

The Development and Education of the Mind

The selected works of Howard Gardner

Howard Gardner

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The Development and Education of the Mind

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In this book American psychologist and educator Howard Gardner has assembled his most important writings about education. Spanning over 30 years, these papers reveal the thinking, the concepts, and the empirical research that have made Gardner one of the most respected and cited educational authorities of our time.

Trained originally as a psychologist at Harvard University, Gardner begins with personal sketches and tributes to his major teachers and mentors. He then presents the work for which he is best known – the theory of multiple intelligences; included is a summary of the original theory as well as accounts of how it has been updated over the years. Also included are seminal papers on the nature of understanding; education in the arts; powerful ways in which to assess learning; broad statements about the educational enterprise; and two accounts of how education is likely to evolve in the globalized world of the twenty-first century.

Following the tradition of John Dewey, Jean Piaget, and Jerome Bruner, Gardner views education as the optimal development of the mind. This volume illustrates how a broad and generous psychological perspective, drawing on other disciplines as well, can bring powerful insights to the processes of education.

Howard Gardner is the John H. and Elisabeth A. Hobbs Professor of Cognition and Education at the Harvard Graduate School of Education. He also holds positions as Adjunct Professor of Psychology at Harvard University and Senior Director of Harvard Project Zero.

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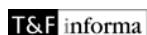
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TO JAMES O. FREEDMAN

EXEMPLARY LEADER, BELOVED FRIEND
ON THE OCCASION OF HIS SEVENTIETH BIRTHDAY

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- 'Project Zero: Nelson Goodman's legacy in arts education', *Journal of Aesthetics and Art Criticism*, 2000, 58(3), 245–9.
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- 'Beyond the IQ: Education and human development', *Harvard Education Review*, 1987, 57, 187–93.
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- 'The unschooled mind: why even the best students in the best schools may not understand', *IBWorld*, April 1993.
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Chapter 1 is a re-edited version of two articles published by *The New York Times*: ‘Getting acquainted with Jean Piaget’, January 3, 1979; and ‘Jean Piaget: The psychologist as Renaissance man’, September 21, 1980.

INTRODUCTION

In the middle of the 20th century, young persons whom I knew dreamt about one day becoming astronauts, athletes, or architects. Some thought about becoming writers, a handful considered careers as teachers. I doubt that any contemporaries considered a career as a writer on education. Now, as I introduce a collection of my writings about education, I can spin an autobiography that logically culminates in this volume. And yet, that would be disingenuous.

A scholarly career is anything but a straight line – and that is all to the good. If one could predict a line of work in a discipline with accuracy, it would scarcely be worth carrying out: the surprises are what makes scholarship fun and serious. My own scholarly training has been in psychology. The two great figures in my field – Sigmund Freud and Jean Piaget – both embarked on careers quite different from that originally envisioned. Freud wanted to be a basic scientist in neurology and in fact, before turning to psychoanalysis, constructed a model of how the brain works. (It seems more plausible in 2005 than it did in 1905 or 1955!) Piaget saw himself as a biologist interested in the nature of knowledge. But as he subsequently pointed out, the “detour” that he took to investigate the minds of children lasted a lifetime. While I am under no illusion that my own contributions to psychology rival those of these and other masters, I too followed a career path quite different from that envisioned when I was attracted to psychology by my charismatic undergraduate tutor, Erik H. Erikson (who happened to be a student of Freud’s and a colleague of Piaget’s).

So, perhaps it is better to spurn autobiographical rationalizations and instead pose four questions about how best to “read” an individual who writes about education.

To begin with, through what disciplinary lens or lenses does the scholar approach educational issues? One approaches Herbert Read, a poet and art critic, quite differently from how one approaches the philosopher John Dewey, the psychologist B.F. Skinner, or the theologian John Henry Cardinal Newman. In my own case, I was trained in developmental psychology, the study of how children evolve in various spheres; cognitive psychology, the effort to model thinking; and neuropsychology, the examination of the effects of brain damage on human cognition and personality. While, among psychologists, I feel a bit of a renegade, I feel very much the psychologist when in the company of those with other disciplinary trainings. When considering human nature, I think almost reflexively in terms of the individual and especially his/her mind; the contributions of biology – neuroscience and genetics – to thought; the equally substantial contributions of parental models, peer examples, teacher input, and the messages that waft thought the culture.

To this scholarly lineage I should add my long-time interest in artistry and artistic cognition. As a child I was a serious pianist, and I have long gained sustenance from involvement

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with the arts. When I first became a psychologist, I was amazed at the virtual absence in American textbooks of consideration of artistic development and artistic cognition. And so I determined to give as much attention to artistic considerations as most other psychologists direct toward the scientific terrain. As you read my writings, you will discover artistic concerns and leitmotifs throughout.

The second question to raise concerns the personal educational experiences of the writer. It has long been noted that almost everyone has strong opinions about education because all of us have had years of experience in schools. As I reflect on my own education, I note the following chapters.

As a young person in the 1950s, I attended public schools in the small city of Scranton, Pennsylvania. The schools were adequate but certainly undistinguished. I found school unchallenging and learned more through my own wide but haphazard reading and my interaction with a few intellectually oriented peers and a handful of relatives and other adults who took an interest in a talkative and curious young student. More consequential was my own training as a young pianist, training which revealed considerable talent but which I abruptly terminated when but 12 years of age. (I did not want to practice the three hours a day mandated by my teacher.) During my freshman year in public high school I continued to be unchallenged and so decided, with my family, that I should attend an independent school. Nearby Wyoming Seminary was somewhat more intellectually oriented but still insufficiently demanding. Only when I was fortunate enough to attend Harvard College in the early 1960s did I discover what a truly engaging intellectual environment could be like. And that is probably why I have remained at Harvard for 45 years.

Personally, then, my educational experiences ranged from the unremarkable to the privileged. However, other educational experiences have had powerful effects on me. Directly upon completion of college, I had the privilege of working with the psychologist-turned-educator Jerome Bruner on the development of a model elementary school curriculum in the social sciences called "Man: A Course of Study." This curriculum treated fifth graders as active thinkers who could appreciate key insights from the range of the human sciences, from anthropology to linguistics to psychology. While clearly directed toward the "high end" of the market, this curriculum made a deep impression on me. Given that my first wife Judy Gardner and I had both worked for Bruner, it is perhaps not surprising that we decided to send our three children to the Shady Hill School in Cambridge, Massachusetts, at the time one of the outstanding examples of progressive education in the United States. I also became fascinated with the "open classroom" method that had developed in Leicestershire in the 1960s and taught for a semester in an "open classroom" in Newton, Massachusetts. Finally, I must mention my 20-year relationship to the preschools in Reggio Emilia, Italy, to my mind the most impressive demonstration of how even three- and four-year-olds can become intellectually engaged with challenging puzzles and ideas.

Looking back over these personal experiences as a growing child, and the signal exposures during my adult years, it is clear that I reject most of my own formal education as a child, while embracing the more intellectually demanding and personally challenging regime of progressive education. I agree with those educational analysts who assert that the best education is a progressive education; alas, as some also point out, when progressive education is not done well, it can be a disaster, leaving the child with little knowledge, little discipline, and a veiled contempt for what passes as education.

A third question has to do with the general value system of the writer. As already suggested, I am sympathetic to the progressive view of human nature as put forth variously in the writings of Jean-Jacques Rousseau, John Dewey, Jean Piaget, and Jerome Bruner. In contrast to a Lockean view of the child as a blank slate, a Skinnerian view of the child as an

actor who must be molded, or a traditionalist view of the child as an inheritor of the best thought of the past and a skepticism vis-à-vis the present and the future, I favor a far more open-ended view of learning. Children have enormous potentials, these potentials should be broadly nurtured, but we should avoid didacticism or excessive guidance. And while there should of course be the transmission of cultural knowledge, I believe that the questions that one learns to ask are ultimately more important than the answers that are passed on from one generation to the other.

At the same time, however, I do not believe that education is easy or natural. In that sense, I depart from the friendlier voices in the progressive tradition. The primary purpose of education should be the inculcation in young minds of the major disciplinary ways of thinking. These turn out to be deeply counterintuitive. And so the educator is challenged to determine how best to counter commonsense views, which are often common nonsense; and how to develop habits of thought – such as those of science, art, mathematics, history – which took centuries to evolve to the current still-tentative form.

This amalgamation of values makes it difficult to pigeonhole me – at least for me! The educational liberals who resonate with my ideas about individual differences are often non-plused or annoyed by my focus on the development of disciplinary thought. And traditionalists who like the focus on disciplines cannot abide my interest in open-ended questions and in the many ways in which a child can be taught or assessed.

A final question to ask of an educational writer concerns his actual writings and the initial reactions to them. Since I have already suggested that most individuals do not hanker to be educational writers, it is important to know what were the first writings. In my case, while I had taught both young children and piano and was a researcher at a school of education, I published almost nothing in education until I was 40. My book *Frames of Mind: The Theory of Multiple Intelligences* was a psychological study, aimed primarily at my psychological colleagues. The few educational passages were included primarily because the funder of the study had a strong interest in educational questions.

No one was more surprised than I at the enormous interest elicited by this work, first manifest in the United States, and then, over the next two decades, in many other parts of the world. From being a psychologist who addressed his writings to those in developmental psychology, cognitive psychology, neuropsychology, and – to a limited extent – to the general public, I was instantly converted into a writer – and, indeed, treated as an expert – on educational issues.

Conceivably, I could have ignored this “reaction of the field” and returned to my psychologist’s silo. I did not, however. I imagine that my conversion into a writer about education had a number of causes: 1) the fact that I had always had an interest in educational issues, dating back to childhood, and had worked with Jerome Bruner, himself a psychologist who was esteemed by educators; 2) my long-time association with Project Zero, a research group that has always been housed in the Harvard Graduate School of Education; 3) the fact that my book was published in the very year that the famous critique of American education, *A Nation at Risk*, was issued, and that educational issues soon moved to the front burner of policymakers and the public, where it has remained ever since; and 4) not least, the great interest in my work shown by educators. I was showered with attention, asked many good questions, given the support to pursue some of them empirically, and, with little hesitation, I took on these challenges.

On the subject of writing, let me add a reflection on my own writing. I began my scholarly life as an historian and, more than most psychologists, I tend to think of issues in terms of historical determinants and context – perhaps that is why I became a developmental psychologist! I like to read and study widely, and so my writings are more inter-disciplinary than those of most psychologists: you will find here abundant references to the natural sciences,

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the arts, and the humanities. While it remains for others to critique my writing, from my own perspective my greatest strengths are as a systematizer and a synthesizer. I raise a question – the nature of artistic cognition, the component of intelligence, what it means to understand – read and think widely about the question, and then put forth my own best taxonomy or mosaic or narrative. Much of my early writing put together the work of others; but with the passage of years, I have developed my own strong views and my own (I hope not strident) voice. It will be interesting to see whether readers also discern the shift from Gardner the synthesizer to Gardner the theorizer and occasional provocateur.

While rejecting the presentation of a strict autobiographical account of “how I got here,” I have sought to provide information which should help readers understand “where I am coming from.” (For those interested in autobiography, I have listed several sources.) In addition, to guide the reader through this collection of papers, I offer a rational account, or at least a rationale, for the selection.

I begin this collection with a set of tributes to the thinkers who had the greatest influence during my intellectual formation. The psychologist Jean Piaget is the giant in my original field of scholarship; like all other cognitive-developmental psychologists, I owe my greatest debt to him. The other three individuals are all persons with whom I had the privilege of working personally. My interests and background are closest to those of Jerome Bruner, and it is probably the case that my career has been more closely modeled after his luminous example than after anyone else’s. I was greatly informed – indeed, formed – by the philosophical thinking of Nelson Goodman, the brilliant thinker who started Project Zero; and I was stretched in new and unanticipated ways by my work with Norman Geschwind, an innovative conceptualizer and a keen observer of patients with revealing neurological conditions.

Work with these thinkers led me to pursue two parallel lines of research – one with children, the other with brain-injured adults. This work was rewarding in itself and I believe that I made contributions to the research literatures on children’s cognitive development and on the breakdown of cognitive capacities after damage to the brain. Much of this work was carried out with Ellen Winner, whom I had the good fortune to marry in 1982. In the final chapter in this section, written in the late 1970s, I both delineate the reservations that I was developing about the work of Jean Piaget and the synthesis about the nature of human symbolization that I was formulating.

In the next part of the book, I put forth the major claims of the theory of multiple intelligences, the work for which I am best known. The six chapters encompass, respectively, a brief introduction to the theory; a critique of the major misconceptions that I have encountered; a consideration of the political aspects entailed in writing about a topic like intelligence; a proposal of how media can be mobilized to take advantage of our multiple intelligences (MI); my changing views about how best to define intelligence; and a survey of the “MI field” after the first two decades.

My work with Nelson Goodman at Project Zero centered on the nature of artistic cognition and artistic education. Indeed, both my work with children and my work with brain-damaged adults was firmly rooted in artistic cognition. The first three chapters in Part 2 portray, in turn, the relationship between artistry and intelligence; an educational approach to curriculum and assessment called ARTS PROPEL; and a museum exhibit that had remarkable educational power. The final chapter grew out of a series of trips that I made to China in the 1980s in my capacity as an arts educator. My observations and informal experiments (carried out with Ellen Winner) teased out fundamental differences in how our respective cultures think of arts and creativity – and also complexified in instructive ways my own views about the development of creativity.

Upon first learning about multiple intelligences, many individuals see an MI classroom or school as an end in itself. I soon became convinced, however, that MI cannot be a viable

educational end. Rather, the goals of education need to arise from our own values, and they need to be stated explicitly and revisited perennially. Once the territory has been staked out, then it becomes possible to determine how a recognition of MI might – or might not – aid in achieving these educational goals.

Once I began to ponder my own educational philosophy, I became convinced of a supravening educational goal: the development of thinking within the major scholarly disciplines. Of course schools can properly pursue more than one goal. But, to my own mind, if education does not inculcate the major disciplinary ways of thinking, then it has failed in a fundamental way. In the fourth part of this book, I delineate my conception of disciplinary understanding; how difficult it is to achieve; and how, once that goal has been set forth, an approach founded on MI can prove productive.

With the passage of time, the accumulation of age, and, one hopes, the achievement of some measure of wisdom, scholars like me are called upon to offer their more general conspectus of education. In the fifth and final part of the book, I put forth my current – though I dare to hope not my final – thoughts about some broad educational issues. I begin by sketching a view of assessment that is far different from the one currently being pursued not only in the United States but in much of the world. Written in the early 1990s, I believe that “assessment in context” is even more timely and more needed now than it was then.

The next three chapters in the book deal, respectively, with the progressive tradition, in whose camp – despite some lapses – I have remained; the ways in which education changes over time, with particular respect to the theme of globalization; and a possible outline of education in the future. The final chapter in the book presents a bridge from my 20 years of writing on education to my current concern with ethics in the professions – a study that my colleagues and I call the “good work project.” While the work on professional ethics is not at present rooted in education, we expect that the ultimate result of the study will include educational interventions for young persons, individuals beginning the professions, and veterans who want or need a refresher on the core values of their profession. Just as I have come to believe that all educational issues harbor value components, I also believe that the inculcation of values is fundamentally an educational challenge – one that never ends for the individual or the species.

To the extent possible, I have ordered these chapters so as to convey a coherent, cumulative story. Indeed, one could read the book from beginning to end – though I doubt that many will find that the best way to approach the book. In lieu of my own autobiographical account, which is now available in many places (Gardner 1989b, Chapters 1 to 4; Gardner, in press; Gardner, n.d.; Winner, n.d.), I am pleased to open the volume with a brief biography of me, written by Mindy Kornhaber, a long-time colleague and friend.

I have written a great deal, though I hope that I can escape the dismissive label “no unpublished thought.” Indeed, by my calculation, I have authored or co-authored at least 20 books, 400 articles, and 150 topical articles and reviews, about half of them on education. Clearly, with a 130,000 word limit, I have had to be quite selective! I elected not to quote from any of my books, to update passages that were clearly anachronistic, to correct errors, and, to the extent possible, to eliminate passages that are clearly redundant; in such cases, I refer readers to a chapter or chapters that cover essentially the same ground as the eliminated material. That said, I have permitted a limited amount of repetition or paraphrase, so that each chapter can be read as self-standing. In lieu of separate bibliographies, I have amassed all references into a single master bibliography.

It remains for me to thank the colleagues who have explicitly given me permission to reproduce material that we have co-authored: Veronica Boix-Mansilla, Thomas Hatch, Mindy Kornhaber, Shirley Veenema; and several other long-term colleagues, including Mihaly Csikszentmihalyi, William Damon, David Perkins, Ellen Winner, and Edgar Zurif;

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March 15, 2005

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HOWARD GARDNER

A biography

Mindy Kornhaber

Palmer, J.A and D.E. Cooper (eds), *Fifty Modern Thinkers on Education*.
London: Routledge, 2001.

Education must ultimately justify itself in terms of enhancing human understanding.

(Gardner, 1999, p. 178)

Howard Gardner, one of the best-known thinkers in education in the United States at the turn of the millennium, did not seem destined to take up this role. In fact, he published six books and over 100 scholarly articles in cognitive development and neuropsychology prior to gaining much recognition from educators in the field of researchers outside the realm of arts education. His seventh book, *Frames of Mind: The Theory of Multiple Intelligences* (1983), was not a book that focused on education. In fact, it contained only two pages directly bearing on the application of his MI theory to educational practice. Yet, it is this book, now translated into more than a dozen languages, that has placed Gardner at the center of educational theory and practice in the United States and established for him a prominent role worldwide.

An exploration of Gardner's life and work prior to *Frames of Mind*, and his intellectual pursuits thereafter, helps to explain Gardner's enormous impact.

Gardner was born in Scranton, Pennsylvania in 1943 to parents who had fled, penniless, from Nazi Germany. His parents had lost a talented first son in a childhood sledding accident at age eight, just prior to Gardner's birth. This fact, along with the horrors of the Holocaust, went undiscussed in Gardner's childhood. Nevertheless, these events "were to exert long-lasting effects on my development and my thinking" (Gardner, 1989b, p. 22). Young Gardner's exposure to activities that might engender physical harm – bicycling and rough sports – were reigned in, even as his early proclivities in music, reading, and writing were eagerly nurtured. As Gardner gradually became aware of these unspoken influences, he recognized that, as the eldest surviving son in his extended family, he was expected to make his mark in this new country. And yet, even before adolescence, Gardner recognized the obstacles to doing so. He knew that other Jewish thinkers of German and Austrian origins – Einstein, Freud, Marx, Mahler – "had lived in the intellectual centers of Europe, and had studied and competed with the leading figures of their generation [while] I had been cast into an uninteresting, intellectually stagnant, and economically depressed Pennsylvania valley" (1989b, p. 23).

Gardner's time in the outpost of Scranton did not last terribly long. He was sent to board at a nearby prep school, at which nurturing teachers showed him great

attention. From there it was off to Harvard University in 1961, where he has thus far spent all but two of his ensuing years.

Gardner entered Harvard planning to study history in preparation for a law career. His undergraduate years saw encounters with several of the leading thinkers of the day, but it was his tutor, Erik Erikson, the charismatic psychoanalyst and scholar of development over the lifespan, who “probably sealed my ambition to be a scholar” (Gardner, 1989b, p. 47).

Immediately after graduation, Gardner began working for Jerome Bruner, a cognitive and educational psychologist. Bruner’s influence was marked. He was “the perfect career model” (Gardner, 1989b, p. 56). Gardner, in this volume, traces his ultimate attraction to education to Bruner’s 1960 book *The Process of Education* and also to his work on Bruner’s curriculum development project “Man: A Course of Study.” The curriculum addressed three “mind-opening questions” (Gardner, 1989b, p. 50): “What makes human beings human? How did they get that way? How could they be made more so?” These questions echo in Gardner’s own work. Gardner’s investigations of human cognition address in part the first of Bruner’s questions. Gardner’s research on the development of symbol systems may be seen as a response to the second. And his most recent research, which seeks to examine how people operate both brilliantly and humanely, can be seen as inspired by the last.

Gardner’s experimental work in human cognition was inspired by his exposure to the work of Jean Piaget during the Bruner project. Piaget’s elegant experiments appealed to Gardner’s keenly logical mind. At the same time, Gardner recognized that Piaget’s stage theory of human development was inadequate. Central to Piaget’s work was a conception of the child as an incipient scientist. But Gardner’s early musical education, as well as his fascination with all other art forms, indicated that the scientist did not necessarily exemplify the highest form of human cognition. What it meant to be “developed” needed to be informed by attention to the skills and capacities of painters, writers, musicians, dancers, and other artists: “Stimulated (rather than intimidated) by the prospect of broadening the definition of cognition, I found it comfortable to deem the capacities of those in the arts as fully cognitive – no less cognitive than the skills of mathematicians and scientists, as viewed by my fellow developmentalists” (Gardner, 1999, p. 28).

Gardner entered graduate school with an interest in creativity and cognition in the arts, a line of research for which there were no real mentors within the psychology department faculty. His opportunity to pursue this work came in 1967 when the philosopher Nelson Goodman formed Harvard Project Zero, a research group that was intended to strengthen arts education. Through the remainder of his graduate education to the present day, Project Zero has been at the center of Gardner’s intellectual life. It has “been the site where my own ideas have developed and the intellectual community in which I have felt especially at home” (Gardner, 1989b, p. 65). Since 1971, when Goodman retired, Project Zero has been under the stewardship of Gardner and his long-time colleague, David Perkins. The organization has grown into one of the leading centers for educational research in the United States. During these years Gardner has mentored scores of young researchers, and the organization has grown from examining cognition in the arts to investigating learning, thinking, and creativity across the range of disciplines, age groups, and educational settings.

At Project Zero Gardner initially pursued studies of children’s development in the visual arts, music, and figurative language. Although he also explored the creative processes of adult artists, he was especially concerned with children’s development of symbol systems as they are used in the arts. He studied these topics

empirically by adapting Piagetian methods to explore the development of children's reasoning with artistic symbol systems. During the 1970s and early 1980s this line of research yielded some forty articles and book chapters. These addressed such issues as children's sensitivity to style in drawings (e.g., Gardner, 1970, 1971, 1972; Gardner and Gardner, 1970; Gardner and Gardner, 1973); their use of figurative language (e.g., Gardner, 1974a; Gardner, Kircher, Winner, and Perkins, 1975; Gardner, Winner, Bechhofer, and Wolf, 1978); and the development of artistry (e.g., Gardner, 1976, 1979; Gardner, Wolf, and Smith, 1975; Wolf and Gardner, 1980).

In an effort to understand how the brain processed different symbol systems, in 1969 Project Zero invited Norman Geschwind, an eminent neurologist, to speak about his work. Geschwind's studies of symbol use and breakdown in brain-damaged patients was "riveting" (Gardner, 1989b, p. 83). Very shortly thereafter, Gardner began conducting empirical work in neuropsychology at the Boston Veterans' Administration Hospital. Over the next two decades he published more than sixty articles and book chapters focused largely on symbol processing in individuals, oftentimes artists, who have suffered brain injury (e.g., Gardner, 1982b; Gardner, Silverman, Denes, Semenza, and Rosenstiel, 1977; Gardner and Winner, 1981).

These dual lines of empirical research converged on a single compelling point. As Gardner wrote, "the daily opportunity to work with children and with brain-damaged adults impressed me with one brute fact of human nature: people have a wide range of capacities. A person's strength in one area of performance simply does not predict any comparable strengths in other areas" (Gardner, 1999, p. 30).

By the mid-1970s Gardner began to construct a theory of human cognition that ran counter both to Piagetian theory, with its pre-eminent scientist, and to psychometric theory, with its keystone of general intelligence or "g." In Gardner's model, the full possibilities of human thinking and accomplishment might be explained. The opportunity to develop this theory was realized during the early 1980s, while Gardner was a leading member in the Project on Human Potential. This project was devised and funded by the Bernard van Leer Foundation "to assess the state of scientific knowledge concerning human potential and its realization" (Gardner, 1985b, p. xix). Gardner's product for the project was his groundbreaking book *Frames of Mind*, in which he spelled out his theory of MI.

Gardner's theory, unlike those generated by traditional psychometric methods, was not a response to the implicit question: What are the cognitive abilities underlying a good IQ test score? Instead, MI was Gardner's response to the explicit question: What are the cognitive abilities that ultimately enable human beings to perform the range of adult roles (or "end states") found across cultures? (Gardner, 1983).

To get at this question, Gardner scoured a wide range of scientific and social-science literatures for candidate intelligences. He maintained that candidate intelligences should meet most, if not all, of eight criteria that he had developed. An intelligence should be found in isolation among brain-damaged individuals. It should also be seen in relative isolation in prodigies, autistic savants, or other exceptional populations. An intelligence ought to have a distinct developmental trajectory. (For instance, the rate of development from infancy to adult expert is not identical for music, language, or interpersonal abilities.) Gardner also claimed that an intelligence should be plausible from the perspective of evolutionary biology. That is, it would be needed for survival in human ancestors and evident in other mammals. In addition, an intelligence should be encodable in symbol systems. Two additional criteria are that an intelligence should be supported not only by psychometric tests but also by evidence from experimental psychological tasks.

Finally, an intelligence should demonstrate a core set of processing operations, such as pitch detection in music or syntax in language, which are stimulated by information relevant to that intelligence.

Using these criteria, Gardner ultimately identified eight relatively autonomous intelligences: linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, interpersonal, intrapersonal, and naturalist (Gardner, 1983, 1995b). The latter enables human beings to recognize, categorize, and draw upon features of the environment. Gardner has also noted that additional intelligences may be added, if they meet most of his criteria. The number of intelligences is less important than that there is a multiplicity of them and that each human being has a unique mix (or “profile”) of strengths and weaknesses in the intelligences.

While academic psychology has remained lukewarm to the theory (e.g., Herrnstein and Murray, 1994; Scarr, 1985), for educators MI holds enormous appeal. The theory has been widely embraced by teachers throughout North America, South America, and Australia, and in parts of Europe and Asia. It has been applied at all levels of education, from preschool through adult education. It has been used across academic disciplines and in vocational education, and it has found a home in classrooms serving largely typical students as well as those serving the learning disabled or gifted.

There are several reasons why MI has taken hold in education. Among these are that the theory validates educators’ everyday experience; students think and learn in many different ways. It also provides educators with a conceptual framework for organizing and reflecting on curriculum, assessment, and pedagogical practices. In turn, this reflection has led many educators to develop new approaches that might better meet the needs of the range of learners in their classrooms (Kornhaber, 1999).

While the educational applications of Gardner’s theory are widespread, the quality of these applications has ranged wildly. Because *Frames of Mind* did not spell out how to apply the theory, teachers, administrators, and numerous independent consultants brought their own ideas to this problem. While some of these appear to enable children’s development and understanding of the disciplines, many others simply require that every topic be addressed in seven or eight – oftentimes superficial – ways. The unevenness of the theory’s application has led simultaneously to the theory’s praise (Knox, 1995; Woo, 1995) and damnation (Collins, 1998; Traub, 1998).

While Gardner recognized the variability in MI applications, he initially felt that it was beyond his sphere, as a theorist and psychologist, to right this situation. Instead, he focused on generating compelling new ideas in the areas of educational assessment (e.g., Gardner, 1991a; Krechevsky and Gardner, 1990; Wexler-Sherman, Gardner, and Feldman, 1988), the development of disciplinary understanding (e.g., Gardner and Boix-Mansilla, 1994a, 1994b; Gardner, 1993a), and creativity (e.g., Gardner, 1993b, 1994; Li and Gardner, 1993). However, he began to take on the task of guiding educational applications of MI in his book *The Unschooled Mind* (Gardner, 1991c), and more explicitly in *Intelligence Reframed* (Gardner, 1999) and *The Disciplined Mind* (Gardner, 2000).

Each of these books underscores Gardner’s belief that education’s central mission should be the development of understanding. Such understanding is marked by performances in which students take knowledge gleaned in a particular setting and apply it to an unfamiliar problem or setting (Gardner, 1991c). For this to happen, educators must opt for depth over breadth (Gardner, 2000); students must have extended opportunities to work on a topic. Gardner asserts that having opportunities to represent and explore a given topic in many ways, in part by

engaging a range of intelligences, makes it more likely that students will be able to apply what they learn in new settings. Recent research undertaken at Project Zero provides some evidence for this (Kornhaber, 1999; Kornhaber, Fierros, and Veenema, 2004).

“[M]y educational vision should be clear. Deep understanding should be our central goal; we should strive to inculcate understanding of what, within a cultural context, is considered true or false, beautiful or unpalatable, good or evil” (Gardner, 2000, p. 186). These themes “motivate individuals to learn about and understand their world” (2000, p. 24). Gardner’s views about understanding stand at odds with the contemporary American trend to harness classroom instruction to broad, excessively detailed, and state-mandated curriculum frameworks. It is nevertheless a vision that is well grounded in the traditions of Socrates, John Dewey, and John Henry Cardinal Newman. It is also shaped by empirical understanding of cognition, as well as the reality that modern educational systems reside within increasingly multi-ethnic and technologically driven societies.

For at least a decade Gardner has emphasized that educators must inculcate understanding in the disciplines, which he regards as among the key inventions of humankind. However, crucial as disciplinary understanding is, it has become clear to Gardner that education must aim for something more than this. The “task for the new millennium” is to “figure out how intelligence and morality can work together to create a world in which a great variety of people will want to live. After all, a society led by ‘smart’ people still might blow up itself or the rest of the world” (Gardner, 1999, p. 4). In line with this task, in 1994 Gardner and his colleagues Mihaly Csikszentmihalyi and William Damon established the “Good Work Project.” The ultimate goal of the project is to identify how individuals at the cutting edge of their professions can carry out work that is exemplary, according to professional standards, and yet also contributes to the good of the wider society. By infusing the findings from this project into educational settings, it may be possible to enhance the disciplinary as well as the humanitarian performances of ensuing generations. It is a hope, and a research project, which Gardner plans to pursue for many years to come.

Acknowledgment

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PART 1

INFLUENCES

CHAPTER 1

THE PATHBREAKING WORK OF JEAN PIAGET

This chapter is a re-edited version of two articles published by *The New York Times*: 'Getting acquainted with Jean Piaget', January 3, 1979; and 'Jean Piaget: The psychologist as Renaissance man', September 21, 1980.

At the age of 21, Jean Piaget, the renowned student of human development, wrote a prescient work entitled *Recherche* (Exploration). In this personal journal, presented in the form of a novel, the hero Sebastian resolves an adolescent religious crisis by adopting an "unshakable faith" in science. Inspired by his studies in biology, Sebastian dreams of "a course synthesizing the sciences of life" with a privileged niche for psychology and the theory of knowledge. Through his fictional shadow, Piaget explored for the first time the possibilities of a biological explanation of mental processes, even introducing equilibration – his fundamental mechanism for explaining cognitive changes.

When *Recherche* was published the following year in 1918, Piaget was a precocious young biologist who had already made a name for himself as an investigator of terrestrial and aquatic mollusks. But shortly thereafter, inspired by the dream of a biological account of human knowledge, Piaget made an epochal career shift from malacology to the still fledgling field of psychology. Using the simple technique of asking children questions and analyzing their errors, Piaget launched the research on children's thought processes which made him famous while still in his twenties and the pre-eminent psychologist at the time of his death.

In charting the minds of children, Piaget invented the field of cognitive development. Those who wish to understand Piaget's contributions must therefore engage the problems that he set for himself in the early 1920s. What do children know at birth? What mechanisms are at their disposal to acquire new knowledge? What forms of knowledge do they possess at various stages in childhood? And how can one describe the knowledge of the mature adult?

Spurning the once widespread notion that the child's mind is simply a miniature version of the adult's, Piaget's major contribution was to describe the forms of knowledge characteristic at each stage of development. Over many years, he carried out hundreds of clever experiments with youngsters in Geneva, Switzerland; he reported them in an imposing series of monographs, several featuring his own three children. Many of the studies probed specific forms of knowledge – the child's conception of number, of space, of causality – but, taken together, they yield a general picture of the child's mind at key points during childhood.

The general public thought of Piaget solely as a child psychologist who illuminated the ways in which children's thinking differs from that of adults. With Sigmund Freud and B.F. Skinner, he stood among the most influential figures in twentieth-century psychology. If his difficult writing style and lack of concern with the emotional side of human nature made him less of a household name than the

other two scholars, his position within the mainstream of contemporary psychology is perhaps more secure. And his focus on cognition seems more attuned to the future course of psychology than Skinner's concern with overt behavior or Freud's preoccupations with motivation, personality, and the unconscious.

But Piaget did not consider himself a psychologist. A biologist by training and a synthetic thinker by inclination, Piaget viewed himself as founder of a new field of knowledge – that of genetic epistemology. The goal of this field was to illuminate the nature of the basic categories of scientific thought, through study of the origins (or genesis) of this knowledge. The task was inherently inter-disciplinary and Piaget labored for decades, first alone and later with colleagues, in an effort to lay out the core aspects of our conceptions of number, logic, space, time, causality, and other building blocks of knowledge. Key to this effort were experts from each field of science as well as genetic psychologists: experimental researchers trained by Piaget to uncover the origins and developments of basic scientific concepts in the young child. Also part of the research team were philosophers, who defined the concepts, and historians of science, who chronicled the growth of knowledge over the centuries within each scientific field. When the insights from this team of scholars were put together, they would yield the fullest possible account of the particular scientific concept in question.

No one can question the grandeur – or the hubris – of this undertaking. Piaget sought no less than a great chain of mental being, which proceeded from the elementary functioning of genes and nerve cells, through the actions of young children upon the physical objects of the world, to the internal operations of thought in the minds of normal adults and innovative scientists, a chain which culminated in fundamental changes in the structure of science. How matter could give rise to new – and valid – ideas: this was Piaget's guiding passion, one as synoptic as those of Freud and Skinner and, indeed, reminiscent of the vision of the greatest thinkers of the past.

While many others might have doubted the feasibility of this enterprise, both from a scientific and philosophical point of view, Piaget kept any misgivings under control, set up his experiments, and forged ahead. Displaying the discipline, energy, and organizational capacity associated with genius, he produced dozens of books and countless papers, revisiting the same core patterns in the light of his most recent findings. In the middle 1950s he founded an International Center of Genetic Epistemology, and, aided by an energetic group of students and collaborators, raced until the end against time to sketch out the principal lines of his vision. And it seems to me that it is in the light of this vision – first fathomed as a teenager and never deviated from thereafter – that Jean Piaget would wish to be assessed.

But such an undertaking is far too vast for most contemporary scientists and so the bulk of commentary on Piaget has focused on his work in developmental psychology. In assessing how the program of 1920 stands up in the purview of 1980, psychologists have focused on three dimensions: the robustness of the empirical phenomena first described by Piaget; the cogency of the key theoretical concepts by which he explained these phenomena; and the viability of his overall image of the mind of the child.

In his capacity to perceive new and important phenomena through the observation of children (including his own), Piaget remains without peer. Essentially working without technical apparatus, he exhibited a respect for his subject, and an empathy for his subjects, which permitted him to enter totally into children's own views of the world. Many initially skeptical scientists have eventually attested to the existence of the phenomena of non-conservation, where preschool children

refuse to believe that matter can change its form and still remain the same quantity; childhood egocentrism, where youngsters are unable to conceive how the world looks to other observers; the impermanence of objects, where infants act as if objects fail to exist when they are no longer in sight. These and dozens of other equally intriguing phenomena now form the mainstay of research in cognitive development. To be sure, it is often possible to discover the roots of these behaviors at an earlier time than Piaget claimed, particularly if the tasks are “stripped down” to their essentials. But, surviving the acid test of scientific validity, the fundamental phenomena continue to be confirmed.

Piaget’s terminology and concepts have survived less intact. Many suffer from imprecise or shifting definitions. The stages and structures in which he so firmly believed have been consistently attacked and, while they retain their suggestive quality, cognitive development is now seen as smoother, less stage-like, and less structurally integrated than Piaget had indicated. Piaget’s lifelong attempt to explain the causes of intellectual change through the mechanism of equilibration has had comparatively little influence and, though Piaget would have winced at the thought, his embracing of biological terminology has had for others a Lamarckian and even, at times, a Bergsonian air about it.

If Piaget’s “middle-level” concepts have not fared well, his overall model of the child as an active problem-solver – a hypothesis-testing scientist in his knickers – has carried the day. Piaget not only put the serious study of the child on the scientific map, but also moved the child’s cognitive powers to the forefront, where they have firmly remained. His sense of what the child is like suffuses the writings of even his harshest critics. In the manner permitted only to the most revolutionary scientists, he changed the way in which future researchers will undertake their studies.

To be sure, there have been shifts in the temper of child study, shifts which left Piaget at the end as a bit of an anachronistic figure. The biological metaphor which he cultivated was increasingly replaced by the metaphor of the computer; his careful descriptions of behaviors were supplanted by series of boxes which detail hypothetical “stages of information processing.” And the areas of the child’s life which he underplayed – the child’s personality, his social and affective life, his artistic gifts – have become, mostly by virtue of the fact that Piaget had not already addressed the major issues, rallying grounds for contemporary students of child development. By what he ignored, as much as by what he illuminated, Piaget set the research agenda for the field which he brought to life. His contribution continues to dominate the texts of child study and, in more than a few cases, Piaget *is* the text.

But what had kept thousands of psychologists throughout the world busy for over a generation was still but a chapter in the book of science that Piaget was writing since the time of *Recherche*. As has happened with other lifelong efforts in the behavioral sciences – and particularly ones as self-avowedly inter-disciplinary – few individuals can even read the entire corpus, let alone evaluate it. In an age of fragmented specialization, Piaget was indubitably a Renaissance man. Nowhere is this more poignantly evident than in *Logic and Scientific Knowledge*, an encyclopedic tome that he planned, edited, and largely wrote, and which surveyed all of the sciences from the perspective of genetic epistemology. To prepare for this massive work, Piaget held seminars with experts from every field of knowledge, often collaborating with them for upwards of a year, rose early each morning and stayed awake evenings tutoring himself in the disciplines of that year, and ultimately mastered at least the basic conceptual issues in each. Undertaking such assignments of synthesis was Piaget’s method of bridging his own science with every other one.

Indeed, it was his way of pursuing his own religion – the passion for truth, the search for the totality of knowledge.

But this Herculean effort has as yet had little impact. An encyclopedia largely from the hand of one man, no matter how brilliant, seems a throwback to a Johnsonian age. The flaws are too evident. Piaget did not have the necessary first-hand familiarity with the phenomena of other sciences, nor the sympathy with the history and cultural background of other disciplines, nor the sophistication in the philosophical analysis of concepts, which he had for the snails and children of Geneva. Yet what slips through in the 1,250 odd pages is the sense of wonder and exploration which gives rise to knowledge. Till the end, the child – and the adolescent – in Piaget were never stilled. Like Sigmund Freud, he was by temperament a passionate speculator and integrator, who sought ruthlessly to suppress his speculative nature, but – fortunately – never wholly succeeded in doing so.

As with Freud, portions of Piaget's research program and many of his particular concepts will be – and in cases already have been – supplanted by less problematic formulations. Yet the central core of the program – Piaget's portrait of the mind of the child – is as likely to last as Freud's insights into the human personality. Just as Freud extended our knowledge of human nature as it had previously inhered in literature and in clinical medicine, Piaget advanced our understanding of the mind, not only as it had been set forth by his psychological predecessors, but also, and perhaps especially, as it had been elucidated by Descartes and Kant. Though not by contemporary standards a philosopher, he was a philosopher in the traditional sense of the term, and far more than any contemporary psychologist, he wrote works which philosophers of the future will have to examine carefully. Alone among his contemporaries, he took the great epistemological issues seriously and contrived new ways of approaching them. The vision of youthful Sebastian will endure.

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