

## **RATIONAL SCHOOLS: THE ROLE OF SCIENCE IN HELPING EDUCATION BECOME A PROFESSION**

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**ABSTRACT:** The continuing failure to distinguish change from change with improvement punishes teachers and students alike, particularly diverse learners—children of poverty, students with disabilities, children with limited English proficiency. As the portion of diverse learners in America's schools grows, so too are the demands and expectations for student achievement. Education is not meeting these challenges, in large part because education lacks the infrastructure of other professions, i.e., supports and controls from the profession, from government bodies, and from independent, external groups. This underdeveloped infrastructure diminishes the role of rational, scientifically supported methods, with other groups dominating the field. A rational process for transforming education is briefly described, as are the attendant changes in the relationship among the groups that control American education.

The need to improve student learning across the disciplines, including critical thinking and problem solving, has received great attention for over a decade. Numerous groups have recommended changes for bringing about these improvements—innovation, reform, restructuring, and choice.

The thesis of this article is that too much attention has been paid to change as an end in itself and too little attention to change with improvement. It is crucial to look beyond a change per se to the effects of a change on students. This focus on results is becoming increasingly important as the makeup of America's schools becomes more varied and poverty stricken. Moreover, today's students face growing expectations in the context of a global economy. The weak professional infrastructure of education exacerbates these challenges. Supporting understanding and action concerning education's weak infrastructure is the primary purpose of this article. Specifically, education lacks supports and controls available to other professionals—from the profession, from government, and from external groups. Developing these supports and controls requires a shift in how decisions are made in education. In particular, scientific evaluations and rational methods will have to become more influential. A discussion of how this might come about concludes the article.

The general public probably believes that educational changes occur in a manner similar to other disciplines: New knowledge is acquired through rational methods, that knowledge is widely publicized, and change takes place based on the findings.

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In medicine, for example, we frequently share in the dissemination of new, scientifically acquired knowledge when the *New England Journal of Medicine* articles are publicized on the nightly news. The art of medicine is shaped by scientifically developed tools. Like medicine, education has its professional journals, full of ostensibly scientific articles. Unlike medicine, however, educational practice often operates independently of rational methods for verifying effectiveness. This lack of reliance on verified effectiveness results in a confusing array of terms such as innovations, reforms, restructuring, choice.

Dictionaries define innovation as change, restructuring as a change in structure, and reform as change that produces improvement. Several important differences between change (educational innovation and restructuring) and reform (change with improvement) are summarized in Table 1. The failure to discriminate education changes that bring about significant improvement in student learning from changes that do not is at the crux of why our schools, particularly those serving at-risk students, have not been able to produce the kind of learning society wants and needs.

**Table 1. Differences Between Educational Changes and Educational Reforms**

- Innovations and restructuring efforts succeed when a change has been made; an educational reform succeeds when learning improves.
- Reforms merit widespread dissemination; innovations and restructuring efforts require careful evaluation to determine if they benefit students. Remember, deregulating Savings and Loans was an innovative restructuring that created thousands of dollars of debt for every man, woman, and child in the U.S.
- Because of the extensive educational support that higher-income families provide their children, most ineffective educational innovations and restructuring efforts do relatively little harm to these students. The opposite is true for students who lack this support at home or who have learning disabilities that make home support relatively ineffectual.
- To be a reform, proof of success is required *before* implementation; an innovation cannot produce proof until after it is finished.
- Innovation and restructuring are part of the problem-solving process in education, not the solution. When President Garfield was assassinated over a 100 years ago, everyone agreed that he was killed by his doctors, not by the bullet. Doctors at that time did not have procedures to ensure cleanliness, antibiotics, or X-rays. What good would it have done to convene 350 national commissions, panels, and reports on innovative ideas for medicine, as has been done over the past decade in education, and then restructure hospitals? The key to addressing America's educational problems is to develop reforms, such as medicine did with hygienic practices, drugs, and diagnostic tools.

All changes begin as innovations. The change may be a change in how schools teach something. The change may be in how decisions are made (restructuring). An innovation, though, cannot be considered as a reform until it demonstrates that it produces the desired changes in student learning (Carnine, 1993).

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The failure to rely on rational methods results in endless switching from one fad to another. These pendulum swings are a symptom of the system's failure to discriminate innovation from reform. Table 2 summarizes major pendulum swings in education this century.

**Table 2. Historical Swings in Instructional Innovations**

- *Natural learning versus contrived instructional approaches.* For example, in beginning reading, the swings have been between phonics, which is contrived, and whole language, which is natural.
- *Basic skills versus higher-order thinking.* For example, mathematics education emphasized the basics from 1900 to 1935, meaningful mathematics from 1935-1958, discovery learning from 1958 to the 1970s, the basics from the 1970s to the 1980s, and now a return to meaningful mathematics and discovery learning.
- *The process associated with a discipline versus knowledge of the content of a discipline.* For example, in science education, the swings have been between content-focused approaches that stress facts, laws, and theories and that use laboratory activities as verification exercises or as secondary applications of concepts previously covered in class; and process approaches that stress inquiry as the central classroom activity (Shymansky, Kyle, & Alport, 1983).
- *Knowledge that is socially relevant versus content knowledge that is central to a discipline.* For example, social studies emphasized relevant knowledge in the 1950s and 1960s, followed by "new social studies" programs that emphasized inductive teaching, discovery learning, and content drawn from the newer social sciences. In the early 1970s, a relevant curriculum stressed "personal development and citizen education accomplished through class discussion and projects concerned with values conflict and moral dilemmas, social and political issues" (Brophy, 1990, p. 361). In the late 1970s and 1980s, content knowledge was emphasized. The shift in content, however, did not reflect a shift in instructional practices.

### Increasing Diversity in America's Students

While some analyses of SAT scores suggest that America's advantaged students know far less than they did 30 years ago, other findings suggest that America's highest achievers are doing very well, even in international comparisons. A 1988 study of mathematics achievement of 13-year-olds (OECD, 1993) reported the highest performers to be from Taiwan, Iowa, North Dakota, Korea, Minnesota, the Soviet Union, Switzerland, Maine, New Hampshire, and Hungary. In a 1994 international mathematics competition for high-school students, the American students not only won but also received a perfect score!

The relative success of America's high achievers should not come as a surprise. Public education and its related institutions—colleges of education, publishers, and

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professional organizations—were designed for families that strongly support education, usually from the middle and upper-middle class. Children from these families receive extensive preparation before being old enough to enter school, and continuing encouragement and help with homework and projects after entering school; e.g., when entering school, children from wealthy backgrounds have about 1,000 hours of literacy experience (Adams, 1988).

The controversy over the performance of America's highest achievers stands in stark contrast to the strong consensus that the bottom half of America's students have serious educational problems, which often lead to serious economic problems.

For example, while children from wealthy families enter school with 1,000 hours of literacy experience, children of poverty enter public school with about forty hours. For the child of poverty to close this gap, assuming an hour a day of literacy experiences in a Head Start program, the child would need about five years of Head Start. Adams (1988) cited Feitelson and Goldstein's study that found "... about 60% of the kindergartners in neighborhoods where children tend to do poorly in school did not own a single book. In contrast, kindergartners in neighborhoods where children tend to do well in school owned, on average, more than fifty-four books each" (pp. 88-89, footnote 101). Most students with disabilities and children who do not speak English join children of poverty in entering schools not designed to meet their educational needs.

Once in school, diverse learners engage in far less academic work. For example, by the end of sixth grade, a child of poverty would need to go to school an additional year-and-a-half to have the same amount of academic experience in school as a more-advantaged child. Other diverse learners (e.g., children with disabilities and non-English-speaking children) have similar experiences. Once a diverse learner falls behind, the prognosis is dismal (Adams, 1988). The probability of remaining a poor reader by the end of fourth grade, given a child was a poor reader at the end of first grade, is 0.88. Whether early reading failure is attributed to a disability, poverty, or limited proficiency in English, the outcome is usually the same—continued failure in school. Juel (1988) found that 40% of the poor fourth-grade readers claimed that they would rather clean their rooms than read (p. 5). Adams (1988) added to this dismal picture:

If low-achieving students can be brought up to grade level within the first three years of school, their reading performance tends not to revert but to stay at grade level thenceforth." However, the downside is "if we fail to bring students' reading to grade level within those first few years, the likelihood of their ever catching up is slim, even with extra funding and special programs (pp. 27-28).

Because American schools are designed for students who receive extensive encouragement and help at home, speak English, and do not have disabilities, diverse learners tend to do poorly in school. And over the past twenty years, there has been dramatic growth in the proportion of diverse learners in America's schools

In 1970, there were 6.7 million single parents; in 1992 there were 15 million. Conversely, there were relatively few stereotypical families in the early '90s: "... a working father, housewife mother, and two children of public school age was 6% of all households for most of the decade" (Hodgkinson, 1992, p. 3).

During the 1980s, the poverty rate for children increased 11 %, reaching 17.9%

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of all children by 1989. By 1993, the level had increased to 23%, " ... one of the highest youth poverty rates in the 'developed' world and has shown little inclination to decline" (Hodgkinson, 1993, p. 620); one in ten students receives special education services, two out of seven children come from homes in which English is not the first language. To add further to these challenging statistics, the fastest growing demographic group in the country from 1980 to 1990 was the prison population, which increased 139% (Hodgkinson, 1992), with recent rates estimated at 300%. There were 1 million people in prison in 1994, twice the 500,000 of just 10 years before. The U.S. has the highest prison population in the world; 82% of America's prisoners are high-school dropouts. Policy implications, strictly in terms of cost-effectiveness, are also unambiguous: At about \$25,000 per year, taxpayers spend roughly five times as much money to house a prisoner as they do to educate a child.

The question addressed by this article is how education can better meet the needs of diverse learners who are at risk of failure, i.e., what courses of action can bring to education the type of rational decision-making that characterizes more mature professions. For example, medicine and engineering study innovations to identify those that could be actual reforms and learn how to disseminate and implement them in an effective manner. Teachers, as do other professionals, need and deserve to know about innovations and reforms. The goal is not to discourage innovations but to use rational methods to decide which innovations are worthy of dissemination as proven reforms. A rational process is becoming increasingly important as America's students become more diverse.

A variety of televised successes by educators, such as Jaime Escalante in California, Marva Collins in Illinois, Thaddeus Lott in Texas, as well as numerous behavioral interventions dealing with mastery and fluency affirm the potency of education (Beck & Clement, 1991; Binder & Watkins, 1989; Pennypacker & Binder, 1992; Watkins, 1988; Greer, 1982; West & Hamerlynck, 1992). These demonstrations are of vital importance. Decisive demonstrations of success are crucial in every field. The debate over whether man was destined to fly ("If he were, he would have wings"), ended when the Wright brothers demonstrated that human flight was possible. Similarly, in education the issue is not whether education can make a substantial difference in the lives of diverse learners, but why such successes are so rare. The goal is to create schools where heroic principals are not needed for diverse learners to receive an excellent education.

### **Increasing Expectations for America's Diverse Learners**

Because of the increasing importance of education to the U.S. economy, national leaders are demanding more from all students, including diverse learners, expecting higher-order thinking as well as mastery of increased bodies of content-area information. As Resnick (1987) stated, "Although it is not new to include thinking, problem solving, and reasoning in someone's school curriculum, it is new to include it in everyone's curriculum" (p. 7). The increased expectations for diverse learners are manifested in national curriculum outcome standards summarized in Table 3. Some innovations that turn out to help advantaged students meet higher expectations

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(e.g., require more academic courses in high school) are relatively ineffective for diverse learners. What is the relevance of stiffer graduation requirements to a high-school dropout? Students who lack fluent prerequisite skills and knowledge are likely to flounder in rigorous academic courses. Reforms are needed that will allow diverse learners to succeed and stay in school.

**Table 3. Increased Expectations for Diverse Learners**

- "... we believe that *all* students can benefit from an opportunity to study the core curriculum specified in the Standards"" (p. 259, The National Standards of the Teachers of Mathematics, 1989).
- " ... a reformed social studies curriculum should be required of *all* students in common, regardless of their 'track' or further vocational and educational plans" (p. 9, The National Center for History in the Schools, 1992).
- "... the commitment to science for *all* implies inclusion not only of those who traditionally have received encouragement and opportunity to pursue science, but of women and girls, all racial and ethnic groups, students with disabilities, and those with limited proficiency in English" (p. 1, The National Science Education Standards, 1993).
- " ... promote equality of educational opportunity and higher academic achievement for *all* students" (p. 2, The Standards Projects for English Language Arts, 1993 ).

### **Education's Weak Professional Infrastructure**

The limited role of rational methods results in less professional support in terms of knowledge that could empower teachers. Without a potent knowledge base, teachers are less bound by codes of professional conduct; e.g., malpractice is not legally recognized in education. The vacuum in the decision-making process left by the minimal role of rational methods in the education process has been filled by consensus. In this consensus process, educational leaders whose expertise is usually in innovation but not reform, decide what schools should do. Consensus should be the dominant mechanism concerning issues relating to values—for example, deciding what outcomes are most valuable. Consensus, however, is not dominant in dealing with technical issues in education, e.g., how and when to teach beginning reading to students who are likely to be identified as having a learning disability. A comparison of the professional infrastructure of teaching with the more mature professions of health and engineering explains why improvement is so meager in education.

According to Rowan (1994), several prominent educators argue that education should not be viewed as a profession. For example

Some analysts (Huberman, 1993; Pratte & Rury, 1991) take the position that teaching is a form of craft work, that is, a set of well-established work practices grounded in the wisdom of accumulated practice rather than a highly codified and advanced scientific knowledge base. Eisner (1978) argued that in the absence of a well-developed science

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of teaching, teachers' work is best seen as a type of artistic endeavor that requires intuition and inspiration for successful performance" (p. 4).

Education might be characterized as having a pre-professional infrastructure without the supports and controls found in all other professions. This problem is particularly acute because it is not commonly recognized. Instead, teachers and schools are blamed when innovation, often devised and mandated from above, fails. Below are examples from Worrell and Carnine (1994) of these three forms of professional support and control:

### **1. Professional support and control**

The American Medical Association and the American Society of Mechanical Engineering publish journals, promote standards, and conduct reviews concerning complaints of malpractice. In education, where rational methods play a relatively small role, professional organizations promote popular approaches that have not been tested. Schools that go against these popular approaches are often punished, even if they are successful. For example, early education professional organizations discourage the teaching of academics in kindergarten. Wesley Elementary in Houston, serving 1,100 low-income, inner-city students, teaches children who start in kindergarten to read by the end of first grade. The school is known throughout the state for its high achievement. Only eighteen children out of 100 have been identified for special education. Instead of responding to reports of the students' high level of success with pride and support, the central administration undermined the principal. The harassment peaked when charges of cheating on standardized tests were leveled against the teachers. These attempts by a district to defame its greatest success story twice propelled it onto national television coverage on PrimeTime Live.

### **2. Governmental support and control comes in many forms**

In health and engineering, the limits of the profession are defined through litigation. Litigation is still not an option in education because the courts have ruled that educators do not have an agreed-upon body of professional knowledge. Unless society increases the professional support for teachers—the amount and quality of knowledge—it is pointless to increase control over schools by doing things such as restructuring. For example, Edward Fiske, former education editor of *The New York Times* and a visiting scholar at Stanford, stated, "There is some reason for hope that in the not-too-distant future schools of education will get on the restructuring bandwagon. Educators . . . must abandon . . . focuses on 'what works,' in favor of a more reflective approach that thinks of teachers as professional educators, thoughtful and competent practitioners of the art of teaching" (p. 257). This book has been praised by President Clinton, national educational leaders, and premier newspapers from across the country.

Governmental agencies also control licensure. Too often, licensure in education is used to explain failure. Alessi (1988) reviewed 5,000 school psychologists' files on students with learning problems. In all 5,000 cases, the psychologists reported that problems were caused by the student or the family, never the school. Medicine

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has a field of study devoted to problems caused by the profession—iatrogenics. Alessi's findings could lead one to conclude that teaching is possibly the perfect profession—not one instance of professional shortcoming out of 5,000 cases. Data dissemination about effective medical practices is handled through the National Institutes of Health and Medline, and Medline provides relatively user-friendly, trustworthy syntheses of research findings. In education, ERIC gives the teacher lists of articles, not syntheses, not user-friendly, and only sometimes trustworthy.

The FDA, FAA, and the Department of Transportation set standards for safety and efficacy; in education, submitting effectiveness data on educational approaches to the Program Effectiveness Panel is voluntary (PEP is the government agency that validates approaches as effective); moreover, we found that less than 5% of the programs validated by PEP were from major publishers covering core academic areas. If the FDA were run in the same manner as PEP, the FDA would regulate vitamins and let anyone make prescription drugs.

### **3. The final source of support and control is from external groups**

Third-party entities such as hospitals, HMOs, and insurance companies audit patient records and convene review committees. Special interest groups, such as the American Cancer Society and American Automobile Association, provide consumer education and promote and fund research. Independent organizations, such as Consumer's Union and Underwriters Laboratories, provide consumer information. Better Business Bureaus and the National Council against Health Fraud respond to consumer complaints. Education needs external groups, such as National Council on Learning Disabilities and Learning Disabilities Association, to take a more active role in monitoring the effects of instructional practices used in the profession.

### **Influences on Decision-Makers**

Increasing supports and controls will not be possible without dramatic changes in how decisions are made in education. At this time, major educational decisions are influenced by the actions of four broadly defined groups: Influence-producers, regulation-producers, knowledge-producers, and knowledge-consumers. The members of each group, as well as their interrelationships, are summarized in Figure 1 (see opposite page). Although any given entity belongs in more than one category, for purposes of simplicity, each entity appears in only one category.

*Influence-producers* are the trendsetters in education. The educational organizations in this category usually create and sanction popular education innovations. Some of these major organizations are listed below:

American Association of Colleges of Teacher Education, American Association of School Administrators, American Council of Great City Schools, American Educational Research Association, American Federation of Teachers, Association for Supervision and Curriculum Development, Council of Chief State School Officers, Council for Exceptional Children, Education Commission of the States, International Reading Association, National Association of Elementary School Principals, National Association of Secondary School Principals, National Council of Teachers of

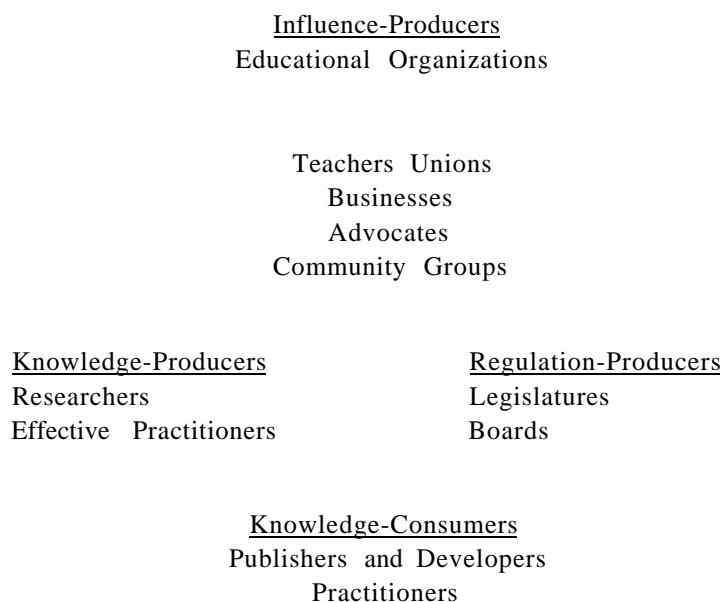


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English, and National Council of Teachers of Mathematics.

Many teachers belong to a union, but relatively few teachers belong to the other organizations. People who identify with these educational organizations include the education staffs in foundations and corporations, in state and federal departments and commissions, in state and federal legislative committees, and governors' offices. These organizations, their members, and others who identify with them make these influence-producers the educational opinion leaders in the U.S.

**Figure 1. Current Relationships Among Influential Groups in American Education**



Influence-producers have been at the forefront of promoting innovations that have not been proven to be reforms. The education curriculum experts have been the most influential. Many curriculum experts are superb at the rhetoric of predicting positive results for diverse learners but falter when it comes to the reality of producing results. Educational curriculum experts are district and state curriculum specialists, college of education faculty in curriculum areas, leaders in national curriculum organizations, and curriculum experts in the educational publishing industry.

Their advocacy has a tremendous effect, which can either benefit or harm diverse students. For example, near the beginning of a document prepared by the National Council of Teachers of Mathematics (1989) outlining their recommendations for math instruction, the authors stated they were protecting the American public from shoddy practices, just as the Food and Drug Administration does. The document included provisions that mandated the methods for instruction. Were these mandates based on scientific research in which the method was tried out with students? This statement from the same document answers that question: It "suggested the establishment of some pilot school mathematics program based on

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these standards to demonstrate that all students—including women and under-served minorities—can reach a satisfactory level of mathematics achievement" (NCTM, 1989, p. 253). Can you imagine the Food and Drug Administration approving a drug and mentioning that it would be a good idea to try it out at some later time to show how wonderful it is? Yet these recommendations for mathematics education are now being implemented in many school districts across the country. The point is not that the recommendations are necessarily harmful, but that parents and teachers do not know whether the recommendations are harmful.

Education curriculum experts may be in groups that are in several categories. A university professor who conducts research may be an author of a program published by a knowledge-producer, may be a member of an influence-producer group, and may also be an advisor to a government agency. Because of the under utilization of rational methods, these multiple memberships lead to undue and unwarranted influence by education curriculum experts.

*Knowledge-producers* are researchers and successful practitioners. Researchers have not been influential in part because of the shortcomings of their research and in part because the non-rational decision-making process in education does not demand quality research. Too little quality research has been conducted to address the many challenges teachers face in kindergarten through grade 12.

... the prestigious National Research Council of the National Academy of Sciences issued a scathing report condemning the field's penchant for "methodologically weak research, trivial studies, an infatuation with jargon, and a tendency toward fads." Without "high-quality and credible evaluations," it warned, "school districts will never be able to choose wisely among available innovations" (Marshall, p. 102).

Successful practitioners transform innovations into reforms. Successful practitioners are often principals who are bucking the system and have learned to keep a low profile to survive. Knowledge-producers have been and are less important than influence-producers because consensus is the dominant force in education, while rational methods play a relatively minor role.

*Knowledge-consumers* are publishers and practitioners who receive most of their information about innovations and reforms, either directly or indirectly, from educational organizations. Because influence-producers dominate education, they hold sway over knowledge-consumers. Knowledge-consumers take their lead from the presentations, writings, and actions of influence-producers. For example, the standards set forth by the National Council of Teachers of Mathematics are being followed quite closely by publishers as they develop educational tools for mathematics. As these tools are purchased, they will increasingly shape the teaching of classroom practitioners. At this time, the NCTM-recommended teaching methods incorporated in the newly developed tools for teaching mathematics are innovations. There is insufficient research to determine if these innovations are also reforms that will improve student learning. Disseminating innovative methods to millions of students is risky.

*Regulation-producers* are governmental agencies that dictate what teachers must do to become certified to work in schools (and to maintain that certification), what constitutes an acceptable course of study in college for prospective teachers, what makes for acceptable educational tools, what factors determine whether schools or

school districts are performing at acceptable levels, which topics should be researched, and so forth. Regulation-producers turn to influence-producers for guidance, just as knowledge-consumers do. Whatever the consensus is about preferred methods, that is what is likely to be required in legislation and regulations. As noted earlier, this consensus is formed without much regard to rational methods.

In 1988, the California State Board of Education issued a document spelling out a list of "progressive" techniques mandated for teaching language arts. The "research" for the mandated "best method" for language arts—in first grade, the teaching of reading, in particular—was primarily testimonial rather than empirical findings dealing with student learning. A review of scientific research related to this mandated method for teaching beginning reading in first grade found no overall research support for the mandate (Stahl & Miller, 1989). In fact, many of the characteristics of these progressive methods have proved unsuccessful with children of poverty. Yet schools that dared to refuse to comply with the mandate were led to believe they might lose state funding.

### **A Rational System for Education**

The one purpose of this article is to advocate for increasing the amount and quality of rational methods in education. Then educators will have increasing access to usable, trustworthy sources of knowledge about what is known and what is not known. Hopefully, the motto for education will become similar to that of medicine, "Science in support of the art of medicine." Rational methods will never define every aspect of education, but rational methods must increase in importance if we are to meet the needs of our diverse learners. Here are five major steps to be taken in developing a professional infrastructure:

**1. Establish priority areas for which research knowledge is most needed by educators;** e.g., skill areas such as beginning reading, content area knowledge and application, social skills, and so forth.

**2. Identify a usable form that knowledge needs to come in to allow educators to select and implement an educational practice;** e.g., a clear, specific definition of an approach, effects in terms of achievement, attitudes, and other measures, professional development requirements, equity information about the results for different types of students, cost, and ongoing internal assessment for continuous improvement.

**3. Establish a knowledge base by consolidating it in a usable form, as described above in #2.**

**4. Increase knowledge in priority domains.** This increase will come by requiring innovations to pass through two stages to become genuine reforms.

(a) Demonstrable effectiveness when implemented by the developers. A so-called innovation or restructuring effort that the developer has not even put in operation is unworthy for dissemination.

(b) Validate effectiveness in representative schools with typical teachers, not

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those hand-picked by the developer. An innovation that works only for the developer and a very, very few teachers is likely to be too impractical to produce widespread benefits.

**5. Organize dissemination and professional development efforts of existing organizations around the knowledge base.** Having invented the light bulb, Thomas Edison had to validate his innovation outside his laboratory. Because there had been no applications of electricity in homes, there had been no purpose in providing homes with access to electricity. So, Edison had to invent and put in place an infrastructure for electricity—transformers, power lines, and so forth. This infrastructure of support made the light bulb usable and trustworthy. Similarly, educators need such an infrastructure for dissemination to support reforms that merit wide-spread implementation in many schools.

The execution of these five steps would gradually lead to professional support and control in education similar to that found in other professions. These steps will not, however, be carried out without several changes in the relationships among the four groups that define American education. These changes will evolve only if each of the four groups take specific action. Descriptions of these actions and their possible consequences are described elsewhere (Carnine, 1995).

These hoped-for relationships are portrayed in Figure 2. First, influence-producers must become more cautious about treating untested innovations as reforms. This caution would lead influence-producers to become more demanding of knowledge-producers, insisting that the quality and quantity of research be sufficient to evaluate innovations and provide information on how to reliably disseminate valuable reforms. Influence-producers who did not sanction and promote practices that turned out to be effective and practical for practitioners would diminish in importance.

**Figure 2. More Rational Relationships Among Influential Groups in American Education**

Influence-Producers	<u>Regulation-Producers</u>
Educational Organizations	Legislatures
Teacher's Unions	Boards
Businesses	
Advocates	
Community Groups	

Knowledge-Producers		Knowledge-Consumers
Researchers		Publishers and Developers
Effective Practitioners		Practitioners

Creating a new education culture will be of great benefit to knowledge-consumers. Publishers and developers will turn more to knowledge-producers to gain information about innovations and reforms so that the reforms can be incorporated

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in the educational tools they publish. Then practitioners will have more efficacious tools.

Similarly, regulation-producers will operate more according to rational methods, utilizing knowledge about innovations and reforms and how reforms can be disseminated. Such knowledge will be a cornerstone for teacher certification, professional development requirements, school accreditation, and so forth.

### Conclusion

The Orient uses a metaphor involving the lotus to define this situation. Many people talk about problems (the muck in which the roots of a lotus take hold) and about how things might be after the problems are solved (the beautiful lotus flower). But few people deal seriously with how to get from the problem to the solution (how to grow the lotus stem that reaches from the muck to the flower). The mechanisms being suggested to organize that movement focus on "rational schools." Table 4 includes a four-stage process that a rational school would follow in deciding upon and implementing programs.

Rational schools are motivated to use trustworthy, usable knowledge to find and implement genuine reforms. Rational schools use information about student learning to set goals and seek out, select, and implement effective instructional and curricular tools while continuing to monitor learning, and thus maintain the improvement cycle. Educational tools are content area textbooks, computer programs, books describing instructional approaches, such as cooperative learning, and so forth. Rational tools are those that have been developed, tried out, and revised to ensure that they are effective and feasible for teachers and students, particularly diverse learners.

Rational schools are needed to support teachers in their work. Large numbers of successful students are not possible until there are large numbers of successful teachers. Teachers are now bombarded with contradictory information. They are told that every innovation is actually a reform—it is research based, that there are model schools where the innovation is succeeding, and that they need to engage in professional development of the innovation. Teachers have seen too many of these so-called reforms fail. Why should teachers believe in any innovation or reform?

Our present and future goals for improving American education will be reached only if we work toward providing the teacher with tools and procedures that work, adequate and sufficient training, and workable classroom structures (see next page).

An increase in marketplace demand for rational methods in education is crucial, whether it comes from the private or public sector. Teachers' unions, businesses, advocates, and community groups need to be educated about the vital need for rational methods in general, and about tools and practices that can be effective with diverse learners in particular. These influence-producers can then actively encourage the use of rational methods. These efforts must not only create awareness about the need, but also offer specific constructive steps (e.g., the rational schools improvement process). It is important to note that the application of the rational schools process must be tailored to the particular perspective and interests of each group. The book from which this article is excerpted contains chapters suggesting how specific groups could go about promoting rational schools and smart tools.

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**Table 4. Rational School Improvement Plan**

*Stage 1. Setting Improvement Goals*

1. Define important achievements for students in terms of measures.
2. Use the agreed-upon measures to construct a school profile.
3. Identify two or three improvement goals.

*Stage 2: Defining the Scope of the Improvement Plan*

1. What is the extent of the improvement that is needed?
2. Where will the approach come from?
3. What scale of initiation and risk are acceptable—small, medium, or large (e.g., a classroom, school, several schools, or district wide)?

*Stage 3: Selecting Tools and Practices for the Improvement Plan*

1. Are the approach and its outcomes clearly defined?
2. What evidence exists that the approach is effective?
  - If the approach has been implemented before:  
Where were these implementations?  
Did they involve teachers and students reasonably comparable to those found in the improvement site?  
What were the results?  
If the approach has not been implemented before because it is new:  
Did the publisher follow a learner-verification procedure in developing the approach? (Learner verification involves field-testing and revising the program based on student errors and on teacher difficulties in using the program.)  
What were the results of the field-testing in terms of student achievement?
  - If there are research studies on the approach:  
Are the results valid? Was the research appropriately designed, implemented, analyzed, and reported?  
Are the results substantial? If research shows only a slight gain in student learning in response to a large expenditure of money and effort, the value of the approach is questionable.
3. Is an accountability process built into the approach?
  - Have student and teacher measures been identified or created that will contribute useful information about an approach's implementation?
  - Does the approach provide regularly scheduled observations for the purpose of supporting student and teacher performance in a timely and effective manner?
  - Are assistance procedures specified for teachers and students who need additional support?
4. Is the approach sustainable?
  - How much professional development is required for initial training? For follow-up training?
  - Are expectations reasonable for administrators?

# RATIONAL SCHOOLS

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