

**ENGELMANN'S DIRECT INSTRUCTION:  
SELECTED WRITINGS FROM THE PAST  
HALF CENTURY**

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*Engelmann's Direct Instruction: Selected Writings from the Past Half Century*

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# INTRODUCTION

*Timothy W. Wood*

Siegfried “Zig” Engelmann is a maverick in the field of education who has dedicated his life to helping all children succeed. Beginning in the 1960s, Engelmann conducted research on learning and the most effective and efficient methods of teaching. From this work, he developed the philosophy that if a child fails to learn, it is not the fault of the student, but rather the instruction. The highly successful Direct Instruction model that he developed—and for which he is best known—is based on this tenet. He has shown that *all* children can have academic success and become self-confident learners if they are properly taught. Engelmann has become a significant influence on the world of education over the past 50 years. His influence can be seen in the vast number of his publications over that time, and this book contains some of those works.

The publications in this book were chosen to represent his entire career, the varying topics he has covered, and his unique insight into the problems that have plagued the world of education. This collection of writings demonstrates Engelmann’s wide ranging influence and effect on the field of education. In selecting the articles for this book, special consideration was given to publications that have not previously been widely distributed, but are crucial to understanding the development and evolution of Engelmann’s career. They demonstrate Engelmann’s wide ranging influence on the field of education. They were selected from a total of 142 publications completed between 1966 and 2014 and which originally appeared in journals, in books, and on Engelmann’s website [zigsite.com](http://zigsite.com). Each article was specifically chosen to represent the breadth of Engelmann’s career by showcasing four key themes of his writing over the years: his theoretical understandings of learning and instruction, the development of the highly effective Direct Instruction (DI) curricular material, promoting reform and change in education, and responding to criticism and roadblocks.

Engelmann’s educational career began with the creation of the Bereiter-Engelmann preschool in 1964. In this setting, he refined his understandings of how children learn and the importance of

carefully designed, explicit, and efficient instruction – instruction that involved only clear and unambiguous communications. This work also led to the development of the DISTAR curricular programs. (DISTAR is an acronym for Direct Instruction System for Teaching and Remediation.)

Over the next five decades, the Direct Instruction corpus of curricula expanded as Engelmann designed dozens of instructional programs that embodied the principles of his philosophy of learning. He developed programs in reading, language, math, writing, social studies, history, and science. Engelmann continued to revise these programs to improve their effectiveness and efficiency and in response to new state standards and requirements.

Engelmann developed his understanding of how children learn by applying a scientific approach to his pursuit. He analyzed every aspect of the process of learning a given subject and how all variables involved in the process were interrelated and needed to be accounted for and controlled in order for the child to succeed. He furthered his understanding of the critical relationship between how he instructed children in terms of wording, set of examples, sequencing of examples, and what they learned. He also learned the importance of appropriate placement of students, assigning them within a given program based on their level of skill and preventing them from being presented information they were not adequately prepared to comprehend and to master or material that would be too easy and a waste of time. Engelmann determined, as no one had before, that the placement of the student, the assignment of an appropriate program, and the communication between teacher and student were all essential to the success of the student. No single element could succeed without the careful coordination and execution of the others.

The first section of this book includes articles related to Engelmann's theoretical understanding of learning and instruction and his core belief that all children can learn when given proper instruction. Most of these articles were written in the earlier part of his career as he was formulating his understandings of learning and instruction. The articles included examine areas as diverse as the

importance of teaching language skills to at-risk students (Chapter 1); the role of mastery learning in supporting student success and self-confidence (Chapter 5); focusing on problems with instruction, rather than with students, when diagnosing learning problems (Chapter 4); and why the often cited theories of Jean Piaget are not supported by empirical evidence (Chapter 3).

Articles in the second section of the book demonstrate the power of Engelmann's approach. They summarize the extraordinary accomplishments of students in the Engelmann-Bereiter preschool in the 1960s (Chapter 6), those in Project Follow Through in the 1970s (Chapter 12), middle class students (Chapter 8), and the severely handicapped (Chapter 9). They also describe the application of DI principles to less traditional modes of instruction with the use of video-disks (Chapter 10), tactual vocoders (Chapter 7), and to rarely studied subject matter with the teaching of absolute pitch (Chapter 11). Thus, these articles provide a glimpse of the power, strength, and versatility of Engelmann's understandings and the Direct Instruction programs.

As Engelmann worked with schools throughout the country, he realized that students' success is not only affected by the actions and decisions made within the classroom. Instead, the entire world of education, the entire system within which children learn, influences their education. Beginning with his work at the Bereiter-Engelmann preschool, Engelmann determined that preschools needed to be academically oriented in order to better prepare the children for their entrance into primary education and future success. In later years, he investigated the influence of the organization of schools, the policies and standards they operate under, colleges of education, and education researchers. All of these entities play important roles in the education of children. Engelmann concluded that the educational system and the actions of powerful decision makers from the national to the local level were holding students back and preventing the realization of high student success that could be attained. The education of children could be improved by changing the educational system.

The third section of this book gives selections of Engelmann's writings related to this area. Some of the articles analyze the problems with traditional curricular approaches and describe how schools could improve supervision of teachers (Chapters 13, 14, and 15). Others take a broader view, urging large scale changes in the organization of schools and critiquing teacher training, publishing policies, and educational research (Chapters 16, 17, 18, and 19).

Engelmann's research and theories on instruction were often not well received in the academic circles of education and psychology, despite their demonstrated success. Throughout his career, Engelmann has faced criticisms and backlash from the educational establishment. His response to these criticisms has been as systematic and thorough as his development of the Direct Instruction programs. The fourth section of this book includes examples of these works. They range from a response to a flawed analysis of the impact of Direct Instruction (Chapter 20) to critiques of educational research (Chapter 21) to analyses of the problems in educational policies (Chapters 22, 23, and 24).

Appendix A lists all of the programs he has developed from 1969 to 2014. Appendix B lists all of Engelmann's published articles and books through mid-2014. Appendix C provides a series of graphs that summarize the trajectory of his publications throughout his career. This analysis illustrates the significant amount of work created over time, as well as trends in the topics addressed. Appendix D provides a brief chronology of Engelmann's career.

Of course, no collection of articles can capture the entirety of a publication record such as Engelmann's. For instance, none of the selections address the vast corpus of curricular material that Engelmann has developed throughout his career. In addition, none of the selections involves Engelmann's highly technical theoretical writings such as the widely acclaimed *Theory of Instruction*. Given the vast scope of Engelmann's career, scholars will no doubt be examining his writings for decades to come.

Engelmann's broad understanding of learning and the world of education, coupled with his passion to help all children succeed, has led to the development of highly effective curricular programs,

a well-developed and insightful philosophy of learning and instruction, extensive proposals to transform the structure of schools and the policies that govern them, and well developed defenses of Direct Instruction against unfounded criticisms. His dedication and passion for education, the work he has produced, and his determination to improve the world of education is unmatched.

Engelmann has been a significant influence on education over the past half century. The world and lives of millions of students are no doubt much more greatly enriched as a result of his efforts than they would otherwise have been. Conducting research on how children learn for 50 years, Engelmann has created an extraordinary collection of instructional programs, research, analyses, and musings on the world of education. Engelmann's unique understanding of learning and ability to analyze, synthesize, and communicate this information is unmatched. His analyses of problems with schools and the failures of the educational system reflect unparalleled insights as well as an undying passion for helping children succeed. The publications selected for this book provide a glimpse into the wealth of knowledge he has accrued and shared over his career.

## **SECTION I**

# **THEORETICAL UNDERSTANDINGS OF LEARNING AND INSTRUCTION**

Engelmann's initial exposure to learning and instruction was not in the classroom as a teacher, but rather while working as a marketing director for an advertising agency in the 1960s. He was given the task of determining how many exposures it would take for children to recognize or remember slogans presented on TV. Engelmann researched techniques for marketing to children in order to determine what type of input was necessary to induce retention, but found no answers. This discovery led him to begin studying different approaches to instructing children, eventually using his three sons as participants. Through these experiments, he developed his own techniques for teaching children and the basis for what would become the Direct Instruction programs. Perhaps most importantly, through these experiments, Engelmann realized the relationship between what his sons learned and how he instructed them. This realization and the recognition of the lack of published research on the theoretical understanding of learning and instruction inspired him to pursue a career in education.

Engelmann's involvement in the field of education began with the creation of the Bereiter-Engelmann preschool in 1964 and the development of instructional programs for its at-risk students. Engelmann's work at the preschool strengthened his theoretical and practical understanding of how to effectively present instruction. The gains made by the preschoolers in reading, language, and math were extraordinary and brought Engelmann's ideas to the attention of the world of education. As the preschool program progressed, Engelmann became more convinced that a child's acquisition of knowledge and development of skills depends on the clarity of instruction. With this understanding of how children learn, Engelmann conducted studies to demonstrate the validity of his philosophy and techniques. He explained the inherent challenges of instruction and described his personal experiences in designing instructional programs and administering them.

Engelmann's earliest publications, in the mid-1960s, discuss his philosophy of instruction, its application in effective instructional programs, and the difficulties in implementing these programs. His philosophy of learning was unmatched at the time and stood on the frontier of a new field of study. Engelmann believed it was necessary to justify the rationale behind the philosophy, but equally important was to demonstrate its effectiveness. To do so, he discussed his experiments of teaching techniques for at-risk children and his first-hand observations of how they received and interpreted instruction. In these experiments, he specifically sought to determine how children learn, how to instruct them most effectively and efficiently, and how appropriate instruction differs for children of different backgrounds and skills. Engelmann utilized scientific methods to analyze each variable of instruction to determine the most effective and efficient approach for each student.

Through his experiences of working directly with children, Engelmann determined that, in comparison to their more affluent peers, at-risk students had a deficit in language skills, which hindered their learning rate. This lack of language skills made the acquisition of reading skills more difficult, so Engelmann began focusing on developing language and reading skills in tandem. This research solidified Engelmann's theory that students' acquisition of knowledge and development of skills depends on the teacher's appropriate instruction, which needs to be adjusted based on the child's skill level. A teacher must recognize and understand the students' skills and what type of instruction they need to progress and acquire new skills in the most effective and efficient manner. This would allow them to become confident and successful students. He concluded that the success of students depends on the use of appropriate academic curriculum, the proper placement of students into classrooms in terms of their skill level, and adequate instruction from teachers.

The publications in this section were selected to cover the development of Engelmann's philosophy of learning, how it evolved, and how it served as the inspiration and basis for the design of his instructional programs. They also demonstrate the broad application of the principles behind his philosophy. The chapters that follow

focus on topics ranging from the importance of specific instruction in language (Chapter 1) and teaching reading to children with intellectual disabilities (Chapter 2), to flaws in the theories of Piaget (Chapter 3), how teachers should diagnose learning problems by focusing on problems with instruction rather than the student (Chapter 4), and the importance of teaching to mastery (Chapter 5). Engelmann's publications not only promote the theories and the programs he developed, but also demonstrate the flaws in other academic programs and how they are not as effective and efficient as the programs he designed. By comparing the varying techniques and approaches to instruction, Engelmann shows why his techniques succeed when others fail. This in-depth analysis of instruction legitimized Engelmann's theories, but it also helped bring light to a new area of study, to increase attention on the world of education, and to propose scientifically sound ideas on how it could be improved.

## SECTION II

# DEVELOPING EFFECTIVE CURRICULAR MATERIAL

Coinciding with the promotion and development of his philosophy of learning, Engelmann used the principles of his philosophy to design instructional programs that could be widely used. In the 1960s, Engelmann began reporting on the success of these programs and how they were related to his theories of learning and instruction. His publications not only promoted his programs, but also legitimized them by demonstrating their strong effectiveness in comparison to other curricula. Throughout his career, Engelmann has tried to explain the differences between his instructional programs and traditional programs. He has critiqued educational theories and programs that, in his judgment, are not able to serve as strong instructional tools. These critiques were written not to promote his work, but to elucidate what principles do and do not lead to effective instruction.

The publications in this section were selected to illustrate the development of Engelmann's instructional programs and how they were based on his philosophy of learning. They demonstrate the validity of his theories and how the Direct Instruction model is not only successful with at-risk students, but *all* students, even those thought to be unteachable before. The broad application of the Direct Instruction model has helped countless students achieve, and also given hope that all children can succeed at the highest levels.

Engelmann's early publications discussed the development of DISTAR reading, language, and math programs, and their implementation in the Bereiter-Engelmann preschool. These articles, one of which is reprinted as Chapter 6 in this section, detail how the programs were designed and implemented to maximize the effectiveness and efficiency of the lessons, while aiding an underserved population. The programs were structured to teach core content at an accelerated rate. This acceleration propelled students to levels where they could be competitive with their more affluent peers.

Engelmann's publications discussed the success and difficulties of implementing the programs as well as the need to take a scientific approach to instruction where all the variables affecting instruction are recognized and controlled. Thus, his earliest publications demonstrated the validity of his philosophy of learning while explaining why traditional programs were not as successful as Direct Instruction programs. He was able to identify the weaknesses of these programs and how the Direct Instruction model accounted for these factors. Engelmann's scientific approach to instruction created a blueprint for the development of future programs, which would cover more topics and grade levels.

In line with his belief in scientific reasoning, Engelmann has always incorporated the collection of data during instruction to make sure that students are learning the material. He has also been a strong proponent of the use of data to determine the effectiveness of an instructional program and whether it should be implemented. The creation of Project Follow Through in the late 1960s gave Engelmann the opportunity to develop a large data set to demonstrate the effectiveness of Direct Instruction.

Project Follow Through was the largest and most expensive experiment ever conducted in the field education. The experiment was funded by the U. S. federal government and designed to determine the most successful academic program for teaching at-risk children. The Direct Instruction model and over twenty other instructional models were systematically implemented in schools across the country in urban and rural settings. Thousands of students from very diverse backgrounds were administered the Direct Instruction programs. The results of Project Follow Through were clear-cut. Students taught with Direct Instruction had stronger academic growth and stronger self-concepts at the end of the intervention. No other curriculum produced these changes. Thus, the results demonstrated the success of the Direct Instruction model. They showed its success with at-risk students, as well as more affluent peers. Both groups experienced accelerated growth and success in comparison to students in other programs. The results also showed its success across all types of community settings. Engelmann has written extensively about the outcome of Project Follow Through and its

demonstration that the Direct Instruction model was by far the most effective program overall. The expansive data set provided strong evidence of the effectiveness of the Direct Instruction model, but also extensive material to analyze and report on in the following decades. One of Engelmann's summaries of the Follow Through results is in Chapter 12.

Following the development of the original Direct Instruction programs, Engelmann applied the theoretical principles to instructional programs for various other topics such as algebra, writing, science, and social studies. He and his colleagues also began to test the effectiveness of the Direct Instruction model with a broader range of students, providing validation of his theories on learning. They applied Direct Instruction principles to teach students with autism, severe handicaps (Chapter 9), and those who were deaf or hard of hearing (Chapter 7). Through these experiments Engelmann demonstrated how the Direct Instruction model is not only successful with at-risk students, but with all students, including middle-class and high achieving students (Chapter 8).

The success of the model with all students is due in part to its focus on maximizing the effectiveness and efficiency of instruction. By providing clear, concise lessons, designed to teach to mastery, students require fewer repetitions and less practice to advance. Some of Engelmann's work incorporated these principles into new modes of instruction. For instance, in the mid-1980s he pioneered the use of video disk technology for instruction (Chapter 10). His work with students who were deaf or hard of hearing involved the development of tactual vocoders to help the students develop proper speech by allowing them to feel the different vibrations for each sound in a word (Chapter 7). These experiments also included students without hearing difficulties, which helped advanced Engelmann's understanding of unfamiliar learning, a continued focus throughout his career and illustrated in this section by his use of Direct Instruction to teach absolute musical pitch (Chapter 11).

Through his research on unfamiliar learning Engelmann gained a better understanding of what it means if a child requires hundreds of repetitions to learn an unfamiliar task and thus, a greater

understanding of the process of learning and the importance of learning to mastery. Furthermore by understanding how children learn unfamiliar tasks or problems it becomes easier to teach them difficult skills. As in other work, Engelmann applied his scientific approach to analyze the situation, identify the variables, and control them to create change.

## **SECTION III**

# **PROMOTING REFORM AND CHANGE IN EDUCATION**

Engelmann has written extensively about the need to restructure the world of education. He has identified a number of the key components: school districts, teachers, teacher colleges, administrators, instructional programs, publishers, the creators of assessments, and education researchers. Engelmann's first publications in this area discussed the need to restructure preschools to become academically oriented so that children entering elementary school would be better prepared to succeed. He later moved to examining the education system as a whole, writing about the lack of advocacy for students, how the actions of school systems often harmed vulnerable children, and how these actions could be viewed as "academic child abuse." Engelmann has observed the failure of students across the country and determined the root of failure to be the school system as a whole. He has argued that teachers are not always trained in the most efficient and effective practices, administrators don't always have firsthand experience working with students and do not always choose programs based on data of proven success, and researchers and publishers often promote inferior programs.

Beginning with the creation of the Bereiter-Engelmann preschool, Engelmann recognized the lack of advocacy for at-risk children. He determined schools were failing these students because the instruction was not adequately designed and executed for them, but rather it was more appropriate and effective with their more affluent peers. Engelmann's work at the Bereiter-Engelmann preschool strengthened his understanding of the most effective ways to organize and orient preschools to heighten children's skills and prepare them for their future education. His observations and analysis led to the conclusion that the present organization of preschool education was problematic for all children and that a restructuring could lead to the greater success of all children.

To determine why students struggled to learn, Engelmann examined various traditional instructional programs to determine how they were designed and executed, and whether it was possible for these programs to succeed if they were followed exactly as designed. By thoroughly analyzing these other programs Engelmann demonstrated how they failed to serve a large percentage of students. He also compared these traditional programs, with Direct Instruction programs, showing how the careful design of DI countered the weaknesses in the traditional programs. These direct comparisons provided data on the greater effectiveness of Direct Instruction, as well as explanations for why they worked when other programs failed. Chapters 13 and 14 in this section provide examples of these writings.

As important as the selection of an appropriate program is for the success of students, proper implementation is essential. In order to help ensure that teachers implement the carefully designed curricula, Direct Instruction programs use scripted lessons and instructions for presenting information and determining students' acquisition of that information. But just providing the teacher with the content does not ensure the successful transmission of information. The teacher's skills are an essential element in the process of learning. Recognizing the importance of both adequate programs and teaching, Engelmann analyzed the role of the teacher, how teachers are the vehicle by which children are educated. Engelmann argued that the teacher's role is much greater than just presenting information. The teacher must be able to observe problems, identify them before they become chronic, provide appropriate feedback, be able to understand the design of the program being taught, recognize any inadequacies in the instruction and correct for them when needed. Furthermore, teachers need the support of supervisors to ensure the proper implementation of these programs; they need to be properly trained to administer the necessary assessments to ensure all students are mastering the content. Chapter 15 in this section discusses the importance of supervision in helping teachers promote their students' success.

After striving for decades to implement solutions for failing students, Engelmann determined the current education system

could not evolve enough to create significant change. Thus, a true revolution would be needed. He argued the current procedures and principles for instruction and education were so ingrained in the current system that change could not come easily. Every aspect of the system would need to be reevaluated from the ground up, with focus directly placed on the success of all students. Utilizing his scientific approach, Engelmann examined every variable of the education system and determined there was a need for a philosophy of education that would clarify the role of the schools, teachers, administrators, programs, and tests. Each element needed to abide by this philosophy in order for all children to succeed. Just as in the proper implementation of Direct Instruction, all variables needed to be controlled to ensure success. To revolutionize the world of education, adequate programs would need to be selected. Teachers would need to be properly trained in these programs and receive adequate supervision from administrators who had in-class experience and an understanding of what it means to teach. Decision makers would need to make decisions based on data. Education researchers would need to support the most effective programs. Success would depend on the cooperation and coordinated execution of each entity. Chapter 16 in this section, titled “Change Schools Through Revolution, Not Evolution,” summarizes this argument.

Engelmann’s analysis of problems in education being the result of multiple interconnected factors was the basis for numerous articles, using various different approaches to provide greater clarity and new perspectives on the issues he discussed. Later in his career, as the problems he identified remained ingrained in the world of education, he used his website [zigsite.com](http://zigsite.com) to address them. Beginning in 2008, Engelmann began publishing fictional dialogues between the philosopher Socrates and participants in the world of education. Following the work of Plato, Engelmann constructed these dialogues in a question-answer format to analyze important issues such as teacher training, program selection, and “gold standards” in education. The dialogues are designed to decipher a problem by ruling out competing possibilities until the truth becomes evident. These articles address serious problems in education that Engelmann had addressed previously but were still present and devastating to the

success of children. Furthermore, these writings provide insight into the logical thought process of his mind as well as his notable wit and style of writing.

Engelmann has viewed his philosophy of learning as essential to the success of all students. Not only is it critical for this philosophy to be applied to those working directly with school systems, but it should also permeate the work of everyone in the world of education, including researchers, publishers, and policymakers. Everyone must have the same goal and follow the same principles and guidelines to ensure the success of children. Through the fictional dialogues with Socrates, Engelmann delineates the importance of sound teacher training and effective schools of education (Chapter 17). He describes the moral responsibilities of publishers for both educational successes and failures (Chapter 18). He stresses the importance of education researchers using logical and scientifically sound policies and procedures (Chapter 19).

Throughout his career, Engelmann has documented how there was—and still is—a lack of advocacy for students, the education system is harmful, and its treatment of children should be viewed as a form of academic child abuse. In his publications, Engelmann has stressed that students should not be held accountable for their failure to learn; instead, administrators and teachers must be viewed as the cause of their failure. If a student fails to learn, it is the result of faulty instruction, not the student. Engelmann's progressive and thorough analysis of the world of education has successfully identified the problems within it, but, equally importantly, he has provided solutions to the problems described. The guidelines and philosophy of education Engelmann has written about so extensively provide real answers and steps for creating educational equality among all students.

Each of the publications in this section was selected to represent Engelmann's dedication to the education of all children. Beginning with his philosophy of learning – that all children can learn when properly taught – Engelmann sought to understand all of the factors that affect the learning process and how to produce the ideal environment for learning. His relentless approach to helping children

succeed inside and outside the classroom can be seen in his dedication to the issue over the decades, the different approaches he has taken to understanding the issue, and his attempts to create viable solutions.

## **SECTION IV**

# **RESPONDING TO CRITICISMS AND ROADBLOCKS**

Engelmann's long career in education was not achieved without its roadblocks as critics from various fields questioned his theories and practices. Despite the strong demonstrations of success with his curricular programs and the soundness of his theories on education, prominent leaders in the fields of education and psychology were not convinced. Engelmann and his colleagues had to overcome a widespread belief that rigorous and/or demanding programs would be harmful to children, causing extreme anxiety, fear of school, and robot-like conformity. Yet, even though criticisms and roadblocks have persisted throughout Engelmann's career, he has continued to relentlessly pursue his goals of creating educational equality and success for all students. Engelmann's reliance on the data that showed the effectiveness of his programs supported his unyielding efforts to help all children succeed. Knowing that Direct Instruction is the most successful instruction program, he has been driven to continue to develop, extend, promote, and defend it from unfounded criticisms.

Engelmann's early criticisms of Piaget's theories on child development and learning (Chapter 3) were the beginning of a long fight to draw attention to poor systems of instruction and ineffective teaching techniques. He believed it was necessary to analyze other instructional programs to defend his programs by demonstrating how these other programs were inadequate. In some instances, Engelmann's responses to criticisms were intended to provide new perspectives on the issues discussed in order to have a greater understanding of the roots of the problems and how they can be solved. In others, he felt it was necessary to respond to maintain the integrity of Direct Instruction and protect it from outlandish claims and misinterpretation of data, which could be popularized if not directly confronted.

Apart from addressing other instructional theories and practices, Engelmann has written about the roles of education policies, education standards, and researchers who do not always promote the most effective programs. All of these entities play critical roles in the success of students and, as a result, can also lead to their failure. Throughout his career, Engelmann has demonstrated the importance of administering appropriate instruction based on the students' skills and preparing teachers to adequately communicate the content by being able to recognize skill deficits in children and respond accordingly. As important as these elements are to the success of children, they are not the only factors. Education policies and standards, and the actions that result from them, shape the education of students. To maximize the chances for success of students, all of these elements must work together under the common goal of providing the most effective instruction.

Beginning in the early 2000s, Engelmann has had an increased focus on these issues. With the greater acceptance of Direct Instruction theories and practices as well as the development of [zigsite.com](http://zigsite.com), Engelmann has been able to more directly address these issues and publish them in an easily accessible format. Engelmann's articles in response to these various factors provide greater insights into the mechanisms of the world of education. He has shed light on the relationships between researchers, publishers, and policy-makers—how education researchers effect the promotion of academic programs, how the reviews of programs relate to state and national policies and standards, how programs are selected for implementation, and how this relates to the potential success of students. Utilizing a scientific approach once again, Engelmann has analyzed the process of education and determined how the process of learning is not solely determined in the classroom, but can be affected by forces based thousands of miles away.

The work of researchers to determine the most effective programs is essential to the promotion of programs and is a key factor in the decision making processes of states when selecting which programs to implement. States use the recommendations of researchers when establishing policies on adoption criteria for programs. Engelmann has written about how poorly executed research results in states

looking for particular features of a successful program rather than if the program has documented its success with students and has data to demonstrate that success. These poor research practices create a trickle-down effect where faulty research procedures result in flawed state policies, which, in turn, create greater problems for administrators, teachers, and students. The determination of what works is not an easy question and that task cannot be taken lightly. Engelmann argues researchers must provide a more stringent analysis of programs to determine their effectiveness because their recommendations are key to the adoption of these programs and, ultimately, the success of children.

Working to bring greater attention to the complexity and disarray of the world of education Engelmann has had to defend the Direct Instruction model and the principles behind it from unfounded criticisms. Engelmann's responses were necessary to prevent the spread of flawed findings and illogical conclusions on the effectiveness of DI. He has demonstrated the effectiveness of his philosophy of learning for decades, yet researchers continued to attack it by finding ways to discredit the data, by manipulating it to create an alternative conclusion, and by making illogical conclusions about the effect of Direct Instruction.

The following publications were selected to show how Engelmann has reacted to criticisms and roadblocks throughout his career, the variety of criticisms, and the different approaches he took to respond. They include a specific response to a highly flawed study (Chapter 20) and critiques of illogical practices of educational researchers (Chapter 21), policymakers (Chapters 22 and 24), and schools of education (Chapter 23).