

# HUMAN & BRAIN HUMAN LEARNING

3rd Edition



By Leslie A. Hart

HUMAN BRAIN AND

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*3rd Edition*

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Leslie A. Hart



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***HUMAN BRAIN AND HUMAN LEARNING***  
***THIRD EDITION***

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By Leslie A. Hart  
Contributing editor, Karen D. Olsen  
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*To those many educators, at all levels,  
who out of deep concern for children,  
students, communities, and nation,  
have dared to work and fight for change.*

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## FOREWORD

The future of teaching and learning lies in the study of the brain.

Only in this strange world of nerve cell and synapse will we someday untangle the mysteries of how people learn.

*Human Brain and Human Learning* makes a major contribution to our grasp of how the brain works. It may well become the basis for important educational reform and for reexamining all we do in schools, including the organization of curricula and the management of learning. We must understand brain functions and operations before schools can be significantly improved.

Leslie Hart's major thesis is that today's educational practice is based on assumptions that relate little to desired student outcomes. He correctly claims that there has been no coherent theory of **human** learning—most of our practices have been based on research conducted with small animals.

In his earlier book, *How the Brain Works*, Hart presented what is known as Proster Theory, dramatically different from conventional theory in that it centers on the brain and explains the learning process in terms of the brain's nature, history, and modes of operation. In the present book, Hart carries his refreshingly new theory forward, relating it specifically to education and particularly to schools. He has also presented Proster Theory in style and language that invites the reader with even minimal technical or scientific background to read with enjoyment and full comprehension. (Those who prefer a moderately technical but still highly lucid substantiation will find it, additionally, in the earlier work.)

Most important to me is that *Human Brain and Human Learning* begins to build a bridge between theory and practice, and offers a broad guide for translating brain research into design and decisions in our schools. On that count, it should arouse intense interest among educators, parents, school board members, and educational researchers. With new knowledge of how the brain functions, of what it demands, and of how learning takes place, we can at last create school environments that will far more successfully help all learners to achieve. Teaching can become congruent to learning.

There emerges from this book a whole new way to look at learning and so a base for a new system of teaching, with the teacher becoming a more dramatic and important "creator" of learning than one who merely instructs. The learning stems from the student's own brain and activities rather than resulting from "being taught." In "brain-compatible" learning—a strikingly new concept—there is a shift "from reliance on raw authority to a far more sophisticated approach of recognizing differences and responding to them in a way that sharply reduces conflict while achieving better outcomes."

While experienced educators will find in the book welcome support for intuitions they have long held (that in fact go far back in the history of education), the reader must be prepared for what can be at first a distressing departure from old and conventional ideas. One must remember that coming at schooling or training from a brain viewpoint is truly new. But Hart draws from a huge amount of present scientific knowledge in a range of relevant disciplines. He builds on the findings and insights of leading brain investigators. In addition, he uses an intimate familiarity with the realities of schools to relate this large body of new knowledge to one's common experiences and observations. The theory he offers and the suggestions he puts forward rest on a solid foundation.

Read and studied carefully, *Human Brain and Human Learning* can have a tremendous impact on education. It should be read by everyone interested in improving our schools, not in small increments, but in a quantum leap. Hart may have developed what all of us have been looking for: The key to greatly improved learning, the basis and methods of reestablishing public confidence in the schools, and designing human environments for human learners.

What is vital now is that Hart's concepts be tried and explored. This is not a "how to" book but the brain-compatible approaches he suggests seem thoroughly practical guides to action. Reality testing of the possibilities he presents is urgently needed. If, as appears likely, learning can be dramatically improved when educational practice centers on understanding how the brain works, the sooner that is done the more students will be effectively educated in the schools and other institutions of our nation.

One thing is certain now: This is an enormously stimulating, penetrating, significant book, demanding attention. It may well prove a landmark in educational thought. And while deeply critical, it also offers more hope for major solutions of our problems than most we have seen for a long time.

Dr. M. Donald Thomas  
Superintendent of Schools  
Salt Lake City, Utah

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## PREFACE

The core problem faced by educators today is how to bring about learning. This book is addressed to that question; it is intended for teachers and instructors, administrators, planners, legislators, curriculum developers, and all concerned with effective and humane education and training, including parents. Since failure to learn brings additional problems in discipline, crime, mental health, and social alienation, readers active in these areas may find this discussion of some value.

Because our schools present the most acute needs, and our ideas about schooling color all educational effort, schools are given much attention here. But the brain-based principles of learning put forward, contrasting sharply with conventional views, can be applied at any level and in any learning situation.

We have many brilliant neuroscientists and neuropsychologists at work, and their contributions in recent years have been magnificent. We have, too, many thoughtful, creative educators with intimate knowledge of schools and training—but almost no modern knowledge of the brain. My hope is that this book will help bridge the lamentable gap that exists between these two fields, and bring to educators some sense of the fresh, exciting new vistas that open up when one takes a brain approach to the problem of human learning.

I must stress, however, that this is not an effort to contribute in anyway to the neurosciences, except perhaps as it may increase the awareness and interest of some brain researchers with respect to the practical learning problems typical of schools. Also, this



book takes a deliberately simplified, holistic approach to the brain, seeking to add to educators' understanding of what the brain is for, and of its overall architecture and broad modes of operation. To do so, it attempts to synthesize from many disciplines in addition to the neurosciences. There is no effort made to deal with learning on a molecular, cellular, or synaptic level. This is an area of brain knowledge in which mystery still prevails; and it seems to me most unlikely in any case that breakthroughs on this micro level would importantly affect dealing with the brain on a macro level, as must those who labor to bring about student learning.

Our schools, I believe, are not ineffective because they do not know what happens at synapses or the chemistry of neurotransmitters, but rather because they have yet to address the brain's role in learning and to fit instruction and environment to the "shape" of the brain as it is now increasingly well understood. We know that as the consequence of long evolution, the brain has modes of operation that are natural, effortless, effective in utilizing the tremendous power of this amazing instrument. Coerced to operate in other ways, it functions as a rule reluctantly, slowly, and with abundant error.

As we realize this, we can focus on the problem of matching settings and instruction to the nature of the brain, rather than trying to force it to comply with arrangements established with virtually no concern for what this organ is or how it works best. The term *brain-compatible* seems appropriate for education designed to fit the brain. It seems reasonable to assume that moving from brain-antagonistic settings to brain-compatible schooling and training could produce strikingly better outcomes.

We know amply enough about the human brain as the organ for learning, I submit, to begin making this transition, now. Working out the best detailed methods and related needs will of course require the contributions of a great many creative and knowledgeable people over years to come.

Leslie A. Hart  
New Rochelle, NY

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## FROM THE EDITOR

I first suggested to Leslie Hart that he consider updating this book in 1993. After all, given the explosion in brain research studies using breakthrough technologies during the decade since the book was first published, surely there was much rewriting to be done. He assured me that little needed to change except updating the footnotes and other source materials data.

At the time, I found his remark quite surprising and, quite honestly, shrugged it off as a bit of author's pride. Surely, I thought, by the time he finished, he would have made sweeping changes.

By 1995, Leslie had completed most of the textual changes. And I was surprised again. Given Leslie's level of synthesis and the fact that he had based so much of his research on firsthand sources rather than second and third hand reporting that take some time to trickle down to the public, *Human Brain and Human Learning* did in fact need but minor rewriting except for one area: the triune brain theory.

A year later, the urban smog of the Northeast was continuing to raise havoc with Leslie's eyesight so he asked me to take over the task of updating footnotes and source materials. With his notes and my reading, the second edition was completed in 1998. Editing on the first update was minimal, only to soften the edges of his frustration or, occasionally, to clarify points that may be new to readers; headers were added to speed search for information. Updating for this third edition reflects brain research made possible due to the more sophisticated technologies now available to study the brain in

action. However, Leslie's keen insights still hold. This is his book. My contributions appear in a different type font—that of this sentence.

As an educator who has spent 30 years looking for a point of attack and a long enough lever sufficient to move our public education system, it is my belief that both the target and the leverage can be found in brain research. In these pages lie hope and challenge in equal measure.

*Human Brain and Human Learning* is the most comprehensive and understandable version of brain research for educators and parents that I have ever seen. I feel privileged to have played a part in its updating and re-release.

Karen D. Olsen  
Oroville, Washington

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# CONTENTS

Foreword	vii
Preface	x
From the Editor	xiii
1. Frustrations: The Need for a New Foundation . . . . .	1
2. Wrong Paths: Mann's Factory to Behaviorism . . . . .	23
3. Theory: Seeing with New Understanding . . . . .	37
4. Proster Theory: Comprehensive New Synthesis . . . . .	49
5. Where and How Learning Happens . . . . .	57
6. Bad Fit: The Brain in a Traditional Classroom . . . . .	87
7. First Fundamental of Learning: The Detection of Patterns . . . . .	107
8. Input: Essential for Pattern Development . . . . .	123
9. Second Fundamental of Learning: We Live by Programs . . . . .	139
10. Proster: Storing and Selecting Programs . . . . .	159
11. The Role of Emotions in Learning . . . . .	179
12. Brain Development: Birth to Adulthood . . . . .	193

## HUMAN BRAIN AND HUMAN LEARNING

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13. Working with Theory: What It Can Tell Us . . . . .	207
14. Theory Applied to Settings . . . . .	217
15. Theory Applied to Situations: The Classroom, Education's Curse . . . . .	237
16. Applying Theory to Activities . . . . .	255
17. What Works: Some Directions We Can Go . . . . .	277
18. Prospects of Change: Can Schools Survive? . . . . .	297
Appendixes . . . . .	325
Appendix A: ITI Classroom Stages of Implementation . . . . .	326
Appendix B: ITI Schoolwide Stages of Implementation . . . . .	328
Appendix C: Resources . . . . .	340
Glossary . . . . .	342
Bibliography . . . . .	354
Index . . . . .	358

# 1

## FRUSTRATIONS: THE NEED FOR A NEW FOUNDATION

The symptom that a particular branch of science or art is ripe for a change is a feeling of frustration and malaise, not necessarily caused by any acute crisis in that specific branch . . . but by a feeling that the whole tradition is somehow out of step, cut off from the mainstream, that the traditional criteria have become meaningless, divorced from living reality, isolated from the integral whole.

— Arthur Koestler<sup>1</sup>

“I taught them, but they didn’t learn.”

That is the classic remark, usually sadly uttered, of the teacher who tried hard to produce the intended student learning but didn’t succeed.

Rare is the classroom teacher who hasn’t often felt frustration of this kind, even after presenting an especially well-prepared lesson or unit with skill and enthusiasm.

“At times,” remarks a teacher, “it seems as if an invisible glass wall drops down between me and the students, and nothing gets through.”

Teachers may well take such failures personally, wondering what they may be doing wrong. Or, since repeated failure can be hard to bear, they may look for others to blame:

"The parents didn't prepare these children for school. They don't encourage and discipline them."

"You can't really expect youngsters from a neighborhood like this to be interested in learning."

"The teachers in the lower grades passed these students along, without basic skills. What can I do with them now?"

"We don't get the facilities and supplies and support we need."

"Schools reflect society. What can you expect? We have to change society first."

Or teachers may join others in deploring television, electronic games, the breakdown of the family, the weakened influence of religion, too little respect for authority, lower moral standards, government interference and red tape, stingy taxpayers, racial and social tensions . . . and much more.

## EXCUSES ARE DISTRACTIONS

But we must recognize, when we take a hard look at education, that these "explanations" or excuses serve merely as distractions from the heart of the matter. The schools' first job lies within the schools. Under our system, students are compelled to attend. *The schools must receive them as they are, not as one might wish them to be. And, the school must bring about learning by every student, not merely giving lip service to "every student can learn," but accomplishing that result.*

No one sensibly minimizes the problems: they are varied, difficult, and often profound. But they are problems only the schools can solve and solve them they must. Increasingly, schools are judged on how they cope with these problems. How much public money schools should be allotted, and even whether they should continue in their present form, rest on this judgment. (Charter schools and voucher programs are but two popularly supported options created because the public schools have failed to embrace, and solve, the serious problems that confront them.)

To say “I taught them, but they didn’t learn” is of course an absurdity, about equivalent to “we had a wonderful dinner but nobody got anything to eat” or “I took a great vacation trip but I didn’t go anywhere.” Similarly, in education we know exactly what frustrates teachers—for an entire school year they carry out certain practices and activities in the classroom that are called “teaching” but which in fact work very poorly, even when implemented with commitment and energy, in a manner generally viewed as conventional and appropriate and, in many respects, demanded by authorities. Yet, inescapably, the “teaching” worked poorly if measured against the goal of producing learning for all students. “I taught them but they did not learn.”

### **The Problem . . . Complying**

If we point a finger of blame at such teachers, it has to be for complying! But teachers may feel that they have no other option if they want to keep their jobs or be free of continual supervision.

The full import of what has just been stated might evoke profound shock and possibly disbelief. Can one seriously propose that what the great majority of teachers regularly do in the great majority of conventional classrooms brings about massive failure to produce desired student learning? Yes, one can, and in fact must, in the light of recent findings and events. It is a conclusion avoidable only through massive denial of the facts. Within a failure of such appalling scope there is unlimited room for criticism, which often fails to shed light on what is most wrong and which may, in fact, help perpetuate outdated concepts. Persistent attention to factors of minor importance can prevent the needed consideration of major, foundational factors.

### **An Old Concept: Learning Automatically Follows Teaching**

Teachers, being visible and vulnerable, tend to be the first targets of criticism, however unfair and superficial that may be and however coerced and constrained the teachers were in trying to carry out their assignments. Here we go back to one of the oldest concepts of our whole education system: *if students are put in a room and “taught,” learning will follow*. This is a handy idea, appealing in its apparent common sense, but it deflects attention from



most of the complexities of the teaching-learning interface and from all the objectives and conditions that affect this interaction. At any level in the world of education, it is shocking to discover how little desire there is, beyond lip service, to probe into such fundamental questions as what we mean by “knowledge,” “knowing,” “learning,” “understanding,” or the glib term “achievement.” Obviously, here lie the foundations of all successful instruction, yet they are largely ignored.

### LEARNING VERSUS TEACHING

Go into an educational library and check the evidence on the shelves. For every volume focused on the topics mentioned above or on “learning” in general, one can find yards of books on *teaching* and *assessment*. Examine the contents of the more broadly circulated publications for school practitioners and the same relationship appears. Look through college course offerings and, again, books on learning are rare.

Even more recent forays into the multiple intelligences and “brain-based” education quickly degenerate into “how to teach it” before their implications for learning are plumbed to any depth. A rare exception is the work of Susan Kovalik & Associates and the care they give to insisting that teachers understand the *why* behind their teaching.

Even more striking (and in a wry sense, amusing) are the urgings and often pompous injunctions of the pundits and politicians *outside* of education who, with the greatest willingness, advise on what is wrong and how to fix it. While the broad assessments of shortcomings are often substantially correct, the more specific suggestions deal with a host of matters from class size and homework to what degrees teachers get and what grades football players must garner to be allowed to play. Every trivial, possibly relevant factor wins examination, but not the obvious crux: How to bring about learning.

Testing, of course, by so-called “standardized” techniques, gets heavy emphasis, on the curious grounds that “we must know exactly where we are” to detect any worthwhile improvement—this after decades of major reports have detailed how desperately bad student attainment is. An analogy here is the ninety-pounds-overweight person who hops on the scales every hour to see whether dieting has achieved another half ounce off.