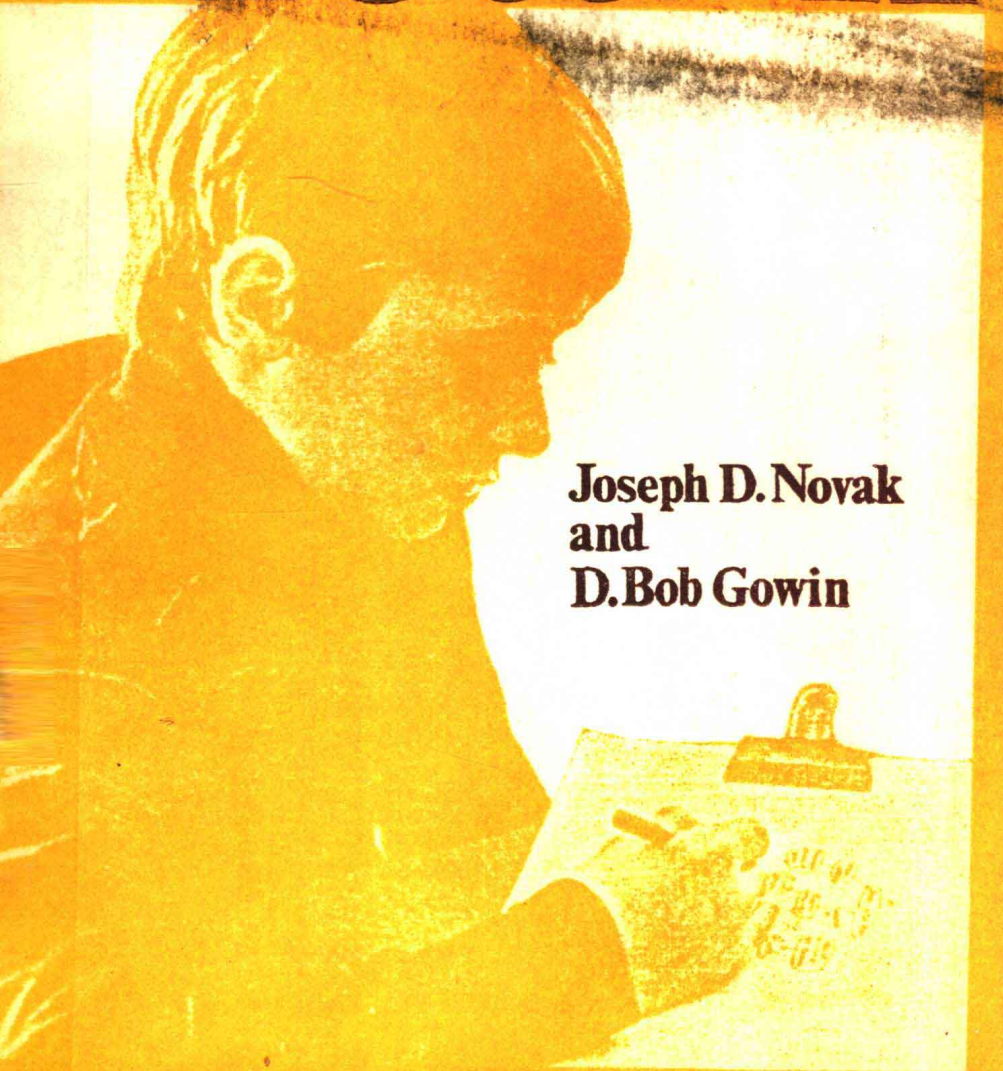


learning  
how to  
**learn**



**Joseph D. Novak  
and  
D. Bob Gowin**

# *Learning how to learn*

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# FOREWORD

During the past year two aspects of my life have often been juxtaposed. As president of a national teaching association, I have served on state and national commissions concerned with clarifying the crises in science education and I have traveled the country discussing the identified crisis with classroom teachers. As a science educator concerned about how students, particularly female and minority students, learn, I have assessed and analyzed learning among black teenagers who used the constructs described within this book. What amazes me in retrospect is how and why those two activities were so separate, so distinct. Surely the first concern of the prestigious commissions and researchers, as well as the journalists who publicized their work, was how children learn. Yet neither in the headlines nor in the footnotes did I find references to meaningful learning – to education. Rather, I read about training, testing, disciplining, and employing. Yet, shouldn't the science education of the children in my research help them think about the consequences of using a nuclear weapon as well as teach them how to read the operational manual and run the machine?

As the hoopla concerning the crisis fades and the work of rejuvenating education begins, I suggest that parents, teachers, administrators, and researchers read this book. It succinctly and clearly presents a view, a theory, of how children learn and, therefore, how teachers and others can help children think about science as well as other topics. Its ideas and techniques may be adopted for preschoolers when objects are conceptually ordered, or for theoretical physicists when findings are conceptually organized. In addition, the authors offer evidence that their propositions work, that children can *learn how to learn*.

Two of the constructs described and discussed in the book, Concept and Vee diagramming, augment learning by combining the the-

## *Foreword*

oretical with the practical, the unfamiliar with the familiar. The third one, clinical interviews, allows teachers and parents to assess such integration. Together they build a firm foundation for learning and for thinking.

Perhaps times are changing. Recently I gave a workshop, mandated by a state's commission on education, for some rather reluctant science teachers. They were tired of unsolicited, external edicts about longer school days, fewer teacher aides, more student-centered laboratories, student and teacher competency tests, and differential teacher pay. Politely they listened to my summary of national reports; quietly they assessed texts with readability formulas; passively they evaluated computer software. But the atmosphere changed when I introduced concept mapping. Enthusiastically and eagerly, they sought more information on how children learn because they could relate the material to learning problems in their classrooms. I believe that changes will come not from legislators or commissioners, but from classroom teachers. Novak and Gowin relate learning with teaching in a way designed to help classroom teachers who, in turn, will educate our children.

Jane Butler Kahle

*West Lafayette, Indiana*

## PREFACE

THIS BOOK was written for all those who believe that learning can be more effective than it now is, either in schools or in any other educational setting. The work grows out of sixty years of the authors' combined experience and research dealing with problems of educating in classroom and field settings.

For almost a century, students of education have suffered under the yoke of the behavioral psychologists, who see learning as synonymous with a *change in behavior*. We reject this view, and observe instead that learning by humans leads to a *change in the meaning of experience*. The fundamental question of this book is, How can we help individuals to reflect upon their experience and to construct new, more powerful meanings?

Furthermore, behavioral psychology, and much of currently popular "cognitive science," neglects the significance of feelings. Human experience involves not only thinking and acting but also feeling, and it is only when all three are considered together that individuals can be empowered to enrich the meaning of their experience. All readers of this book have surely experienced sometime during their schooling the debilitating effect of an experience that threatened their self-image, their sense that "I'm OK." We have found repeatedly in our research studies that educational practices that do not lead learners to grasp the meaning of the learning task usually fail to give them confidence in their abilities and do nothing to enhance their sense of mastery over events. Whereas *training* programs can lead to desired behaviors such as answering math problems or spelling correctly, *educational* programs should provide learners with the basis for understanding why and how new knowledge is related to what they already know and give them the affective assurance that they have the capability to use this new knowledge in new contexts. Schooling is too often an assault on students' egos because the rote, arbitrary,

## Preface

verbatim instruction so common in classrooms has few intrinsic rewards. Students who do seek meaning in such instruction often fail. For them, school is at best frustrating and at worst an ordeal in which they must suffer the ridicule of teachers, classmates, and sometimes parents. We commonly blame these victims for failing at rote learning, and categorize them as “learning disabled” or, more denigrating, school dropouts or simply losers. The cost of these failures, both to the individuals and to society, is enormous.

We have come to recognize that questions of learning cannot be addressed comprehensively unless we consider simultaneously questions dealing with three other commonplaces involved in education: teachers and how they teach, the structure of the knowledge that shapes the curriculum and how it is produced, and the social matrix, or governance, of the educational setting. In any episode of educating, all four must be considered. The strategies we present are designed to enhance educating by helping learners to learn about human learning, about the nature of knowledge and the construction of new knowledge, about strategies for better curriculum design, and the possibilities for governance of education that is liberating and empowering.

We do not intend to demean teachers. We seek instead to celebrate the sense of achievement that results when students and teachers share meanings and give emotional support to each other. The relationship between students and teachers need not be an adversarial one — poor pedagogical practices or a poor curriculum, or both, are usually to blame. Much that is wrong with education can be changed, and most of the needed changes are not expensive. Although programs that offer new pedagogical strategies or create new curricula do cost money, it costs us very little to change our minds. Are our ideas cost effective? We need only consider one point. Teachers have been working very hard to achieve what is both impractical and burdensome, and therefore costly: We have expected them to *cause* learning in students, when of course learning must be *caused by* the learner. When students learn about learning in the ways we recommend, they take charge of their own learning. Relieved of the burden of having to cause learning,<sup>1</sup> teachers can concentrate on teaching. When the goal of teaching becomes the achievement of shared meaning, a great deal of both teachers' and students' energy is released. The strategies offered in this book can not only help learners, they will also make better and more powerful teachers. And therein lies much of the

## *Preface*

potential of the book, for in the course of a career, a teacher can influence the lives of thousands

There is, we believe, a solid theoretical foundation for the practical strategies we put forward. This is a “how to do it” book with a solid theoretical base and considerable empirical research behind its claims. Throughout the book, we cite our own and others’ works, as well as the Master’s and PhD theses of some of the more than fifty students who have worked with us. But we are not out to convince the skeptic. Rather, our purpose is to provide workable strategies to help students learn how to learn. We also illustrate how these same strategies can be applied to better organize educational programs and to benefit future research in education. We recognize that helping students learn how to learn in the sense we intend is a new and profoundly important endeavor. Because we have just begun to explore the human potential for learning, our ideas will undoubtedly be revised and expanded in the future. Our experience has shown us, however, that the basic strategies we propose are useful and powerful, and can only become more so as they evolve.

So we invite you, the reader, to join us in an adventure in education that is potentially revolutionary and has no limits, for there are no limits to the power of the human mind to construct new meanings from experience.

J. D. Novak  
D. B. Gowin

*Ithaca, New York*  
*May 1984*



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**S**IR ISAAC NEWTON said that if we achieve something of value, it is because we stand on the shoulders of giants who have come before us. We recognize our indebtedness to the brilliant thinkers whose work has shaped our thinking, especially John Dewey, Joseph Schwab, and David Ausubel. But equally important have been the many graduate students and teachers who have worked with us, offered counsel and criticism, and often provided encouragement as well as wisdom. Among the teachers are Mary Bente, Harris Brotman, Loy Crowder, Jay Decatur, Sarah De Franco, Richard Eklund, Jon Glase, Kenneth Greisen, David Henderson, Roald Hoffmann, Donald Holcomb, Jane Kahle, Doug Larison, James Maas, Richard McNeil, James Noblitt, Walter Slatoff, and Charles Wilcox.

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# LEARNING ABOUT LEARNING

## WHAT IS THIS BOOK ALL ABOUT?

**WE ARE CONCERNED** with educating people and with helping people learn to educate themselves. We want to help people get better control over the meanings that shape their lives. Educating is powerfully liberating; failures in educating are powerfully oppressive. Wherever educating occurs, in schools and out, we think we can help people get better control over the events of educating, and thus over that part of their lives that is being transformed.

“Seek simplicity, but distrust it,” claimed Alfred North Whitehead. We share this view, and desire in seeking simplicity to preserve complexity. Sometimes simple ideas are so obvious they are obscure. We will try to illustrate simple but potentially powerful strategies to help students learn and to help educators organize learning material. The two principal educational tools we will discuss are *concept mapping* (see Figure 1.1), which is a way to help students and educators see the *meanings* of learning materials, and *knowledge Vee diagramming* (see Figure 1.2), which is a way to help students and educators penetrate the *structure and meaning* of the knowledge they seek to understand. In addition, we will describe some strategies that help students and teachers move toward what we will call *shared meanings and feelings*. This task is ambitious, but our experiences have shown that it is not unattainable. We invite you to join us in an exploration that is still very much in progress, for we (the authors) and our students are continuing our search for ways to become better teachers and/or learners and to help students learn what it means to learn. This process is symbiotic: illuminated by the teacher and student sharing ideas and advanced by their mutual commitment to educating.

In Chapter 2, we will present a full discussion of concept mapping.

# Learning how to learn

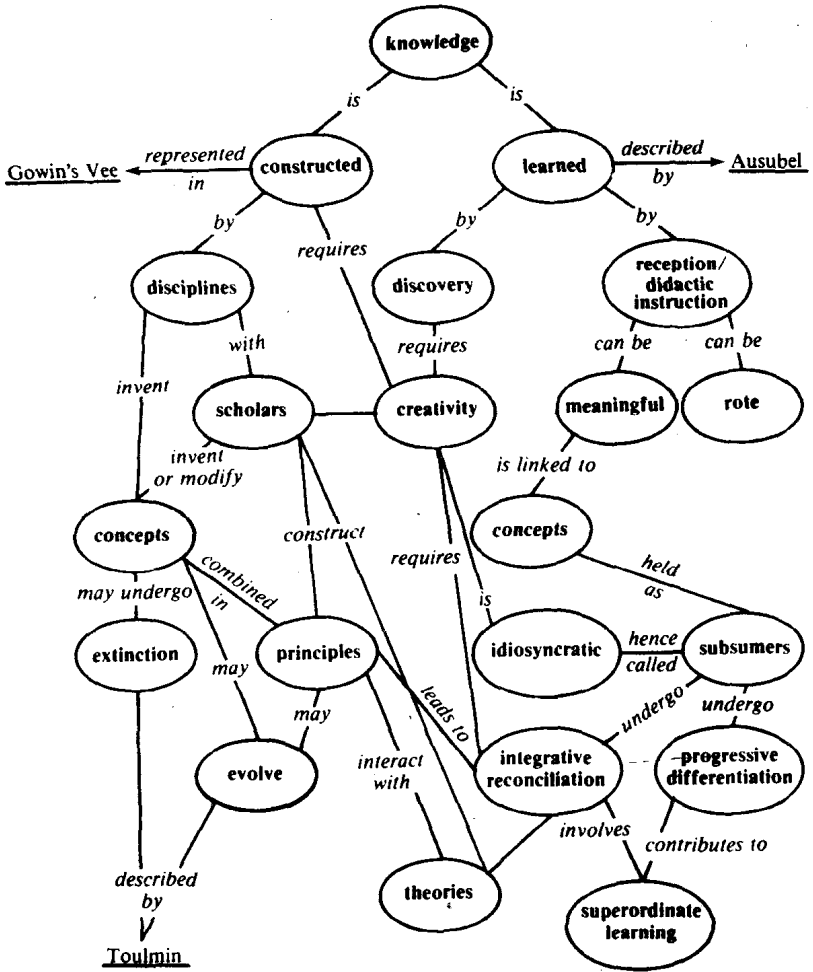


Figure 1.1 A concept map showing the major ideas presented in this book regarding acquisition and construction of knowledge. Key concepts are shown in ovals; appropriate linking words form key propositions.

We provide both practical advice and theoretical perspective, stressing that people think with concepts and that concept maps serve to externalize these concepts and improve their thinking. In Chapter 3, we show that Vee diagramming based on epistemological study of an event is a simple and flexible way to help students and teachers

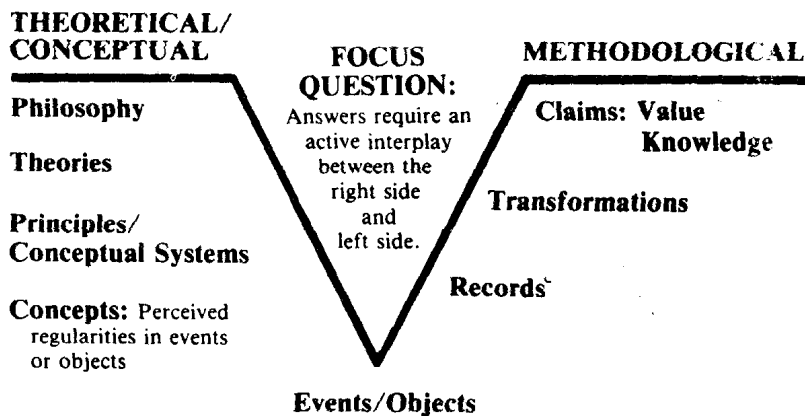


Figure 1.2 Gowin's Vee heuristic invented to illustrate the conceptual and methodological elements that interact in the process of knowledge construction or in the analysis of lectures or documents presenting knowledge.

grasp the structure of knowledge. It has been our experience that once people have tried applying concept mapping and Vee diagramming to familiar material, they see the value and power in these strategies.

For decades it has been debated whether education is an art or a science. We will not enter into this debate, which is somewhat analogous to the debate regarding heredity versus environment as the determinant of human performance. Whatever the detailed issues may have to say to us, our general premise is that education can be both an art (or craft) and a science and that human potential is influenced by both heredity and environment. Because almost no one today advocates eugenics, the only option available to educators is improvement of the learning environment. The strategies presented in this book are based on and derived from theoretical developments in learning psychology and philosophy in much the same way that many new medical, agricultural, or engineering practices are derived from theoretical advances in the sciences. Without belaboring the issues, we try to illustrate the symbiosis that exists between theory development and advances in educational strategies. We will show this relationship in the course of illustrating strategies for helping students understand how knowledge is constructed by human beings – by students, teachers, and scholars.

## *Learning how to learn*

To some of our readers, it may come as a surprise to learn that knowledge is *constructed*. That people *discover* knowledge is a common myth. Discovery may play a role in the production of new knowledge, but it is never more than just one of the activities involved in creating new knowledge. The construction of new knowledge begins with our observations of events or objects through the concepts we already possess. By *event* we mean anything that happens or can be made to happen: Lightning is a natural event; wars, schooling, and atom splitting are events people make happen. By *object* we mean anything that exists and can be observed: Dogs, stars, and humans are naturally occurring objects; houses, pottery, and totem poles are objects humans construct. So we see that the construction of knowledge can involve both naturally occurring events or objects and events or objects that humans construct. Knowledge is not discovered like gold or oil, but rather is constructed like cars or pyramids. Let us turn now to the role that concepts play in knowledge making.

We define *concept* as a regularity in events or objects designated by some label. "Chair" is the label we use (in English) to designate an object with legs, a seat, and a back that is used for sitting on. "Wind" is the label we use for the event that involves air in motion. Although it is possible that other animals also recognize regularities in events or objects, humans seem to be unique in their capacity to invent and use language (or symbols) to label and communicate these perceived regularities.<sup>1</sup> Culture is the vehicle through which children acquire concepts that have been constructed over centuries; schools are relatively recent inventions for (we hope) accelerating this process. William James once suggested that the world of the newborn infant is a blooming, buzzing confusion. We don't know if this is true, but we do know that very young infants learn to distinguish the sounds of mother or father coming to feed them and of other important events from the noises around them, and that their cries can signal recognition of these perceived regularities in events. This innate capacity to sort out regularities and to recognize and/or apply labels enables the infant to acquire speech (which all normal children do by age three), an incredible feat that is in many respects the most difficult learning task the individual will ever face. For until children have

1. There is some debate as to whether or not chimpanzees and perhaps other higher animals have this capacity, but there can be no debate that humans conceive and use concept labels uniquely well.



## *Learning about learning*

constructed this first set of concepts from experience, they cannot use language to recognize and label regularities like those we call trees, kangaroos, winter, or birthday parties. So eager are normal young children to learn new labels, and the regularities they specify, that their repeated questioning can become annoying to parents or older siblings. Children then begin to acquire language rules that, when combined with concept labels, give more precise meaning to events or objects: the request “Milk!” becomes “Me milk!” and later “Please give me some milk to drink.” By the time children begin school they have acquired a network of concepts and language rules that play crucial roles in subsequent school learning. Children also learn methods for organizing events or objects that enable them to see new regularities and in turn to recognize the labels that represent those regularities. And this process continues until senescence or death.

We are interested in both learning and knowing. They are not the same. Learning is personal and idiosyncratic; knowing is public and shared. We are interested in thinking, feeling, and acting – all three are present in any educative experience and change the meaning of the experience. Though infant and school child, expert and novice, apprentice and master may share the same experience, the meaning of that experience can be radically different. Educating is the process by which we actively seek to change the meaning of experience. Educating can be liberating or oppressive; this book is committed to making educating more liberating.

### THE KNOWLEDGE VEE

In 1977, Gowin invented a heuristic device that we have found to be increasingly useful in helping people understand the structure of knowledge and process of knowledge construction (see Gowin 1981). Figure 1.2 shows a simplified version of Gowin’s Vee.

At the point of the Vee are events or objects, and this in one respect is where knowledge production begins; it is a good “point” at which to begin. If we are to observe regularities, we may find it necessary to select specific events or objects in our environment, observe them carefully, and perhaps make some kind of record of our observations. This selection and record-making process will require concepts we already know; the concepts we possess will influence what events or objects we choose to observe and what records we choose to make. These three elements – concepts, events/objects,