process of identifying disciplinary ways of doing. Our Campus Writing and Speaking Program played a critical role in that process because we realized early on the potential for linking ways of doing to disciplinary ways of knowing and writing (and speaking). Many other colleges and universities are now or, will be, participating in



outcomes-based assessment. spurred not only by regional accrediting agencies but also by accreditation by professional organizations. most notably ABET but many others as well. This is an opportunity that writing professionals should seize,

But even without a formal assessment process in place, it is still possible when working with faculty to guide them in identifying course or program learning outcomes and helping them incorporate writing as a means of both teaching and evaluating the outcomes. Starting with what students should be able to do can provide a natural link to what they should be able to write. Writing professionals can also do their *own* analyses of writing in a particular discipline. but this approach may Jack the benefit of engaging faculty in identifying disciplinary ways of doing and writing for themselves.

In Russell's history of WID. he notes that the educational system of the old college encouraged a language-rich teaching and learning environment, the recitations that dominated the classroom augmented by the popular and intensely competitive student declamations and debates outside class (*Writing* 38-45). The new university, with its focus on the delivery of highly specialized declarative knowledge and on writing as outside the disciplines. tends to promote a relatively language-poor educational environment. The emphasis on knowing, doing, and writing in the disciplines may be seen as an attempt to return to that earlier language-rich environment when writing and speaking were at the center of education. From another perspective, however, this emphasis may be understood as a part of a broader critique of the modern university and particularly the disciplinary structure of knowledge on which it is founded. a move toward postdisciplinarity or nondisciplinarity (Delanty; Ford; Mourad; Readings: see also Samuels).

For example, Roger P. Mourad argues that the disciplines are based on the epistemology of a preexisting reality that is independent of the inquirer and that may be described through the incremental additions to knowledge about that reality. As an alternative to this understanding of the disciplines, he proposes a postdisciplinary mode of inquiry, which is inquirer-based rather than object-based, meaning that knowledge is local and dynamic rather than universal and incremental, that scholars work in temporary alliances at

The new university, with its focus on the delivery of highly specialized declarative knowledge and on writing as outside the disciplines, tends to promote a relatively language-poor educational environment. The emphasis on knowing, doing, and writing in the disciplines may be seen as an attempt to return to that earlier language-rich environment when writing and speaking were at the center of education.

the intersection of disciplines rather than in disciplines themselves, and that reality is changed by the inquirer rather than independent Of the inquirer (77-104). Importantly, this postdisciplinary inquiry would make no distinction among knowledge, research, and teaching. "Teaching," Mourad says, "would become integral to research rather than essentially the after-the-fact transmission of its results. Teaching *would* not be something one does in addition to or instead of research but something one does through and in the course of research" (105).

Now, I don't want to suggest that the project I am describing in this paper would necessarily spark a revolution in the way we conceive of the university.

**Disciplines may be seen as based on ways of doing and thus ways of knowing and writing, modes of inquiry rather than static territories of knowledge to be more and more thoroughly mapped, a shift in emphasis from knowledge to knowing.**

However, I do think that reconceptualizing the disciplines in terms of metagenres and metadisciplines is at least an implicit challenge to the disciplines as separate divisions of declarative knowledge. Instead, disciplines may be seen as based on ways of doing and thus ways of knowing and writing, modes of inquiry rather than static territories of knowledge to be more and more thoroughly mapped, a shift in emphasis from knowledge to knowing. And in deemphasizing the knowledge base of the disciplines,

metagenres and metadisciplines also highlight relationships among the disciplines that are often otherwise obscured, a concept of the disciplines that is much more fluid than the focus on specialized knowledge would suggest.

By questioning the strict boundaries that mark off the disciplines one from another, postdisciplinarity also implicitly questions the assumed disjunction between the specialized knowledge of a discipline and the generalized knowledge of writing: the former is not so special; the latter is not so general. It may be, then, that writing is located neither fully in nor fully outside the disciplines because disciplinary boundaries themselves are porous and in flux; the disciplines are not fixed containers at all. Projecting the disciplines as ways of knowing, doing, and writing tends to emphasize not disjunction but junction. the intersections of disciplines, the connection between research and teaching, and the ties between writing and knowing. From this perspective, it is not so much writing in or outside but writing *of* the disciplines.

## Appendix: Sample Program Outcomes Documents

### CURRICULAR OUTCOMES DEPARTMENT OF ZOOLOGY

Students should demonstrate the ability to:

1. engage in clear and careful scientific inquiry. Specifically students should be able to show that they can:
  - ask pertinent questions about zoological phenomena and formulate hypotheses based on those questions, drawing on scientific concepts and principles.
  - apply deliberate and thorough observational skills in conducting an experiment and collecting data to test hypotheses.
  - organize and summarize data and render them in a way that is accurate and comprehensible in both verbal and graphical modes.
  - draw conclusions from data that allow the students to support or refute hypotheses and make a case for alternative hypotheses.

*Evidence for assessment:* lab reports; oral or written scientific papers; posters; class activities

2. apply information they have learned in one context to relevant cases in different contexts. Specifically students should be able to show that they can:
  - discern the conceptual similarities that underlie one case and link them to other relevant cases the student is familiar with and to concepts learned in the abstract in class.
  - successfully solve problems in one case by applying concepts and strategies they have derived from previous learning experiences, including both abstract concepts taught in class and other problems they have solved.

*Evidence for assessment:* problems assigned for homework; case studies; essay test questions; class activities

3. apply critical thinking skills to solving problems in zoology and related fields. Specifically students should be able to show that they can:
  - identify, define, and analyze a problem: what it is that generates the problem, what is given, what is unknown, and what are the criteria for viable solutions to the problem.
  - read and interpret data and generalize from those data to scientific concepts *and* principles that can apply to the solution of a problem.
  - apply appropriate scientific concepts and principles to problems *in* order to provide a range of viable solutions to the problem and design a project for solving the problem
  - evaluate the solutions according to the established criteria, choose the most viable solution, and make a convincing case for that solution.

*Evidence for assessment:* oral or written project proposals; oral or written management plans; problem sets in homework; position statements; **essay** test questions; environmental impact statements; class activities

4. analyze, synthesize, and criticize scientific literature in the field
  - distill the important information from scientific articles and describe that information clearly and concisely,
  - read scientific studies critically: assessing the knowns and unknowns, identifying the strengths and weaknesses, evaluating the arguments, and making recommendations for improvement.
  - effectively perform a review of the literature, both in its abbreviated form (as in the introduction of a scientific article) and its extended form. Students should integrate material in an organized fashion and build a logical case concerning the literature. In other words, students should not merely catalogue their sources but instead make an argument using the reading as evidence,

*Evidence for assessment:* literature reviews; annotated bibliographies; critical analyses of scientific articles; debates; research papers from scientific sources; oral summaries of **articles**; class activities

5. communicate scientific information effectively to nonscientific audiences. Specifically students should be able to show that they can;
  - take complex information related to zoology, understand it, and synthesize for non-experts who need to understand and act on the information.

*Evidence for assessment:* presentations; editorials; lay summaries; class activities

Program Review  
Department of Psychology  
B.A. in Psychology

## PROGRAM OUTCOMES

Upon graduation, psychology majors should be able to:

1. demonstrate an understanding of basic theory and concepts of psychology and the ability to engage in the systematic inquiry into human behavior and experience. Specifically students should be able to show that they can:
  - a. demonstrate their knowledge of key psychological theories and concepts
  - b. ask pertinent and productive questions that lead to an analysis of a problem; the source of the problem, the kinds of data needed to solve the problem, and the criteria that must be met for a solution to the problem.

- c. demonstrate an understanding of the data collection process, showing that they know how to collect data for solving problems and how to evaluate those data for their relevance and credibility.
- d. make sound judgments about solutions to problems based on the data they or others have collected.
- e. present data in a way that is accurate and appropriate to the audience.
- f. make a strong case for their judgments based on data, presenting their point logically and clearly.

*Opportunities to guide learning:* research proposals, research studies, oral and written lab reports, exams, class discussion

- 2. discover, understand, manage, and communicate source materials in psychology. Specifically students should be able to show that they can:
  - a. find, evaluate, and arrange potential source materials related to a subject.
  - b. effectively summarize source materials.
  - c. synthesize, analyze, and come to conclusions from multiple source materials.
  - d. make all arguments fit a claim or a proposed action based on source materials.
  - e. show that they are skillful consumers of psychology in the popular and scholarly press, analyzing claims, arbitrating among conflicting claims, and recognizing when data confirm or disconfirm hypotheses.

*Opportunities to guide learning:* exams, class discussion, summaries, abstracts, literature reviews, research projects, proposals, critical analyses, critiques of proposals, debates, oral presentations.

- 3. work effectively within the complexity and ambiguity that characterize the domains of investigation in the human sciences. Specifically, students should be able to show that they can:
  - a. handle a broad range of data, both quantitative and qualitative empirical data as well as data from theoretical and philosophical sources.
  - b. generate a variety of alternative hypotheses for explaining psychological phenomena,
  - c. show that they recognize some of the ways in which researchers, participants, and consumers construct meaning through research paradigms used in psychological settings.

*Opportunities to guide learning:* exams, class discussion, research studies, critical analyses or scholarly articles, journal entries

- 4. generalize theoretical knowledge of psychology to real-world applications. Specifically students should be able to show that they can:
  - a. apply core concepts and principles to different life situations.
  - b. apply theories of developmental processes and theories of behavior change to situations that require evaluation, maintenance, and/or change.

- c. show that they are aware of subjectivity in psychological research and applications and the potential for imposing their own cultural values on subjects and data,
- d. demonstrate awareness that researchers, agents of change, and participants in research and intervention construct meaning in their world, and that the ways in which individuals construct meaning may well affect the course of research and intervention.

*Opportunities to guide learning:* exams, class discussion, homework case reports, reading journals, group case reports, internship project reports, reflective essays or journal entries concerning students' experience with real-world applications

## TEXTILES ENGINEERING

### Program Outcome for Design Component: EC2000 Criterion 3c

To demonstrate that graduates have an ability to design a system, component or process to meet desired needs. They should show that they have a mastery of the design process *And* that they can apply that process effectively in generating and presenting a design in textiles engineering:

1. *problem definition:* establishing a problem or need, identifying customer and project requirements, performing market and technical analyses
2. *concept generation:* converting customer and project requirements to product specifications, generating multiple product options
3. *concept selection:* comparing product options to product specifications, selecting optimal product option(s)
4. *concept refinement:* creating and testing prototypes or models, analyzing technical, economic, and environmental viability of design based on prototype or model; selling the product

### Evaluation Criteria for Design Component: EC2000 Criterion 3c

#### Problem Definition

*in their project reports, the learn of students should show that they can:*

1. establish a problem to be solved or a need to be met by a product on the basis of quantitative data from a market analysis
2. identify specific customer groups for whom the product would solve the problem or meet the need
3. perform a detailed and complete analysis of potential customers' problems or needs based on quantitative information from sources such as surveys, interviews, and reviews of literature

4. describe the project requirements such as parameters related to finances and time and constraints on equipment and raw materials
5. analyze the technology necessary and available for meeting market needs, including a survey of existing technology, potential technology, and technology used by potential competitors

### **Concept Generation**

*In their project reports, the team of students should show that they can:*

1. convert customer and project requirements into product specifications by the use of quantitative metrics of customer needs
2. identify a suitable number of creative concepts for product options to meet the product specifications
3. effectively demonstrate, using diagrams, sketches, etc., how each of the concepts may function as a product option for meeting product specifications

### **Concept Selection**

*In their project reports, the team of students should show that they can:*

1. analyze the proposed concepts by quantifying the relationship between the various product options and the product specifications
2. identify and make a convincing case for the optimal product *option(s)* among all the concepts

### **Concept Refinement**

*In their project reports, the team of students should show that they can:*

1. create an appropriate and useful prototype, model, or other visual representation of the proposed product
2. use the representation effectively for identifying and proving governing engineering concepts related to the product
3. test the design by performing an industrial design analysis on the product representation (ergonomics, aesthetics, function, etc.)
4. test the design by performing a technical analysis on the product representation (how well it works)
5. test the design by performing an economic analysis (cost/benefit ratio, viability of production, etc.)
6. address the environmental impact of the manufacturing, disposal of by-products, and overall risk to society of the potential product
7. effectively sell the product in terms of its potential economic, technical, and environmental viability

## Acknowledgments

I would like to recognize the following faculty at my university for their leadership in creating the assessment materials quoted here: Lynn Turner, Food Science; Meredith Davis, Graphic Design; Will Kimler, History; Gerry Luginbuhl, Microbiology; David Greene, Multidisciplinary Studies; Andrew Taylor, Political Science and Public Administration; Sharolyn Lane, Psychology; Jon Rust, Textiles Engineering; and Jim Gilliam, Zoology. I am grateful to Carolyn R. Miller and David M. Rieder for reading earlier versions of this paper.

## Notes

1. Janet Giltrow has used *meta-genre* in a different sense, a genre in which people write or talk about genre.

2. The outcomes and other quoted material related to assessment in NC State's College of Design is taken from an in-house document, compiled by college faculty, consisting of guiding principles for assessment and goals and performance standards for each department in the college.

## Works Cited

- Anderson, John R. *Cognitive Psychology and Its Implications* (4th ed.), New York: W.H. Freeman, 1995.
- Bazerman, Charles. "Review: The Second Stage in Writing Across the Curriculum." *College English* 53 (1991): 209-12.
- "Systems of Genres and the Enactment of Social Intentions." *Genre and the New Rhetoric*. Eds. Avi Freedman and Peter Medway. London: Taylor & Francis. 1994. 79-101.
- Berthoff, Ann E. *Forming/Thinking! Writing: The Composing Imagination*. Rochelle Park, NJ: Hayden, 1978.
- Brubacher, John S., and Willis Rudy. *Higher Education in Transition: A History of American Colleges and Universities* 4th ed. New Brunswick, NJ: Transaction Publishers, 1997.
- Carter, Michael. "A Process (or Establishing Outcomes-Based Assessment Plans for Writing and Speaking in the Disciplines: Language and Learning Across the Disciplines 6 (2002): 4-29.
- Connors, Robert J. "The New Abolitionism: Toward a Historical Background," *Reconceiving Writing, Rethinking Writing Instruction*. Ed. Joseph Petraglia. Mahwah, NJ: Erlbaum, 1995. 3-26.
- Delanty, Gerard. *Challenging Knowledge; The University in the Knowledge Society*. Buckingham, UK: The Society for Research into Higher Education & Open UP. 2001.
- Emig, Janet. "Writing as a Mode of Learning," *College Composition and Communication* 28 (1977): 122-28.
- Flower, Linda, and John R. Hayes. "The Cognition of Discovery: Defining a Rhetorical Problem," *College Composition and Communication* 31 (1980): 21-32.
- Ford, Marcus Peter. *Beyond the Modern University: Toward a Constructive*



- Postmodern University. Westport, CT: Praeger, 2002.
- Giltrow, Janet. "Meta-Genre." *The Rhetoric and Ideology of Genre: Strategies for Stability and Change*. Ed. Richard Coe. Loreli Lingard, and Tatiana Teslenko. Cresskill, NJ: Hampton P, 2002.187-205.
- Herrington, Anne J. "Writing to Learn: Writing Across the Disciplines." *College English* 43 (1981): 379-87.
- Jones, Robert, and Joseph J. Comprone. "Where Do We Go Next in Writing Across the Curriculum?" *College Composition and Communication* 44 (1993): 59-68.
- Kirscht, Judy, Rhonda Levine, and John Reiff, "Evolving Paradigms: WAC and Rhetoric of Inquiry." *College Composition and Communication* 45 (1994): 369-80.
- Krashen, Stephen D. *Second Language Acquisition and Second Language Learning*. New York: Prentice- Hall. 1988.
- Lauer, Janice M. "Heuristics and Composition." *College Composition and Communication* 21 (1970): 396-404.
- Leff, Michael. "In Search of Ariadne's Thread: A Review of the Recent Literature on Rhetorical Theory." *Central States Speech Journal* 29 (1978): 73-91.
- Lucas, Christopher J. *American Higher Education: A History*. New York: SL Martin's, 1994.
- McKeon, Richard. "Creativity and the Commonplace." *Rhetoric: Essays in Invention and Discovery*. Ed. Richard Peter McKeon and Mark Backman. Woodbridge, CT: Oxbow, 1987. 25-36.
- McLeod, Susan H. "Writing Across the Curriculum: The Second Stage, and Beyond." *College Composition and Communication* 40 (1989): 337- 43.
- Miller, Carolyn R. "The Aristotelian Topes: Hunting for Novelty." *Rereading Aristotle's Rhetoric*. Ed. Alan G. Gross and Arthur E. Walzer. Carhondale: Southern Illinois UP. 2000.130-46.
- "Genre as Social Action." *Quarterly Journal of Speech* 70 (1984): 151-67. Rpt. *Genre and the New Rhetoric*. Ed. Aviva Freedman and Peter Medway. London: Taylor & Francis 1994. 23-42.
- "Rhetorical Community: The Cultural Basis of Genre." *Genre and the New Rhetoric*. Ed. Aviva Freedman and Peter Medway. London: Taylor & Francis. 1994.67- 78
- Mourad, Roger P.Jr. *Postmodern Philosophical Critique and the Pursuit of Knowledge in Higher Education*. Westport, C1: Bergin & Garvey, 1997.
- Odell, Lee. "The Process of Writing and the Process of Learning." *College Composition and Communication* 31 (1980): 42-S0.
- Readings, Bill. *The University in Ruins*. Cilmbridge, MA: Harvard UP, 1996.
- Reither, James A. "Writing and Knowing: Toward Redefining the Writing Process." *College English* 47 (1985): 620-28.
- Rohman, D. Gordon , "Pre-Writing: The Stage of Discovery in the Writing Process." *College Composition and Communication* 16 (1965): 106-12.
- Russell, David R. "Rethinking Genre in School and Society: An Activity Theory Analysis." *Written Communication* 14 (1997): 504-54.
- "Writing Across the Curriculum in Historical Perspective: Toward a Social Interpretation." *College English* 52 (1990): 52-73.
- Writing in the Academic Disciplines, 1870-1990: A Curricular History*. Carbondale, It : Southern Illinois UP. 1991

"Writing to Learn to 00: WAC, WAW, WAW-WOW!" *Language and Learning Across the Disciplines* 2 (1997): 3-8,

Samuels, Robert. "Re-Inventing the Modern University with WAC: Postmodern Composition as Cultural and Intellectual History." *Across the Disciplines: Interdisciplinary Perspectives on Language, Learning, and Academic Writing* 1 (2004). <http://wac.colostate.edu/atd/articles/samuels2004.cfm>.

Scott, Robert L. "On Viewing Rhetoric as Epistemic." *Central States Speech Journal* 18 (1967): 9-16.

"On Viewing Rhetoric as Epistemic: Ten Years Later." *Central States Speech Journal* 27 (1976): 258-66,

Swales, John. "Language for Specific Purposes." *Annual Review of Applied Linguistics*, 20 (2000): 59-76.

Veysey, Laurence R. *The Emergence of the American University*. Chicago: U of Chicago P, 1965.

Youlis, Richard E., Alton L. Becker, and Kenneth L. Pike. *Rhetoric: Discovery and Change*. New York: Harcourt, 1970.

## Michael Carter

Michael Carter is a professor of English at North Carolina State University, where he also serves as Associate Director of the Campus Writing and Speaking Program and Interim Associate Dean of the Graduate School. He is the author of *Where Writing Begins: A Postmodern Reconstruction* and articles in a variety of journals, including *Research in the Teaching of English*, *College Composition and Communication*, *College English*, and *Rhetorica*. He has been principal investigator for two National Science Foundation grants to create LabWrite, an online guide for helping students learn science by writing better lab reports.