

the door to many other exciting research possibilities, and fellow researchers will certainly find it valuable. In addition to the insight on the effects of gender on professional interpersonal interactions, *Gender and Collaboration* also includes a very good analysis of the general requirements for successful teamwork. Perhaps engineering students can benefit from this book's detailed description of effective collaboration skills, and in addition, the book can alert students to gender issues. The book is also certainly useful for instructors, as it contains specific recommendations on how to encourage effective teamwork, and how to ensure the inclusion of women.



Donald, J.G. (2002). *Learning to Think: Disciplinary Perspectives*. San Francisco, CA: Jossey Bass. Pages: 330. Price: \$35.00 USD (cloth).

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Janet Gail Donald's impressive book synthesizes the results of an extensive research project spanning more than twenty-five years and many university disciplines. Donald conducted the research as a member and director of the Centre for University Teaching and Learning at McGill University. *Learning to Think* focuses primarily on the disciplines of physics, engineering, psychology, law, education, English literature, chemistry, and biology. It addresses three overarching questions: What kind of learning environment does each discipline provide? What knowledge and higher order thinking processes are important for students to learn? And, what are the optimal ways of cultivating these thinking processes? To answer these questions, Donald and her assistants carried out several cycles of research. Each cycle included multiple methods for collecting and analyzing data, such as participant classroom

observations, interviews with exemplary instructors, and interviews and questionnaires for students. To contextualize the project, the first chapter reviews scholarly work on university disciplines, drawing on sociology and epistemology, as well as developmental, educational, and cognitive psychology.

The subsequent chapters of *Learning to Think* each analyze teaching and learning in one of eight disciplines, except the third chapter, which focuses on both biology and chemistry. Each chapter comprises parallel sections devoted to "The Disciplinary Context," "Students' Experience Learning," "The Learning Task," "The Development of Thinking Processes," "The Challenge of Instruction," and "The Disciplinary Perspective." Throughout these chapters, Donald's analysis draws primarily on professors' conceptions of their own disciplines, and on educational psychology. For example, disciplinary knowledge and students' knowledge are both represented as semantic networks, featuring nodes that stand for concepts, and links that stand for the strength and type of relationships among these concepts. The activities of students are conceptualized largely as thinking processes such as selection, inference, synthesis, and verification. Good university teaching is conceptualized predominantly in terms of moderate constructivist theory and practices, such as collaborative learning, problem-based learning, and strategy instruction.

Learning to Think may quickly become the principal text on the psychology of learning in the university. Its great strength is the broad perspective afforded by its inclusion of diverse disciplines, depth of analysis, and methodological variety, combined with its attention to the most problematic aspects of university learning. Donald identifies similarities in the challenges facing most disciplines: burgeoning volumes of knowledge; a large student body with disparate levels of academic preparedness; and fragmentation due to specialization within disciplines. She also identifies differences among disciplines, and conceptualizes these on several dimensions, particularly

emphasizing the continuum from deductive, paradigmatic disciplines such as physics, through inductive disciplines such as biology, to interpretive disciplines such as English literature. Donald relates these dimensions to the challenges of teaching in specific disciplines. For example, in paradigmatic disciplines, the relative consensus on core theoretical frameworks results in greater convergence in concept coverage across courses, while in the social sciences and humanities, the greater diversity of theoretical frameworks results in less coherence around key concepts. Other kinds of challenge are more idiosyncratic: In physics, students' intuitive conceptions clash with those of academic physics; in education, the brevity of post baccalaureate programmes clashes with the need to develop both disciplinary knowledge, and meta-knowledge about how elementary and secondary students learn these disciplines.

Donald's exploration of the gap between the curriculum that professors intend and the curriculum that students experience is particularly intriguing. Professors may conceptualize learning goals differently from their students. Many students enter psychology, for instance, expecting to learn to understand themselves better; instead they find a discipline focused on theory building and empirical hypothesis testing. Moreover, thinking and learning in the disciplines are seldom discussed in depth. As one English literature professor noted, "Thinking processes are probably the most important thing students would pick up from the course, and yet they are probably the least explicitly examined or taught" (p. 271). Although professors prefer that students engage thoughtfully with subject matter, many enter university with learning styles oriented toward quick, superficial, rote learning. And professors may inadvertently encourage this orientation by imposing extremely heavy workloads, or using potentially superficial forms of assessment, such as multiple choice testing. At certain points, Donald's criticisms are frank: "Of greater concern to [chemistry and biology] instructors should be the classroom situation, which shows considerable commonality across

these disciplines. The mode is to use large class lectures, with some discussion. Labs are frequently not conjunctive with the lectures, and students operate in a rote or algorithmic manner rather than meaningfully” (p. 129).

In the face of these challenges, Donald is not at all pessimistic. She describes, discipline-by-discipline, professors’ innovative practices for encouraging thinking and understanding. These practices include explicit discussion of the learning goals of disciplines, greater coherence in course content, cooperative learning, problem-based learning, and explicit instruction in thinking and problem solving strategies. She succinctly summarizes her views on instructional methods with a table that compares “Found” and “Optimal” practices in various disciplines (pp. 273-274). To these practices, she might have added traditional practices such as writing-intensive programmes that emphasize critical thinking and understanding. Donald notes that reform must take place at three levels: the institution, the faculty, and the students.

Having noted the great strengths of *Learning to Think*, I would be remiss not to raise some critical issues. First, although Donald values each discipline on its own terms, the natural sciences are represented by three different disciplines, while the humanities are represented by English literature alone. Other humanities, such as philosophy or history, might have given a different picture of learning to think. Secondly, Donald’s characterization of various disciplines as deductive, inductive, or interpretive, seems too simple. She touches on this problem occasionally (e.g., p. 99), but could develop it further. Thirdly, it is not clear what her working model of thinking processes adds to our understanding of thinking in the disciplines. For example, she notes that “...consistencies in the use of certain specific thinking processes across disciplines suggest that there are thinking processes a student in any discipline needs to acquire” (p. 283), and includes among these “identifying context,” “stating assumptions,” and “changing perspective.”

However, the fact that a set of activities can be assigned a common verbal label does not mean that there is a type of thinking process coextensive with the application of that label, and different from thinking processes designated by other labels. Donald discusses the expertise framework, which stresses the role of pattern knowledge in selecting problem solving operations, and she uses this framework in parts of her analysis, noting for example that in engineering, “Technological laws, and functional and structural rules” provide the lexicon of patterns that are used to retrieve courses of action (p. 87). Nevertheless, much of *Learning to Think* focuses either on the structure of students’ knowledge, or on generic thinking processes, rather than the interactions between them.

These limitations, however, are inevitable in a book of this scope, and do not detract from the importance of *Learning to Think*. I avoided opening this review with suggestions about possible readerships, because Donald’s book deserves a thoughtful examination from a wide audience. For university administrators, it draws attention to the conditions that will help faculty to develop their teaching and engage students in more meaningful learning. For professors in a variety of disciplines, it provides insights into the challenges that their students face as they move from course to course. For educational psychologists, it provides a valuable supplement to the existing research literature, most of which focuses on primary and secondary education. And perhaps most importantly, for university students it could provide an insider’s perspective on what their professors believe university disciplines are all about.

