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ABSTRACT

Proceedings of a conference designed to provide a group of teachers, administrators and university professors with an opportunity to share information on initiating and sustaining innovative programs in education are summarized in this paper. The participants represented 21 exemplary programs in mathematics, science, and/or computer education as identified by the SouthEastern Regional Vision for Education (SERVE). Four sections discuss the following four topics: reasons for innovation; the characteristics of a good innovator; factors that make for program success; and components recommended for expanding or transferring innovative programs. The final section presents recommendations made by participants for local administrators, policymakers, teacher educators, and SERVE. One figure is included. Appendices include a reprint of the article, "Getting Reform Right: What Works and What Doesn't," by M. G. Fullan and M. B. Miles, the forum agenda, and a list of participants. (LMI)

WHAT TEACHERS HAVE TO SAY ABOUT CREATING INNOVATIONS IN EDUCATION

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PROCEEDINGS FROM THE SHARING SUCCESS FORUM

May 22, 1992
Orlando, Florida

SERVE
SouthEastern Regional Vision for Education

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VOICES FROM THE FIELD

"As professional educators, we have no choice but to look for and implement innovative programs that will benefit our children. Seeing the success of our program has made me more willing to be innovative."
—Dennis Silas, Assistant Principal and Teacher

"I am constantly thinking of new and better ways to involve students in the activities of science. I love the laboratory experience—it is the most work, but the most fun and most rewarding part of chemistry (and all science). —Jacqueline Simms, Teacher

"Technology . . . has allowed each member of the school community to claim ownership in the learning process."
—Cynthia Richardson, District Administrator

"I am a less structured, traditional teacher now and I realize that it is not necessary for me to make all the decisions that affect my classroom and students." —Sandra Whisenant, Teacher

"My key to success . . . is due to my willingness to take risks and pursue the use of research-based technological innovations before they become commonplace." —Mary Gunter, District Administrator

"I believe that great things can be accomplished when teachers and administrators work together to develop and implement effective, innovative instructional programs." —Linda Brooks, Assistant Principal

"The superintendent and assistant superintendent have been very supportive of all my innovative efforts. Some days I seem to be running out of steam but their willingness to support me rejuvenates me and thus I'm willing to look to the future." —Ann Stafford, District Administrator

"We spent a full year planning and developing general ideas for our program and gaining parental and community support for the idea. We then spent three months of intense preparation and training for the staff. . . . All the planning . . . prior to implementation has been a key to our success." —Buddy Strickland, District Superintendent

"The best method of transfer is to begin with an on-site visit to an existing program followed by summer seminars and workshops." —Joyce Hughston, Teacher

"Teaching has become more exciting. Each day, I become more reflective about what I do in the classroom."
—Mike Rooney, Teacher

"The enthusiasm, excitement, and the knowledge that we have seen in our students strengthens our desire to use creative ideas in the classroom."
—Susan Grunwald and Yvonne Hornbuckle, Teachers

INTRODUCTION

On May 22, 1992, a group of teachers, principals, district- and state-level administrators, and university professors gathered in Orlando, Florida to discuss their work as innovators in education. The participants who were invited to this "Sharing Success Forum" represented 21 exemplary programs in mathematics, science, and/or computer education as identified by SERVE's Sharing Success Program. SERVE—the SouthEastern Regional Vision for Education—designed the Sharing Success Program to increase the awareness and use of exemplary education programs throughout the Southeast and to offer teachers the opportunity to become involved in collaborative efforts to demonstrate and disseminate effective classroom programs. The Forum was designed to provide an opportunity for these pioneers to discuss common issues related to their experiences as innovators.

In the opening session, Dorothy Routh, Deputy Director of SERVE, talked to the participants about the change process. As educators, she said, we need to recognize that while change is often uncomfortable—upsetting established patterns and ideas—it is also inevitable. Those who take the initiative and "ride the wave" of change, says Routh, will be the ones who focus the direction of that change. Change in education should be viewed as an evolutionary planning process *(see Figure 1)*. Routh enumerated key elements of successful innovations in education, which include making student learning the central goal, rewarding risk taking, empowering teachers and students, providing ongoing staff development, and actively addressing problems. The discussions that followed throughout the day focused on these elements; those who have been innovative in their classrooms and schools mentioned similar requirements for success. *(See Appendix A for a related article, by M. Fullan and M. Miles, about change.)*

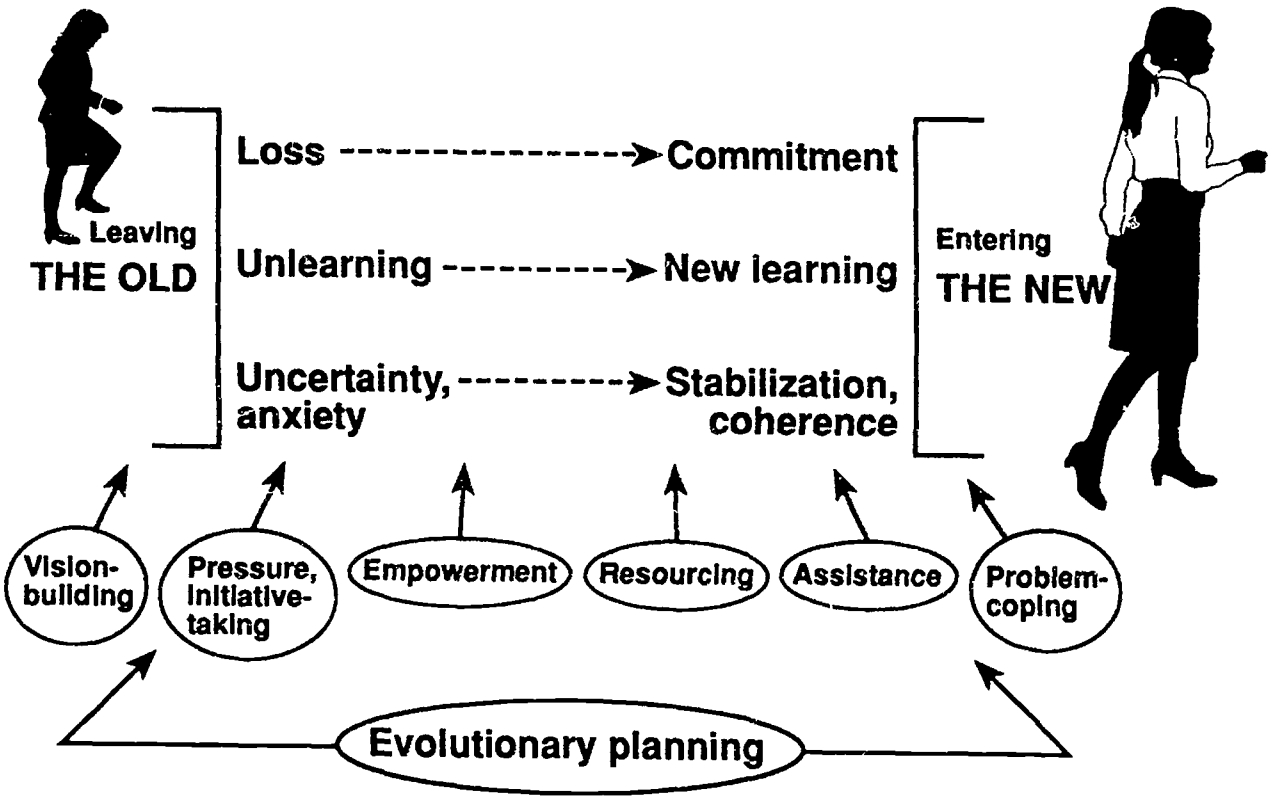
This document will summarize the information that these experienced practitioners revealed about initiating, sustaining, supporting, and transferring innovative programs in education. This information was gathered through written answers to questions, presentations by selected participants, and open discussions among all attendees. While the focus was on mathematics, science, and computer education, the reflections and suggestions offered by these practitioners are relevant to educators in any field. These proceedings are organized as answers to four main questions:

1) Why be innovative?
2) What makes a good innovator?
3) What do innovators need to succeed?
4) How can innovative programs be expanded or transferred?

In addition, participants offered a number of specific recommendations to others who may be involved in creating or supporting change. These recommendations fall into four categories and are for

1) local-level administrators,
2) policymakers,
3) teacher educators, and
4) SERVE.

Educational Change:
The Transition Process



M.B. Miles & R. van der Vegt, 1984
K.S. Louis & M.B. Miles, 1990

WHY BE INNOVATIVE?

All students need to learn but many are not successful in traditional settings. Innovators recognize this and are willing to admit that some of what they have done in the past did not help these students. Participants in the Sharing Success Forum noted that their students had needed such changes as an integrated curriculum, cooperative learning experiences, and the use of manipulatives in order to learn. They also pointed out that other educators often see the same needs, and it helps innovators to know that they are not alone in wanting to try something different.

Innovation benefits students in many ways. The following is a list of benefits to students who are involved in innovative, effective programs:

Students

- are excited about learning.
- are actively involved in lessons.
- are "electrified," interested, and motivated.
- look forward to school each day.
- understand concepts; they do not just memorize.
- like/enjoy science/math.
- have shown significant, long-term academic achievement gains in reading and math on standardized tests.
- see the practical applications of science and technology.
- have the opportunity to explore new ideas instead of hearing lectures about them.
- are more environmentally aware and believe they can make a difference in the world in which they live.
- are more responsible.
- have developed pride and self-confidence by meeting challenges.
- believe that their educational opportunities have improved.
- feel more successful.
- know that learning can be fun.

Innovation benefits teachers in many ways. The following is a list of benefits to teachers who are employing innovative, effective practices:

Teachers

- are more excited about the learning process and about teaching.
- are excited about using a hands-on approach and do so more often.
- are using many more resources besides textbooks.
- are more creative in their lessons.
- have more input into curriculum.
- oversee their own staff development.
- want to enhance curriculum with new research findings and technological innovations.
- are no longer afraid of mathematics.
- are making mathematics more relevant to students' needs.
- are more open-minded about the potential uses of technology.
- are integrating all disciplines.
- are giving students tools to think for themselves.

- have become facilitators and guides to their students.
- are more often reflective about their own teaching.
- are seeking out new ideas.
- are working together as a team and learning from each other.
- are willing to share ideas and materials with one another.
- are more confident in the classroom.
- have increased self-esteem.
- feel ready to tackle new and bigger challenges and are exploring other innovative possibilities.
- are encouraging others to try new things too.
- take pride in the teaching profession and their schools.
- would not go back to traditional methods.

Clearly, many good reasons exist for creating innovation in education. The following pages will provide suggestions for doing so.

WHAT MAKES A GOOD INNOVATOR?

Innovators are risk takers. This sentiment was expressed over and over throughout the Forum. Teachers and administrators must have the courage to try something new. They should not be penalized if a new idea does not work as they had hoped, but should be praised for trying. Without experimentation, great ideas will go undiscovered.

Innovators are visionary and creative. Innovators perceive the needs of students, teachers, and the community and have a vision for an improved lesson, classroom, school, or district. Participants discussed meetings that they attended where educators expressed their ultimate wishes and dreams for their schools; though these ultimate goals may not have been accomplished, it gave the educators a foundation on which to create new ideas.

Innovators are flexible. Because innovators are exploring new ideas, they cannot be sure of the outcome and often change the program as they proceed.

Innovators stay abreast of current research in their fields. This may mean knowing what new mathematics manipulatives have been created and how to use them, what educational technologies have become available, or what new information has been revealed about students' learning styles. Some participants also mentioned keeping informed about the current trends in educational reform and how schooling is impacted at the local, district, state, and national level.

Innovators attend workshops, seminars, and training sessions by outside consultants in order to learn about the methods or programs which they will use in their innovative programs. Participants reported that their districts had provided the support necessary for teachers or administrators to attend a conference in Chicago on mathematics teaching, visit Costa Rica in preparation for an elementary project on the rain forest, attend a grants-writing workshop, visit a school with an innovative science program, or bring in nationally-recognized experts on learning styles to conduct a one-week institute.

WHAT DO INNOVATORS NEED TO SUCCEED?

Innovators need ongoing professional development to learn new skills and knowledge and to deal with unexpected challenges. Follow-up and ongoing support were emphasized at the Forum as the most important aspects of successful staff development; one-shot workshops do not promote change. A number of Forum participants said that their efforts to change the way they taught would not have been possible without regular visits from the university professor or state-level administrator that had provided the initial training. This may be especially important when implementing new educational technologies about which teachers may be anxious. Teachers are also students who can benefit from demonstrations of new strategies and need time to practice what they learn. It may also be helpful to have teachers model the new techniques. For example, in an inservice about cooperative learning, teachers should be encouraged to enroll as teams and work together over an extended period to develop new strategies and lessons. Staff development should take into account teachers' own learning styles, interests, and time schedules and should be specific to the grades they teach.

Innovators need time to plan. Participants stated that the greater the time they had to plan and research their ideas, the more successful they were in implementing them. For example, one district administrator used extra planning time to tour every elementary classroom and talk to teachers about what they needed to improve mathematics teaching; she used this information to formulate an innovative and effective plan.

Innovators need others to help plan and to share ownership. As part of the planning process, participants emphasized the need to involve many of the people who may be affected by a change including teachers, parents, and principals. If these people are included in the decision making from the beginning, they are more likely to feel ownership of the innovation and to promote it. Teachers in one district learned that their ideas would be accepted by the superintendent more readily if proposed by a committee consisting of parents, teachers, and a district-level representative.

Innovators need some autonomy to make their own decisions. Granting innovators autonomy and some authority to make decisions encourages success and helps innovators feel ownership of their projects. A common sentiment of Forum participants was that their incentive for implementing ideas for change came from someone above them saying "Go for it" and letting them take the reigns. One principal said that he gives teachers in his school the freedom to decide what goes on in their classrooms and then convenes the teachers on a weekly basis to share ideas that have worked.

Innovators need support from leadership. Just as innovators need some independence, they also need support. Visionary leaders can help innovators stretch their expectations and be more creative. Participants emphasized that acceptance from leadership is critical to success; administrators must be willing to push for new ideas in order to support teachers. Leaders can also be instrumental in assuring that educators work as a team. Some participants discussed the difficulty encountered when they were practicing innovative strategies while colleagues were using traditional methods; the principals' efforts to bring teachers together to share and plan resolved some of this conflict.

A simple request from a leader can also be the motivating factor for initiating change. A pair of innovative teachers at the Forum had been invited to a series of workshops by a district administrator who asked them to implement what they were learning; this led to their award-winning cooperative classrooms. Another participant shared a story about her principal who announced that he wanted to see every mathematics teacher using a manipulative when he brought them their paycheck; very soon all the teachers in the school were trying new tactics and sharing with each other. A third example came from a teacher whose district had instituted a "No Ditto Paper Week" that inspired teachers to try something different.

Innovators need support from colleagues. Sharing new ideas among educators is key to sustaining innovative efforts. Most teachers need to feel acceptance and support from their peers. Contact with colleagues is also useful for transferring an innovation; enthusiasm and confidence can be "catching."

Innovators need feedback and praise. If educators are going to be innovative, they must have confidence in their own abilities. The best way to build this confidence is to praise them for their efforts. This is especially important for a new program which may require more and challenging work during the initial stages. Innovators will need plenty of encouragement and "pats on the back" to sustain their energy and commitment. One district represented at the Forum recognizes its teachers through an end-of-the-year banquet. Another uses the media to publicize successes of individual teachers and schools. A third posts plaques on the classroom doors of exceptional teachers. Participants noted that it is important to seek out recognition for innovators by nominating them for awards or developing a special ceremony.

Innovators need resources. Most innovative programs cannot be fully implemented without new materials, resources, or information. Participants had taken every opportunity to acquire free materials when developing their programs. Many solicited local organizations for assistance, volunteers, contributions, and equipment. Local businesses supported a number of innovative programs by sponsoring workshops, funding new ideas, and offering release time for employees to tutor students or make presentations to classes. While seeking resources may be a difficult task for some teachers, successful innovators encourage others not to be afraid to ask anyone for money and not to give up. Another avenue for increasing resources is through outside grants. Teachers or district administrators may benefit from workshops or publications on how to write winning grant proposals, and many at the Forum requested this information. One superintendent said that he hires experts to write proposals for the district; while this may seem a bit expensive, his district has received over two million dollars as a result.

Innovators need community support. Most Forum participants believe that innovators need to develop a network of community representatives, schools, local businesses, and others to promote educational change. Not only is this helpful for securing needed resources, but it allows innovators to gather input from a variety of perspectives. It also promotes ownership of a non-traditional program thereby decreasing the conflicts that may arise between parents and teachers or administrators. Suggestions for promoting community involvement include having a hands-on night for parents to explore new materials and technological resources, seeking media coverage of a new program, or asking the PTA to help recruit volunteers from the community.

How can innovative programs be expanded or transferred?

The following components are recommended for successful expansion or transfer of an innovative program:

Evaluation

Innovators in the initial program need to conduct appropriate and ongoing evaluations in order to determine how well the program is meeting its goals and to demonstrate that it is an improvement over past methods. Keeping records of what actions work well allows innovators to modify programs and see the value of their work. Positive results of evaluation will help "sell" the program to other schools and/or teachers, can be used to obtain outside resources, and may encourage more community members to get involved. Forum participants cautioned that evaluation is time-consuming and that educators may need release time for evaluation. Another option is to hire outside evaluators; one administrator said that he builds money for outside evaluators into every grant proposal.

Site visits

Teachers who want to try a new strategy may learn best by visiting and observing other teachers who are using it. This tactic may also convert skeptical teachers. An alternative to site visits is to videotape innovators in action and disseminate the tape to other schools or districts. (SERVE has videotaped innovative mathematics and science teachers at work and has a videotape series available entitled *Southern Solutions in Improving Mathematics and Science Education.*) A related activity to promote transfer of an innovative idea is to place experienced teachers from the program in new schools where they can demonstrate, counsel, and generate excitement.

Staff development run by teachers

Teachers trust what other teachers say. Having an experienced, enthusiastic teacher lead a professional development workshop adds credibility and encourages others to "buy in." Some districts give staff development money directly to teachers to plan their own inservice workshops. Forum participants offered a number of characteristics of good workshops for transferring innovative ideas:

- Invite/send the teachers who are best in a school and most enthusiastic about change, not those who need remediation.
- Distribute materials to teachers before the workshop.
- Do not criticize teachers' current efforts.
- Offer many ways to use the same strategy and let teachers choose what works best for them.
- Help teachers see how they can integrate a new strategy into their current work instead of viewing it as just another add-on.
- Make workshops informal and fun.

Teacher ownership

When an innovative program is implemented by other teachers or another school, success requires that those new teachers develop a sense of ownership of the program. This ownership can be cultivated by allowing teachers to express their needs and expectations for the innovation and to modify the program to meet those needs. Teachers who show particular interest or who volunteer to assist should be offered increased responsibility in the implementation of the program.

Teacher presentations

Innovators who share what they are doing not only have the potential to recruit others to use similar methods, but also receive insights on improving the program through questions and feedback from others. Districts should provide money and release time for teachers to travel to conferences or workshops and present their activities. Innovators can also develop videotapes, slide shows, or displays to present at meetings, distribute to the local media, or showcase in local businesses. Such presentations will also keep district-level administrators informed about what individual schools and teachers are doing.

RECOMMENDATIONS

The preceding pages focused on the needs and activities of individuals--particularly teachers--who are innovative. These innovators have, in turn, offered the following recommendations to those who are in a position to create or support innovative changes in education:

Recommendations for local-level administrators

- Be willing to dream; avoid thinking "we have no money so forget it."
- Do not let testing dictate curriculum and instruction.
- Hire teachers who are risk-takers and committed to and enthusiastic about change.
- Provide release time for teachers to travel to other schools.
- Encourage articulation between elementary, middle, and high school teachers.
- Allow time for the results of a new program to be demonstrated.
- Seek the involvement of those above you and make sure they look good through your efforts.
- Stay abreast of knowledge about content areas; seek out new ideas.
- Listen to teachers' suggestions for inservice activities and consultants.
- Consider creating a time span between the last day of school and the beginning of summer school in which to offer summer institutes in different areas for teachers.
- Seek out recognition; do not wait for others to come to you.
- Help students, parents, teachers, and administrators see positive results.

Recommendations for state policymakers

- Get input for policies from districts all over the state; needs vary considerably.
- Include teachers on policymaking boards.
- Offer seed money for new ideas that meet state priorities in education.
- Do not require additions or revisions to curriculum without money to support them.
- Integrate authentic student assessment strategies into accountability expectations.
- Encourage businesses that support education to see the value of alternative assessment tools in measuring success.
- Support developmentally appropriate practices for young children and avoid a rigid academic curriculum and testing for the early elementary grades.
- Discontinue "pull-out" programs that remove students from the classroom.

Recommendations for postsecondary teacher educators

- Provide prospective teachers with more information about teaching students through students' preferred learning styles, classroom management tools, new techniques such as concept mapping, using new forms of student assessment, evaluating one's own teaching, and participating in school-based management.
- Train teachers to use new technologies.
- Provide teachers with leadership skills.
- Model appropriate teaching methods in university classes.
- Spend more time in elementary and secondary schools in order to appreciate the changing classroom.

- Become more aware of the increasing diversity of students that teachers are encountering and provide suggestions for how to teach diverse classrooms.
- Ensure that new teachers have the skills to access information and solve problems; they will need to teach these to their students.
- Require preservice teachers, in their own classes, to produce knowledge and seek answers.
- Ensure that teachers are confident enough with content knowledge so that they are not "straight-jacketed" to the textbook.
- Educate all teachers about child development and developmentally appropriate practices for young children.

Recommendations for SERVE

Regarding needed information:

- Develop materials on assessing student groups and their work.
- Teach educators about cultivating positive public relations.
- Provide information to educators on becoming change agents.
- Develop information to counter negative perceptions of mathematics and science in society.
- Help educators find money by identifying potential funding sources, updating districts on new funding opportunities, and developing materials on writing grant proposals.

Regarding staff development:

- Develop and conduct training for teachers.
- Conduct training for staff development specialists in each district.
- Offer or support consultant-led workshops or summer institutes for teachers.
- Give teachers a menu of staff development options to choose from and encourage teachers to take workshops in areas that are new to them.
- Use professional educational organizations as a mechanism for advertising staff development opportunities.

Regarding dissemination activities:

- Offer networking opportunities to educators through computerized conferences and region-wide meetings.
- Provide relevant information at meetings which can be taken back to individual districts and used.
- Establish a regular booth at conferences to publicize successful programs in the region.
- Assist teachers in visiting innovative programs.
- Offer grants to demonstration sites to publicize their work and create videotapes and brochures about their programs.
- Act as a broker for innovative teachers who do not have time to publicize their activities and train other teachers.
- Hire teachers during the summer to create implementation manuals for the transfer of good programs.

APPENDICES

- A--"Getting Reform Right: What Works and What Doesn't" by M.G. Fullan and M.B. Miles. Reprinted with permission of *Phi Delta Kappan*
- B--Sharing Success Forum Agenda
- C--Sharing Success Forum Participants

Getting Reform Right: What Works and What Doesn't

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There are as many myths as there are truths associated with change, Messrs. Fullan and Miles assert, and educators need to deepen the way they think about change. To that end, the authors analyze seven reasons change fails and offer seven "propositions" for successful change.

By Michael G. Fullan and Matthew B. Miles

AFTER YEARS of failed education reform, educators are more and more in the habit of saying that "knowledge of the change process" is crucial. But few people really know what that means. The phrase is used superficially, glibly, as if saying it over and over will lead to understanding and appropriate action.

We do believe that knowing about the change process is crucial. But there are as many myths as there are truths associated with change, and it is time to deepen the way we think about change. We need to assess our knowledge more critically and describe what we know. One needs a good deal of sophistication to grasp the fundamentals of the change process and to use that knowledge wisely.

We also believe that serious education reform will never be achieved until there is a significant increase in the number of people – leaders and other participants alike – who have come to internalize and habitually act on basic knowledge of how successful change takes place. Reformers talk of the need for deeper, second-order changes in the structures and cultures of schools, rather than superficial first-order changes.[1] But no change would be more fundamental than a dramatic expansion of the capacity of individuals and organizations to understand and deal with change. This generic capacity is worth more than a hundred individual success stories of implementing specific innovations. As we shall see, even individual success stories don't last long without an appreciation of how to keep changes alive.

Rather than develop a new strategy for each new wave of reform, we must use basic knowledge about the do's and don'ts of bringing about *continuous improvement*. In this article we present this knowledge in the form of seven basic reasons why reform fails – and seven propositions that could lead to success.

MICHAEL G. FULLAN is dean of the Faculty of Education at the University of Toronto. MATTHEW B. MILES is a senior research associate with the Center for Policy Research, New York, N.Y.

WHY REFORM FAILS

Schools and districts are overloaded with problems – and, ironically, with solutions that don't work. Thus things get worse instead of better. Even our rare success stories appear as isolated pockets of excellence and are as likely to atrophy as to prosper over time. We get glimpses of the power of change, but we have little confidence that we know how to harness forces for continuous improvement. The problem is not really lack of innovation, but the enormous overload of fragmented, uncoordinated, and ephemeral attempts at change.

We begin with reasons why typical approaches do not work. In our view there are seven basic reasons why reforms fail. Though each one has its own form, these seven should be understood in combination, as a set.

1. Faulty maps of change. It's hard to get to a destination when your map doesn't accurately represent the territory you're to traverse. Everyone involved in school reform – teachers, administrators, parents, students, district staff members, consultants, board members, state department officials, legislators, materials developers, publishers, test-makers, teacher educators, researchers – has a personal map of how change proceeds. These constructs are often expressed in the form of a proposition or statement.

1. Resistance is inevitable, because people resist change.

2. Every school is unique.

3. *Plus ça change, plus c'est la même chose.*

4. Schools are essentially conservative institutions, harder to change than other organizations.

5. You just have to live reform one day at a time.

6. You need a mission, objectives, and a series of tasks laid out well in advance.

Illustration by Mario Noche

7. You can never please everyone, so just push ahead with reforms.

8. Full participation of everyone involved in a change is essential.

9. Keep it simple, stupid: go for small, easy changes rather than big, demanding ones.

10. Mandate change, because people won't do it otherwise.

People act on their maps. But maps such as these don't provide reliable or valid guidance. Some, like number 1, are simply self-sealing and tautological. Others, like number 2, are true in the abstract but totally unhelpful in providing guidance. Imagine if a Michelin guide book were to tell you that "each restaurant is unique," refuse to make ratings, and tell you that you're on your own.

Some, like number 3, have the seductive appearance of truth, though they are mostly false. It stretches the bounds of credulity to say that the schools we see today are no different from those of yesteryear or that all change efforts are self-defeating. Such maps are self-defeating. At their worst, they tell us that nothing really changes – and that nothing will work. On such self-exculpatory propositions as number 4, there's simply very little evidence, and what there is leads to the verdict of "not proven."[2]

Sometimes our maps are in conflict with themselves or with the maps of colleagues. For example, number 5 advocates the virtues of improvisation, while number 6 lauds rational planning. In fact, the literature on organizational change and a recent study of major change in urban high schools show that *neither* statement is valid as a guide to successful school reform.[3] The same appears to be true for propositions 7 and 8.

Still other mapping statements are directly contradicted by empirical evidence. For example, though number 9 looks obvious, studies of change have repeatedly found that substantial change efforts that address multiple problems are more likely to succeed and survive than small-scale, easily trivialized innovations.[4]

And number 10, as attractive as it may be politically, simply doesn't work. Indeed, it often makes matters worse. You can't mandate important changes, because they require skill, motivation, commitment, and discretionary judgment on the part of those who must change.[5]

Our aim here is not to debunk all our maps. Maps are crucial. But unless a map is a valid representation of the territory, we won't get where we want to go. Later in this article, we will outline a map that, we believe, corresponds well with the real territory of change.

We must have an approach to reform that acknowledges that we may not know all the answers.

2. Complex problems. Another major reason for the failure of reform is that the solutions are not easy – or even known in many cases. A number of years ago Arthur Wise labeled this problem the "hyperrationalization" of reform:

> To create goals for education is to will that something occur. But goals, in the absence of a theory of how to achieve them, are mere wishful thinking. If there is no reason to believe a goal is attainable – perhaps evidenced by the fact that it has never been attained – then a rational planning model may not result in goal attainment.[6]

The reform agenda has broadened in fundamental ways in the last five years. One need only mention the comprehensive reform legislation adopted in virtually every state and the scores of restructuring efforts in order to realize that current change efforts are enormously complex – both in the substance of their goals and in the capacity of individuals and institutions to carry out and coordinate reforms.

Education *is* a complex system, and its reform is even more complex. Even if one considers only seemingly simple, first-order changes, the number of components and their interrelationships are staggering: curriculum and instruction, school organization, student services, community involvement, teacher inservice training, assessment, reporting, and evaluation. Deeper, second-order changes in school cultures, teacher/student relationships, and values and expectations of the system are all the more daunting.

Furthermore, higher-order educational goals for all students require knowledge and abilities that we have never demonstrated. In many cases, we simply don't know how to proceed; solutions have yet to be developed. This is no reason to stop trying, but we must remember that it is folly to act as if we know how to solve complex problems in short order. We must have an approach to reform that acknowledges that we don't necessarily know all the answers, that is conducive to developing solutions as we go along, and that sustains our commitment and persistence to stay with the problem until we get somewhere. In other words, we need a different map for solving complex rather than simple problems.

3. Symbols over substance. In the RAND-sponsored study of federal programs supporting educational change, Paul Berman and Milbrey McLaughlin found that some school districts adopted external innovations for opportunistic reasons rather than to solve a particular problem. These apparent reforms brought extra resources (which were not necessarily used for the intended purpose), symbolized that action was being taken (whether or not follow-up occurred), and furthered the careers of the innovators (whether or not the innovation succeeded). Thus the mere appearance of innovation is sometimes sufficient for achieving political success.

Education reform is as much a political as an educational process, and it has both negative and positive aspects. One need not question the motives of political decision makers to appreciate the negative. Political time lines are at variance with the time lines for education reform. This difference often results in vague goals, unrealistic schedules, a preoccupation with symbols of reform (new legislation, task forces, commissions, and the like), and shifting priorities as political pressures ebb and flow.

We acknowledge that symbols are essential for success. They serve to crys-

tallize images and to attract and generate political power and financial resources. Symbols can also provide personal and collective meaning and give people faith and confidence when they are dealing with unclear goals and complex situations.[7] They are essential for galvanizing visions, acquiring resources, and carrying out concerted action. When symbols and substance are congruent, they form a powerful combination.

Nonetheless, reform often fails because politics favors symbols over substance. Substantial change in practice requires a lot of hard and clever work "on the ground," which is not the strong point of political players. After several experiences with the dominance of symbolic change over substantive change, people become cynical and take the next change that comes along much less seriously.

Symbolic change does not have to be without substance, however. Indeed, the best examples of effective symbols are grounded in rituals, ceremonies, and other events in the daily life of an organization. While we cannot have effective reform without symbols, we can easily have symbols without effective reform — the predominant experience of most educators and one that predisposes them to be skeptical about *all* reforms.

Reforms also fail because our attempts to solve problems are frequently superficial.

4. Impatient and superficial solutions. Reforms also fail because our attempts to solve problems are frequently superficial. Superficial solutions, introduced quickly in an atmosphere of crisis, normally make matters worse.[8] This problem is all the more serious now that we are tackling large-scale reforms, for the consequences of failure are much more serious.

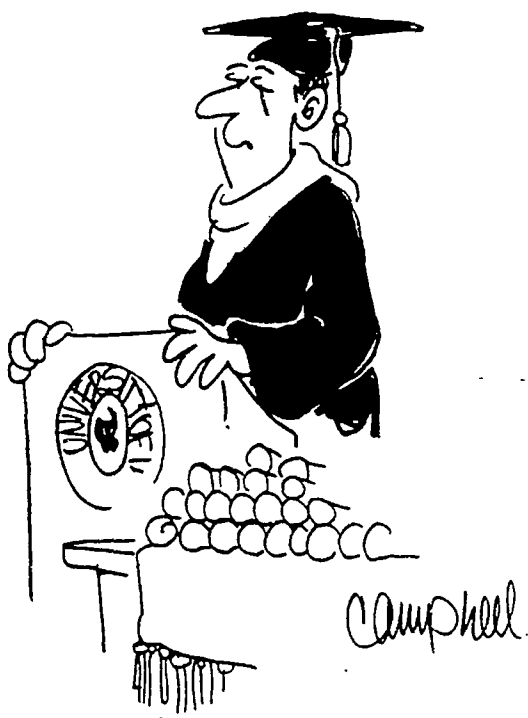
Reforms in structure are especially susceptible to superficiality and unrealistic time lines, because they can be launched through political or administrative mandates. Two examples at opposite ends of the political spectrum provide cases in point. A recent study of the impact of statewide testing in two states found that, while new testing mandates caused action at the local level, they also narrowed the curriculum and created adverse conditions for reform:

> [C]oping with the pressure to attain satisfactory results in high-stakes tests caused educators to develop almost a "crisis mentality" in their approach, in that they jumped quickly into "solutions" to address a specific issue. They narrowed the range of instructional strategies from which they selected means to instruct their students: they narrowed the content of the material they chose to present to students: and they narrowed the range of course offerings available to students.[9]

Site-based management — opposite in many ways to the strategy of centralized testing — also shows problems associated with structural reforms. Daniel Levine and Eugene Eubanks, among others, have indicated how school-based models often result in changes in formal decision-making structures but rarely result in a focus on developing instructional skills or on changing the culture of schools.[10] There are numerous other examples of new legislation and policies — career ladders, mentoring and induction policies, testing and competency requirements, and so on — being rushed into place with little forethought about possible negative consequences and side effects.

A related bane of reform is faddism. Schools, districts, and states are under tremendous pressure to reform. Innovation and reform are big business, politically and economically. The temptation is great to latch on to the quick fix, to go along with the trend, to react uncritically to endorsed innovations as they come and go. Local educators experience most school reforms as fads.

There are two underlying problems. One is that mistaken or superficial solutions are introduced; the other is that,



"For many years, you've been preparing to enter uncharted waters — and today you walk the plank."

even when the solution is on the right track, hasty implementation leads to failure. Structural solutions are relatively easy to initiate under the right political conditions, but they are no substitute for the hard work, skill, and commitment needed to blend different structural changes into a successful reform effort. In other words, changes in structure must go hand in hand with changes in culture and in the individual and collective capacity to work through new structures. Because education reform is so complex, we cannot know in advance exactly which new structures and behavioral patterns should go together or how they should mesh. But we do know that neglecting one or the other is a surefire recipe for failure.

5. **Misunderstanding resistance.** Things hardly ever go easily during change efforts. Since change necessarily involves people, and people can commit willed actions, it seems natural to attribute progress that is slower than we might wish to their "resistance." Before a recent workshop, one of us asked a group of principals to list the problems they faced in a specific change project. More than half said "resistance" – variously known as intransigence, entrenchment, fearfulness, reluctance to buy in, complacency, unwillingness to alter behaviors, and failure to recognize the need for change. These traits were attributed to teachers and other staff members, though not to the principals themselves.

But it is usually unproductive to label an attitude or action "resistance." It diverts attention from real problems of implementation, such as diffuse objectives, lack of technical skill, or insufficient resources for change. In effect, the label also individualizes issues of change and converts everything into a matter of "attitude." Because such labeling places the blame (and the responsibility for the solution) on others, it immobilizes people and leads to "if only" thinking.

Change does involve individual attitudes and behaviors, but they need to be framed as natural responses to transition, not misunderstood as "resistance." During transitions from a familiar to a new state of affairs, individuals must normally confront the loss of the old and commit themselves to the new, unlearn old beliefs and behaviors and learn new ones, and move from anxiousness and uncertainty to stabilization and coherence. Any significant change involves a period of intense personal and organizational learning and problem solving. People need supports for such work, not displays of impatience.

Failure to institutionalize an innovation underlies the disappearance of many reforms.

Blaming "resistance" for the slow pace of reform also keeps us from understanding that individuals and groups faced with something new need to assess the change for its genuine possibilities and for how it bears on their self-interest. From computers across the curriculum, to mainstreaming, to portfolio assessments, to a radical change in the time schedule, significant changes normally require extra effort during the transitional stage. Moreover, there's little certainty about the kinds of outcomes that may ensue for students and teachers (and less assurance that they will be any better than the status quo). These are legitimate issues that deserve careful attention.

Many reform initiatives are ill-conceived, and many others are fads. The most authentic response to such efforts is resistance. Nevertheless, when resistance is misunderstood, we are immediately set on a self-defeating path. Reframing the legitimate basis of most forms of resistance will allow us to get a more productive start and to isolate the real problems of improvement.

6. **Attrition of pockets of success.** There are many examples of successful reforms in individual schools – cases in which the strong efforts of teachers, principals, and district administrators have brought about significant changes in classroom and school practice.[11] We do not have much evidence about the durability of such successes, but we have reason to believe that they may not survive if the conditions under which they developed are changed.

Successful reforms have typically required enormous effort on the part of one or more individuals – effort that may not be sustainable over time. For example, staff collaboration takes much energy and time to develop, yet it can disappear overnight when a few key people leave. What happens outside the school – such as changes in district policies on the selection and transfer of teachers and principals – can easily undo gains that have been made.

Local innovators, even when they are successful in the short run, may burn themselves out or unwittingly seal themselves off from the surrounding environment. Thus schools can become hotbeds of innovation and reform in the absence of external support, but they cannot *stay* innovative without the continuing support of the district and other agencies. Innovative schools may enjoy external support from a critically important sponsor (e.g., the district superintendent) or from a given agency only to see that support disappear when the sponsor moves on or the agency changes policies. Of course, the failure to institutionalize an innovation and build it into the normal structures and practices of the organization underlies the disappearance of many reforms.[12]

We suspect that few things are more discouraging than working hard against long odds over a period of time to achieve a modicum of success – only to see it evaporate in short order as unrelated events take their toll. It is not enough to achieve isolated pockets of success. Reform fails unless we can demonstrate that pockets of success add up to new structures, procedures, and school cultures that press for continuous improvement. So far there is little such evidence.

7. **Misuse of knowledge about the change process.** The final problem is related to a particular version of faulty maps: "knowledge" of the change process is often cited as the authority for taking certain actions. Statements such as "Ownership is the key to reform," "Lots of inservice training is required," "The school is the unit of change," "Vision and leadership are critical," and so on are all

half-truths. Taken literally, they can be misused.

Reform is systemic, and actions based on knowledge of the change process must be systemic, too. To succeed we need to link a number of key aspects of knowledge and maintain the connections before and during the process of change. In the following section we offer seven such themes, which we believe warrant being called propositions for success.

PROPOSITIONS FOR SUCCESS

The seven basic themes or lessons derived from current knowledge of successful change form a set and must be contemplated in relation to one another. When it comes to reform, partial theories are not very useful. We can say flatly that reform will not be achieved until these seven orientations have been incorporated into the thinking and reflected in the actions of those involved in change efforts.

1. Change is learning – loaded with uncertainty. Change is a process of coming to grips with new personal meaning, and so it is a learning process. Peter Marris states the problem this way:

> When those who have the power to manipulate changes act as if they have only to explain, and when their explanations are not at once accepted, shrug off opposition as ignorance or prejudice, they express a profound contempt for the meaning of lives other than their own. For the reformers have already assimilated these changes to their purposes, and worked out a reformulation which makes sense to them, perhaps through months or years of analysis and debate. If they deny others the chance to do the same, they treat them as puppets dangling by the threads of their own conceptions.[13]

Even well-developed innovations represent new meaning and new learning for those who encounter them initially and require time to assimilate them. So many studies have documented this early period of difficulty that we have given it a label – "the implementation dip."[14] Even in cases where reform eventually succeeds, things will often go wrong before they go right. Michael Huberman and Matthew Miles found that the absence of early difficulty in a reform effort was usually a sign that not much was being attempted; superficial or trivial change was being substituted for substantial change.[15]

More complex reforms, such as restructuring, represent even greater uncertainty: first, because more is being attempted; second, because the solution is not known in advance. In short, anxiety, difficulties, and uncertainty are *intrinsic to all successful change*.

Ownership of a reform cannot be achieved *in advance* of learning something new.

One can see why a climate that encourages risk-taking is so critical. People will not venture into uncertainty unless there is an appreciation that difficulties encountered are a natural part of the process. And if people do not venture into uncertainty, no significant change will occur.

Understanding successful change as learning also puts ownership in perspective. In our view, ownership of a reform cannot be achieved *in advance* of learning something new. A deep sense of ownership comes only through learning. In this sense, ownership is stronger in the middle of a successful change process than at the beginning and stronger still at the end. Ownership is both a process and a state.

The first proposition for success, then, is to understand that all change involves learning and that all learning involves coming to understand and to be good at something new. Thus conditions that support learning must be part and parcel of any change effort. Such conditions are also necessary for the valid rejection of particular changes, because many people reject complex innovations prematurely, that is, before they are in a sound position to make such a judgment.

2. Change is a journey, not a blueprint. If change involved implementing single, well-developed, proven innovations one at a time, perhaps we could make blueprints for change. But school districts and schools are in the business of implementing a bewildering array of innovations and policies simultaneously. Moreover, reforms that aim at restructuring are so multifaceted and complex that solutions for any particular setting cannot be known in advance. If one tries to account for the complexity of the situation with an equally complex implementation plan, the process will become unwieldy, cumbersome, and usually unsuccessful.

There can be no blueprints for change, because rational planning models for complex social change (such as education reform) do not work. Rather, what is needed is a guided journey. Karen Seashore Louis and Matthew Miles provide a clear analysis of this evolutionary planning process in their study of urban high schools involved in major change efforts:

> The evolutionary perspective rests on the assumption that the environment both inside and outside organizations is often chaotic. No specific plan can last for very long, because it will either become outmoded due to changing external pressures, or because disagreement over priorities arises within the organization. Yet there is no reason to assume that the best response is to plan passively, relying on incremental decisions. Instead, the organization can cycle back and forth between efforts to gain normative consensus about what it may become, to plan strategies for getting there, and to carry out decentralized incremental experimentation that harnesses the creativity of all members to the change effort. . . . Strategy is viewed as a flexible tool, rather than a semi-permanent expansion of the mission.[16]

The message is not the traditional "Plan, then do," but "Do, then plan . . . and do and plan some more." Even the development of a shared vision that is central to reform is better thought of as a journey in which people's sense of purpose is identified, considered, and continuously shaped and reshaped.

3. Problems are our friends. School

improvement is a problem-rich process. Change threatens existing interests and routines, heightens uncertainty, and increases complexity. The typical principal in the study of urban schools conducted by Louis and Miles mentioned three or four major problems (and several minor ones) with reform efforts. They ranged from poor coordination to staff polarization and from lack of needed skills to heart attacks suffered by key figures. Problems arise naturally from the demands of the change process itself, from the people involved, and from the structure and procedures of schools and districts. Some are easily solved; others are almost intractable.

It seems perverse to say that problems are our friends, but we cannot develop effective responses to complex situations unless we actively seek and confront real problems that are difficult to solve. Problems are our friends because only through immersing ourselves in problems can we come up with creative solutions. Problems are the route to deeper change and deeper satisfaction. In this sense, effective organizations "embrace problems" rather than avoid them.

Too often, change-related problems are ignored, denied, or treated as an occasion for blame and defense. Success in school reform efforts is much more likely when problems are treated as natural, expected phenomena. Only by tracking problems can we understand what we need to do next to get what we want. Problems must be taken seriously, not attributed to "resistance" or to the ignorance and wrongheadedness of others.

What to do about problems? In their study of urban schools, Louis and Miles classified coping styles, ranging from relatively shallow ones (doing nothing at all, procrastinating, "doing it the usual way," easing off, or increasing pressure) to deeper ones (building personal capacity through training, enhancing system capacity, comprehensive restaffing, or system restructuring/redesign). They found that schools that were least successful at change *always* used shallow coping styles. Schools that were successful in changing could and did make structural changes in an effort to solve difficult problems. However, they were also willing to use Band-Aid solutions when a problem was judged to be minor. It's important to note that successful schools did *not* have fewer problems than other schools – they just coped with them better.

The enemies of good coping are passivity, denial, avoidance, conventionality, and fear of being "too radical." Good coping is active, assertive, inventive. It goes to the root of the problem when that is needed.

Success in school reform efforts is much more likely when problems are treated as natural.

We cannot cope better through being exhorted to do so. "Deep coping" – the key to solving difficult problems of reform – appears to be more likely when schools are working on a clear, shared vision of where they are heading and when they create an active coping structure (e.g., a coordinating committee or a steering group) that steadily and actively tracks problems and monitors the results of coping efforts. Such a structure benefits from empowerment, brings more resources to bear on problems, and keeps the energy for change focused. In short, the assertive pursuit of problems in the service of continuous improvement is the kind of accountability that can make a difference.

4. Change is resource-hungry. Even a moderate-sized school may spend a million dollars a year on salaries, maintenance, and materials. And that's just for keeping schools as they are, not for changing them. Change demands additional resources for training, for substitutes, for new materials, for new space, and, above all, for time. Change is "resource-hungry" because of what it represents – developing solutions to complex problems, learning new skills, arriving at new insights, all carried out in a social setting already overloaded with demands. Such serious personal and collective development necessarily demands resources.

Every analysis of the problems of change efforts that we have seen in the last decade of research and practice has concluded that time is the salient issue. Most recently, the survey of urban high schools by Louis and Miles found that the average principal with a schoolwide reform project spent 70 days a year on change management. That's 32% of an administrator's year. The teachers most closely engaged with the change effort spent some 23 days a year, or 13% of their time on reform. Since we have to keep school while we change school, such overloads are to be expected.

But time is energy. And success is likely only when the extra energy requirements of change are met through the provision of released time or through a redesigned schedule that includes space for the extra work of change.

Time is also money. And Louis and Miles discovered that serious change in big-city high schools requires an annual investment of between $50,000 and $100,000. They also found some schools spending five times that much with little to show for it. The key seemed to be whether the money simply went for new jobs and expensive equipment or was spent for local capacity-building (acquiring external assistance, training trainers, leveraging other add-on funds, and so on). Nevertheless, some minimum level of funding is always needed.

Assistance itself can be a major resource for change. It may include training, consulting, coaching, coordination, and capacity-building. Many studies have suggested that good assistance to schools is strong, sustained over years, closely responsive to local needs, and focused on building local capacity. Louis and Miles found that at least 30 days a year of *external* assistance – with more than that provided internally – was essential for success.

We can also think of educational "content resources" – such big ideas as effective schools, teaching for understanding, empowerment, and school-based management – that guide and energize the work of change. In addition, there are psychosocial resources, such as support, commitment, influence, and power. They're

supposedly intangible, but they are critical for success.

The work of change requires attention not just to resources, but to "resourcing." The actions required are those of scanning the school and its environment for resources and matching them to existing needs; acquiring resources (buying, negotiating, or just plain grabbing); reworking them for a better fit to the situation; creating time through schedule changes and other arrangements; and building local capacity through the development of such structures as steering groups, coordinating committees, and cadres of local trainers.

Good resourcing requires facing up to the need for funds and abjuring any false pride about self-sufficiency. Above all, it takes willingness to invent, to go outside the frame in garnering and reworking resources. (We are reminded of the principal who used money for the heating system to pay for desperately needed repainting and renovation, saying, "I knew that, if the boiler broke, they'd have to fix it anyway.") The stance is one of steady and tenacious searching for and judicious use of the extra resources that any change requires. Asking for assistance and seeking other resources are signs of strength, not weakness.

5. Change requires the power to manage it. Change initiatives do not run themselves. They require that substantial effort be devoted to such tasks as monitoring implementation, keeping everyone informed of what's happening, linking multiple change projects (typical in most schools), locating unsolved problems, and taking clear coping action. In Louis and Miles' study, such efforts occurred literally 10 times more frequently in successfully changing schools than in unchanging ones.

There appear to be several essential ingredients in the successful management of change. First, the management of change goes best when it is carried out by a *cross-role group* (say, teachers, department heads, administrators, and – often – students and parents). In such a group different worlds collide, more learning occurs, and change is realistically managed. There is much evidence that steering a change effort in this way results in substantially increased teacher commitment.

Second, such a cross-role group needs *legitimacy* – i.e., a clear license to steer. It needs an explicit contract, widely understood in the school, as to what kinds of decisions it can make and what money it can spend. Such legitimacy is partly conferred at the front end and partly earned through the hard work of decision making and action. Most such groups do encounter staff polarization: they may be seen by others as an unfairly privileged elite; or they may be opposed on ideological grounds. Such polarization – often a sign that empowerment of a steering group is working – can be dealt with through open access to meetings, rotation of membership, and scrupulous reporting.

The management of change goes best when it is carried out by a *cross-role group*.

Third, even empowerment has its problems, and cooperation is required to solve them. Everyone has to learn to take the initiative instead of complaining, to trust colleagues, to live with ambiguity, to face the fact that shared decisions mean conflict. Principals have to rise above the fear of losing control, and they have to hone new skills: initiating actions firmly without being seen as "controlling," supporting others without taking over for them. All these stances and skills are learnable, but they take time. Kenneth Benne remarked 40 years ago that the skills of cooperative work should be "part of the general education of our people."[17] They haven't been, so far. But the technology for teaching these skills exists. It is up to steering groups to learn to work well together, using whatever assistance is required.

Fourth, the power to manage change does not stop at the schoolhouse door. Successful change efforts are most likely when the local district office is closely engaged with the changing school in a collaborative, supportive way and places few bureaucratic restrictions in the path of reform.

The bottom line is that the development of second-order changes in the culture of schools and in the capacity of teachers, principals, and communities to make a difference *requires* the power to manage the change at the local school level. We do not advocate handing over all decisions to the school. Schools and their environments must have an interactive and negotiated relationship. But complex problems cannot be solved from a distance; the steady growth of the power to manage change must be part of the solution.

6. Change is systemic. Political pressures combine with the segmented, uncoordinated nature of educational organizations to produce a "project mentality."[18] A steady stream of episodic innovations – cooperative learning, effective schools research, classroom management, assessment schemes, career ladders, peer coaching, etc., etc. – come and go. Not only do they fail to leave much of a trace, but they also leave teachers and the public with a growing cynicism that innovation is marginal and politically motivated.

What does it mean to work systemically? There are two aspects: 1) reform must focus on the development and interrelationships of all the main *components* of the system simultaneously – curriculum, teaching and teacher development, community, student support systems, and so on; and 2) reform must focus not just on structure, policy, and regulations but on deeper issues of the *culture* of the system. Fulfilling both requirements is a tall order. But it is possible.

This duality of reform (the need to deal with system components and system culture) must be attended to at both the state and district/school levels. It involves both restructuring and "reculturing."[19] Marshall Smith and Jennifer O'Day have mapped out a comprehensive plan for systemic reform at the state level that illustrates the kind of thinking and strategies involved.[20] At the school/district level, we see in the Toronto region's Learning Consortium a rather clear example of systemic reform

Wishful thinking and legislation have poor records as tools for social betterment.

in action.[21] Schools, supported by their districts, avoid ad hoc innovations and focus on a variety of coordinated short-term and mid- to long-term strategies. The short-term activities include inservice professional development on selected and interrelated themes; mid- to long-term strategies include vision building, initial teacher preparation, selection and induction, promotion procedures and criteria, school-based planning in a system context, curriculum reorganization, and the development of assessments. There is an explicit emphasis on new cultural norms for collaborative work and on the pursuit of continuous improvement.

Systemic reform is complex. Practically speaking, traditional approaches to innovation and reform in education have not been successful in bringing about lasting improvement. Systemic reform looks to be both more efficient and more effective, even though this proposition is less proven empirically than our other six. However, both conceptually and practically, it does seem to be on the right track.[22]

7. All large-scale change is implemented locally. Change cannot be accomplished from afar. This cardinal rule crystallizes the previous six propositions. The ideas that change is learning, change is a journey, problems are our friends, change is resource-hungry, change requires the power to manage, and change is systemic all embody the fact that *local* implementation by everyday teachers, principals, parents, and students is the only way that change happens.

This observation has both an obvious and a less obvious meaning. The former reminds us all that any interest in system-wide reform must be accompanied by a preoccupation with how it plays itself out locally. The less obvious implication can be stated as a caution: we should not assume that only the local level counts and hand everything over to the individual school. A careful reading of the seven propositions together shows that extra-local agencies have critical – though decidedly not traditional – roles to play. Most fundamentally, their role is to help bring the seven propositions to life at the local level.

Modern societies are facing terrible problems, and education reform is seen as a major source of hope for solving them. But wishful thinking and legislation have deservedly poor track records as tools for social betterment. As educators increasingly acknowledge that the "change process is crucial," they ought to know what that means at the level at which change actually takes place. Whether we are on the receiving or initiating end of change (as all of us are at one time or another), we need to understand why education reform frequently fails, and we need to internalize and live out valid propositions for its success. Living out the seven propositions for successful change means not only making the change process more explicit within our own minds and actions, but also contributing to the knowledge of change on the part of those with whom we interact. Being knowledgeable about the change process may be both the best defense and the best offense we have in achieving substantial education reform.

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APPENDIX B

SHARING SUCCESS FORUM
AGENDA
MAY 22, 1992

8:00 a.m.	Continental Breakfast
8:30 a.m.	General Session Introduction Overview of Sharing Success Purpose of the Forum
9:00 a.m. -- 12:00 p.m.	**Concurrent Sessions**
9:00 a.m.	**Session A:** Getting an innovative program started. **Session B:** Overcoming barriers and pitfalls.
10:15 a.m. -- 10:45 a.m.	Break and Demonstration of SERVE-Line (SERVE's Electronic Bulletin Board)
10:45 a.m.	**Session C:** Transferring innovations to other teachers and schools. **Session D:** District and school support of innovative teachers.
12:00 p.m.	Luncheon
Concurrent Sessions (continued) 1:30 p.m. -- 2:30 p.m.	**Session E:** Recommendations to state policymakers and postsecondary institutions.
2:30 p.m. -- 3:00 p.m.	**Session F:** Recommendations on how the SERVE Lab can help to improve Math and Science in the region.
	Wrap-up Session/Building a Network

APPENDIX C

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