

THE SCIENCE AND SUCCESS OF ENGELMANN'S DIRECT INSTRUCTION

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FOREWORD

As a long-time school administrator and follower of what works in efforts to improve schools and raise student achievement, I have been captivated throughout my career by the ingenious creativity, fervent commitment, and ardent compassion for student learning manifested in the work of Siegfried Engelmann. It was nearly 40 years ago, as a beginning graduate student at the University of Oregon, that I met Engelmann and learned firsthand the power of combining logic, science, and vision that he has done throughout his career to empower student learning. Later, as first president of the Association for Direct Instruction and first editor of *The Direct Instruction News*, I had the privilege of working directly with Engelmann on early efforts to spread knowledge of his work to professional audiences on a wide scale. Engelmann has combined his training in philosophy, his research on the design of instruction, his strong belief that all students can learn if taught well, and his relentless commitment to the integrity of the teaching-learning process to enable more students to learn at higher levels. In doing so, he has made an incalculable difference in the lives of many thousands of students and their teachers.

This book captures the extraordinary accomplishments and brilliant career of one of America's most passionate and prolific educators and details the writings and program development constituting his body of work. For more than 50 years, "Ziggy," as he is affectionately called by friends and close colleagues, has been developing effective instructional programs for students at all levels and advocating for their broader use. *The Science and Success of Engelmann's Direct Instruction* provides clear insight into how Direct Instruction programs are developed (Chapter 1) and summarizes the research findings on their effectiveness (Chapter 2). It provides an intriguing account of the politics of educational program adoption and explores the inexplicable wide-scale "non-adoption" of this seemingly compelling approach to improving education (Chapter 3). Chapter 4 lays out the corpus of Engelmann's work, detailing the breadth and depth of his work across nearly five decades. The book also covers how Direct Instruction plays out at a systems level (Chapter 5) and how it has influenced and interacted with the development of a behavioral approach to education (Chapter 6). The final chapter speculates on the future of Direct Instruction (Chapter 7). A set of appendices to the book provides a comprehensive and well-done annotated bibliography of the instructional programs and other professional writings that Engelmann and his colleagues have published in a half century of extraordinary productivity. Also included in the appendices are the complete bibliographic citations of Engelmann's body of written work and a brief but fascinating overview of his career.

The book illustrates the broad scope of Direct Instruction, its wide-ranging applicability, and its extraordinary staying power in the increasingly high-stakes realm of educational accountability. Engelmann and his colleagues have developed programs across the educational curriculum—in beginning and intermediate level reading, in oral and written language, and in beginning and intermediate mathematics. Much of the text for the reading programs covers expository material in science, health, and social studies. Direct Instruction programs have been developed and widely applied for preschool through secondary school levels, and training routines have been developed for adult learners implementing the programs. The work of Engelmann and colleagues has been implemented broadly in compensatory education (Project Head Start, Project Follow Through, and Title I), in regular education (Reading First and other schoolwide implementations) and in special education settings in K–12. Finally, Direct Instruction programs have demonstrated unparalleled staying power, now approaching 50 years of application. The Direct Instruction approach incorporated findings from the 1960s and '70s work in teacher effectiveness and spawned research in educational psychology on teaching and learning from the '70s to the present. Today's wide-scale implementation of the response to intervention (RTI) model reflects the elements of Direct Instruction and illustrates the connectedness, formative influences and tremendous staying power of Engelmann's work across five decades. By any measure of influence, this record is truly extraordinary. It is for this reason that the journal *Remedial and Special Education* named Engelmann one of the 54 most influential people in the history of special education and that the Council of Scientific Society Presidents awarded him the 2002 Award of Achievement in Education Research.

What makes Direct Instruction unique? First, the design of Direct Instruction programs is based on principles of formal logic. Second, the approach is based on scientific research and on evidence-based principles of instructional design—a unique feature among educational instructional programs. Third, the programs are structured for explicit instructional delivery and program implementation to maximize student success and school improvement. Together, these features set Direct Instruction programs apart from all other curricular programs and instructional approaches in the educational marketplace. This is a defining feature of Engelmann's legacy.

But that's not all that's unique. Engelmann, himself, is unique. Now approaching his mid-80s and still as outspoken and vociferous as ever, he continues to go to his office each day—not to drink coffee and tell stories with old cronies—but to continue working passionately and relentlessly to develop the most highly effective instructional programs possible for an elite clientele—our nation's youth—both the underprivileged and under-performing children in our society whom he believes can learn well if only

they are taught well—and the typically performing children whom he believes can achieve at higher levels if only they are taught and held to higher standards. This is his cause, and this has been his life. But this is only a glimpse of his story. The rest of the story unfolds in the pages of this book. For explanation, edification, and inspiration, I urge you to read on....

Stan Paine, PhD

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INTRODUCTION

Jean Stockard

This book is a tribute to the legacy and genius of Siegfried Engelmann and his decades of work in developing the Direct Instruction (DI) curricular programs. For almost a half century Engelmann has shown how all children can learn if they are taught effectively. The instructional programs he has developed reflect the most stringent requirements of the scientific world. They build on sound theoretical understandings of how effective instruction and learning occur, they involve painstaking attention to each detailed step of the instructional process, and they have been validated with rigorous tests of their efficacy. Engelmann's work has transformed the instructional experience of thousands of students and has also led to noted improvements in school behavioral climates and instructional practices. It clearly has the potential to solve the problem of low academic achievement that has plagued our nation for many years.

THE PROBLEM AND ITS SOLUTION

Reams of statistical data document problems with low achievement of students in the United States. For instance, the 2011 results from the National Assessment of Educational Progress (NAEP) showed that only about a third of all fourth graders could be classified as proficient in reading skills. Less than a fifth of African Americans, Hispanics, American Indians or Alaskan Natives reached this level (U.S. Department of Education, 2012a). Similar results appear in other subject areas and in the higher grades. International comparisons show that students in the United States are outperformed by those in many other countries. Even though U.S. expenditures on public education are at or above the international averages, American students' scores on international assessments of achievement are generally below the average of other nations (U.S. Department of Education, 2012b).

Educational achievement is strongly related to eventual educational attainment and many areas of adult well-being, such as occupational status, income, teenage child-bearing, drug and alcohol abuse, social and psychological adjustment, and physical health and longevity. Thus, the data on low achievement in the United States translate into painful losses on many fronts. Individual students with lower levels of achievement are likely to have diminished opportunities and rewards throughout their lives. This harms not just them, but also their families and communities. On a national level the losses compound and can be seen in areas as diverse as a less skilled labor force

and resultant economic losses to greater costs associated with social, psychological, and health services.

Over the last half century, hundreds, if not thousands, of books have addressed the problems of low academic achievement and failing schools. Just a sampling of titles from each decade illustrates how the concerns have pervaded public and scholarly discourse: *Equality of Educational Opportunity* (Coleman, 1966), *Crisis in the Classroom* (Silverman, 1970), *Illiterate America* (Kozol, 1985), *The Schools We Need and Why We don't Have Them* (Hirsch 1996), *So Much Reform, So Little Change* (Payne, 2008) and *Stop the School Bus: Getting Education Reform Back on Track* (Tirozzi, 2013). Each of these works, in its own way, documents the fact of low levels of achievement, the tremendous cost that it conveys, and the need for change.

Ironically, the answer to the problem has been available throughout virtually all of this time period. Starting in the mid-1960s, Zig Engelmann began his analysis of how children learn and the development of extraordinarily effective ways of teaching them. His work has been guided by two hallmark principles: 1) All children can learn when instruction is systematic, explicit, and efficient; 2) Poor achievement does not result from poor students, but from poor teaching. Working with preschool aged children from highly deprived backgrounds, he demonstrated these principles, teaching them to read and to do complex math problems before they reached traditional kindergarten age. He then expanded this work, developing instructional programs for reading and math, as well as other subjects such as spelling, language, and even music. His programs have targeted students at various age ranges, from preschoolers to adults with learning deficits.

All Direct Instruction programs embody the two guiding principles. The instruction is designed to be explicit, so that there is only one possible interpretation of the material presented. The sequencing of material is systematic, continually building on past learning and reinforcing previously learned material. Regularly scheduled testing ensures that students understand before moving on. As a result, the instruction is efficient, with students able to learn more in a shorter amount of time. The programs provide explicit guidelines for teachers, with clear directions on the wording that should be used to ensure that the material is presented in an explicit and efficient manner and in a way that continually motivates and reinforces students for their learning. All of the programs are developed through careful field testing and analysis.

Decades of research show that Engelmann's DI programs work. Effectiveness has been documented in widely different settings, including urban, rural, and suburban sites and in English speaking countries around the world. The positive results appear

with students with different characteristics: middle class high achieving students and high risk students, general education students and special education students, schools with different racial-ethnic compositions, and preschoolers through adults. The positive results appear with different types of assessments, from state test scores to curriculum based measures to norm-referenced tests. They also appear with all types of research designs, from randomized control trials to various quasi-experimental group designs and single subject studies. The vast amount of data supporting the programs' efficacy is very unusual, not just in the field of education but in social science generally. Engelmann has clearly found the answer to low achievement and to the problems of our schools.

In what might be seen as a backhanded compliment, the term “explicit and systematic” instruction has been adopted and advocated by at least some within the educational establishment, including groups such as the National Reading Panel (2000). Instructional programs appear that claim to have these traits, and they are even called “direct instruction,” using lower case rather than upper case initial letters. Yet research shows that none of these “little di” programs are as effective as Engelmann’s Direct Instruction. It is not one or two characteristics of DI that make it effective, it is the totality of the approach – and especially the scientific nature of its development – that makes it effective. None of the little di programs use this systematic, scientific approach to development.

For almost 50 years the educational establishment has ignored the evidence of DI’s effectiveness. In fact, this establishment has often actively worked to hide reports of DI’s success from the public and policy makers. As a result, the promise and potential of Direct Instruction has still not been fulfilled.

Yet, despite this resistance from the mainstream educational establishment, Direct Instruction remains strong. It continues to be used by teachers and schools throughout the United States and other countries, helping many students achieve their full capacity. Research documenting its effectiveness continues to mount. More amazingly, Engelmann, the genius behind the developments, has continued to work into his 80s – to develop instructional programs, to help teachers teach and to guarantee that all students can learn.

THE CHAPTERS THAT FOLLOW

This book is a tribute to the success of Direct Instruction and, especially, to the genius and the resilience of Zig Engelmann. The first part of the book documents the

extensive research embodied in the development of DI programs, the research that confirms their effectiveness, the unfavorable and short-sighted reactions of the education establishment to the work, and Engelmann's resilience and strength in continuing to develop programs, write essays and books, and promote learning and effective instruction for all students. The second part of the book examines the legacy of his work, including the guidance it gives for transforming schools to effective learning centers for all children and the ways in which it has influenced the tradition of behavioral management in schools, helping them to be safe for all children and places in which students can see themselves as competent and successful learners. The book ends with a look at the future, the potential for wider acceptance of Engelmann's developments, and the hope for truly solving the problems of achievement in America's schools.

The Scientific Basis of Direct Instruction

The first part of the book is titled "The Scientific Basis of Direct Instruction" and includes four chapters. In Chapter 1, "Research from the Inside," Engelmann describes how DI programs are developed and tested using extensive examples from his work. He notes how the development process involves logical analyses of subject matter, then testing ways to teach the material, and then revising and retesting. Taken as a whole, the process illustrates, in almost a classical manner, an inductive approach to research. Engelmann contrasts his method of curricular development with that used in less scientific approaches to the area. It is clear why these other approaches are less successful.

Chapter 2 is authored by Cristy Coughlin, who has conducted extensive reviews of the literature regarding the efficacy of Direct Instruction programs. She summarizes research findings on the effectiveness of DI, using numerous meta-analyses and literature reviews as the basis of the analysis. Unlike the inductive approach used in the development of programs, the efficacy studies use deductive reasoning, comparing the effectiveness of DI to that of other programs. All of the summary studies that Coughlin found document that Direct Instruction is more effective than other approaches.

Given the careful development of the programs documented in Chapter 1 and the strong evidence of their effectiveness discussed in Chapter 2, the failure of the educational establishment to fully embrace Direct Instruction is, at the least, baffling. The third chapter of this volume, written by Engelmann and Stockard and titled "Blinded to Evidence: How Educational Researchers Respond to Empirical Data," addresses this issue. Using insights from their individual experiences and scholarly traditions, the authors critically examine the response of the educational research community to

empirical research such as that reviewed by Coughlin in Chapter 2. They contrast the educational establishment's actions to the traditional and widely accepted norms of scientific research and conclude that there is no rational or normative basis for their failure to endorse Direct Instruction.

The first part of the book ends with a chapter authored by Timothy Wood. In his chapter, "The Engelmann Corpus of Writings," Wood uses a thematic and historical approach to analyze Engelmann's writings from the mid-1960s to the mid-2010s. He explores Engelmann's writings related to theories of learning and instruction, curriculum development, educational reform and change, and criticisms of Direct Instruction and political roadblocks. The chapter bolsters others in this section by reinforcing understandings of the scientific basis of Engelmann's writings. It also shows the resilience and strength of Engelmann and his work, the continuities over time and, especially, the way in which he has persevered despite the "blindness" of the educational establishment.

Translating the Science to Schools

The second part of this book, "Translating the Science to Schools," examines the ways in which Direct Instruction has affected and transformed schools. Chapter 5, "Creating Successful Schools with Direct Instruction," is written by Kurt Engelmann. In this chapter K. Engelmann describes key elements of successful DI implementations, including a description of underlying principles, the ways in which these principles govern the actions of teachers and administrators, and challenges that can impede the success of DI implementations.

One of the long-lasting legacies of Siegfried Engelmann's work is the tradition of behavioral management and applied behavior analysis. In Chapter 6, "Direct Instruction and Behavior Support in Schools," Caitlin Rasplica examines the linkages of Direct Instruction and behavioral work within education. Taking a historical view she describes intersections in the developments of the fields and parallels in their specific designs. She shows how effective contemporary approaches to behavioral management for individual students, classrooms, and schools build on the insights and principles that are embodied in Engelmann's Direct Instruction programs as well as his analyses of effective instruction.

In the last chapter, "Debating DI's Future," Shepard Barbash examines the prospects for DI's survival and growth in a changing marketplace. Will teaching become a profession that is guided by scientific evidence? If so, then more and more teachers will use Direct Instruction. If not, then DI will remain unpopular and might even die

out. Barbash makes the case for optimism and pessimism to show that both fates are possible. He argues that the best way to promote DI is to give everyone an honest report card on how schools are performing, hold educators accountable for their performance, and promote more competition among schools for students.

Engelmann's Writings: Bibliographies and Annotations

The book includes three appendices, all authored by Wood. They document Engelmann's extensive bibliographic record from his first published writings in the mid-1960s through the mid-2010s. Appendix A lists all the instructional programs that Engelmann has developed and includes a historical overview of the curriculum. Appendix B has a complete annotated bibliography of Engelmann's other writings, documenting the expansive content that is described in Chapter 4. Appendix C summarizes Engelmann's career by listing highlights of his work from the 1950s to the 2010s.

A LONG-TERM LEGACY

The authors of the chapters in this book represent multiple generations and multiple disciplines, bringing a variety of perspectives to their analyses of Engelmann's career and impact. As described more fully in their biographical sketches, none of the authors had undergraduate training in schools of education. Their educational backgrounds span the social sciences and humanities, from philosophy and history to psychology, geography and sociology. Some of the authors are in the first decade of their professional lives, some are mid-career, and others are Professors Emeriti. This diversity produces optimism regarding the future of Direct Instruction. Not only do those from a variety of backgrounds understand its importance to the society, this understanding goes beyond the generation that was involved with Direct Instruction's beginnings and extends to those who will be involved in the future.

This book is a tribute to the career of Siegfried Engelmann and the many ways in which the scientific basis of his work has impacted schools and students throughout the world. As documented in Chapter 4 and in the appendices, Engelmann has continued into his 80s to develop new programs and to write new articles, books, chapters, and blog entries on his website, Zigsite.com. Like geniuses from other disciplines, his work will no doubt continue to inspire and help others through generations to come. This volume should be seen as a celebration of all that Engelmann has accomplished to date, all that will appear in the coming years, and the impact of his work on future generations.

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